ADDENDUM #1 – April 24, 2025

ADDENDUM NO. ONE to the plans and specifications for the Presque Isle County Annex Court Bldg. HVAC, Roof and Bldg. Renovations at 151 E. Huron Ave., Rodgers City, Michigan 49779, dated April 15, 2025, Prepared by JFR Architects, PC, 33668 Bartola Drive, Sterling Heights, MI 48312, 586-436-0187, jfrarchitects@gmail.com.

The above plans and specifications are modified, supplemented, or augmented as follows, and this ADDENDUM NO. ONE, is hereby made a part of the contract documents.

CLARIFICATIONS:

ITEM NO. 01: **Clarification to Invitation to Bid, Bidding Information and Bid Form**

DATE and TIME CHANGE

The Pre-Bid Meeting will be rescheduled to Wednesday May 7, 2025, at 11:00am local time at the project site in the Board / Conference Room.

ITEM NO. 02: **Clarification to Invitation to Bid, Bidding Information and Bid Form**

DATE and TIME CHANGE

The Bid Due date will be rescheduled to Wednesday May 21, 2025, at 10:00am local time delivered to the Presque Isle County Clerk's Office.

END OF ADDENDUM NO. 1

PROJECT MANUAL & SPECIFICATIONS

PROJECT NUMBER: 24-028
APRIL 15, 2025

PROJECT:

H.V.A.C. and ROOFING
and BUILDING RENOVATIONS

PRESQUE ISLE COUNTY ANNEX COURT BUILDING

151 E. HURON STREET
ROGERS CITY, MICHIGAN 49779

OWNER:

PRESQUE ISLE COUNTY
151 E. Huron Ave.
Rodgers City, MI 49779
989-734-3288

PROJECT IDENTIFICATION

PROJECT:
PRESQUE ISLE COUNTY
H.V.A.C., ROOFING and BLDG. RENOVATIONS
151 E. Huron Ave.
Rodgers City, Michigan 49779

OWNER:
PRESQUE ISLE COUNTY
151 E. Huron Ave.
Rodgers City, Michigan 49779
(989) 734-3288

ARCHITECT:
JFR ARCHITECTS, PC
33668 Bartola Drive
Sterling Heights, MI 48312
(586) 436 – 0187

STRUCTURAL ENGINEER:
JURMU ENGINEERING
10856 Larson Road
Pelkie, MI 49958
(906) 353-6112

MECHANICAL ENGINEER:
Lawrin Engineering, Inc.
41000 Woodward Ave,
Suite 350 East #4265
Bloomfield Hills, MI 48304
(586) 601-4219

ELECTRICAL ENGINEER:
IRON CORE ENGINEERING
3200 Auten Road
Ortonville, MI 48462
(810) 919-2120

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SECTION 00 00 50 - INVITATION FOR BIDS

PROJECT

PRESQUE ISLE COUNTY
H.V.A.C., ROOFING and BLDG. RENOVATIONS
151 E. Huron Ave.
Rodgers City, Michigan 49779

OWNER

PRESQUE ISLE COUNTY
151 E. Huron Ave.
Rodgers City, Michigan 49779
(989) 734-3288

ARCHITECT

JFR ARCHITECTS, PC
33668 Bartola Drive
Sterling Heights, Michigan 48312
586-436-0187
jfrarchitects@gmail.com

PROJECT DESCRIPTION:

The work consists of the basic following highlights:

1. The work generally included is the removal and replacement of the existing roof top mechanical units with new “ground mounted” air handler units, all associated duct work and diffuser work, VAV boxes will be included as part of the necessary work scope.

2. All associated roofing removal and replacement required for the removed roof top units and new mechanical systems are included in the work scope.

3. All associated site and civil work required for the new mechanical systems are included in the work scope.

4. All electrical power and lighting work required for the new mechanical systems are included in the work.

5. Also included is associated architectural work required for the new mechanical systems, including but not limited to removal and replacement of ceiling system, exterior walls, exterior windows , doors and storefronts, carpentry as necessary for a complete project.

TYPE OF PROPOSAL:

A single lump sum proposal is being entertained for all the work of the proposal.

DATE OF SUBMISSION:

Until 10:00 a.m., Local Time., Wednesday, May 14, 2025, the Owner will receive sealed proposals for work herein set forth, at the Presque Isle County Clerk's office at 151 E. Huron Ave, Rodgers City, Michigan 49779, the proposals will be publicly opened and read aloud shortly thereafter.

PROPOSAL GUARANTY:

Each proposal must be accompanied by a certified check, cashiers check, or a satisfactory Surety Bid Bond in an amount not less than five percent (5%) of the total bid price as guaranty. No bid shall be considered unless it is accompanied by the required guaranty.

Checks shall be made payable to Presque Isle County

Such cash, checks, or bid bonds will be returned to all except the three (3) lowest bidders for each contract within twenty (20) days after the opening of bids, and the remaining cash, checks, or bid bonds will be returned promptly after the Owner and the accepted bidders have executed the Contract, or if no award has been made, within ninety (90) days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

CONTRACT SECURITY:

The successful bidders will be required to furnish a satisfactory performance and labor and material payment bond each in an amount equal to 100 percent of the Contract Sum, within five (5) days after notification of intent to enter into Contract. All bonds must be in good standing companies from United States of America origination, with not less than best A+ or better rating. Failure to do so will result in forfeiture of proposal guaranty.

INSURANCE REQUIRMENTS:

The successful contractor shall submit a Certificate of Insurance prior to the signing of a contract meeting the minimum limits of liabilities as outlined in this Project Manual. All insurance carriers must be acceptable to the County and licensed in the State of Michigan. The Contractor shall not allow for any lapse of insurance coverage in the amounts required. Failure of the Contractor to maintain the required insurance shall be grounds for contract cancellation.

Cancellation Notice: Compensation Insurance, Commercial General Liability Insurance and Motor Vehicle Liability Insurance, as described above, shall include an endorsement stating the following: “It is understood and agreed that thirty (30) days Advance Written Notice of Cancellation, Non-Renewal, Reduction and/or Material Change shall be sent to Presque Isle County Clerk’s Office, 151 E. Huron Ave., Rogers City, MI. 49799.”

If any of the above coverage’s expires during the term of the contract, the Contractor shall deliver renewal certificates and/or policies to the Presque Isle County Clerks Office at least ten (10) days prior to the expiration date

HOLD HARMLESS:

To the fullest extent permitted by law, Vendor agrees to defend, pay in behalf of, indemnify and hold harmless Presque Isle County, its elected and appointed officials, employees and volunteers and others working in behalf of Presque Isle County against any and all claims, demands, suits, or loss, including all costs and attorney fees connected therewith, and for any damages which may be asserted, claimed or recovered against or from Presque Isle County, its elected and appointed officials, employees, volunteers or others working in behalf of Presque Isle County by reason of personal injury, including bodily injury and death and/or property damage, including loss of use thereof, which arises out of or is in any way connected or associated with this contract.

GENERAL REQUIREMENTS:

These guidelines are provided to assist contractors submitting in response to this Request for Proposal in formulating a thorough response. The successful firm ensures and understands that:

1. All licenses required by the State of Michigan are to be maintained by the contractor during the course of the contract.
2. All required insurances are to be maintained by the contractor during the course of the contract.
3. The contractor will provide a single point of contact for the duration of the contract.
4. The contractor will ensure completion of the project in accordance with the proposed time line as proposed by the consultant.
5. The contractor will comply with administrative procedures of Presque Isle County.
6. The contractor will meet with applicable Presque Isle County departments and consultants to review specific concerns or issues.
7. The contractor is qualified and experienced in providing this type of construction services.
8. All costs incurred in the preparation, submission, and presentation of this proposal, in any way whatsoever, will be wholly absorbed by the prospective contractor. All supporting documentation will become the property of Presque Isle County unless requested otherwise at the time of submission. Michigan FOLA requires the disclosure, upon request, of all public records that are not exempt from disclosure under Section 13 of the Act, which are subject to disclosure under the Act. Therefore, confidentiality of information submitted in response to this Request for Proposals is not assured.

BIDDING DOCUMENTS:

Copies of the bidding documents via PDF's will be available electronically thru:
:

1. Bidnet Direct (Michigan MITN)
   www. Bidnet.com

2. Presque Isle County Clerks (County Building Committee)
   Darrin Darga
   (989) 734-3288 piclerk@picounty.org

   Joe Libby
   (989) 306-1400 libbyj@picounty.org

   151 E. Huron Ave.
   Rodgers City, Michigan 49779
   (989) 734-3288

3. JFR Architects, PC
   James F. Renaud AIA
   (586) 436-0187 jfrarchitects@gmail.com

PRE-BID MEETING:

A pre-bid meeting will be held on Wednesday, April 30, 2025 at 11:00 am local time at the building location at 151 E. Huron Ave, Rodgers City, Michigan 49799 in the buildings first floor board / conference room.

Attendance at this pre-bid meeting is not mandatory, however it is strongly recommended as an opportunity for contractors to see the existing conditions, materials and items which are to be included in the project and to review questions and scope concerns. Absolutely no extra cost will be allowed for any item or thing which could have been seen by visiting the site, prior to the bid due date.

PROPOSAL ACCEPTANCE:

The right to accept and/or reject any and all proposals and to waive any and all informalities and/or irregularities in bid proposals submitted during the bidding process is reserved by the Owner, which right may be exercised at the sole discretion of the Owner.

PROPOSAL WITHDRAWAL:

Proposals for base bids may not be withdrawn for a period of ninety (90) days after the time established for the receipt of proposals. Bidders may withdraw at any time prior to the time set for the receipt of proposals.

END OF SECTION 00 00 50

SECTION 00 10 10 – BIDDING INFORMATION

Owner will receive sealed proposals only as set forth in the Invitation for Bid and complying with all requirements as contained in Bidding Information and Instructions to Bidders as issued by Presque Isle County Clerks Office.

PRE BID MEETING

A pre-bid meeting will be held on Wednesday April 30, 2025 at 11:00 am local time at the building location at 151 E. Huron Ave, Rogers City, Michigan 49799 in the existing building 1st floor Board / Conference room.

Attendance at this pre-bid meeting is non mandatory although strongly recommended as set forth in the bidding invitation and instructions as an opportunity for contractors to see the existing conditions, materials and items which are to be included in the project and to review questions and scope concerns. Absolutely no extra cost will be allowed for any item or thing which could have been seen by visiting the site, prior to the bid due date.

CONSTRUCTION SCHEDULE

The Owner intends to award the contract shortly after review and approval of the successful bidder in May 2025 and work is to start immediately after the award of contract. The work associated with the construction and renovation of this addition and interior renovations is required to be completed and operational and turned over to the owner absolutely no later than October 1, 2025.

EXAMINATION

Each bidder shall examine the Bidding Documents and satisfy themself about the extent of the proposed work by personal examinations of the site and surroundings, and make his own estimate therefrom of the facilities and difficulties attending the performance and completion of the job.

No additional compensation will be allowed on account of conditions which could be determined by examining the Bidding Documents or the project site.

INTERPRETATION

If any person contemplating submitting a bid is in doubt as to the true meaning of any part of the Drawings, Specifications, or other Bidding Documents, he must submit to the Architect directly a written request for an interpretation thereof. Bidders requesting clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least 5 days prior to the date for receipt of Bids. Direct all questions to:

JFR Architects, PC
586-436-0187
jfrarchitects@gmail.com

Attention:
James F. Renaud AIA

Any interpretation, correction, or change of the Bidding Documents will be made by Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner, will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes. Addenda will be delivered to all who are known to have received bidding documents.

If such an interpretation is not requested, the bids will be presumed to be based upon the interpretation and directions given by the Architect after Contract award, in accordance with provisions of the Contract.

Neither the Owner nor the Architect will be responsible for any verbal explanations or interpretations of the Bidding Documents.

Every request for such interpretation should be in writing, addressed to the Architect, and to be given consideration, must be received at least five (5) days prior to the date fixed for the opening of bids. Any and all such interpretations, and any supplemental instructions will be in the form of written addenda to the Bidding Documents which, if issued, will be delivered to all prospective bidders (at the respective address furnished for such purposes) prior to the date fixed for the opening of bids. All addenda so issued shall become part of the Bidding Documents.

SUBSTITUTIONS

To obtain approval to use unspecified products, bidders shall submit written requests at least ten (10) days before the bid date and hours. Requests received after this time will not be considered. Requests shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. If the product is acceptable, the Architect will approve it in an Addendum issued to all prime bidders on record.

BASIS OF BID

A single lump sum proposal is being entertained for the complete work of this proposal.

Partial or segregated bids or assignments will not be considered. Include quotes for all alternates prices; failure to do so may result in rejection of proposal.

PREPARATION

Proposal shall be submitted on the form bound in these specifications, Bid Form, in original form without erasures, interlineations or alterations.

Submit one (1) printed copy and one (1) electronic copy on a “thumb drive” of proposal; retain one for your records. Oral, telegraphic, or telephone proposals will not be accepted.

Proposals must be filled out in ink or typewritten in duplicate. Blank spaces in the proposals must be filled in and no changes shall be made to the phraseology of the proposal. Quotes shall be entered in verbal and numeric forms. In case of a discrepancy between the written and the numeric form, the written form shall govern.

All bids shall be signed and dated in longhand.

Bids which are not signed by the individual making them should have attached thereto a power of attorney, evidencing authority to act as agent for the person whom it is signed.

Bids which are signed for a partnership should be signed by one of the partners or by an attorney-in-fact. If signed by an attorney-in-fact, evidence of authority to sign the bids shall be attached.

Bids which are signed for a corporation should have the correct corporate name thereon and the signature of the president or other officer legally able to contract in the name of the corporations.

In addition, a signed Secretary's Certificate evidencing the authority of the Officer to contract in the name of the corporation shall be included. Any proposal submitted by a corporation shall bear its seal.

CONTRACTORS

The Contractor shall be able to provide proof of relevant experience with this particular project type and scope for a period of not less than 5 years minimum and not less than 5 similar project references and examples that are comparable to this project type and scope. Farther more the project manager, project engineer, project field superintendent and project foreman as employed by the contractor shall also provide a minimum experience level of not less than 5 years experience on similar project types and scopes. The contractor must be able to provide all documented experience references as required to verify the required project experience requirements along with project names, locations, budgets and dated started and completed.

SUBCONTRACTORS

The Owner and Architect reserve the right to require of bidders tentatively selected for consideration in the awarding of the Contract, a list of the subcontractors whom the Contractor intends to employ.

The Owner reserves the right to disapprove the use of any proposed subcontractor, and in such event, the bidder submitting such subcontractor shall submit another such subcontractor in like manner within the time specified by the Owner. The Owner reserves the right to reject any bid if such information required by the Owner is not submitted as above indicated.

IRREGULARITIES

The Owner reserves the right to disqualify Bids before or after opening, upon evidence of collusion with intent to defraud, or other illegal practices upon the part of the bidder.

The Owner also reserves the right to reject any or all bids in whole or in part and to waive any informalities therein.

Any error and/or omission in the proposal form or any other irregularity as a result of negligent preparation shall not furnish cause for relief for any damages resulting therefrom, nor in any way relieve the Contractor from fulfillment of all contractual obligations as provided for in the Bidding Documents.

TAXES AND CONTRIBUTIONS

Proposal, unit prices, alternate prices stated include all taxes or contributions required by bidders business.

Michigan State sales tax is applicable to this work.

BID BREAKDOWN CONSTRUCTION INFORMATION

Upon notice from the Architect, the low bidders shall submit a detailed cost breakdown and schedule of values of all work covered by the Bidding Documents. The breakdown shall show quantity of material and labor, units of material and labor, material cost, labor cost and total cost.

EXECUTION OF CONTRACT

The Owner reserves the right to accept any and all bids, or to negotiate contract terms with the various bidders when such is deemed by the Owner to be in his best interest.

END OF SECTION 00 10 10

SECTION 00 10 15 – REQUIRED BID SUBMISSION MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Following this page is the Bid Form. Bidder must completely fill out the Bid Form and Submit (1) original copies, electronic copy by the date and time specified.

B. Following the Bid Form is the NON-COLLUSION AFFIDAVIT. Bidder must completely fill out this Form and Submit (1) original copies, by the date and time specified.

C. Following the Bid Form, is the “Contractor’s Qualification Statement, AIA Document A305”, of which the bidder must submit with their bid.

1.2 BIDDER'S CHECKLIST

A. To assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements. Failure to submit any of the required documents may be cause for bid disqualification.

B. Attach this complete checklist to the Bid Form.

1. ▢ Used the Bid Form provided in the Project Manual.
2. ▢ Prepared the Bid Form as required by the Instructions to Bidders.
3. ▢ Indicated on the Bid Form the Addenda received.
4. ▢ Attached to the Bid Form Bid Security in form and for the amount required.
5. ▢ Attached to the Bid Form Proposed Schedule of Values Form.
6. ▢ Attached to the Bid Form Proposed Construction Schedule.
7. ▢ Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond as described in the Bidding Documents.
8. ▢ Verified that the Bidder can provide Certificates of Insurance in the amounts indicated in the Bidding Documents.

END OF SECTION 00 10 15

BID FORM – SECTION 00 10 20

BID PROPOSAL FOR: Presque Isle County

PROJECT:
PRESQUE ISLE COUNTY
H.V.A.C., ROOFING and BLDG. RENOVATIONS
151 E. Huron Ave.
Rodgers City, Michigan 49779

BID TO:

PRESQUE ISLE COUNTY – CLERKS OFFICE
151 E. Huron Ave.
Rodgers City, Michigan 49779
(989) 734-328

Attention:

Darrin Darga - County Clerk
(989) 734-3288
piclerk@picounty.org

BID DUE DATE: **Wednesday May 14, 2025 @ 10:00pm Local Time per Presque Isle County Purchasing Requirements**

BIDDERS NAME: _____

BIDDERS ADDRESS: _____

BIDDERS PHONE: _____

BIDDERS E-MAIL: _____

The undersigned, having examined the site and its location as it affects the cost of the work, and the contract documents, including the drawings and specifications, and addenda (if any) as prepared by the architect and owner, hereby proposes to furnish all supervision, technical personnel, labor, materials, tools, machinery, appurtenances, equipment and services to complete the following base bids items:

We the undersign have examined the Contract Documents for the proposed Presque Isle County Annex Building at 151 E. Huron Ave. H.V.A.C. and Roofing and Building renovation project prepared by JFR Architects, PC.

In accordance therewith, the undersigned proposes to furnish all labor and materials for construction as set forth in the Contract Documents, including the following Addenda, if any (fill in the addenda number and date, thus confirming receipt):

Addendum Number _____ Addendum Number _____

Addendum Number _____ Addendum Number _____

1. Accompanying the proposal is the required bid security, the same being subject to forfeiture in the event of default by the undersigned.

2. I understand that the Owner reserves the right to reject any or all bids, and it is agreed that this bid may not be withdrawn for a period of ninety (90) days from the opening thereof.

3. Attached herewith are the documents requested in the Required Bid Submission Materials, Section 00 10 15.

A. Fill out the Bid Form and Submit (2) original copies, by the date and time specified.

B. NON-COLLUSION AFFIDAVIT. Bidder must completely fill out and Submit (2) original copies, by the date and time specified.

C. "Contractor's Qualification Statement, AIA Document A305", of which the bidder Submit (2) original copies, by the date and time specified.

D. Bidders "checklist" completed and included

E. All bids require a five percent (5%) Bid Bond.

F. Awarded construction projects require a 100 percent (100%) Performance, Payment and Materials Bond.

G. Submit a minimum of 5 owner / project references of similar or like projects completed within the last 5 years, including and as follows and required in the AIA 305 Document

1. Client Company (Commercial Projects)

2. Contact Name

3. Address

4. Phone, fax and e-mail

5. Project Information

6. Size/Cost/Budget

7. Percent Complete

8. Year Completed

9. Project Photos

H. Submit the company qualifications and as follows and required in the AIA 305 Document

1. Business Name
2. Primary Contact and/or Signatory
3. Address
4. Phone, fax and e-mail
5. Business type, i.e. LLC, INC etc
6. Business License and State
7. Business Mission Statement
8. Number of years in business with present company DBA
9. Submit previous DBA names, if applicable
10. Submit a list of Sub-Contractors and Consultants for the project, if applicable.

I. Evaluation of Bids; Bids will be evaluated on what will serve the best interest of Presque Isle County, criteria examples as listed but not limited to as follows;

1. Company Information
2. Experience
3. Similar Projects
4. Quality
5. References
6. Warranty/Guarantee
7. Fee/Price

4. Bid Information:

A. BASE BID:

Insert a lump sum base bid amount in the blank provided for the complete project including all material, labor, means and methods, site delivery and accessing of the site, temporary conditions, general conditions, OH & P, installations taxes and all associated costs as required to perform the work.

Base Bid:

_____Dollars $_____

B. VOLUNTARY ALTERNATES:

The following voluntary alternates are offered by the bidder. The undersigned agrees that the amounts indicated below shall be added to or deducted from the Base Bid, as the case may be, for each alternate which is accepted. Utilize an additional sheet of paper (added to the end of this Bid Form) if the quantity of Voluntary Alternates exceeds two.

Description of Voluntary Alternates	Add	Deduct
1._____	_____	_____
2._____	_____	_____

C. ALLOWANCES

If a bidder carries an allowance in his Base Bid for any work, the allowance must be specifically described on an additional sheet of paper (added to the end of the Proposal Form by the bidder) with the amount of the allowance identified therein. Allowances not disclosed in this manner will not be consider, reviewed or allowed.

D. PRICE GUARANTEE

The undersigned proposes that the price stated in the Proposal is guaranteed for ninety (90) consecutive days from bid date.

E. TAXES

The undersigned acknowledges that the price stated above includes all taxes of whatever character or description.

F. SCHEDULE

The undersigned agrees to commence work operations immediately upon award of contract. Completion is extremely important to the Owner and will be a very important consideration in award of contract. The Owner intends to award the contract shortly after review and approval of the successful bidder in May, 2025 and work is to start immediately after award of contract. The work associated with the construction and renovations is expected to be completed and operational and turned over to the owner absolutely no later than October 1, 2025. The Contractor understand this building will be occupied and operation during construction.

G. NEGOTIATION

The undersigned agrees that, should the overall cost exceed the funds available, he will be willing to negotiate with the Owner and Architect for the purpose of making further reductions in the Contract work, and shall agree to give full credit for all such reductions in the work requested by the Owner, including full value of labor, materials, and subcontract work and reasonable proportionate reductions in overhead and profit, thereby arriving at an agreed upon Contract price.

Company

Name:_____

Contact Name:_____

Signature:_____Title_____

Phone Number: _____ Fax Number: _____

Federal Tax ID Number:_____

Date:_____

H. PRIMARY SUB-CONTRACTOR WORK

Indicate proposed primary Sub-Contractor and their contact information and address for their respective work as included in the Base Proposal and the various Alternate Proposals:

Demolition Contractor: Name: _____

Address: _____

Site and Earthwork Contractor: Name: _____

Address: _____

Masonry Contractor: Name: _____

Address: _____

Concrete Contractor: Name: _____

Address: _____

Electrical Contractor: Name: _____

Address: _____

Mechanical Contractor: Name: _____

Address: _____

Plumbing Contractor: Name: _____

Address: _____

Roofing Contractor: Name: _____

Address: _____

Carpenter Contractor: Name: _____

Address: _____

Tile Finishes Contractor: Name: _____

Address: _____

NON-COLLUSION AFFIDAVIT

County)
) SS:

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

_____
(Individual, Partner, Corporate Officer)

making the foregoing proposals or bids; that such bids are genuine and not collusive or sham; such bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in sham a bid, or that such other person shall refrain from bidding and has not in any manner, directly with any person, to fix the bid price of afferent 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 the Joint Purchasers or any person or persons proposal are true; and further, that such bidder has not, directly or indirectly submitted this bid, or the contents thereof, or divulged information or data relative thereto any association or to any member or to any member or agent thereof.

_____

Sworn to and subscribed before me this _____ day of _____, 20_____.

_____
Notary Public

My commission expires on _____

BIDDER: THIS AFFIDAVIT MUST BE COMPLETED, SIGNED, NOTARIZED AND INCLUDED IN YOUR BID SUBMISSION.

END OF BID FORM – SECTION 00 10 20

AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

[ ] Corporation
[ ] Partnership
[ ] Individual
[ ] Joint Venture
[ ] Other

NAME OF PROJECT *(if applicable)*: a

TYPE OF WORK (file separate form for each Classification of Work):

[ ] General Construction
[ ] HVAC
[ ] Electrical
[ ] Plumbing
[ ] Other (please specify)

§ 1. ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

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

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

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

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User Notes: (992502978)

§ 1.3.3 President's name:
§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:
§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:
§ 1.4.1 Date of organization:
§ 1.4.2 Type of partnership (if applicable):
§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:
§ 1.5.1 Date of organization:
§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2. LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3. EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)
§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

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§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4. REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5. FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

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Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6. SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of 20

Notary Public:

My Commission Expires:

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User Notes: (992502978)

DOCUMENT 00 31 13 - PRELIMINARY SCHEDULES

PART 1 - GENERAL

1.1 PROJECT SCHEDULE

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but do not affect Contract Time requirements.

B. The Successful bidder and contractor will be required to provide the owner with a detailed schedule and coordination of construction based on their expertise in the industry and the listed milestone outline below.

C. **NOTE:** The existing County Annex building will remain open and operational with staff and customers during the construction of the new H.V.A.C. mechanical unit replacement and renovation project, the contractor must be prepared to work around an occupied and operation building.

D. Project schedule and construction milestones.

Presque Isle County and the purchasing department anticipates awarding a contract for construction immediately after bids are received, fully evaluated and approved.

Below is an outline of expectations for the completion of the project. The successful contractor will be responsible for developing a detailed schedule based on these proposed "milestone" dates for review and approval by the owner, with monthly updates during construction.

* Letter of intent to the successful contractor is expected to be issued by the end of May 2025 for the project.

* Construction contract is anticipated to be fully executed in June 2025 for the project between the owner and contractor

* The successful contractor is expected to immediately start working on the project for submittals and organization of long lead time procurement items, etc. in June 2025

* Contractor mobilization by July 2025 or sooner

* Construction schedule for August and September of 2025 before the heating season will be required for building operation.

  Note: winter conditions are not anticipated or approved for this project

* All work, substantial completion, punch list, commission, close out documents, owners training and owners move-in is to be 100% completed in October 2025.

* Contractor is required to provide a CPM bar graphic schedule with their bid proposals showing their proposed preliminary schedule based on the contractors, sub-contractors and suppliers' construction expertise and means and methods experiences in this type of work and similar project with occupied buildings.

END OF DOCUMENT 00 31 13

SECTION 00 31 43 - PERMIT APPLICATION

PART 1 - GENERAL

1.1 PERMIT APPLICATION INFORMATION

A. This Document, with its referenced attachments, is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.

B. Permit Application: The project Plan Review and General Building Permit for this project will be the responsibility of the General Contractor to apply, submit and obtain including the application and all associated fees with the AHJ.

Presque Isle County Building Department.

and

Rogers City Building and Development Authority

C. All Sub-trades Permits, Applications, Fees and Inspection Cost are the responsibility of the General Contractor and Sub-Contractors to pay for as required for this project.

D. All Soil Erosion Permits, Applications, Fees and Inspection Cost are the responsibility of the General Contractor and Sub-Contractors to pay for as required for this project.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 00 31 43

SECTION 00 50 10 – PROJECT CONTRACT MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. The owner intends to use the AIA A101 – 2017 “Standard Form of Agreement Between Owner and Contractor” for the project contract.

B. Presque Isle County Purchasing will include the standard Service Contract” as “other provision” of section 8.7 to the AIA A101 contract.

C. Following this section are samples of the proposed contract and general conditions which will be executed as the project agreement.

END OF SECTION 00 50 10

AIA® Document A101™ – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

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

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

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

The Architect:
(Name, legal status, address and other information)

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

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

Sample

The Owner and Contractor agree as follows.

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TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

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

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

☐ Not later than ( ) calendar days from the date of commencement of the Work.

Init.

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☐ By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

Sample

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ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

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

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

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§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

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

§ 5.2 Final Payment

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

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

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

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

Init.
/
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§ 8.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

Sample

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§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

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

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

Sample

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☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

Sample

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AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

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provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

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information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

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site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

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capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

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remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

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.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the

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time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

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ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

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Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

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Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

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Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

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Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

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by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

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

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

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

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

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to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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

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§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not

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constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

.1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents;

.3 terms of special warranties required by the Contract Documents; or

.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

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§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

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endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

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Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

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Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

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

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

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§ 13.3 Rights and Remedies

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

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

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§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

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15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

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

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

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

§ 15.4 Arbitration

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

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

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

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

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consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

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

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

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

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DOCUMENT 00 99 99 - LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 LIST OF DRAWINGS

A. Drawings: Drawings that will be enumerated in the Owner/Contractor Agreement as part of the Contract Documents are listed on the Table of Contents page of the separately bound drawing set titled Cover Sheet and Index of Drawings, dated April 15, 2025, as modified by subsequent Addenda and Modifications.

B. The following drawings, dated April 15, 2025, are issued for the Presque Isle County Annex Court Building, H.V.A.C., Roof and Building Renovations, 151 E. Huron Ave., Rogers City, Michigan 49799, Project Number # 23-048

SHEET NO.	**TITLE**
GENERAL:	
G0-01	COVER SHEET and BUILDING CODE INFORAMTION
C1-01	ARCHITECTRUAL DEMOLITION SITE PLAN
C1-02	ARCHITECTRUAL NEW WORK SITE PLAN and DETAILS
A2-01	BASEMENT DEMOLITION PLANS and RCP
A2-02	1st FLOOR DEMOLITION PLANS and RCP
A2-03	2nd FLOOR DEMOLITION PLANS and RCP
A4-01	EXTERIOR ELEVATIONS
A5-01	PARTIAL ROOF PLAN
A5-02	ROOF DETAILS
A7-01	WALL SECTIONS and DETAILS
STRUCTURAL :	
S-100	STRUCTRUAL GENERAL NOTES
S-101	AHU FOUNDATION PLAN and STEEL FRAMING PLAN

MECHANICAL:

MG0.1	MECHANICAL SHEET INDEX, SYMBOLS LIST AND ABBREVIATIONS
M0.0	MECHANICAL BASEMENT DEMO PLAN
M0.1	MECHANICAL FIRST FLOOR DEMO PLAN
M0.2	MECHANICAL SECOND FLOOR DEMO PLAN
M0.3	MECHANICAL ATTIC / ROOF DEMO PLAN
M1.0	MECHANICAL BASEMENT PLAN
M1.1	MECHANICAL FIRST FLOOR PLAN
M1.2	MECHANICAL SECOND FLOOR PLAN
M1.3	MECHANICAL ATTIC / ROOF PLAN
M5.1	MECHANICAL DETAILS
M5.2	MECHANICAL DETAILS
M6.1	MECHANICAL SCHEDULES
M7.1	TEMPERATURE CONTROL DIAGRAMS
M7.2	TEMPERATURE CONTROL DIAGRAMS

ELECTRICAL:

E0-01	ELECTRICAL SHEET INDEX, LEGEND AND ONE LINE DIAGRAM
E1-01	ELECTRICAL SPECIFICATIONS
E1-02	ELECTRICAL SPECIFICATIONS
E2-01	ELECTRICAL DEMOLITION PLANS
E3-01	ELECTRICAL NEW WORK BASEMENT AND 1ST FLOOR PLANS
E3-02	ELECTRICAL NEW WORK SECOND FLOOR PLANS
E6-01	ELECTRICAL PANEL SCHEDULES

END OF SECTION 00 99 99

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Type of Contract.
3. Work phases.
4. Work under other contracts.
5. Use of premises.
6. Work restrictions.
7. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Presque Isle County Annex Court Building

H.V.A.C., Roofing and Building Renovations

1. Project Location 151 E. Huron Ave., Rogers City, Michigan 49799

B. Owner: Presque Isle County

C. Architect: JFR Architects, PC

D. The Summary of Work consists of the following:

The Work consists of the following:

1. The work generally included is the removal and replacement of the existing roof top mechanical units with new “ground mounted” air handler units, all associated duct work and diffuser work, VAV boxes will be included as part of the necessary work scope.

2. All associated roofing removal and replacement required for the removed roof top units and new mechanical systems are included in the work scope.

3. All associated site and civil work required for the new mechanical systems are included in the work scope.

4. All electrical power and lighting work required for the new mechanical systems are included in the work.

5. Also included is associated architectural work required for the new mechanical systems, including but not limited to removal and replacement of ceiling system, exterior walls, exterior windows , doors and storefronts, carpentry as necessary for a complete project.

1.4 TYPE OF CONTRACT

A. Project will be constructed as a single lump sum bid under the general contractor.

1.5 WORK PHASES

A. The Work shall be conducted in one (1) phase of continuous construction from start to finish.

1.6 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

a. Owner’s Security Contractor
b. Owner’s IT Contractors

1.7 USE OF PREMISES

A. General: Contractor will be required to schedule and phase all construction with the Presque Isle County staff during construction, the building will be partial occupied and in operation during construction.

Contractor's use of premises is limited by Owner's right to perform work or to retain other contractors on portions of Project.

1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside and outside the existing building during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections per CSI’s "MasterFormat 2024" numbering system.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.10 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form from AIA or CSI standard acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related

materials and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within [seven] days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within [15] days of receipt of request, or [seven] days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than [15] days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
c. Requested substitution provides sustainable design characteristics that specified product provided for compliance with IgCC requirements.
d. Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
e. Requested substitution provides sustainable design characteristics that specified product provided for compliance with Green Globes requirements.
f. Substitution request is fully documented and properly submitted.
g. Requested substitution will not adversely affect Contractor's construction schedule.
h. Requested substitution has received necessary approvals of authorities having jurisdiction.
i. Requested substitution is compatible with other portions of the Work.
j. Requested substitution has been coordinated with other portions of the Work.
k. Requested substitution provides specified warranty.
l. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience:

1. Not allowed
2. Architect will consider requests for substitution if received within [60] days after [the Notice of

Award]. Requests received after that time may be considered or rejected at discretion of Architect.

a. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1) Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2) Requested substitution does not require extensive revisions to the Contract Documents.
3) Requested substitution is consistent with the Contract Documents and will produce indicated results.
4) Requested substitution provides sustainable design characteristics that specified product provided for compliance with LEED requirements.
5) Requested substitution provides sustainable design characteristics that specified product provided for compliance with IgCC requirements.
6) Requested substitution provides sustainable design characteristics that specified product provided for compliance with ASHRAE 189.1 requirements.
7) Requested substitution provides sustainable design characteristics that specified product provided for compliance with Green Globes requirements.
8) Substitution request is fully documented and properly submitted.
9) Requested substitution will not adversely affect Contractor's construction schedule.
10) Requested substitution has received necessary approvals of authorities having jurisdiction.
11) Requested substitution is compatible with other portions of the Work.
12) Requested substitution has been coordinated with other portions of the Work.
13) Requested substitution provides specified warranty.
14) If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
2. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    e. Quotation Form: Use acceptable to Architect

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714 Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 WORK CHANGE DIRECTIVE

A. Work Change Directive: Architect may issue a Work Change Directive Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule and Contractor's Construction Schedule.
2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets .
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to Architect by the last day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. Each copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors and construction testing firms.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Schedule of unit prices.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of building permits.

9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
10. Initial progress report.
11. Report of preconstruction conference.
12. Certificates of insurance and insurance policies.

I. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

J. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within [15] days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, in web-based Project software directory, and in prominent location in each built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Coordination of Multiple Contracts: Each contractor shall cooperate with Project coordinator, who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors and direction of Project coordinator to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

   a. Runs of vertical and horizontal conduit **1-1/4 inches** in diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
   c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan

files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format:

a. Same digital data software program, version, and operating system as original Drawings.
b. [DWG], Version, operating in [Microsoft Windows] operating system.

2. File Submittal Format: Submit or post coordination drawing files using [format same as file preparation format] [PDF format].
3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.

a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
b. Digital Data Software Program: Drawings are available in Auto CAD DWG
c. Contractor shall execute a data licensing agreement in the form of AIA Document C106

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Owner name.
3. Owner's Project number.
4. Name of Architect
5. Architect's Project number.
6. Date.
7. Name of Contractor.
8. RFI number, numbered sequentially.
9. RFI subject.
10. Specification Section number and title and related paragraphs, as appropriate.
11. Drawing number and detail references, as appropriate.
12. Field dimensions and conditions, as appropriate.
13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

14. Contractor's signature.
15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716

1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log [weekly] Use software log that is part of web-based Project management software.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.

1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings,

and Project Record Drawings.

2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD DWG
4. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement

    a. Subcontractors and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of AIA Document C106

5. The following digital data files will be furnished for each appropriate discipline:

    a. Floor plans.

B. Web-Based Project Management Software Package: web-based Project management software package for purposes of hosting and managing Project communication and documentation until Final Completion.

1. Web-based Project management software includes, at a minimum, the following features:

    a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    c. Document workflow planning, allowing customization of workflow between project entities.
    d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    e. Track status of each Project communication in real time, and log time and date when responses are provided.
    f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    g. Processing and tracking of payment applications.
    h. Processing and tracking of contract modifications.
    i. Creating and distributing meeting minutes.
    j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    k. Management of construction progress photographs.
    l. Mobile device compatibility, including smartphones and tablets.

2. Provide up to Project management software user licenses for use of Owner Architect, and Architect's consultants. Provide software training at Architect's office for web-based Project software users.
3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
4. Manufacturers: Subject to compliance with requirements,

    a. Autodesk, Inc.
    b. Deltek Inc.
    c. Procore Technologies, Inc.

C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital

signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than [15] days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner , Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
b. Tentative construction schedule.
c. Phasing.
d. Critical work sequencing and long lead items.
e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises and existing building.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Sustainable Design Requirements Coordination Conference: Contractor will schedule and conduct a sustainable design coordination conference before starting construction, at a time convenient to Owner Architect, and Contractor.

1. Attendees: Authorized representatives of Owner,Architect, and their consultants; Contractor and its superintendent and sustainable design coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect meeting sustainable design requirements, including the following:

    a. Sustainable design Project checklist.
    b. General requirements for sustainable design-related procurement and documentation.
    c. Project closeout requirements and sustainable design certification procedures.
    d. Role of sustainable design coordinator.
    e. Construction waste management.
    f. Construction operations and sustainable design requirements and restrictions.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

D. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Project Closeout Conference: Contractor will Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than [90] days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for completing sustainable design documentation.
    f. Requirements for preparing operations and maintenance data.
    g. Requirements for delivery of material samples, attic stock, and spare parts.
    h. Requirements for demonstration and training.
    i. Preparation of Contractor's punch list.
    j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    k. Submittal procedures.
    l. Coordination of separate contracts.
    m. Owner's partial occupancy requirements.
    n. Installation of Owner's furniture, fixtures, and equipment.
    o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

F. Progress Meetings: Conduct progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.

7) Off-site fabrication.
8) Access.
9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

G. Coordination Meetings: Conduct Project coordination meetings at biweekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner[and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each contractor present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Resolution of BIM component conflicts.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Status of RFIs.
15) Proposal Requests.

16) Change Orders.
17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.
3. Section 014000 "Quality Requirements" for schedule of tests and inspections.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start

of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of labor and equipment necessary for completing an activity as scheduled.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports to contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at [weekly] intervals.

H. Material Location Reports: Submit at [weekly] intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Unusual Event Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including [phasing] [work stages] [area separations] [interim milestones] [and] [partial Owner occupancy].
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values,[list of subcontracts,] submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that is capable of managing construction schedules.

1. Use [Microsoft Project] [Procore] [Oracle Primavera Cloud] [Deltek Open Plan] for current [Windows] operating system.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant to attend all meetings related to Project progress, alleged delays, and time impact.

C. Time Frame: Extend schedule from date established for the Notice of Award to date of Substantial Completion and Final Completion.

1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than [20] days, unless specifically allowed by Architect.
2. Temporary Facilities: Indicate start and completion dates for the following as applicable:

a. Securing of approvals and permits required for performance of the Work.

b. Temporary facilities.
c. Construction of mock-ups, prototypes and samples.
d. Owner interfaces and furnishing of items.
e. Interfaces with Separate Contracts.
f. Regulatory agency approvals.
g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
5. Startup and Testing Time: Include no fewer than [15] days for startup and testing.
6. Commissioning Time: Include no fewer than [15] days for commissioning.
7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include not more than [30] days for completion of punch list items and Final Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

a. Coordination with existing construction.
b. Limitations of continued occupancies.
c. Uninterruptible services.
d. Partial occupancy before Substantial Completion.
e. Use-of-premises restrictions.
f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Building flush-out.

m. Startup and placement into final use and operation.
n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion

1. Temporary enclosure and space conditioning.

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 7 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

K. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice of Award.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first [90] days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within [30] days of date established for the Notice of Award.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in [10] percent increments within time bar.

1.9 CPM SCHEDULE REQUIREMENTS

A. Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within [14] days of date established for the Notice of Award. Outline significant construction activities for the first [90] days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a[cost- and resource-loaded,] time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule, so it can be accepted for use no later than [60] days after date established for the Notice of Award.

a. Failure to include any work item required for performance of this Contract must not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.

c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and inspection.
j. Commissioning.
k. Punch list and Final Completion.
l. Activities occurring following Final Completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates to be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, sustainable design documentation, and demonstration and training (if applicable), in the amount of [5] percent of the Contract Sum.

   a. Each activity cost to reflect an appropriate value subject to approval by Architect.
   b. Total cost assigned to activities to equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts [one week] before each regularly scheduled progress meeting.

1.10 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List to be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within **one** day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Concealed Work photographs.
3. Periodic construction photographs.
4. Time-lapse sequence construction photographs.
5. Final Completion construction photographs.
6. Preconstruction video recordings.
7. Periodic construction video recordings.
8. Time-lapse sequence construction video recordings.
9. Construction webcam.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
3. Section 024116 "Structure Demolition" for photographic documentation before building demolition operations commence.
4. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.
5. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description in web-based Project management software site:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Architect
d. Name of Contractor.
e. Date photograph was taken.
f. Description of location, vantage point, and direction.
g. Unique sequential identifier keyed to accompanying key plan.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with a record of providing satisfactory services similar to those required for Project.

1.4 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of **12** megapixels, Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1.5 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.

B. General: Take photographs with maximum depth of field and in focus.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points

1. Flag excavation areas construction limits before taking construction photographs.
2. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Underslab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take photographs weekly with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal Category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled dates for purchasing.
    h. Scheduled date of fabrication.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
9. Category and type of submittal.
10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.
3. Paper: Prepare submittals in paper form and deliver to Architect.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow [15] days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow [15]days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow [21] days for initial review of each submittal.
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow [15] days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect' action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Contractors action stamp.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
4. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

6. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
7. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for

independent testing and inspection.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to

authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

a. Name of evaluation organization.
b. Date of evaluation.
c. Time period when report is in effect.
d. Product and manufacturers' names.
e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect

B. Contractor's Approval: Indicate Contractor's approval for each submittal with indication in web-based Project management software. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required**, and return**.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action
2. Submittals by Web-Based Project Management Software: Architect will indicate, on Project management software website, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 DEFINITIONS

A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.

B. Consolidate: To strengthen loose or deteriorated materials in place.

C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.

F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.

G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

H. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.

I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.

J. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.

K. Retain: To keep an element or detail secure and intact.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.3 COORDINATION

A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.

1. Schedule construction operations in sequence required to obtain best Work results.
2. Coordinate sequence of alteration work activities to accommodate the following:

a. Owner's continuing occupancy of portions of existing building.
b. Owner's partial occupancy of completed Work.
c. Other known work in progress.
d. Tests and inspections.

3. Detail sequence of alteration work, with start and end dates.
4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
5. Use of elevator and stairs.
6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use in existing structure. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.

B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site

1. Attendees: In addition to representatives of Owner,Architect, and Contractor,testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:

a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
b. Fire-prevention plan.
c. Governing regulations.
d. Areas where existing construction is to remain and the required protection.
e. Hauling routes.
f. Sequence of alteration work operations.
g. Storage, protection, and accounting for salvaged and specially fabricated items.
h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
i. Qualifications of personnel assigned to alteration work and assigned duties.
j. Requirements for extent and quality of work, tolerances, and required clearances.
k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.

3. Reporting: Contractor conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of OwnerArchitect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other

items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.

a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:

1) Interface requirements of alteration work with other Project Work.
2) Status of submittals for alteration work.
3) Access to alteration work locations.
4) Effectiveness of fire-prevention plan.
5) Quality and work standards of alteration work.
6) Change Orders for alteration work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1. Carefully dismantle and salvage each item or object in a manner to prevent damage and protect it from damage, then promptly deliver it to Owner where directed at Project site

1.6 INFORMATIONAL SUBMITTALS

A. Alteration Work Subschedule:

1. Submit alteration work sub schedule within [seven] days of date established for commencement of alteration work

B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.

C. Alteration Work Program: Submit [30 days] before work begins.

D. Fire-Prevention Plan: Submit [30 days] before work begins.

1.7 QUALITY ASSURANCE

A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of [five] recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.

    a. Construct new mockups of required work whenever a supervisor is replaced.

B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.

C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.

1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.

D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

E. Safety and Health Standard: Comply with ANSI/ASSP A10.6.

1.8 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
3. Store items in a secure area until delivery to Owner.

B. Salvaged Materials for Reinstallation:

1. Repair and clean items for reuse as indicated.
2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.

C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.

D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.

1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the

identifying marks.
2. Secure stored materials to protect from theft.
3. Control humidity so that it does not exceed 85 percent. Maintain temperatures **5 deg F** or more above the dew point.

1.9 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs

1. Comply with requirements specified in Section 013233 "Photographic Documentation."

B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

C. Owner's Removals: Before beginning alteration work, verify in correspondence with Owner that the following items have been removed:

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.

1. Use only proven protection methods, appropriate to each area and surface being protected.
2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
3. Erect temporary barriers to form and maintain fire-egress routes.
4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the building.

B. Temporary Protection of Materials to Remain:

1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.

D. Utility and Communications Services:

1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required

for alteration work.

3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.

E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.

1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

F. Existing Roofing: Prior to the start of work in an area, install roofing protection

3.2 PROTECTION FROM FIRE

A. General: Follow fire-prevention plan and the following:

1. Comply with NFPA 241 requirements unless otherwise indicated.
2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.

a. If combustible material cannot be removed, provide fire blankets to cover such materials.

B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Use of open-flame equipment is not permitted. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:

a. Train each fire watch in the proper operation of fire-control equipment and alarms.
b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
e. Maintain fire-watch personnel at each area of Project site until two hours after conclusion of daily work.

C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of

rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.

1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.

B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.

C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.

E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

A. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs Comply with requirements in Section 013233 "Photographic Documentation."

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.

1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 01 35 16

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Contractor, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. See Divisions Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

I. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 2 through 16.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Preliminary design mix proposed for use for material mixes that require control by testing agency.
6. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations, List: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Abbreviations and acronyms not included in this list are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States." The information in this list is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; (see FGIA).
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; www.concrete.org.
9. ACP - American Clean Power; (Formerly: American Wind Energy Association); www.cleanpower.org.
10. ACPA - American Concrete Pipe Association; www.concretepipe.org.
11. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
12. AF&PA - American Forest & Paper Association; www.afandpa.org.
13. AGA - American Gas Association; www.aga.org.
14. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
15. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
16. AI - Asphalt Institute; www.asphaltinstitute.org.
17. AIA - American Institute of Architects (The); www.aia.org.
18. AISC - American Institute of Steel Construction; www.aisc.org.
19. AISI - American Iron and Steel Institute; www.steel.org.
20. AITC - American Institute of Timber Construction; (see PLIB).
21. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
22. AMPP - Association for Materials Protection and Performance; www.ampp.org.
23. ANSI - American National Standards Institute; www.ansi.org.
24. AOSA/SCST - Association of Official Seed Analysts (The)/Society of Commercial Seed Technologists (The); www.analyzeseeds.com.
25. APA - APA - The Engineered Wood Association; www.apawood.org.
26. APA - Architectural Precast Association; www.archprecast.org.
27. API - American Petroleum Institute; www.api.org.
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASA - Acoustical Society of America; www.acousticalsociety.org.
30. ASCE - American Society of Civil Engineers; www.asce.org.
31. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (see ASCE).
32. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
33. ASME - ASME International; [**American Society of Mechanical Engineers (The)**]; www.asme.org.
34. ASSE - ASSE International; (American Society of Sanitary Engineering); www.asse-plumbing.org.
35. ASSP - American Society of Safety Professionals; www.assp.org.
36. ASTM - ASTM International; www.astm.org.
37. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
38. AVIXA - Audiovisual and Integrated Experience Association; www.avixa.org.
39. AWI - Architectural Woodwork Institute; www.awinet.org.
40. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
41. AWPA - American Wood Protection Association; www.awpa.com.
42. AWS - American Welding Society; www.aws.org.
43. AWWA - American Water Works Association; www.awwa.org.

44. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
45. BIA - Brick Industry Association (The); www.gobrick.com.
46. BICSI - BICSI, Inc.; www.bicsi.org.
47. BIFMA - Business and Institutional Furniture Manufacturer's Association; www.bifma.org.
48. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
49. BSI - British Standards Institution; www.bsigroup.com.
50. BWF - Badminton World Federation; www.bwfbadminton.com.
51. CARB - California Air Resources Board; www.arb.ca.gov.
52. CDA - Copper Development Association Inc.; www.copper.org.
53. CE - Conformite Europeenne (European Commission); www.ec.europa.eu/growth/single-market/ce-marking.
54. CEA - Canadian Electricity Association; www.electricity.ca.
55. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
56. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
57. CGA - Compressed Gas Association; www.cganet.com.
58. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
59. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
60. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
61. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
62. CMHA - Concrete Masonry & Hardscape Association; (Formerly: National Concrete Masonry Association); www.masonryandhardscapes.org.
63. CPA - Composite Panel Association; www.compositepanel.org.
64. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
65. CRRC - Cool Roof Rating Council; www.coolroofs.org.
66. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
67. CSA - CSA Group; www.csagroup.org.
68. CSI - Cast Stone Institute; www.caststone.org.
69. CSI - Construction Specifications Institute (The); www.csiresources.org.
70. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
71. CTA - Consumer Technology Association; www.cta.tech.
72. CTI - Cooling Technology Institute; www.coolingtechnology.org.
73. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
74. DHA - Decorative Hardwoods Association; www.decorativehardwoods.org.
75. DHI - Door and Hardware Institute; www.dhi.org.
76. ECIA - Electronic Components Industry Association; www.ecianow.org.
77. EIMA - EIFS Industry Members Association; www.eima.com.
78. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
79. EOS/ESD - EOS/ESD Association, Inc.; Electrostatic Discharge Association; www.esda.org.
80. ESTA - Entertainment Services and Technology Association; www.esta.org.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FGIA - Fenestration and Glazing Industry Alliance; https://fgiaonline.org.
84. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
85. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
86. FM Approvals - FM Approvals LLC; www.fmapprovals.com.
87. FM Global - FM Global; www.fmglobal.com.
88. FRSA - Florida Roofing and Sheet Metal Contractors Association, Inc.; www.floridaroof.com.
89. FSA - Fluid Sealing Association; www.fluidsealing.com.
90. FSC - Forest Stewardship Council U.S.; www.fscus.org.
91. GA - Gypsum Association; www.gypsum.org.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HMMA - Hollow Metal Manufacturers Association; (see NAAMM).
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Accreditation Service; www.iasonline.org.
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
99. ICPA - International Cast Polymer Association (The); www.theicpa.com.
100. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
101. IEC - International Electrotechnical Commission; www.iec.ch.

102. IEEE SA - IEEE Standards Association; https://standards.ieee.org.
103. IES - Illuminating Engineering Society; www.ies.org.
104. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
105. IGMA - Insulating Glass Manufacturers Alliance; (see FGIA).
106. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.org.
107. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
108. Intertek - Intertek Group; www.intertek.com.
109. ISA - International Society of Automation (The); www.isa.org.
110. ISFA - International Surface Fabricators Association; www.isfanow.org.
111. ISO - International Organization for Standardization; www.iso.org.
112. ITU - International Telecommunication Union; www.itu.int.
113. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
114. LPI - Lightning Protection Institute; www.lightning.org.
115. MBMA - Metal Building Manufacturers Association; www.mbma.com.
116. MCA - Metal Construction Association; www.metalconstruction.org.
117. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
118. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
119. MHI - Material Handling Industry; www.mhi.org.
120. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
121. MPI - Master Painters Institute; www.paintinfo.com.
122. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry, Inc.; www.msshq.org.
123. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
124. NACE - NACE International; (National Association of Corrosion Engineers International); (see AMPP).
125. NADCA - National Air Duct Cleaners Association; www.nadca.com.
126. NAIMA - North American Insulation Manufacturers Association; www.insulationinstitute.org.
127. NALP - National Association of Landscape Professionals; www.landscapeprofessionals.org.
128. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
129. NBI - New Buildings Institute; www.newbuildings.org.
130. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
131. NCMA - National Concrete Masonry Association; (see CMHA).
132. NEBB - National Environmental Balancing Bureau; www.nebb.org.
133. NECA - National Electrical Contractors Association; www.necanet.org.
134. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
135. NEMA - National Electrical Manufacturers Association; www.nema.org.
136. NETA - InterNational Electrical Testing Association; www.netaworld.org.
137. NFHS - National Federation of State High School Associations; www.nfhs.org.
138. NFPA - National Fire Protection Association; www.nfpa.org.
139. NFPA - NFPA International; (see NFPA).
140. NFRC - National Fenestration Rating Council; www.nfrc.org.
141. NGA - National Glass Association; www.glass.org.
142. NHLA - National Hardwood Lumber Association; www.nhla.com.
143. NLGA - National Lumber Grades Authority; www.nlga.org.
144. NOFMA - National Oak Flooring Manufacturers Association; (see NWFA).
145. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
146. NRCA - National Roofing Contractors Association; www.nrca.net.
147. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
148. NSF - NSF International; www.nsf.org.
149. NSI - Natural Stone Institute; www.naturalstoneinstitute.org.
150. NSPE - National Society of Professional Engineers; www.nspe.org.
151. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
152. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
153. NWFA - National Wood Flooring Association; www.nwfa.org.
154. NWRA - National Waste & Recycling Association; www.wasterecycling.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; www.plasa.org.
158. PLIB - Pacific Lumber Inspection Bureau; www.plib.org.
159. PVCPA - Uni-Bell PVC Pipe Association; www.uni-bell.org.
160. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
161. RFCI - Resilient Floor Covering Institute; www.rfci.com.

162. RIS - Redwood Inspection Service; (see WWPA).
163. SAE - SAE International; www.sae.org.
164. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
165. SDI - Steel Deck Institute; www.sdi.org.
166. SDI - Steel Door Institute; www.steeldoor.org.
167. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
168. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (see ASCE).
169. SIA - Security Industry Association; www.securityindustry.org.
170. SJI - Steel Joist Institute; www.steeljoist.org.
171. SMA - Screen Manufacturers Association; www.smainfo.org.
172. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
173. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
174. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
175. SPIB - Southern Pine Inspection Bureau; www.spib.org.
176. SPRI - Single Ply Roofing Industry; www.spri.org.
177. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
178. SSINA - Specialty Steel Industry of North America; www.ssina.com.
179. SSPC - SSPC: The Society for Protective Coatings; (see AMPP).
180. STI/SPFA - Steel Tank Institute/Steel Plate Fabricators Association; www.steeltank.com.
181. SWI - Steel Window Institute; www.steelwindows.com.
182. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
183. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
184. TCNA - Tile Council of North America, Inc.; www.tcnatile.com.
185. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.kbcdco.tema.org.
186. TIA - Telecommunications Industry Association; www.tiaonline.org.
187. TMS - The Masonry Society; www.masonrysociety.org.
188. TPI - Truss Plate Institute; www.tpinst.org.
189. TPI - Turfgrass Producers International; www.turfgrasssod.org.
190. TRI - Tile Roofing Industry Alliance; www.tileroofing.org.
191. ULSE - UL Standards & Engagement Inc.; www.ulse.org.
192. UL - UL Solutions Inc.; www.ul.com.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
196. WA - Wallcoverings Association; www.wallcoverings.org.
197. WCLIB - West Coast Lumber Inspection Bureau; (see PLIB).
198. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association; www.wdma.com.
200. WI - Woodwork Institute; www.woodworkinstitute.com.
201. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
202. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - U.S. Department of Commerce; www.commerce.gov.
3. DOD - U.S. Department of Defense; www.defense.gov.
4. DOE - U.S. Department of Energy; www.energy.gov.
5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov
6. DOS - U.S. Department of State; www.state.gov.

7. EPA - United States Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. GPO - U.S. Government Publishing Office; www.gpo.gov.
10. GSA - U.S. General Services Administration; www.gsa.gov.
11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USP - U.S. Pharmacopeial Convention; www.usp.org.
20. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from U.S. General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specifications and Standards; (see DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; https://tfsweb.tamu.edu/.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 45 23 – TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

B. Except as indicated in this Section, refer to the various technical specification sections for specific testing requirements which will be required by the Contractor.

1.02 SCOPE OF INDEPENDENT TESTING LABORATORY SERVICES:

A. The Contractor will employ and pay for the services of an Independent Testing and Inspection Laboratory to perform the following testing:

- Soils
- Concrete (Flatwork / Foundations)
- Structural Steel
- Windows and Doors
- Electrical
- HVAC Balancing
- Roofing
- Plumbing
- Masonry

B. Testing Laboratory inspection, sampling and testing is required as identified in the technical specifications.

1.03 QUALIFICATION OF TESTING AND INSPECTION LABORATORY:

A. Meet “Recommended Requirements for Independent Laboratory Qualification”, published by AMERICAN COUNCIL OF INDEPENDENT LABORATORIES.

B. Meet basic requirements of ASTM E-329, “Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction” and ASTM D3740.

C. Authorized to operate in the State in which the Project is located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of NATIONAL BUREAU OF STANDARDS during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment:

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
   a. NATIONAL BUREAU OF STANDARDS
   b. Accepted values of natural physical constants.

1.04 CONTRACTORS RESPONSIBILITIES

A. Unless listed in 1.02.A., the Contractor shall be responsible to provide and pay for all testing associated with their scope of work. Tests shall be made by a qualified independent testing agency approved by the Owner and Architect. Coordinate selection of the testing agency through the Architect. The Contractor shall arrange and pay for the following services:

1. Inspection and tests specified as the Contractor's responsibility in the various sections of the Specifications.
2. Inspections and tests required by the General Conditions including those tests required by codes, ordinances, or the approval authority or regulatory agencies.
3. Inspection and tests performed for the Contractors convenience.

B. Contractor shall cooperate with the laboratory to facilitate the execution of its required services. Employment of the laboratory shall in no way relieve Contractors obligations to perform the Work of the Contract.

C. Contractor testing shall as a minimum comply with the requirements of this section.

D. The Contractor is responsible to pay the cost of additional testing, if in the event that additional testing of the Contractors materials, installation, etc. is required by the independent testing laboratory because of test results not in compliance with the Contract Documents requirements and/or additional testing required as a result of Contractors negligence or poor workmanship.

PART 2 - EXECUTION

2.01 TESTING AND INSPECTION LABORATORY DUTIES

A. Unless otherwise noted, the testing agency shall provide all required personnel and equipment as required for inspections and tests, for obtaining specimens and samples, and for delivery of specimens and samples to the laboratory when required.

B. Cooperate with the General Contractor and Architect to provide qualified personnel after due notice.

C. Perform specified inspections, sampling and testing of materials and methods of construction in accordance with specified standards.

1. Comply with specified standards.
2. Ascertain compliance of materials with requirements of Contract Documents.

D. Promptly notify General Contractor, Architect and Owner of observed irregularities or deficiencies of work or products.

E. Promptly submit written report(s) of each test and inspection; submit one copy of report each to the Architect, Owner, and General Contractor with the following:

1. Date issued
2. Project title and number
3. Testing laboratory name, address and telephone number
4. Name and signature of laboratory inspector

5. Date and time of sampling or inspection
6. Record of temperature and weather conditions
7. Date of test
8. Identification of product and specification section
9. Location of sample or test in the project
10. Type of inspection or test
11. Results of tests and compliance with Contract Documents
12. Interpretation of test results

2.02 LIMITATIONS OF AUTHORITY OF TESTING AND INSPECTION LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.
2. Approve or accept any portion of the work, but may provide an expert opinion whereby the Owner and Architect may make an informed decision as to acceptance or rejection.
3. Perform any duties of the Contractor.
4. Stop the work.

PART 3 – CONTRACTOR RESPONSIBILITIES:

3.01 CONTRACTORS RESPONSIBILITIES:

A. Cooperate with laboratory personnel, provide access to work, to manufacturer's operations.

B. Secure and deliver to Architect adequate quantities of representative samples of materials proposed to be used of which require testing.

C. Provide to the Architect the preliminary design mix proposed to be used for concrete, and other materials mixes which required control by testing laboratory.

D. Furnish copies of products test reports as required.

E. Furnish incidental labor and facilities as follows:

1. To provide access to work to be tested.
2. To obtain and handle sample at the project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

F. Notify the Architect sufficiently in advance of operations (24 hour minimum) to allow for laboratory assignment of personnel and scheduling of tests.

1. Where tests or inspections cannot be performed as scheduled due to Contractor scheduling conflict or not being prepared, costs for testing agency personnel, equipment, and/or travel expenses shall be paid by the Contractor.

G. Employ and pay for the services of testing laboratory to perform additional inspections, sampling and testing required:

1. For the Contactors convenience.
2. When initial test indicate work does not comply with Contract Documents.

H. When the Contractor is providing the testing and prior to start of work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer and responsible officer. Submit copy of report of laboratory facilities inspection made by Materials Reference laboratory of National Bureau of Standards (NBS) during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3.02 RE-TEST RESPONSIBILITIY:

A. Where the results of required inspections, tests, or similar services provide unsatisfactory and do not indicate compliance with the requirements of the Contract Documents, the re-tests shall be the responsibility of the Contractor regardless of whether the original test was the Contractors responsibility.

B. Re-testing of work revised or replaced by the Contractors is the Contractors responsibility where required tests were performed on original work. All costs and fees for re-testing shall be paid by the Contractor.

C. Schedule delays and costs which are the result of non-conforming work or remedy will be the responsibility of the Contractor.

3.03 SPECIAL INSPECTIONS:

A. Where the requirements for special inspections are listed and required per the 2006 Michigan Building code in chapter 17 for all structural test and components shall be submitted to the architect and engineer as well as the building official having authority over the project.

END OF SECTION 01 45 23

SECTION 01 50 00 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

B. Temporary utilities required include but are not limited to:

1. Temporary electric power and light.

C. Temporary construction and support facilities required include but are not limited to:

1. Temporary heat.
2. Field offices and storage sheds.
3. Temporary roads and paving.
4. Sanitary facilities, including drinking water.
5. Temporary enclosures.
6. Temporary Project identification signs and bulletin boards.
7. Waste disposal services.
8. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities required include but are not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection.

1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulations.
6. Michigan Department of Transportation.

B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Division-6 Section "Rough Carpentry."

1. For job-built temporary offices, shops and sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.

2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.

3. For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood.

4. For safety barriers, sidewalk bridges and similar uses, provide minimum 5/8" thick exterior plywood.

C. Paint: Comply with requirements of Division-9 Section "Finish Painting."

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

D. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

E. Water: Provide potable water approved by local health authorities.

F. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized barbed wire top strand and galvanized steel pipe posts, 1-1/2" I.D. for line posts and 2-1/2" I.D. for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Water Hoses: Provide 3/4" heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air- conditioned units on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. First Aid Supplies: Comply with governing regulations.

J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the

Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a Change Order.

B. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.

2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

C. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

2. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.

C. Temporary Heat: Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

D. Heating Facilities: Except where use of the permanent system is authorized, provide vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open flame, or salamander type heating units is prohibited.

E. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

1. Furnish with a desk and chairs, appropriately-sized conference table with chairs, a 4-drawer file cabinet, plan table and plan rack and a 6-shelf bookcase.
2. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

F. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

G. Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Architect.

1. Paving: Comply with Division-2 Section "Asphalt Concrete Paving" for construction and maintenance of temporary paving.

2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.

3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner.

4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.

5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

H. Sanitary facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulations and health codes for the type, number, location, operation and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.

I. Toilets: Use of the Owner's existing/new toilet facilities will not be permitted.

J. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

K. Drinking Water Fixtures: Provide drinking water fountains where indicated, including paper supply.

L. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division-2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations and construction free of water.

M. Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

N. Project Identification and Temporary Signs: Prepare project identification and other signs of the size indicated; install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.
1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

O. Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when Work is being performed.

P. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

Q. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.

B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

E. Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chain-link fencing with posts set in a compacted mixture of gravel and earth.

F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to:

a. Replace air filters and clean inside of ductwork and housings.

b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.

c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. See Division 1 Section "Closeout Procedures" for submitting warranties for Contract closeout.

C. See Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified material or product cannot be provided.
b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.

c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.
k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Change Order.
b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
2. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
3. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Provide Alternate product comparison against Basis-of-Design product. Architect to determine if Alternate product is equal.

4. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 30 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Architect.

B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Starting and adjusting.
4. Protection of installed construction.
5. Correction of the Work.

B. See Division 1 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

B. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral

anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

END OF SECTION 01 73 00

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See all Divisions Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
   1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
   3. Products: List products to be used and firms or entities that will perform the Work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
   6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure. Submit to Structural Engineer of Record for the Project for approval.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete, Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
   5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. See Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.

C. See Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

D. See Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, which must be completed or corrected before certificate will be issued. All items on the list must be completed within sixty (60) calendar days of issuance. Within ten (10) days of receipt of Architect’s list of items, Contractor will submit a schedule to complete these items.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. All costs incurred by the Architect or the Architect’s Consultants to close out the project (after 60 calendar days have passed from issuance of punch list items), will be charged to the Owner at the current hourly rates and thus deducted from the final contract amount, via Change Order.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Replace parts subject to unusual operating conditions.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

E. If the Owner or Architect determines that the cleaning is not sufficient, the Owner or Architect will request that the cleaning be redone; or at the Owner’s option, the Owner will hire a professional cleaning company to perform the said work, and thus deduct the cost from the final Pay Application.

END OF SECTION 01 77 00

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. See all Divisions Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit copies of Record Drawings as follows:
   a. Final Submittal: Submit two set(s) of marked-up Record Prints, and the following:

      1) Record Transparencies: One set.
      2) Record CAD Drawing Files and Plots: One set.

B. Record Specifications: Submit two copies of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit two copies of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Transparencies: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected transparencies of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Architect for resolution.
3. Owner will furnish Contractor one set of transparencies of the Contract Drawings for use in recording information.

C. Record CAD Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:

1. Format: AutoCAD; Version 2017 min or newer.
2. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.

D. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.
3. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

2.5 FINAL RECORD DOCUMENT PROCEDURE

A. The Contractor shall insure that an accurate, on-going record is kept of all deviations from the approved design Drawings and Specifications, which may occur as actually constructed.
B. Upon completion of the Work, the Contractor shall submit to the Construction Manager for review, two (2) complete sets of record (As-Built) drawings and specifications. The record drawings or “As-Builts” shall include all deviations from the original approved design Drawings and Specifications.
C. Contractor shall obtain receipt for the record documents and submit said receipt with request for final payment of the contract. Release of Final Payment shall be withheld pending approval of the as-built documentation submitted by the Construction Manager.
D. Once the Construction Manager has received all the mark-ups from all trades, documents are turned over to the Architect and Engineers for updates to the CAD files for record drawings. Once completed, the Architect and Engineers turns over the final CAD files to the County.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

B. Instruction Time: Length of instruction time will be measured by actual time spent performing demonstration and training in required location. No payment will be made for time spent assembling educational materials, setting up, or cleaning up.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For facilitator

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.

d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript:

a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and

reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 01 79 00

SECTION 02 41 13 SELECTIVE SITE DEMOLITION

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of existing sidewalks, grass, earth, landscaping, soils, concrete patios, and miscellaneous related site appurtenances.

1.03 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

B. Remove, salvage, and return to Owner all existing lock cylinders and cores in doors being removed.

1.05 SUBMITTALS

A. Preconstruction Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by demolition operations. Submit before any demolition or removal Work begins.

1.06 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition and removal work similar in material and extent to that indicated for this Project.

B. Regulatory Requirements: Comply with governing regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 and NFPA 241.

1.07 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to the area where demolition and removal work will take place. Conduct demolition and removal work so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Maintain access to existing walkways, corridors, and other adjacent occupied facilities.

1. Do not close or obstruct walkways, corridors, or other occupied facilities without written permission from Owner.

C. Owner assumes no responsibility for condition of areas to be demolished.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

E. Storage or sale of removed items or materials on-site will not be permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

PART 2 PRODUCTS

2.01 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions to determine extent of demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.02 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during demolition operations.

B. Do not interrupt existing utilities serving occupied facilities unless authorized in writing by Owner.

1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.

C. Utility Requirements: Refer to Division for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.03 PREPARATION

A. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around demolition area and to and from occupied portions of building. Retain or revise first two paragraphs and associated subparagraph below if required. Coordinate with Division 1 Section "Temporary Facilities and Controls." Delete if temporary enclosures and partitions are shown on Drawings.

3.04 POLLUTION CONTROLS

A. Dust Control: use water mist, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.

3.05 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with demolition systematically.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.

5. Dispose of demolished items and materials promptly.

6. Return elements of construction and surfaces that are to remain to condition existing before demolition operations began.

B. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

E. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

F. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.06 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner’s property and legally dispose of them.

END OF SECTION 02 41 13

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 017300 "Execution" for cutting and patching procedures.
3. Section 013516 "Alteration Project Procedures" for general protection and work procedures for alteration projects.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Review and finalize protection requirements.
7. Review procedures for noise control and dust control.
8. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Survey of Existing Conditions: Submit survey.

D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

E. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Temporary interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed in accordance with EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct

selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials:

1. It is not expected that hazardous materials will be encountered in the Work.

a. Hazardous materials will be removed by Owner before start of the Work.
b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. On-site sale of removed items or materials is not permitted.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

C. Sustainable Design Requirements for Building Reuse:

1. Maintain the existing building structure, envelope, and interior nonstructural elements of a historic building or contributing building in a historic district. Do not demolish such existing construction beyond indicated limits.
2. Maintain the existing building structure, envelope, and interior nonstructural elements of an abandoned or blighted building. Do not demolish such existing construction beyond indicated limits.
3. Maintain the existing building structural systems where indicated to remain. Do not demolish such existing construction beyond indicated limits.
4. Maintain the existing interior ceilings, interior partitions, and/or demountable walls where indicated to remain. Do not demolish such existing construction beyond indicated limits.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video, Comply with Section 013233 "Photographic Documentation."

1. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

A. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location and cleaned and reinstalled in their original locations after selective demolition operations are complete.

D. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated utilities when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If disconnection of utilities and building systems will affect adjacent occupied parts of the building, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to those parts of the building.
4. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.

5. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.

a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

6. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:

a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.
b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

3.4 SALVAGE/REINSTALL

A. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 12 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete:

1. Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch** at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
2. Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings. Do not use methods requiring solvent-based adhesive strippers.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight

1. Remove existing roof, flashings, copings, and roof accessories.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them in accordance with Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing materials.

1.2 DEFINITIONS

A. Form-Facing Material: The temporary form materials that come in direct contact with the concrete as part of the formwork components in supporting the concrete while the concrete is setting and gaining sufficient strength to be self-supporting. The most common materials are steel, aluminum, and wood.

B. Form Lining: Materials used to line the concreting face of formwork to impart a smooth or patterned finish to the concrete surface, to absorb moisture from the concrete, or to apply a set-retarding chemical to the formed surface of the concrete.

C. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.

C. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with **ACI 301**.

a. Location of construction joints is subject to approval of Architect.

3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
6. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

D. Samples:

1. For waterstops.
2. For Form Liners: **12- by 12-inch** sample, indicating texture.

1.5 INFORMATIONAL SUBMITTALS

A. Research Reports: For insulating concrete forms indicating compliance with ICC's Acceptance Criteria AC353.

B. Field quality-control reports.

C. Minutes of preinstallation conference.

D. Qualification Statements: For testing and inspection agency.

1.6 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately [**100 sq. ft.**] in the location indicated or, if not indicated, as directed by Architect.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Insulating Concrete Forms: Store forms off ground and under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with **ACI 301**, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

    a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with **ACI 301**, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

    a. Wind Loads: As indicated on Drawings.

        1) Horizontal Deflection Limit: Not more than 1/240 of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete, and as follows:

    a. Plywood, metal, or other approved panel materials.
    b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

        1) APA HDO (high-density overlay).
        2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.
        3) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
        4) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces spiral or vertical seams not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation, with straight end forms.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

2.3 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than **0.022-inch-** thick, galvanized-steel sheet. Temporarily fill or

cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than **0.034 inch** thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, **3/4 by 3/4 inch**, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners to be acceptable to form liner manufacturer.

F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than **1 inch** to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than **1 inch** in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

G. Sealant: One-part moisture cure silicone sealant used with form liners.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with **ACI 301**.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of **ACI 117** and to comply with the Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-3.0: **ACI 117** Class A, **1/8 inch**.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than **12 inches**.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Form Liners: Install per manufacturer's written installation instructions and recommended tolerances.

M. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

N. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

O. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

P. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

Q. Coat contact surfaces of forms with form-release agent, in accordance with manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than **50 deg F** for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 INSTALLATION OF SHORING AND RESHORING

A. Comply with **ACI 318** and **ACI 301** for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

C. Prepare test and inspection reports.

END OF SECTION 03 10 00

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Epoxy repair coating.
3. Zinc repair material.
4. Bar supports.
5. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
3. For structural thermal break insulated connection system, indicate general configuration, insulation dimensions, tension bars, compression pads, shear bars, and dimensions.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

D. Delegated Design Submittal: For structural thermal break insulated connection system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For testing and inspection agency.

B. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
2. Dual-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

D. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.

1. Store reinforcement to avoid contact with earth.
2. Do not allow epoxy-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
3. Do not allow dual-coated reinforcement to be stored outdoors for more than 60 days without being stored under an opaque covering.
4. Do not allow stainless steel reinforcement to come into contact with uncoated reinforcement.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design structural thermal break insulated connection system, including attachment to building construction.

B. Structural Performance of Structural Thermal Break Insulating Connection System: Structural thermal break insulated connection system to withstand the following loads and stresses:

1. Dead Loads: As indicated on Drawings.

a. Shear Load: As indicated on Drawings.
b. Bending Moment: As indicated on Drawings.

2. Live Loads: As indicated on Drawings.

a. Shear Load: As indicated on Drawings.
b. Bending Moment: As indicated on Drawings.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Headed-Steel Reinforcing Bars: ASTM A970/A970M.

D. Epoxy-Coated Reinforcing Bars:

1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
2. Epoxy Coating: ASTM A775/A775M with less than 2 percent damaged coating in each 12-inch bar length.

E. Dual-Coated Reinforcing Bars: ASTM A1055/A1055M.

1. Steel Bars: ASTM A615/A615M, Grade 60, deformed bars.
2. Zinc Coating: ASTM A1055/A1055M Type II.
3. Epoxy Coating: ASTM A775/A775M with less than 2 percent damaged coating in each 12-inch bar length.

F. Stainless Steel Reinforcing Bars: ASTM A955/A955M, Grade 60 Type 304, deformed.

G. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60 deformed bars, assembled with clips.

H. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

I. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

J. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from

galvanized-steel wire into flat sheets.

K. Epoxy-Coated Welded-Wire Reinforcement: ASTM A884/A884M, Class A coated, Type 1, plain steel.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, ASTM A775/A775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

D. Mechanical Splice Couplers: ACI 318 Type 2, same material of reinforcing bar being spliced; dowel-bar type

E. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Galvanized, ASTM A884/A884M, Class A, Type 1, epoxy coated, with less than 2 percent damaged coating in each 12-inch wire length.

F. Stainless Steel Tie Wire: ASTM A1022/A1022M, not less than 0.0508 inch in diameter.

G. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A775/A775M.

H. Zinc Repair Material: ASTM A780/A780M.

2.4 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install structural thermal break insulated connection system in accordance with manufacturer's instructions.

H. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

    a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

I. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

J. Dual-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating in accordance with ASTM D3963/D3963M.

K. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material in accordance with ASTM A780/A780M.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

END OF SECTION 03 20 00

SECTION 03 30 13 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.

B. Related Sections include the following:

1. Division 03 Section "Architectural Concrete" for general building applications of specially finished formed concrete.
2. Division 03 Section "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.
3. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
4. Division 32 Section "Concrete Paving" for concrete pavement and walks.
5. Division 32 Section "Decorative Concrete Paving" for decorative concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Welding certificates.

E. Qualification Data: For Installer and manufacturer.

F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

G. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

H. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

I. Field quality-control test and inspection reports.

J. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately **200 sq. ft. (18.6 sq. m)** for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control,concrete finishes and finishing,cold- and hot-weather concreting procedures,curing procedures,construction contraction and isolation joints, and joint-filler strips,semirigid joint fillers,forms and form removal limitations, shoring and reshoring procedures,vapor-retarder installation,anchor rod and anchorage device installation tolerances,steel reinforcement installation,floor and slab flatness and levelness measurement,concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.
b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
c. Structural 1, B-B or better; mill oiled and edge sealed.
d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

G. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

H. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

I. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar support contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type Igray.

a. Fly Ash: ASTM C 618, Class [C].
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class [3S] coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: [**1 inch (25 mm)**] nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

7. Color: As selected by Architect from manufacturer's full range.

2.7 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Available Manufacturers:

a. Greenstreak.
b. Progress Unlimited, Inc.
c. Williams Products, Inc.

2. Profile: Flat, dumbbell with center bulb.
3. Dimensions: [**4 inches by 3/16 inch thick (100 mm by 4.75 mm thick)**]; nontapered.

B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

1. Products:

a. Colloid Environmental Technologies Company; Volclay Waterstop-RX.
b. Concrete Sealants Inc.; Conseal CS-231.
c. Greenstreak; Swellstop.
d. Henry Company, Sealants Division; Hydro-Flex.
e. JP Specialties, Inc.; Earthshield Type 20.
f. Progress Unlimited, Inc.; Superstop.
g. TCMiraDRI; Mirastop.

2.8 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Available Products:
a. .
b. Stego Industries, LLC; Stego Wrap, 6 mils.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than [**4100 psi (29 MPa)**] at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than [**5000 psi (34.5 MPa)**] at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Ground Granulated Blast-Furnace Slag: 50 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: [**4000 psi (27.6 MPa)**] at 28 days.
2. Maximum Water-Cementitious Materials Ratio: [**0.50**].
3. Slump Limit: [**4 inches (100 mm)**], plus or minus 1 inch (25 mm).
4. Air Content: [**6**] percent, plus or minus 1.5 percent at point of delivery for [**1-inch (25-mm)**] nominal maximum aggregate size.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: [**4000 psi (27.6 MPa)**] at 28 days.
2. Maximum Water-Cementitious Materials Ratio: [**0.50**].
3. Slump Limit: [**4 inches (100 mm)**], plus or minus 1 inch (25 mm).
4. Air Content: [**6**] percent, plus or minus 1.5 percent at point of delivery for [**1-inch (25-mm)**] nominal maximum aggregate size.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: [**4000 psi (27.6 MPa)**] at 28 days.
2. Minimum Cementitious Materials Content: [**520 lb/cu. yd. (309 kg/cu. m)**].
3. Slump Limit: [**4 inches (100 mm)**], plus or minus 1 inch (25 mm).
4. Air Content: [**6**] percent, plus or minus 1.5 percent at point of delivery for [**1-inch (25-mm)**] nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

D. Suspended Slabs: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: [**4000 psi (27.6 MPa)**] at 28 days.
2. Minimum Cementitious Materials Content: [**520 lb/cu. yd. (309 kg/cu. m)**].
3. Slump Limit: [**4 inches (100 mm)**], plus or minus 1 inch (25 mm).
4. Air Content: [**6**] percent, plus or minus 1.5 percent at point of delivery for [**1-inch (25-mm)**] nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for [24] hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

1. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated
2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
   b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
   c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for suspended slabs.
   d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed [**1/4 inch (6 mm)**] [**3/16 inch (4.8 mm)**] [**1/8 inch (3.2 mm)**]

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 14days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.15 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least onemonth(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.17 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 (ASTM E 1155M) within 48 hours of finishing.

END OF SECTION 03 30 13

SECTION 04 01 10 - MASONRY CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cleaning the following:

1. Unit masonry surfaces.

1.2 ALLOWANCES

A. Allowances for cleaning masonry are specified in Section 012100 "Allowances."

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under [**100 psi**]

B. Low-Pressure Spray: [**100 to 400 psi**; **4 to 6 gpm**]

C. Medium-Pressure Spray: [**400 to 800 psi**; **4 to 6 gpm**]

D. High-Pressure Spray: [**800 to 1200 psi**; **4 to 6 gpm**]

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Review methods and procedures related to cleaning masonry including, but not limited to, the following:

a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
b. Materials, material application, and sequencing.
c. Cleaning program.
d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

B. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units

according to masonry repair Sections. Patch holes in mortar joints according to masonry repointing Sections.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include material descriptions and application instructions.
2. Include test data substantiating that products comply with requirements.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paint-remover manufacturer and chemical-cleaner manufacturer.

B. Preconstruction Test Reports: For cleaning materials and methods.

C. Cleaning program.

1.8 QUALITY ASSURANCE

A. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.

1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.

D. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Clean an area approximately **25 sq. ft.** for each type of masonry and surface condition.

a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage one or more chemical-cleaner manufacturers to perform preconstruction testing on masonry surfaces.

1. Use test areas as indicated and representative of proposed materials and existing construction.
2. Propose changes to materials and methods to suit Project.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is **40 deg F** and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of **140 to 160 deg F**.

C. Detergent Solution, Job Mixed: Solution prepared by mixing **2 cups** of tetrasodium pyrophosphate (TSPP), **1/2 cup** of laundry detergent, and **20 quarts** of hot water for every **5 gal.** of solution required.

D. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing **2 cups** of tetrasodium pyrophosphate (TSPP), **5 quarts** of 5 percent sodium hypochlorite (bleach), and **15 quarts** of hot water for every **5 gal.** of solution required.

2.2 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Nonglazed Masonry Dilute acidic cleaner with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended in writing by chemical-cleaner manufacturer.

1. Stones: Use only on unpolished granite, unpolished dolomite marble, and siliceous sandstone.

PART 3 - EXECUTION

3.1 MASONRY-CLEANING SPECIALIST

A. Masonry-Cleaning Specialist Firms: Subject to compliance with requirements,

3.2 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
3. Neutralize alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

B. Remove downspouts nozzles and associated hardware adjacent to immediate work area and store during masonry cleaning. Reinstall when masonry cleaning is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from **20 feet** away by Architect.

B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.

1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

    a. Equip units with pressure gages.
    b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
    c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
    d. For high-pressure water-spray application, use fan-shaped spray that disperses water at an angle of at least 40 degrees.
    e. For heated water-spray application, use equipment capable of maintaining temperature between **140 and 160 deg F** at flow rates indicated.
    f. For steam application, use steam generator capable of delivering live steam at nozzle.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

F. Water Application Methods:

1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least **6 inches** from

masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

G. Steam Cleaning: Apply steam to masonry surfaces at the very low pressures indicated for each type of masonry. Hold nozzle at least **6 inches** from masonry surface and apply steam in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

H. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush application. not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

I. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

J. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.4 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover

a. Comply with requirements in "Paint Removal" Article.
b. Repeat application up to two times if needed.

3. Remove asphalt and tar with solvent-type paste paint remover

a. Comply with requirements in "Paint Removal" Article.
b. Apply paint remover only to asphalt and tar by brush without prewetting.
c. Allow paint remover to remain on surface for 10 to 30 minutes.
d. Repeat application if needed.

3.5 PAINT REMOVAL

A. Paint-Remover Application, General: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

B. Paint Removal with Solvent-Type Paste Paint Remover:

1. Remove loose and peeling paint using medium -pressure water spray, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
2. Apply thick coating of paint remover to painted surface with natural-fiber cleaning brush, deep-nap roller, or large paint brush. Apply in one or two coats according to manufacturer's written instructions.

3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
4. Rinse with cold water applied by medium-pressure spray to remove chemicals and paint residue.

3.6 CLEANING MASONRY

A. Cold-Water Soak:

1. Apply cold water by intermittent spraying to keep surface moist.
2. Use perforated hoses or other means that apply a fine water mist to entire surface being cleaned.
3. Apply water in cycles of [five minutes] on and [20 minutes] off.
4. Continue spraying [until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests] [for 72 hours]
5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by medium-pressure spray.

C. Hot-Water Wash: Use hot water applied by medium-pressure spray.

D. Steam Cleaning: Apply steam at very low pressures not exceeding [**30 psi**]. Remove dirt softened by steam with wood scrapers, stiff-nylon or -fiber brushes, or cold-water wash, as indicated by cleaning tests.

E. Detergent Cleaning:

1. Wet surface with [cold] water applied by low-pressure spray.
2. Scrub surface with detergent solution using medium-soft brushes until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from mortar joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet.
3. Rinse with [cold] water applied by medium-pressure spray to remove detergent solution and soil.
4. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

F. Mold, Mildew, and Algae Removal:

1. Wet surface with [cold] water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
4. Rinse with [cold] water applied by medium-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

G. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in two applications by brush
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer
4. Rinse with cold water applied by [ow-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.7 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection, to perform preconstruction product testing, and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives visit Project site not less than twice to observing progress and quality of the work.

3.8 FINAL CLEANING

A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 04 01 10

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:

1. Concrete masonry units (CMUs).
2. Decorative concrete masonry units.
3. Firebox brick.
4. Clay flue lining units.
5. Stone trim units.
6. Mortar and grout.
7. Reinforcing steel.
8. Masonry joint reinforcement.
9. Ties and anchors.
10. Face Brick Veneer (Alternate #1)

B. Products furnished, but not installed, under this Section include the following:

1. Dovetail slots for masonry anchors, installed under Division 03 Section "Cast-in-Place Concrete."
2. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 05 Section "Structural Steel Framing."

C. Products installed, but not furnished, under this Section include the following:

1. Cast-stone trim, furnished under Division 04 Section "Cast Stone Masonry."
2. Steel lintels and shelf angles for unit masonry, furnished under Division 05 Section "Metal Fabrications."
3. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) Retain paragraph above or below. See Editing Instruction No. 2 in the Evaluations.

C. Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according to ASTM C 1314

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

1. Decorative concrete masonry units, in the form of small-scale units.
2. Face brick, in the form of straps of five or more bricks.
3. Colored mortar.
4. Weep holes/vents.

D. Qualification Data: For testing agency.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

2.2 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged bullnose units for outside corners, unless otherwise indicated.

B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested

as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.

C. Concrete Masonry Units: ASTM C 90

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa)
2. Weight Classification: Normal weight
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Size (Width): Manufactured to the following dimensions:
5. First of each pair of options in six subparagraphs below is a metric size, second is equivalent metric dimension for IP size. If retaining first options, verify availability.

6. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
7. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

SIZES AND SHAPES

Surfaces are manufactured to provide finished dimensions of 7-5/8" x 15-5/8" ± 1/8". Bed depth dimensions for single face units are 3-9/16", 5-9/16", 7-9/16", 11-9/16" ± 1/8". Two face units are 3-1/2", 5-1/2", 7-1/2", 11-1/2", ± 1/8". Nominal 2", 4", 6", 8", 10" and 12" standard block thickness are available as well as all standard block shapes. High-strength units for special structural requirements, over-sized units, and metric shapes and sizes are also avail able.

2.4 CONCRETE AND MASONRY LINTELS

A. General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

B. Concrete Lintels: Precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete."

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 BRICK

A. General: Provide shapes indicated and as follows:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207, Type S.

D. Masonry Cement: ASTM C 91

E. Mortar Cement: ASTM C 1329

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

G. Colored Cement Product: Packaged blend made from and mortar pigments, all complying with specified requirements, and containing no other ingredients.

H. Refractory Mortar Mix: Ground fireclay or non-water-soluble, calcium aluminate, medium-duty refractory mortar that passes ASTM C 199 test; or an equivalent product acceptable to authorities having jurisdiction.

I. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

D. Masonry Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) in width, plus 2 side rods at each wythe of masonry 4 inches (100 mm) or less in width.

2.8 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.

B. Adjustable Anchors for Connecting to Structure: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

C. Adjustable Masonry-Veneer Anchors

1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:

a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow brick and concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Lay structural-clay tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- (6- to 10-mm-) thick joints.
4. Where epoxy-mortar pointed joints are indicated, rake out setting mortar to a uniform depth of 1/4 inch (6 mm) and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

D. Set firebox brick in full bed of refractory mortar with full head joints. Form joints by buttering both surfaces of adjoining brick and sliding it into place. Make joints just wide enough to accommodate variations in size of brick, approximately 1/8 inch (3 mm). Tool joints smooth on surfaces exposed to fire or smoke.

E. Install clay flue liners to comply with ASTM C 1283. Install flue liners ahead of surrounding masonry. Set clay flue liners in full bed of refractory mortar 1/16 to 1/8 inch (1.6 to 3 mm) thick. Strike joints flush on inside of flue to provide smooth surface. Maintain expansion space between flue liner and surrounding masonry except where surrounding masonry is required to provide lateral support for flue liners.

F. Set stone, cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

G. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch (19 mm) or more in width.

H. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints,

a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes
b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement
c. First option in subparagraph below provides headers equal to 4 percent of wall area for standard modular-size brick; second option provides 4 percent coverage for thicker brick.

3. Header Bonding: Provide masonry unit headers extending not less than 3 inches (76 mm) into each wythe. Space headers not over 12 inches (305 mm) clear horizontally and 16 inches (406 mm) clear vertically.

B. Bond wythes of composite masonry together using bonding system indicated on Drawings.

C. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

D. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar

E. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

F. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide individual metal ties not more **than 8 inches o.c.**
2. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at **corners,** returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to concrete and masonry backup masonry-veneer anchors to comply with the following requirements:

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete

C. Form expansion joints in brick made from clay or shale as follows:

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 07 Section "Joint Sealants,"

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours

3.11 FIELD QUALITY CONTROL

A. Testing Frequency: One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

B. Clay Masonry Unit Test: For each type of unit provided, per ASTM C 67.

C. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm). Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot (3 mm per 300 mm). Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches (100 mm) in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 05 12 23 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Structural steel.
2. Grout.

B. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Steel Decking" for field installation of shear connectors.
3. Division 05 Section "Metal Fabrications" for steel lintels or shelf angles not attached to structural-steel frame,miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 09 painting Sectionsfor surface preparation and priming requirements.
5. Division 13 Section "Metal Building Systems" for structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

C. Welding certificates.

D. Qualification Data: For Installer,fabricator and professional engineer.

E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.

2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Direct-tension indicators.
4. Tension-control, high-strength bolt-nut-washer assemblies.
5. Shear stud connectors.
6. Shop primers.
7. Nonshrink grout.

F. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1,P2,P3 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

E. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
4. AISC's "Specification for Allowable Stress Design of Single-Angle Members."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 572/A 572M, Grade 50 (345).

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: [Standard
2. Finish: Black, except where indicated to be galvanized.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.

1. Finish: Plain.
2. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8,) compressible-washer type.

a. Finish: Plain.

B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

C. Sleeve Nuts: ASTM A 108, Grade 1018, cold-finished carbon steel.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A 6/ A 6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to receive sprayed fire-resistive materials.
4. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
1. SSPC-SP 3, "Power Tool Cleaning."
2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils (0.038 mm).

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/ A 123M.

1. Fill vent holes and grind smooth after galvanizing.
2. Galvanize [**lintels**] attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic DesignAdd leveling plates to paragraph below if required. Delete options in paragraph and subparagraphs if no bearing plates.

B. Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting bearing plates. Clean bottom surface of bearing plates.

1. Set bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design"for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than- continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories**,** bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05 12 23

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SECTION 05 40 00 – COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Wall, Soffit and Ceiling framing.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   - Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/360 (1/720 for brick backup) of the wall height.

1.3 SUBMITTALS

A. Product Data: For each type of product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports.

F. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

E. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60 (Z180), or equivalent.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Minimum Flange Width: 1-3/8 inches (35 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

C. Vertical Deflection Clips: Manufacturer's standard bypass head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges

2.1 INTERIOR NON-LOAD-BEARING WALL FRAMING

COLD FORMED METAL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch (1.09 mm).
2. Minimum Flange Width: 1-3/8 inches (35 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.

C. Vertical Deflection Clips: Manufacturer's standard bypass head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.2 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.3 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035 ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

- PREPARATION

  - Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

  - Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

- INSTALLATION, GENERAL

  - Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

  - Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

  - Install framing members in one-piece lengths.

  - Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

  - Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

  - Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

  - Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

- Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

  - Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

- EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

  - Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

  - Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

    - Stud Spacing: As indicated.

  - Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

  - Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

    - Install single deflection tracks and anchor to building structure.
    - Install double deflection tracks and anchor outer track to building structure.
    - Connect vertical deflection clips to bypassing infill studs and anchor to primary building structure.

  - Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

    - Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

      - Install solid blocking at 96-inch (2440-mm) centers.

    - Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
    - Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud- track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

  - Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall- framing system.

- INTERIOR NON-LOAD-BEARING WALL INSTALLATION

- Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

- Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

    - Stud Spacing: As indicated on Drawings.

- Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

- Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

    - Install single deep-leg deflection tracks and anchor to building structure.
    - Install double deep-leg deflection tracks and anchor outer track to building structure.
    - Connect vertical deflection clips to studs and anchor to building structure.
    - Connect drift clips to cold-formed steel metal framing and anchor to building structure.

- Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.

    - Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
    - Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- Top Bridging for Single Deflection Track: Install row of horizontal bridging within 18 inches (450 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

    - Install solid blocking at 96-inch (2440-mm) centers.

- Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

- ERECTION TOLERANCES

    - Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

        - Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

- FIELD QUALITY CONTROL

- Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- Field and shop welds will be subject to testing and inspecting.
- Testing agency will report test results promptly and in writing to Contractor and Architect.
- Remove and replace work where test results indicate that it does not comply with specified requirements.
- Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- REPAIRS AND PROTECTION
  - Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold- formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
  - Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - MISC. METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Loose bearing and leveling plates.
5. Steel weld plates and angles for casting into concrete not specified in other Sections.
6. Steel Pipe Railings
7. Miscellaneous steel trim including steel angle corner guards steel edgings and loading-dock edge angles.
8. Metal bollards.
9. Pipe guards.
10. Cast-iron wheel guards.
11. Metal downspout boots.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts and other items indicated to be cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 05 Section "Structural Steel Framing."

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Prefabricated building columns.
3. Metal nosings and treads.
4. Paint products.
5. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type and finish of extruded nosing and tread.

D. Mill Certificates: Signed by manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

E. Welding certificates.

F. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.6, "Structural Welding Code--Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304,316L.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304,316L.

D. Steel Tubing: ASTM A 500, cold-formed steel tubing.

E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

F. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.

1. Size of Channels: As indicated.
2. Material: Galvanized steel complying with ASTM A 653/A 653M, commercial steel, Type B, with G90 (Z275) coating; [**0.108-inch (2.8-mm)**] [**0.079-inch (2-mm)**] [**0.064-inch (1.6-mm)**] nominal thickness.
3. Material: Steel complying with ASTM A 1008/A 1008M, commercial steel, Type B Revise paragraph below after verifying availability if another class is required for structural reasons. Insert ductile iron if needed for structural reasons.

G. Cast Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

E. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

G. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

I. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F 593 (ASTM F 738M) for bolts and ASTM F 594 (ASTM F 836M) for nuts, Alloy Group [**1 (A1)**] [**2 (A4)**].

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

G. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

J. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

K. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

L. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group [**1 (A1)**] [**2 (A4)**] stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Division 09 painting SectionsSelect paragraph above or one or both primer paragraphs and associated subparagraphs below. First paragraph below specifies a typical primer for painted finishes that provides minimum protection to steel. Second paragraph specifies a typical primer for high-performance coating. If retaining both, indicate on Drawings or in a schedule where each is required.

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 420 g/L (3.5 lb/galor less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products:

    a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    b. Carboline Company; Carbozinc 621.
    c. ICI Devoe Coatings; Catha-Coat 313.
    d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    g. Tnemec Company, Inc.; Tneme-Zinc 90-97.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm), unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

2.1 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.2 STEEL PIPE RAILINGS

A. Steel Pipe Railings:

1. Provide railings and handrails capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
   a. Concentrated loads of 200 lbs. Applied at any point in any direction.
   b. Uniform load of 50 lbs. Per linear ft. applied in both vertical and horizontal directions simultaneously.
2. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option.
3. At tee and cross intersections provide coped joints.
4. At bends interconnect pipe by means of prefabricated elbow fittings or flush radius bends, as applicable.
5. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces of pipe.
6. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.
7. Close exposed ends of pipe by welding 3/16" thick steel plate in place or by use of prefabricated fittings.
8. Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnections of pipe and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

2.3 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trimPrime exterior miscellaneous steel trimwith zinc-rich primer.

2.4 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe

1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
2. Where bollards are indicated to receive push-button controls for door operators, provide necessary cutouts for push-button controls and hole for wire.

B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all 4 corners for 3/4-inch (19-mm) anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Fabricate sleeves for bollard anchorage from steel pipewith 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

D. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch (6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4 inch (19 mm) steel machine bolt.

2.5 PIPE GUARDS

A. Fabricate pipe guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.

B. Galvanize pipe guards after fabrication.

C. .

2.6 CAST-IRON WHEEL GUARDS

A. Provide wheel guards of 3/4-inch- (19-mm-) thick, hollow-core, gray-iron castings; of size and shape indicated. Provide holes for countersunk anchor bolts and grouting.

2.7 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast aluminum in heights indicated with inlets of size and shape to suit downspouts.

1. Outlet: Vertical, to discharge into pipe

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.9 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.10 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Satin Finish: No. 4.

D. Dull Satin Finish: No. 6.

E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.11 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

2.12 COPPER-ALLOY FINISHES

A. Finish designations for copper alloys comply with the system established for designating copper-alloy finish systems defined in NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

B. Cast-**Bronze**Finish: M12 (Mechanical Finish: matte finish, as fabricated).

C. ExtrudedBronze Finish: M11 (Mechanical Finish: specular, as fabricated).

D. Bronze Plate, Sheet, Strip, and Bar Finish: M10 (Mechanical Finish: unspecified, as fabricated).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 INSTALLING METAL BOLLARDS

A. Anchor bollards to existing construction with expansion anchors Provide four 3/4-inch (19-mm) bolts at each bollard, unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

B. Anc**with pipe sleeves preset and anchored into concrete**Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

C. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.

D. Anchor internal sleeves for removable bollards in concrete by inserting into pipe sleeves preset into concreteFill annular space around internal sleeves solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward internal sleeve.

E. Anchor internal sleeves for removable bollards in place with concrete footings. Center and align sleeves in holes 3 inches (75 mm) above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace sleeves in position until concrete has cured.

F. Place removable bollards over internal sleeves and secure with 3/4-inch (19-mm) machine bolts and nuts. After tightening nuts, drill holes in bolts for inserting padlocks. Owner will furnish padlocks.

G. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.5 INSTALLING PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each pipe guard. Mount pipe guards with top edge 26 inches (660 mm) above driving surface.

3.6 INSTALLING CAST-IRON WHEEL GUARDS

A. Anchor wheel guards to concrete or masonry construction to comply with manufacturer's written instructions. Fill cores solidly with concrete.

3.7 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preservative-treated lumber.
3. Fire-retardant-treated lumber.
4. Dimension lumber framing.
5. Miscellaneous lumber.
6. Plywood backing panels.

B. Related Requirements:

1. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.
3. Section 064023 "Interior Architectural Woodwork" for interior wood stairs and railings.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than **2 inches nominal** size in least dimension.

B. Dimension Lumber: Lumber of **2 inches nominal** size or greater but less than **5 inches nominal** size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. Lumber grading agencies, and abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Sustainable Design Submittals:

1. Chain-of-Custody Qualification Data: For manufacturer and vendor.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

C. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

D. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

A. Regional Materials: Wood products shall be manufactured within **500 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles** of Project site.

B. Regional Materials: Wood products shall be manufactured within **500 miles** of Project site.

C. Regional Materials: Wood products shall be manufactured within **100 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **100 miles** of Project site.

D. Indigenous Materials: Wood products shall be manufactured within **500 miles** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

E. Regional Materials: Wood products shall be manufactured within **500 miles** of Project site from materials

that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles** of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

F. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
4. Dress lumber, S4S, unless otherwise indicated.

G. Maximum Moisture Content:

1. Boards: 15 percent.
2. Dimension Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:

1. UC1: Interior construction not in contact with ground or subject to moisture. Include all rough carpentry.

   a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   b. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   c. Wood floor plates that are installed over concrete slabs-on-grade.
   d. Wood furniture.
   e. Wood millwork.

2. UC2: Interior construction not in contact with ground but may be subject to moisture. Include all rough carpentry.

   a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   b. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   c. Wood floor plates that are installed over concrete slabs-on-grade.
   d. Wood millwork.
   e. Wood flooring.

3. UC3B (All Other Commodity Specifications): Uncoated products excluding sawn products in exterior construction not in contact with ground, exposed to all weather cycles including prolonged wetting. Include all rough carpentry.

   a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   b. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.

   UC4A (All Other Commodity Specifications): Non-critical products excluding sawn products in contact with ground and exposed to all weather cycles, normal exposure conditions. Include all

rough carpentry.

4. UC4B (Commodity Specification A): Critical or difficult-to-replace sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, high decay potential, and salt water splash. Include all rough carpentry

    a. Wood foundations.

5. UC4B (All Other Commodity Specifications): Critical or difficult-to-replace products excluding sawn products in contact with ground and exposed to all weather cycles including high decay potential and salt water splash. Include all rough carpentry.

6. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

7. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes

8. After treatment, redry boards, dimension lumber to 19 percent maximum moisture content.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat **all rough carpentry unless otherwise indicated.**

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, **furring, stripping,** and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than **18 inches** above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions by Grade: **No. 2** grade.

1. Application: **Interior partitions not indicated as load bearing**.
2. Species:

    a. Hem-fir (north); NLGA.
    b. Southern pine or mixed southern pine; SPIB.
    c. Spruce-pine-fir; NLGA.
    d. Hem-fir; WCLIB, or WWPA.
    e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
    f. Northern species; NLGA.
    g. Eastern softwoods; NeLMA.
    h. Western woods; WCLIB or WWPA.

B. Load-Bearing Partitions by Grade: No. 2 grade.

1. Application: Exterior walls and interior load-bearing partitions.
2. Species:

    a. Hem-fir (north); NLGA.

b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Southern pine or mixed southern pine; SPIB.
e. Spruce-pine-fir; NLGA.
f. Douglas fir-south; WWPA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-larch (north); NLGA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Load-Bearing Partitions by Performance: Any species and grade with a modulus of elasticity of at least [**1,500,000 psi**] and an extreme fiber stress in bending of at least [**1000 psi**] **2-inch nominal** thickness and **12-inch nominal** width for single-member use.

1. Application: Exterior walls and interior load-bearing partitions.

D. Ceiling Joists: No. 2 grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Douglas fir-larch (north); NLGA.
e. Southern pine or mixed southern pine; SPIB.
f. Spruce-pine-fir; NLGA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-south; WWPA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
j. Northern species; NLGA.
k. Eastern softwoods; NeLMA.
l. Western woods; WCLIB or WWPA.

E. Joists, Rafters, and Other Framing by Grade: **Select Structural** grade.

1. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Southern pine or mixed southern pine; SPIB.
e. Spruce-pine-fir; NLGA.
f. Douglas fir-south; WWPA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-larch (north); NLGA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

F. Joists, Rafters, and Other Framing by Performance: Any species and grade with a modulus of elasticity of at least **1,500,000 psi** and an extreme fiber stress in bending of at least **1000 psi** for **2-inch nominal** thickness and **12-inch nominal** width for single-member use.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.

5. Furring.
6. Grounds.
7. Utility shelving.

B. Dimension Lumber Items: **No. 2** grade lumber of **the following species:**

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

C. Concealed Boards: [**15**] percent maximum moisture content and the following species and grades:

1. Mixed southern pine or southern pine; No. [**2**] grade; SPIB.
2. Hem-fir or hem-fir (north); **No. 2 Common** grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir; **No. 2** grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods; No. [**2**] Common grade; NeLMA.
5. Northern species; No. [**2**] Common grade; NLGA.
6. Western woods; [**No. 2** grade; WCLIB or WWPA.

D. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, **Exterior, A-C** in thickness indicated or, if not indicated, not less than [**3/4-inch**] nominal thickness.

2.6 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than **1-1/2 inches** into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners **with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329**

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on [**ICC-ES AC01**] [**ICC-ES AC58**] [**ICC-ES AC193**] [**or**] [**ICC-ES AC308**] as appropriate for the substrate.

2.7 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets:

1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; **1-inch** nominal thickness, compressible to **1/32 inch**; selected from manufacturer's standard widths to suit width of sill members indicated.
2. Closed-cell neoprene foam, **1/4 inch** thick, selected from manufacturer's standard widths to suit width of sill members indicated.
3. Self-adhering sheet consisting of **64 mils** of rubberized asphalt laminated on one side to a **4-mil-** thick, polyethylene-film reinforcement, and with release liner on adhesive side**; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction**.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, **butyl rubber** compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than **0.025 inch**.

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of [**70**] g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate **furring,** nailers, blocking, **grounds,** and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

F. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than **16 inches** o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than **96 inches** o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than **96 inches** o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and **2-inch nominal** thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than **100 sq. ft.** and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than **20 feet** o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

N. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.

O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for **screeding or** attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than **1-1/2 inches** wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install **1-by-3-inch nominal-** size furring **horizontally** at [**24 inches**] [**600 mm**] o.c.

C. Furring to Receive Gypsum Board or Plaster Lath: Install **1-by-2-inch nominal-** size furring vertically at [**16 inches**] [**400 mm**] o.c.

3.4 INSTALLATION OF WALL AND PARTITION FRAMING

A. General: Provide single bottom plate and double top plates using members of **2-inch nominal** thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions **and for load-bearing partitions where framing members bearing on partition are located directly over studs**. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide **2-by-6-inch nominal-** size wood studs spaced **16 inches**] [**600 mm**] [**400 mm**] o.c. unless otherwise indicated.
2. For interior partitions and walls, provide [**2-by-6-inch nominal-** size wood studs spaced [**16 inches**] [**600 mm**] [**400 mm**] o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at midheight of partitions more than **96 inches** high, using members of **2-inch nominal** thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs**, except that two studs may be used for interior non-load-bearing partitions**.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than **4-inch nominal** depth for openings **48 inches** and less in width, **6-inch nominal** depth for openings **48 to 72 inches** in width, **8-inch nominal** depth for openings **72 to 120 inches** in width, and not less than **10-inch nominal** depth for openings **10 to 12 feet** in width.
2. For load-bearing walls, provide double-jamb studs for openings **60 inches** and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated[**or, if not indicated, according to Table R502.5(1) or Table R502.5(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings**].

D. Provide diagonal bracing in **exterior walls, at both walls of each external corner**][**walls, at locations**

indicated, at 45-degree angle, full-story height unless otherwise indicated.

3.5 INSTALLATION OF FLOOR JOIST FRAMING

A. General: Install floor joists with crown edge up and support ends of each member with not less than **1-1/2 inches** of bearing on wood or metal, or **3 inches** on masonry. Attach floor joists as follows:

1. Where supported on wood members, by[**toe nailing or by**] using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends **3 inches** and do not embed more than **4 inches**.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds **48 inches**.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than **2 inches** from top or bottom.

E. Provide solid blocking of **2-inch nominal** thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than **4 inches** or securely tie opposing members together. Provide solid blocking of **2-inch nominal** thickness by depth of joist over supports.

G. Anchor members paralleling masonry with **1/4-by-1-1/4-inch** metal strap anchors spaced not more than **96 inches** o.c., extending over and fastening to three joists. Embed anchors at least **4 inches** into grouted masonry with ends bent at right angles and extending **4 inches** beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of **96 inches** o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, **1-by-3-inch nominal-** size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.

1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide **1-by-8-inch nominal-** size or **2-by-4-inch nominal-** size stringers spaced **48 inches** o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches** deeper. Bevel ends of jack rafters for full bearing against valley rafters.
2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and **2 inches** deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide **1-by-6-inch nominal-** size boards between every third pair of rafters, but not more than **48 inches** o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00 – WOOD SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Subflooring, Decking and underlayment.
2. Sheathing joint-and-penetration treatment materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**

1. Review air-barrier and water-resistant glass-mat gypsum sheathing requirements and installation, special details, transitions, mockups, air-leakage testing, protection, and work scheduling that covers air-barrier and water-resistant glass-mat gypsum sheathing.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Subflooring and underlayment.
2. Sheathing joint-and-penetration treatment materials.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

C. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

3. Include details of interfaces with other materials that form part of air barrier.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer**,** including list of ABAA-certified installers and supervisors employed by Installer, who work on Project

B. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

C. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

D. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Air-barrier and water-resistant glass-mat gypsum sheathing.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer of air-barrier and water-resistant glass-mat gypsum sheathing.

1. Installer is to be licensed by ABAA in accordance with ABAA's Quality Assurance Program and is to employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution

1. Build integrated mockups of exterior wall assembly incorporating backup wall construction, window, storefront, door frame and sill, ties and other penetrations, and flashing to demonstrate crack and joint treatment and sealing of gaps, terminations, and penetrations of air-barrier sheathing assembly.

a. Coordinate construction of mockups to permit inspection and testing of sheathing before external insulation and cladding are installed.
b. Include junction with roofing membrane building corner condition
c. If Architect determines mockups do not comply with requirements, reconstruct mockups until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
2. For testing and inspecting agency providing tests and inspections related to air-barrier and water-resistant glass-mat gypsum sheathing: an independent agency, qualified in accordance with ASTM E329 for testing indicated, and certified by Air Barrier Association of America, Inc.

D. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

E. Certified Wood: Provide an invoice including vendor's chain-of-custody number, product cost, and entity being invoiced.

F. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

G. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier and water-resistant glass-mat gypsum sheathing assemblies are to comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage in accordance with ASTM E1186, chamber pressurization or depressurization with smoke tracers
2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate in accordance with ASTM E783 or ASTM E2357.
3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested in accordance with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

A. Emissions: Products are to meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Certified Wood: The following wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.

1. Plywood.
2. Oriented strand board.
3. Particleboard underlayment.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

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 Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, 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 are to comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood is to be tested in accordance with ASTM D5516 and design value adjustment factors are to be calculated in accordance with ASTM D6305. Span ratings after treatment are to be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: plywood indicated on Drawings, and the following:

2.5 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: **Exposure 1, Structural I** single-floor panels or sheathing.

1. Span Rating: Not less than [**16**]
2. Nominal Thickness: Not less than [**7/8 inch**] .

B. Underlayment: Provide underlayment in nominal thicknesses indicated

1. Plywood Underlayment for Carpet: DOC PS 1, Exposure 1, Underlayment.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For [roof] [parapet] [and] [wall] sheathing, provide fasteners [with hot-dip zinc coating complying with ASTM A153/A153M]
2. For [roof] [parapet] [and] [wall] sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours in accordance with ASTM B117.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced and Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum **2 inches** wide, **10 by 10 or 10 by 20 threads/inch**, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

C. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with [**APA AFG-01**] [**ASTM D3498**] that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesive shall have a VOC content of [**70**] g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesive shall comply with the testing and product requirements of the California Department of

Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate [wall] [parapet] [and] [roof] sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

a. Glue and nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels **1/8 inch** apart at edges and ends.

2. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Screw to cold-formed metal framing.
c. Space panels **1/8 inch** apart at edges and ends.

3. Underlayment:

a. Nail to subflooring.
b. Space panels **1/32 inch** apart at edges and ends.
c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

3.3 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing and Inspecting Agency: Engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements.

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
3. Termination mastic has been applied on cut edges.
4. Strips and transition strips have been firmly adhered to substrate.
5. Compatible materials have been used.
6. Transitions at changes in direction and structural support at gaps have been provided.
7. Connections between assemblies (sheathing and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
8. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier sheathing assemblies will be tested for evidence of air leakage in accordance with [ASTM E1186, chamber pressurization or depressurization with smoke tracers] [ASTM E1186, chamber depressurization using detection liquids].
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate in accordance with [ASTM E783] [or] [ASTM E2357].

E. Air barriers will be considered defective if they do not pass tests and inspections.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

END OF SECTION 06 16 00

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standing and running trim for transparent finish.
2. Miscellaneous materials.
3. Shop priming.
4. Shop finishing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing interior architectural woodwork that are concealed within other construction before interior architectural woodwork installation.
2. Section 062023 "Interior Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections, to ensure that interior architectural woodwork can be supported and installed as indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1.4 ACTION SUBMITTALS

A. Product Data:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

B. Wood-Preservative Treatment:

1. Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Indicate type of preservative used and net amount of preservative retained.
3. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.

C. Fire-Retardant Treatment: Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

D. Waterborne Treatments: For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

E. Shop Drawings:

1. Include the following:

a. Dimensioned plans, elevations, and sections.
b. Attachment details.

2. Show details.
3. Show locations and sizes of furring, blocking, and hanging strips, including blocking and reinforcement concealed by construction and specified in other Sections.
4. Apply [AWI Quality Certification] Program label to Shop Drawings.

F. Samples: For each exposed product and for each shop-applied color and finish specified.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [architectural woodwork manufacturer] [and] [Installer].

B. Product Certificates: For the following:

1. Composite wood products.
2. Adhesives.

C. Evaluation Reports: For wood materials, from ICC-ES.

D. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: [AWI Quality Certification Program] certificates.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in [AWI's Quality Certification Program]
2. Installer Qualifications: [Manufacturer of products] [and] [Licensed participant in AWI's Quality Certification Program]

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Architectural Woodwork Standards, Section 2.

B. Do not deliver interior architectural woodwork until painting and similar finish operations that might damage woodwork have been completed in installation areas.

C. Store woodwork in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1. Handle and store fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions.

1.9 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.

B. Environmental Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between [25 and 55] percent during the remainder of the construction period.

C. Field Measurements: Where interior architectural woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where interior architectural woodwork is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Frames: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.2 ARCHITECTURAL WOODWORK

A. Manufacturers: Subject to compliance with requirements

2.3 WOODWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1. Provide [labels] [and] [certificates] from [AWI] certification program indicating that woodwork[and installation] complies with requirements of grades specified.

2. The Contract Documents contain requirements that are more stringent than the Architectural

Woodwork Standards. Comply with Contract Documents and Architectural Woodwork Standards.

B. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

C. Regional Materials: Wood products shall be manufactured within 500 miles of Project site.

D. Regional Materials: Wood products shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

E. Indigenous Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

F. Regional Materials: Wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

G. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.

H. Certified Wood: Wood products shall be certified as "FSC Pure"[or "FSC Mixed Credit"] according to FSC STD-01-001 and FSC STD-40-004.

I. Certified Wood: Wood products shall be labeled according to the AF&PA's Sustainable Forestry Initiative, be certified as "FSC Pure" according to FSC STD-01-001 and FSC STD-40-004, or be certified and labeled according to the standards of the Programme for Endorsement of Forest Certification.

J. Certified Wood: Wood products shall [contain not less than 60 percent] [be made from] certified wood tracked through a chain-of-custody process. Certified wood documentation shall be provided by sources certified through a forest certification system with principles, criteria, and standards developed using ISO/IEC Guide 59 or the World Trade Organization's "WTO Agreement on Technical Barriers to Trade."

K. Certified Wood: Wood products shall be certified according to the American Tree Farm System's "AFF Standard," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Architectural Woodwork Standards Grade: [Premium]

B. Hardwood Lumber:

1. Wood Species and Cut:[Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.]
2. Species: [Red oak] [White oak]
3. Wood Moisture Content: [5 to 10] percent.
4. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
5. For trim items[other than base] wider than available lumber, use veneered construction. Do not glue for width.

    a. For veneered base, use hardwood lumber core, glued for width.

6. For base wider than available lumber, glue for width. Do not use veneered construction.
7. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Nailers: [Softwood or hardwood lumber] kiln-dried to less than 15 percent moisture content.

1. Preservative Treatment: Provide softwood lumber treated by pressure process, AWPA U1; Use Category UC3b.

a. Provide [where indicated] [where in contact with concrete or masonry]
b. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
c. Preservative Chemicals: Acceptable to authorities having jurisdiction[and containing no arsenic or chromium].
d. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.

B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.

1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

D. Adhesives: Do not use adhesives that contain urea formaldehyde.

E. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

F. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. Adhesives: Do not use adhesives that contain urea formaldehyde.

H. Adhesives: Do not use adhesives that contain urea formaldehyde.

I. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

1. Adhesives shall have a VOC content of [70] <Insert value> g/L or less.
2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
5. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
6. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical

Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.

1. Ease edges to radius indicated for the following:

a. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.

1. Disassemble components only as necessary for shipment and installation.
2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
3. Notify Architect seven days in advance of the dates and times interior architectural woodwork fabrication will be complete.
4. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled.

a. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting.
b. Verify that parts fit as intended, and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

2.7 SHOP PRIMING

A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

B. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."

1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork.[Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.]

2.8 SHOP FINISHING

A. Finish interior architectural woodwork [with transparent finish] at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.

C. Transparent Finish:

1. Architectural Woodwork Standards Grade: [Premium]
2. Finish System:

    a. 4: Latex Acrylic, Water Based.
    b. 12: Polyurethane, Water Based.

3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to woodwork made from closed-grain wood before staining and finishing.
4. Staining: Match approved sample for color
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
6. Filled Finish for Open-Grain Woods:[After staining, apply wash-coat sealer and allow to dry.] Apply paste wood filler and wipe off excess. Tint filler to match stained wood.
7. Sheen: [Satin, 31-45] gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.

B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

3.2 INSTALLATION

A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.

B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.

C. Install interior architectural woodwork level, plumb, true in line, and without distortion.

1. Shim as required with concealed shims.
2. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes in accordance with AWPA M4.

F. Fire-Retardant-Treated Wood: Install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.

1. Secure with countersunk, concealed fasteners and blind nailing.
2. Use fine finishing nails[or finishing screws] for exposed fastening, countersunk and filled flush with interior architectural woodwork.
3. For shop-finished items, use filler matching finish of items being installed.

H. Standing and Running Trim:

1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
2. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary.
3. Scarf running joints and stagger in adjacent and related members.
4. Fill gaps, if any, between top of base and wall with [plastic wood filler; sand smooth; and finish same as wood base if finished] [latex sealant, painted to match wall].
5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

3.3 FIELD QUALITY CONTROL

A. Inspections: Provide inspection of installed Work through [AWI's Quality Certification Program] certifying that woodwork, including installation, complies with requirements of the Architectural Woodwork Standards for the specified grade.

1. Inspection entity is to prepare and submit report of inspection.

3.4 REPAIR

A. Repair damaged and defective interior architectural woodwork, where possible, to eliminate functional and visual defects[and to result in interior architectural woodwork being in compliance with requirements of Architectural Woodwork Standards for the specified grade].

B. Where not possible to repair, replace defective woodwork.

C. Shop Finish: Touch up finishing work specified in this Section after installation of interior architectural woodwork.

1. Fill nail holes with matching filler where exposed.
2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.

D. Field Finish: See for final finishing of installed interior architectural woodwork not indicated to be shop finished.

3.5 CLEANING

A. Clean interior architectural woodwork on exposed and semiexposed surfaces.

END OF SECTION 06 40 23

SECTION 07 21 00 – THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Rigid Insulation
2. Cavity-wall insulation.
3. Concealed building insulation.
4. Exposed building insulation.
5. Loose-fill building insulation.
6. Self-supported, spray-applied cellulosic insulation.
7. Radiant barriers.
8. Vapor retarders.
9. Sound attenuation insulation.

B. Related Sections include the following:

1. Division 01 Section "Sustainable Design Requirements" for additional LEED requirements.
2. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
3. Division 06 Section "Sheathing" for foam-plastic board sheathing over wood framing.
4. Division 07 Section "[Self-Adhering Sheet Waterproofing] [Elastomeric Sheet Waterproofing] [Thermoplastic Sheet Waterproofing] [Cold Fluid-Applied Waterproofing] [Hot Fluid-Applied Rubberized Asphalt Waterproofing]" for insulation and insulated drainage panels installed with waterproofing.
5. Division 07 Section "[Polymer-Based Exterior Insulation and Finish Systems EIFSB] [Water-Drainage Exterior Insulation and Finish System (EIFS)]" for insulation specified as part of these systems.
6. Division 07 Section[s] "[Built-up Asphalt Roofing] [Built-up Coal-Tar Roofing] [Ethylene-Propylene-Diene-Monomer (EPDM) Roofing] [Chlorosulfanate-Polyethylene (CSPE) Roofing] [Thermoplastic Membrane Roofing] [Atactic-Polypropylene (APP) Modified Bituminous Membrane Roofing] [Styrene-Butadiene-Styrene Modified Bituminous Membrane Roofing] [Self-Adhering Modified Bituminous Membrane Roofing]" [and] [" Coated Foamed Roofing"] for insulation specified as part of roofing construction.
7. Division 07 Section "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
8. Division 09 Section[s] ["Gypsum Plastering"] ["Gypsum Veneer Plastering"] ["Portland Cement Plastering"] ["Gypsum Board"] [and] ["Gypsum Board Shaft-Wall Assemblies"] for installation in metal-framed assemblies of insulation specified by referencing this Section.
9. Division 21 Section "Fire-Suppression Systems Insulation."
10. Division 22 Section "Plumbing Insulation."
11. Division 23 Section "HVAC Insulation."
12. Division 33 Section "Subdrainage" for insulated drainage panels.

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 PERFORMANCE REQUIREMENTS

A. Plenum Rating: Provide [glass] [slag-wool-fiber/rock-wool]-fiber insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per "Erosion Test" and "Mold Growth and Humidity Test" described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.

1. Erosion Test Results: Insulation shows no visible evidence of cracking, flaking, peeling, or delamination of interior surface of duct assembly, after testing for 4 hours at 2500-fpm (13-m/s) air velocity.
2. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: Full-size units for each type of exposed insulation indicated.

C. LEED Submittals:

1. Credit MR 4.1[and MR 4.2]: Product Data indicating percentages by weight of postconsumer and preconsumer recycled content for products having recycled content.

a. Include statement indicating costs for each product having recycled content.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

E. Research/Evaluation Reports: For foam-plastic insulation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

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 method indicated below by UL or another 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 E 84.
2. Fire-Resistance Ratings: ASTM E 119.

3. Combustion Characteristics: ASTM E 136.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Manufacturers:
   a. Dow Chemical Company.
   b. Owens Corning.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Fiber Glass.

4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

C. Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with[foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene] [polypropylene-scrim-kraft] vapor-retarder membrane on 1 face.

D. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

2.4 LOOSE-FILL INSULATION

A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.

B. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type II for poured application; with maximum flame-spread and smoke-developed indexes of 5.

2.5 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils (0.15 mm) thick, with maximum permeance rating of 0.13 perm (7.5 ng/Pa x s x sq. m).

B. Reinforced-Polyethylene Vapor Retarders: 2 outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft. (12 kg/100 sq. m), with maximum permeance rating of 0.0507 perm (2.9 ng/Pa x s x sq. m).

C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

D. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

E. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

F. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and with demonstrated capability to bond vapor retarders securely to substrates indicated.

2.6 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

C. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.

D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.7 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.
2. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Angle: Formed from 0.030-inch- (0.762-mm-) thick, perforated, galvanized carbon-steel sheet with each leg 2 inches (50 mm) square.
2. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of [1 inch (25 mm)] [2 inches (50 mm)] [3 inches (76 mm)] between face of insulation and substrate to which anchor is attached.

E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

2.8 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2.9 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

2.10 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

2.11 INSTALLATION OF [PERIMETER] [AND] [UNDER-SLAB] INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

1. If not otherwise indicated, extend insulation a minimum of 24 inches (610 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

C. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection course with joints butted. Set in adhesive according to insulation manufacturer's written instructions.

D. Protect top surface of horizontal insulation from damage during concrete work by applying protection course with joints butted.

2.12 INSTALLATION OF CAVITY-WALL INSULATION

A. On units of foam-plastic board insulation, install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates indicated.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

B. Install units of cellular-glass insulation with closely fitting joints using method indicated:

1. Gob Method: Apply 4 gobs of adhesive per unit and set units firmly against inside wythe of masonry or other construction as shown. Apply gobs at each corner; spread gobs to form pads 4 inches (101 mm) in diameter by 1/4 inch (6 mm) thick.
2. Serrated-Trowel Method: Apply adhesive to entire surface of each cellular-glass insulation unit with serrated trowel complying with insulation manufacturer's written instructions.
3. Coat edges of insulation units with full bed of adhesive to seal joints between insulation and between insulation and adjoining construction.
4. Coat exterior face (cold face) of installed cellular-glass block insulation course with asphalt coating.

2.13 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Set vapor-retarder-faced units with vapor retarder [to warm side] [in location indicated] <Insert location> of construction, unless otherwise indicated.

1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

D. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
6. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320 and as follows:

a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

E. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

F. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

G. Place loose-fill insulation into spaces indicated, [either] [by pouring] [or] [by machine blowing], to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

1. For cellulosic-fiber loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation."

H. Apply self-supported, spray-applied cellulosic insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

I. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

2.14 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Install [3-inch- (76-mm-)] <Insert thickness> thick, unfaced [glass] [slag-wool-fiber/rock-wool]-fiber blanket insulation over suspended ceilings at partitions in a width that extends insulation 48 inches (1219 mm) on either side of partition.

B. Install [1-1/2-inch- (38-mm-)] <Insert thickness> thick, unfaced [glass] [slag-wool-fiber/rock-wool]-fiber blanket insulation over suspended ceilings so that insulation extends over entire ceiling.

2.15 INSTALLATION OF RADIANT BARRIERS

A. Install interior radiation control coating system according to ASTM C 1321.

B. Install sheet radiant barriers in locations indicated according to ASTM C 1158.

2.16 INSTALLATION OF VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (400 mm) o.c.

C. Before installing vapor retarder, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

D. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

E. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

F. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

2.17 PROTECTION

A. Protect installed insulation[and vapor retarders] from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 53 23 - EPDM MEMBRANE ROOFING

I. GENERAL

The project includes the provision of a complete Elevate RubberGard™ EPDM membrane roofing system.

A. Summary
   1. Furnish and install a complete EPDM roofing system, including:
      a) Roofing Manufacturer's requirements for the specified warranty
      b) Preparation of roofing substrates
      c) Wood nailers for roofing attachment
      d) Vapor barrier
      e) Insulation
      f) Adhered EPDM membrane
      g) Metal roof edging and copings
      h) Flashings
      i) Walkway pads
      j) Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system

B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane Manufacturer, at http://www.holcimelevate.com.

D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane Manufacturer.

E. Related Sections
   1. Section 06 10 00 – Rough Carpentry
   2. Section 07 62 00 – Sheet Metal Flashing and Trim
   3. Section 07 71 00 – Roof Specialties
   4. Section 07 72 00 – Roof Accessories
   5. Section 22 14 26.13 – Roof Drains

F. Definitions
   1. Definitions in the current editions of ASTM D1079 and NRCA's “The NRCA Roofing Manual: Membrane Roof Systems” apply to work of this Section.

G. Submittals
   1. Product Data
      a) Provide membrane Manufacturer's printed data sufficient to show that all components of roofing

system, including insulation and fasteners, comply with the specified requirements and with the membrane Manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.

b) Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable. Include data itemizing the components of the classified or approved system.

2. Installation Instructions
   a) Provide Manufacturer's instructions to Installer, marked up to show exactly how all components will be installed.
   b) Where instructions allow installation options, clearly indicate which option will be used.
3. Shop Drawings
   a) Provide roof plan indicating orientation of steel deck and fastener and/or adhesive layouts.
   b) Provide the roof membrane Manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
4. Provide copy of Pre-Installation Notice to show that Manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the Manufacturer.
5. Submit samples of each product to be used.
6. Specimen Warranty
7. Closeout Submittals
   a) Executed Warranty
   b) Maintenance data

H. Quality Assurance
1. Applicator Qualifications
   a) Current Elevate Master Contractor status
   b) At least five years’ experience in installing specified system
   c) Capability to provide payment and performance bond to building Owner
2. Pre-Installation Conference
   a) Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
   b) Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
   c) Review methods and procedures related to roofing installation, including Manufacturer's written instructions.
   d) Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   e) Examine deck substrate conditions and finishes, including flatness and fastening.
   f) Review structural loading limitations of roof deck during and after roofing.
   g) Review base flashings, special roofing details, roof drainage, roof penetrations, equipment

curbs, and condition of other construction that affects roofing system.
h) Review governing regulations and requirements for insurance and certificates if applicable.
i) Review temporary protection requirements for roofing system during and after installation.
j) Review roof observation and repair procedures after roofing installation.
k) Notify Architect well in advance of meeting.

I. Delivery, Storage and Handling
1. Deliver products in Manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
2. Discard and legally dispose of material that cannot be applied within its stated shelf life.
3. Store materials clear of ground and moisture with weather protective covering.
4. Keep combustible materials away from ignition sources.
5. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck and/or structural overloading.

J. Field Conditions
1. Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed in accordance with Manufacturer's written instructions and warranty requirements.

K. Warranty
1. Provide Elevate 30-year Red Shield™ Roofing System Limited Warranty covering membrane, roof insulation, and system accessories. Comply with all warranty procedures required by Manufacturer, including notifications, scheduling, and inspections. *See Platinum EPDM specification for 30-year systems.*
2. Limit of Liability: No dollar limitation (NDL)
3. Scope of Coverage: Repair leaks in the roofing system caused by
a) Ordinary wear and tear
b) Normal exposure to the elements
c) Manufacturing defect in Elevate materials
d) Defective workmanship used to install these materials
e) Damage due to winds up to 80mph
f) Not Covered:
(1) Damage due to winds in excess of 80 mph
(2) Damage due to hurricanes or tornadoes
(3) Hail
(4) Intentional damage
(5) Unintentional damage due to normal rooftop inspections, maintenance, or service

II. PRODUCTS

L. Manufacturers

1. Acceptable Manufacturer – Roofing System: Elevate roofing, lining, and wall systems, Nashville, TN, http://www.holcimelevate.com
   a) Roofing systems manufactured by others may be acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the Manufacturer meets the following qualifications:
      (1) Specializing in manufacturing the roofing system to be provided
      (2) Minimum ten years of experience manufacturing the roofing system to be provided
      (3) Able to provide a no dollar limit, single source roof system warranty backed by corporate assets in excess of one billion dollars
      (4) ISO 9001 certified
      (5) Able to provide polyisocyanurate insulation produced in own facilities
2. Manufacturer of Insulation and Cover Board: Same Manufacturer as roof membrane
3. Manufacturer of Metal Roof Edging: Same Manufacturer as roof membrane
   a) Metal roof edging products by other Manufacturers are not acceptable.
   b) Field- or shop-fabricated metal roof edgings are not acceptable
4. Substitution Procedures: See Instructions to Bidders
   a) Submit evidence that the proposed substitution complies with the specified requirements.

M. Roofing System Description
1. Roofing System
   a) Membrane: Ethylene propylene diene monomer (EPDM)
      (1) Thickness: As specified elsewhere
      (2) Membrane Attachment: Adhered Attached
   b) Slope: ¼:12 (2%) by means of tapered insulation
   c) Comply with applicable local building code requirements.
   d) Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification
2. Vapor Barrier over deck/deck cover:
   a) Membrane: High density polyethylene sheet with SBS modified bitumen adhesive
   b) Attachment: Self-adhering
   c) Insulation *(non-composite)*:
      (1) Total System R-Value: 30 or greater
         (a) Maximum Board Thickness: 3″ (76.2 mm)
         (b) Use as many layers as necessary to achieve required R-value
         (c) Stagger joints in adjacent layers
      (2) Base Layer: Polyisocyanurate foam board, non-composite
         (d) Attachment: Mechanical fastening
      (3) Fill Layers: Polyisocyanurate foam board, non-composite
         (e) Attachment: Mechanical fastening
      (4) Top Layer: Polyisocyanurate foam board, non-composite

(5) Attachment: Mechanical fastening
(f) Gypsum-Based Cover Board
(i) Thickness: 0.25″ (6.4 mm)
(ii) Attachment: Mechanical fastening

N. EPDM Membrane Materials
1. Roofing and Flashing Membrane: Black cured synthetic single-ply membrane composed of ethylene propylene diene monomer (EPDM) with the following properties:
a) Thickness: 0.075" (1.90 mm)
b) Reinforcement: Reinforced
c) Nominal Thickness Tolerance: ±10%
d) Sheet Width: Use widest sheet practical for jobsite conditions to minimize field seams
e) Acceptable Product: RubberGard™ MAX Reinforced EPDM Membrane by Elevate
2. Membrane Fasteners: Type and size as required by roof membrane Manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane Manufacturer.
3. Protection Mat: Nominal 4.5 oz/yd^2 (152.6 g/m^2) black synthetic, non-woven, needle-punched, Geotextile fabric: Protection Mat by Elevate
4. Flashing Membrane: Self-curing, non-reinforced membrane composed of non-vulcanized EPDM rubber, complying with ASTM D 4811 Type II, and with the following properties:
a) Thickness: 0.055″ (1.4 mm)
b) Color: Same as field membrane
c) Acceptable Product: RubberGard™ EPDM FormFlash™ by Elevate
5. Self-Adhering Flashing Membrane: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam™ Flashing by Elevate
6. Self-Adhering Batten Cover: Semi-cured 45 mil EPDM membrane laminated to 35 mil (0.9 mm) EPDM tape adhesive; QuickSeam™ Batten Cover.
7. Pre-Molded Pipe Flashings: EPDM, molded for quick adaptation to different sized pipes; Elevate EPDM Pipe Flashing
8. Self-Adhesive Lap Splice Tape: 35 mil (0.9 mm) EPDM-based, formulated for compatibility with EPDM membrane and high-solids primer; QuickSeam™ Splice Tape by Elevate
9. Splice Adhesive: Synthetic polymer-based, formulated for compatibility with EPDM membrane and metal surfaces; SA-1065 Splice Adhesive by Elevate
10. Bonding Adhesive: Formulated for compatibility with EPDM membrane and wide variety of substrate materials; Single-Ply LVOC Bonding Adhesive - 1168 by Elevate
11. Adhesive Primer: Synthetic rubber-based primer formulated for compatibility with EPDM membrane and tape adhesive, with VOC content less than 2.1 lb./gal (250 g/L)*)*; QuickPrime™ Plus LVOC by Elevate
12. Seam Edge Treatment: EPDM rubber-based sealant, formulated for sealing exposed edges of membrane at seams; Lap Sealant HS by Elevate

13. Pourable Sealer: One part polyurethane; Black One-Part Pourable Sealer by Elevate.
14. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal S-20 by Elevate
15. Metal Plates and Strips used for Fastening Membrane and Insulation: Steel with Galvalume coating; corrosion-resistance meeting FM 4470 criteria
16. Termination Bars: Aluminum bars with integral caulk ledge; 1.3″ (33 mm) wide by 0.10″ (2.5 mm) thick; Termination Bar by Elevate
17. Roof Walkway Pads: EPDM, 0.30″ (7.6 mm) thick by 30″ x 30″ (760 mm x 760 mm) with EPDM tape adhesive strips laminated to the bottom; QuickSeam™ Walkway Pads by Elevate.
18. Yellow Safety Strip: A 5.5″ (140 mm) by 100′ long (30 m) strip and nominal 30 mil (0.76 mm) thick yellow TPO membrane laminated to a white, cured, seam tape, compatible with TPO and EPDM; QuickSeam™ Yellow Safety Strip by Elevate

O. Roof Insulation and Cover Boards
1. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with glass reinforced mat laminated to facers, complying with ASTM C 1289 Type II Class 1 , with the following additional characteristics:
   a) Thickness: As indicated elsewhere
   b) Size: 48″ (1.22 m) by 96″ (2.44 m), nominal (if mechanically fastened)
   c) R-Value (LTTR) per inch (25 mm): min. 6.2R at 40 °F (4.4 °C) and min. 5.7R at 75 °F (23.9 °C)
   d) Compressive Strength: 20 psi (138 kPa)
   e) Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents
   f) Acceptable Product: *(class 1)* ISOGARD GL polyiso board insulation by Elevate
   g) Gypsum-Based Cover Board: Non-combustible, water-resistant gypsum core with embedded glass mat facers, complying with ASTM C 1177/C 1177M, and with the following additional characteristics:
      (1) Size: 48″ (1.22 m) by 96″ (2.44 m), nominal (if mechanically fastened) or 48″ (1.22 m) by 48″ (1.22 m), nominal (if adhered)
      (2) Thickness: 0.25″ (6.4 mm) **or** 0.5″ (12.7 mm) **or** 0.625″ (15.9 mm)
      (3) Surface Water Absorption: 2.5 g max., when tested in accordance with ASTM C 473
      (4) Surface Burning Characteristics: Flame spread of 0, smoke developed of 0, when tested in accordance with ASTM E 84
      (5) Combustibility: Non-combustible, when tested in accordance with ASTM E 136
      (6) Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies
      (7) Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D 3273 for minimum of 4 weeks
2. Insulation Fasteners: Type and size as required by roof membrane Manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane Manufacturer.

P. Vapor Barrier
1. Vapor Barrier Membrane: Comprised of SBS modified bitumen adhesive, factory-laminated to a tri-

laminate woven, high-density polyethylene top surface. Release liner protecting adhesive. May be used as a temporary roof membrane for up to ninety (90) days.

a) Thickness: 0.0325" (0.826 mm) minimum, when tested in accordance with ASTM D 5147
b) Max Load at Break at 73 °F (23 °C): 64 lbf/in, MD (11 kN/m) 88 lbf/in, XMD (15 kN/m) when tested in accordance with ASTM D 5147
c) Low Temperature Flexibility: -30 °F (-34 °C) when tested in accordance with ASTM D 5147
d) Moisture Vapor Permeance, 0.02 Perms (0.92 Ng/Pa•s•m2) maximum, when tested in accordance with ASTM E 96
e) Air Permeability: 0.00114 $ft^3/min•ft^2$ (0.007 $L/sec•m^2$) maximum, when tested in accordance with ASTM E 2178
f) Acceptable Product: V-Force Vapor Barrier Membrane by Elevate.

Q. Metal Accessories

1. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer
   a) Wind Performance:
      (1) Membrane Pull-Off Resistance: 100 lbs./ft (1460 N/m), minimum, when tested in accordance with ANSI/SPRI ES-1 Test Method RE-1, current edition
      (2) Fascia Pull-Off Resistance: At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-2, current edition
      (3) Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-270 rating
   b) Description: Two-piece, 45° sloped galvanized steel sheet edge member securing top and bottom edges of formed metal fascia
      (1) Fascia Face Height: 5″ (127 mm)
      (2) Edge Member Height Above Nailer: 1 ¼″ (31 mm)
      (3) Fascia Material and Finish: 24-gage, 0.024″ (0.06 mm) galvanized steel with Kynar 500 finish in Manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film
      (4) Length: minimum of 120″ (3.048 m)
      (5) Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia
      (6) Acceptable Product: Appropriate Elevate pre-manufactured fascia system
2. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion
3. Anchor Bar Cleat: 20-gage, 0.036″ (0.9 mm) G90 coated commercial type galvanized steel with pre-punched holes
4. Curved Applications: Factory modified
5. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners

permitted

6. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14″ (355 mm) long legs on corner pieces
7. Scuppers: Welded watertight
8. Accessories: Provide matching brick wall cap, downspout, extenders, and other special fabrications as shown on the drawings
9. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated
   a) Wind Performance:
      (1) At least the minimum required when tested in accordance with ANSI/SPRI ES-1 Test Method RE-3, current edition.
      (2) Provide product listed in current Factory Mutual Research Corporation Approval Guide with at least FM 1-90 rating.
   b) Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8″ (200 mm) wide splice plates with factory applied dual non-Curing sealant strips capable of providing watertight seal.
   c) Material and Finish: 24-gage, 0.024″ (0.06 mm) thick galvanized steel with Kynar 500 finish in Manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.
   d) Dimensions:
      (1) Wall Width: As indicated on the drawings.
      (2) Piece Length: Minimum 144″ (3.65 m).
   e) Curved Application: Factory fabricated in true radius.
   f) Anchor/Support Cleats: 20-gage, 0.036″ (0.9 mm) thick pre-punched galvanized cleat with 12″ (305 mm) wide stainless-steel spring mechanically locked to cleat at 72″ (1.82 m) on center.
   g) Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and end caps; minimum 14″ (355 mm) long legs on corner, intersection, and end pieces.
   h) Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 lbs. (109 kg) for actual substrate used; no exposed fasteners.
   i) Acceptable Product: Appropriate Elevate pre-manufactured coping system

R. Accessory Materials
1. Wood Nailers: PS 20-dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   a) Width: 3 ½″ inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it
   b) Thickness: Same as thickness of roof insulation

III. INSTALLATION

S. General

1. Install roofing, insulation, flashings, and accessories in accordance with roofing Manufacturer's published instructions and recommendations for the specified roofing system. Where Manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
2. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
3. Do not start work until Pre-Installation Notice has been approved by Manufacturer as confirmation that this project qualifies for a Manufacturer's warranty.
4. Perform work using competent and properly equipped personnel.
5. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the Applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
6. Install roofing membrane only when surfaces are clean, dry, smooth, and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult Manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 °F (15 to 25 °C).
7. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
8. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
9. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
10. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
11. Until ready for use, keep materials in their original containers as labeled by the Manufacturer.
12. Consult membrane Manufacturer's instructions, container labels, and Safety Data Sheets (SDS) for specific safety instructions. Keep all adhesives, sealants, primers, and cleaning materials away from all sources of ignition.

T. Examination

1. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment, and that deflection will not strain or rupture roof components or deform deck.
2. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
3. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
4. Examine roof substrate to verify that it is properly sloped to drains.

5. Verify that the specifications and drawing details are workable and not in conflict with the roofing Manufacturer's recommendations and instructions; start of work constitutes acceptance of project conditions and requirements.

U. Preparation
1. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease, and other materials that may damage the membrane.
2. Fill all surface voids in the immediate substrate that are greater than 1/4″ (6 mm) wide with fill material acceptable to membrane Manufacturer.
3. Seal, grout, or tape deck joints, where needed, to prevent seepage into building.

V. Vapor Barrier Installation
1. All substrates (except metal decks) must be primed prior to application. Use only primer supplied by membrane Manufacturer.
2. Expanded Polystyrene, Extruded Polystyrene, Common Polyisocyanurate, Fiberglass, Wood Fiber, Perlite, and existing single-ply roofs are not acceptable substrates for SBS bitumen adhesive.
3. Application can be made at ambient temperatures as low as 25 °F (-4 °C) as long as membrane has been stored in a heated area so that it will be between 50 °F (10 °C) and 100 °F (38 °C) at the time of application.
4. Install with minimum 3" (76.2 mm) side laps and 6" (152.4 mm) end laps.
5. Roll in with a 75 lb. (34 kg) roller to fully mate each roll to substrate, including all lap areas.

W. Insulation and Cover Board Installation
1. Install insulation in configuration and with attachment method(s) specified in PART 2, under Insulation.
2. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
3. Lay roof insulation in courses parallel to roof edges.
4. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than ¼″ (6 mm). Fill gaps greater than ¼″ (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than ¼″ (6 mm).
5. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by Factory Mutual for specified FM Class and membrane Manufacturer, whichever is more stringent
6. Adhesive Attachment: Apply in accordance with membrane Manufacturer's instructions and recommendations; "walk-in" individual roof insulation boards to obtain maximum adhesive contact

X. Single-Ply Membrane Installation
1. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
2. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
3. Install membrane without wrinkles and without gaps or fishmouths in seams, and bond and test

seams and laps in accordance with membrane Manufacturer's instructions and details.
   a) Adhered Membrane: Bond membrane sheet to substrate using membrane Manufacturer's recommended bonding material, application rate, and procedures.
4. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 1:12 inches (8.3%) using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing Manufacturer. Exceptions: Round pipe penetrations less than 18″ (460 mm) in diameter and square penetrations less than 4″ (200 mm) square.
   a) Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing Manufacturer and compliant with IBC.

Y. FLASHING AND ACCESSORIES INSTALLATION
1. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane Manufacturer's recommendations and details.
2. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   a) Follow roofing Manufacturer's instructions.
   b) Remove protective plastic surface film immediately before installation.
   c) Install water block sealant under the membrane anchorage leg.
   d) Flash with Manufacturer's recommended flashing sheet unless otherwise indicated.
   e) Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   f) If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   g) When the roof slope is greater than 1:12 (8.3%), apply seam edge treatment along the back edge of the flashing.
3. Scuppers: Set in sealant and secure to structure; flash as recommended by Manufacturer.
4. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing Manufacturer.
5. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces:
   a) Install weathertight flashing at all walls, curbs, parapets, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8″ (200 mm) above membrane surface.
   b) Use the longest practical flashing pieces.
   c) Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane Manufacturer's recommendations.
   d) Complete the splice between flashing and the main roof sheet with specified splice adhesive

before adhering flashing to the vertical surface.

e) Provide termination directly to the vertical substrate as shown on roof drawings.

6. Roof Drains:
   a) Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed Manufacturer's recommendations.
   b) Position membrane, then cut a hole for roof drain to allow ½″ to ¾″ (12 to 19 mm) of membrane to extend inside clamping ring past drain bolts.
   c) Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   d) Apply sealant on top of drain bowl where clamping ring seats below the membrane
   e) Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.
7. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
8. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
9. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2″ (50 mm) deep, with at least 1″ (25 mm) clearance from penetration, sloped to shed water.
10. Structural Steel Tubing: If corner radii are greater than ¼″ (6 mm) and longest side of tube does not exceed 12″ (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
11. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by Manufacturer.

Z. Walkway Installation
1. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.
   a) Use specified walkway pads unless otherwise indicated.
   b) Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1″ (25 mm) and maximum of 3″ (75 mm) from each other to allow for drainage.
   c) If installation of walkway pads over field fabricated splices or within 6″ (150 mm) of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6″ (150 mm) on either side.
   d) Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

AA. Field Quality Control
1. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system Manufacturer specifically to inspect installation for warranty purposes (e.g., not a sales representative).
2. Perform all corrections necessary for issuance of warranty.

BB. Cleaning

1. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
2. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of Manufacturers of components and surfaces.
3. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

CC. Protection

1. Where construction traffic must continue over finished roof membrane, provide durable protection, and replace or repair damaged roofing to original condition.

END OF SECTION 07 53 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Roof drainage sheet metal fabrications.

2. Low-slope roof sheet metal fabrications.

3. Miscellaneous sheet metal flashing and trim.

B. Related Requirements:

1. Division 07 low slope membrane roofing section for installing sheet metal flashing and trim integral with roofing and for related warranty requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.

2. Include identification of material, thickness, weight, and finish for each item and location in Project.

3. Indicate details meet requirements of SMACNA and NRCA required by this Section.

4. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

1.3 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI ES-1 tested.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI ES-1 tested; fabrication shop shall be listed as able to fabricate required details as tested and approved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Flashings and Fastening: Comply with requirements of Division 07 roofing sections. Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. NRCA: "The NRCA Roofing Manual" for construction details and recommendations.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B209/B209M, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface., alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with

1. Basis of Design Product: Tremco, Inc., TremLock Sheet.

2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 2605. 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.

b. Color: Match Project sample.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A653/A653M, G90 (Z275) coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); with smooth, flat surface; prefinished by coil-coating process to comply with ASTM A755/A755M.

1. Basis of Design Product: Tremco, Inc., TremLock Sheet.

2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. 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.

1) Color: Match Project sample.

3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Lead Sheet: ASTM B749 lead sheet.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils (0.76 mm) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Low-Temperature Flexibility: ASTM D1970; passes after testing at minus 20 deg F (29 deg C) or lower.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.

b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Zinc-Coated(Galvanized) and Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane at concealed joints and silicone at exposed joints; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2.4-m-) long, but not exceeding 12-feet- (3.6-m-) long sections. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed splice plate.

2. Fabricate from the Following Materials:

a. Aluminum: 0.050 inch (1.27 mm) thick.

b. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.

B. Copings: Fabricate in minimum 96-inch- (2.4-m-) long, but not exceeding 12-feet- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: As indicated, or if not indicated, as selected from SMACNA Manual profiles.

2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed splice plate.

3. Fabricate from the Following Materials:

a. Aluminum: 0.050 inch (1.27 mm) thick.

b. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.

C. Cleats for Roof Edge Flashing and Copings:

1. Aluminum: 0.063 inch (1.60 mm) thick.

2. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.034 inch/22 ga. (0.85 mm) thick.

D. Expansion Joint Cover: Fabricate from the following materials:

1. Aluminum: 0.050 inch (1.27 mm) thick.

2. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.034 inch/22 ga. (0.85 mm) thick.

3. Stainless Steel: 0.025 inch/24 ga. (0.63 mm) thick.

E. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.040 inch (1.02 mm) thick.

F. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.040 inch (1.02 mm) thick.

G. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel or Aluminum-Zinc Alloy-Coated Steel: 0.028 inch/24 ga. (0.71 mm) thick.

2. Lead: (19.53 kg/m2) 4 lb/sq. ft.; (1.6 mm) 0.0625 inch thick.

H. Roof-Drain Flashing: Fabricate from the following materials:

1. Lead: (19.53 kg/m2) 4 lb/sq. ft.; (1.6 mm) 0.0625 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller. Cover underlayment within 14 days.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.2 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

2. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

3.3 ROOF FLASHING INSTALLATION

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.

2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

C. Copings:

1. Install copings in accordance with ANSI/SPRI/FM 4435/ES-1.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.

2. Extend counterflashing 4 inches (100 mm) over base flashing.

3. Lap counterflashing joints minimum of 4 inches (100 mm).

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 71 00 – MANUFACTURED ROOF ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Roof edge flashings.
2. Counterflashings and reglets.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
1. Wind Zone 3: For velocity pressures of 46 to 104 lbf/sq. ft. (2.20 to 4.98 kPa): 208-lbf/sq. ft. (9.96- kPa) perimeter uplift force, 312-lbf/sq. ft. (14.94-kPa) corner uplift force, and 104-lbf/sq. ft. (4.98- kPa) outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop-and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.

2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim; including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples: For each type of manufactured roof specialty indicated with factory-applied color finishes.

D. Product Test Reports: Verifying compliance of copings and roof edge flashings with performance requirements.

1.4 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.

B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weather-tight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.6 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leak-proof, secure, and non-corrosive installation.

- PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Basis-of-Design Product: The designs for roof edge flashings, roof edge drainage system, and counterflashings and reglets are based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers specified.

2.2 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

   1. Surface: Smooth, flat finish.
   2. Mill Finish: As manufactured.
   3. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Three-Coat Fluoropolymer: AAMA 620. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent PVDF resin by weight.

2.3 CONCEALED METALS

A. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand

design loads.

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.5 ROOF EDGE FLASHINGS

A. Canted Roof Edge Fascia: Manufactured, two-piece, roof edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet (3.6 m) and a continuous formed galvanized steel sheet cant dam, 0.028 inch (0.7 mm) thick, minimum, with integral drip edge cleat. Provide matching mitered and welded corner units.

1. Basis-of-Design Product: PAC-Clad; Petersen “Pac-Tite WT Canted Fascia” or a comparable product by one of the following:
2. Manufacturers:

    a. Architectural Products Co.
    b. Castle Metal Products.
    c. Metal-Era, Inc.
    d. Metal-Fab Manufacturing LLC.
    e. MM Systems Corporation.
    f. Perimeter Systems, a division of Southern Aluminum Finishing Co.
    g. W. P. Hickman Company

3. Fascia Cover: Fabricated from the following exposed metal:
    a. Prepainted, Aluminum: 0.063 inch thick.

4. Fascia Cover Color: Refer to ‘Material Finish / Color Schedule section 000200’ for color selections.
5. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
6. Face Height: As indicated on drawings.
7. Finish Color Designation: (MRE - #) designates specified finish color. Refer to color and material finish schedule.

2.6 ROOF EDGE COPING

A. Sloped Roof Edge Coping : Manufactured, single piece, roof edge coping consisting of snap-over metal coping cover in section lengths not exceeding 12 feet (3.6 m) and two piece continuous formed galvanized steel sheet two part cleat retainers with spring form supports, with integral drip edge cleat. Provide matching mitered and welded corner units.

1. Basis-of-Design Product: PAC-Clad; Petersen “Pac-Tite -Coping” or a comparable product by

one of the following:

2. Manufacturers:

    a. Architectural Products Co.
    b. Castle Metal Products.
    c. Metal-Era, Inc.
    d. Metal-Fab Manufacturing LLC.
    e. MM Systems Corporation.
    f. Perimeter Systems, a division of Southern Aluminum Finishing Co.
    g. W. P. Hickman Company

3. Coping Cover: Fabricated from the following exposed metal:
    a. Prepainted, steel: 22 gage, and 24 gage based on width.

4. Fascia Cover Color: Refer to 'Material Finish / Color Schedule section 000200' for color selections.
5. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
6. Coping Height: As indicated on drawings.
7. Coping Width: As indicated on drawings and required to provide coverage of wall construction and finish materials.
8. Finish Color Designation: (MRE _ #) designates on drawings specified finish color. Refer ot color and material finish schedule.

2.7 COUNTERFLASHINGS AND REGLETS

A. Basis-of-Design Product: W. P. Hickman Company "Concealed Mount CMR 575"; (2) piece counter flashing or a comparable product by one of the following:

B. Manufacturers:

1. Castle Metal Products.
2. Cheney Flashing Company.
3. Fry Reglet Corporation.
4. Keystone Flashing Company.
5. Merchant & Evans, Inc.
6. Metal-Era, Inc.
7. MM Systems Corporation.

C. 2 Piece Counterflashings: Manufactured units in lengths not exceeding 12 feet (3.6 m)] designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal in thickness indicated:
    a. Prepainted, Aluminum: 0.063 inch thick.

D. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashings indicated with factory-mitered and -welded corners and junctions, from the following exposed metal in thickness indicated:
    a. Prepainted, Aluminum: 0.063 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

1. Install manufactured roof specialties with provisions for thermal and structural movement.
2. Torch cutting of manufactured roof specialties is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.

D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.

E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet (3.6 m) with no unplanned joints within 18 inches (450 mm) of corners or intersections.

F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

3.2 ROOF EDGE FLASHING INSTALLATION

A. Install cleats, cant dams, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings to resist uplift and outward forces according to performance requirements.

3.3 COUNTERFLASHING AND REGLET INSTALLATION

A. Counterflashings: Coordinate installation of counterflashings with installation of base flashings. Insert counterflashings in reglets or receivers and fit tightly to base flashings. Extend counterflashings 4 inches (100 mm) over base flashings. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with elastomeric sealant.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches (900 mm) apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet (15.24 m) apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

END OF SECTION 07 71 00

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Roof curbs.
2. Equipment supports.
3. Pipe and duct supports.
4. Pipe portals.
5. Preformed flashing sleeves.
6. Roof walkways.
7. Underlayment.
8. Miscellaneous materials.
9. Roof Hatches

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Delegated Design Submittals: For roof curbs equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

D. Samples: For each type of roof accessory and for each color and texture specified.

E. Samples for Initial Selection: For each type of roof accessory indicated with factory-applied color finishes.

F. Samples for Verification: Include Samples of each type of roof accessory to verify finish and color selection, in manufacturer's standard sizes.

G. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating percentage of postconsumer and preconsumer recycled content and cost.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items, including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Qualification Statements:

C. Delegated Design Engineer Qualifications:

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories.

1.5 QUALITY ASSURANCE

A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice where Project is located and who is experienced in providing engineering services of the type indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof accessories in contact with other materials that might cause staining, denting, or other surface damage. Store roof accessories in accordance with manufacturer's instructions.

B. Store materials off ground in dry location and in accordance with manufacturer's instructions in well-ventilated area.

C. Store and protect roof accessories from nicks, scratches, and blemishes.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-accessory substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture,

fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design [roof curbs] [and] [equipment supports] to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance:

2.2 PIPE AND DUCT SUPPORTS

A. Fixed-Height Cradle-Type Pipe Supports: Polycarbonate pipe stand accommodating up to [**1-1/2-inch-**] <**Insert dimension**> diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

B. Fixed-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand with [**polycarbonate**] [**stainless steel**] roller carrying assembly accommodating up to [**7-inch-**] <**Insert dimension**> diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

C. Adjustable-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand base, pipe support, and roller housing, with stainless steel threaded rod designed for adjusting support height, accommodating up to [**18-inch**] <**Insert dimension**> diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

D. Adjustable-Height Structure-Mounted Pipe Supports: Extruded-aluminum tube, filled with urethane insulation; [**2 inches**] <**Insert dimension**> in diameter; accommodating up to [**7-inch-**] <**Insert dimension**> diameter pipe or conduit, with provision for pipe retainer; with aluminum baseplate, EPDM base seal, manufacturer's recommended hardware for mounting to structure or structural roof deck as indicated, stainless steel roller and retainer, and extruded-aluminum carrier assemblies; as required for quantity of pipe runs and sizes.

2.3 METAL MATERIALS

A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheer complying with minimum ASTM A653/A653M, **G90** coating designation or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, **Class AZ50** coating designation; structural quality.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of **0.2 mil**.
3. Powder Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of **2 mils**.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of **0.5 mil**.

B. Aluminum Extrusions and Tubes: **ASTM B221**, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

C. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.

D. Steel Shapes: ASTM A36/A36M, hot-dip galvanized in accordance with ASTM A123/A123M unless otherwise indicated.

E. Steel Tube: ASTM A500/A500M, round tube.

F. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized in accordance with ASTM A123/A123M.

G. Steel Pipe: ASTM A53/A53M, galvanized.

2.4 UNDERLAYMENT

A. Felt: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

B. Slip Sheet: Rosin-sized building paper, **3 lb/100 sq. ft.** minimum.

2.5 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.

C. Glass-Fiber Board Insulation: ASTM C726, nominal density of **3 lb/cu. ft.**, thermal resistivity of **4.3 deg F x h x sq. ft./Btu x in. at 75 deg F**, thickness as indicated.

D. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

E. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction,[**containing no arsenic or chromium,**] and complying with AWPA C2; not less than **1-1/2 inches** thick.

F. Fasteners: Roof accessory manufacturer's recommended fasteners, designed to comply with performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

K. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.6

ROOF HATCHES

A. Roof Hatches: Fabricate roof hatches with insulated double-wall lids and insulated double-wall curb frame with integral deck mounting flange and lid frame counterflashing. Fabricate with welded or mechanically fastened and sealed corner joints. Provide continuous weather tight perimeter gasketing and equip with corrosion-resistant or hot-dip galvanized hardware.
   1. Basis-of-Design Product: The Bilco Company “Type E – 5oh7 Roof Scuttle” 36” x 36” minimum or size indicated on drawings, or a comparable product by one of the following:

E-50HZ - 36" x 36" Ladder Access Roof Hatch - Aluminum - Miami-Dade Approved – Bilco

The Bilco E-50HZ is an aluminum roof hatch that passed the Miami-Dade approval process and strengthened the product's reliability and credibility. Installing the roof hatch protects the building and its occupants during extreme weather conditions.

Compliance: The E-50HZ follows local codes and regulations to meet the requirements of Miami-Dade. It has undergone tests and reviews to ensure its capable of handling and withstanding cyclones, tropical storms, and hurricanes.

Innovative: It uses BilClip®, an easy-to-install advanced flashing system that ensures the safety, security, and reliability of the roof hatch installed in the building's roof deck. It helps minimize the panel's structural risk of getting damaged.

Durability: The 11 gauge (2.3 mm) aluminum can withstand heavy loads up to 40 psf (195 kg/m2) live load and extreme temperatures. It has an EPDM rubber gasket that is highly resistant to weather, ozone, and UV radiation. It also protects the roof hatch to ensure its durability and functionality last longer.

Specifications:

Material (select one):

- Aluminum: The cover and frame are 11 gauge (2.3 mm).

Cover:

- Brake-formed
- hollow-metal design
- It has 1" (25 mm) concealed fiberglass insulation.
- It has a 3" (76 mm) beaded, overlapping flange, fully welded at corners.
- It can hold up to 40 psf (195 kg/m2) live load.

Curb:

- It has a 12" (305 mm) curb height with integral cap flashing
- It has 1" (25 mm) fiberboard insulation fully welded at the corners.
- 3-1/2" (89 mm) mounting flange
- It has 7/16" holes (11 mm) to secure the frame to the roof deck.

Gasket:

- It has extruded EPDM rubber gasket permanently adhered to the cover.

Hinges:

- Heavy-duty pintle hinges
- It has 3/8" (9 mm) Type 316 stainless steel hinge pins

Latch:

- Slam latch
- Interior and exterior turn handles

- padlock hasps

Lift Assistance:

- It has compression spring operators encased intelescopic tubes. Automatic hold-open arm with grip handle release.

Finish:

- Aluminum: Mill Finish.

Hardware:

- Aluminum**:** It has type 316 Stainless steel hinges. All other hardware is zinc-plated/chromate sealed.

2. Manufacturers:

    a. Babcock-Davis; a Cierra Products Inc. Company.
    b. Bristolite Skylights.
    c. Custom Curb, Inc.
    d. Dur-Red Products.
    e. Hi Pro International, Inc.
    f. J. L. Industries, Inc.
    g. Metallic Products Corporation.
    h. Milcor Inc.; a Gibraltar Company.
    i. Nystrom, Inc.
    j. O'Keeffe's Inc.
    k. Precision Ladders, LLC.
    l. Roof Products & Systems Corporation.
    m. ThyCurb; Div of Thybar Corporation.
    n. Wasco Products, Inc.
    o. Western Canwell.

3. Loads: Fabricate roof hatches to withstand 40-lbf/sq. ft. (1.9-kPa) external and 20-lbf/sq. ft. (0.95- kPa) internal loads.
4. Type and Size: Single-leaf lid, 36 by 36 inches minimum or size indicated on drawings.
5. Curb and Lid Material: Galvanized steel sheet, 0.079 inch (2.0 mm) thick.

    a. Finish: High-performance organic coating.

6. Insulation: Cellulosic-fiber board.
7. Interior Lid Liner: Manufacturer's standard metal liner of same material and finish as outer metal lid.
8. Exterior Curb Liner: Manufacturer's standard metal liner of same material and finish as metal curb.
9. Fabricate units to minimum height of 12 inches (300 mm), unless otherwise indicated.
10. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate hatch curbs with height constant.
11. Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
12. Ladder Safety Post: Manufacturer's standard ladder safety post. Post to lock in place on full extension. Provide release mechanism to return post to closed position.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA AMP 500, "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 adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

1. Lap horizontal joints not less than **4 inches**.

B. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than **6 inches** staggered **24 inches** between courses.
5. Overlap side edges not less than **3-1/2 inches**. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

C. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lap joints not less than **2 inches**.

D. Slip Sheet: Install slip sheet, wrinkle free, [directly on substrate] before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than **4 inches**.

3.3 INSTALLATION, GENERAL

A. Install roof accessories in accordance with manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended in writing by manufacturer's written installation instructions.

1. Coat concealed side of [uncoated aluminum] [and] [stainless steel] roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.4 INSTALLATION OF ROOF ACCESSORIES

A. Roof Curb: Install each roof curb so top surface is level.

B. Equipment Support: Install equipment supports so top surfaces are level with each other.

C. Pipe and Duct Support: Comply with MSS SP-58. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.

D. Preformed Flashing-Sleeve and Flashing-Pipe Portal: Secure flashing sleeve to roof membrane in accordance with flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane in accordance with roof membrane manufacturer's instructions.

3.5 CLEANING AND PROTECTION

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099113 "Exterior Painting."

C. On completion of installation, clean exposed surfaces in according with manufacturer's written instructions. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as roof accessories are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof accessories in a clean condition during construction.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish

touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 72 00

SECTION 07 84 13 - FIRESTOPPING

PART I - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this section.

1.02 DESCRIPTION OF WORK:

A. Provide labor and materials necessary for complete installation of firestopping materials and systems. Section includes firestopping for the following:

1. Penetrations through fire resistance rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Penetrations through fire resistance rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits and other penetrating items.
3. Penetrations through smoke barriers and construction enclosing compartmentalized area involving both empty openings and openings containing penetrating items.
4. Sealant joints in fire resistance rated construction.

1.03 SUBMITTALS:

A. Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL or other nationally recognized independent testing laboratories firestop systems to be used and manufacturer's installation instructions.

1. Submit material safety data sheets (MSDS) provided with product delivered to jobsite.

B. Product certificates signed by manufacturers of firestopping products certifying that their products and installation comply with specified requirements. Certification shall be signed by the Installer.

1.04 QUALITY ASSURANCE:

A. Conform to applicable governing codes, including local governing authorities, but not limited to the following:

1. NFPA 101
2. 2015 International Building Code
3. 2015 MBC

B. Meet requirements of ASTM E814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated and other ASTM Standards as applicable for the installation.

1. ASTM E84 "Test Method for Surface Burning Characteristics of Building Materials".
2. ASTM E119 "Test Methods for Fire Tests of Building Construction and Materials".

PARTS 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products by one of the following:

1. Hilti Construction Chemicals, Tulsa, OK
2. Specified Technologies Inc. (STI) Sommerville, NJ

3. 3M Fire Protection Products, St. Paul, MN
4. The Rectorseal Corp., Houston, TX
5. Tremco, Inc. Beachwood, OH

2.02 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
   1. All materials shall comply with ASTM E814 or E119 (UL 1429) and shall be manufactured of non-toxic, non-hazardous, asbestos free materials, and unaffected by water or moisture when cured.
   2. Primers: Conform to manufacturer's recommendations for primers required for various substrate and conditions.
   3. Backup materials: Backup materials, supports, and anchoring devices shall be provided as required by UL testing.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated system. Accessories include but are not limited to the following items:

   1. Permanent forming/damming/backing materials must be noncombustible and may include the following:
      a. Semirefractory fiber (mineral wool) insulation.
      b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
      c. Joint fillers for joint sealants.
   2. Temporary forming materials.
   3. Substrate primers.
   4. Collars.
   5. Steel sleeves.

2.03 FIRE STOPPING, MATERIALS

A. Use only firestopping products that have been UL 1479 or ASTM E814 tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

B. For penetrations by noncombustible items including steel pipe, copper pipe, rigid steel conduit, and electrical metallic tubing (EMT), the following materials are acceptable:

   1. Hilti FAS 601 Elastomeric Firestop Sealant
   2. STI SpecSeal Sealant SSS 100
   3. 3M Fire Barrier CP25
   4. The RectorSeal Corp. Metacaulk 1000, 950, 835, Putty, & Mortar.
   5. Fyre-Sil, Tremco, Inc.
   6. Biofireshield K10 and K2 Mortar, Biostop 500+, Biootherm 100/22200 & Biostop Putty, The RectorSeal Corp.

C. For penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) the following materials are acceptable:

1. STI Wrap Strip SSW12
2. Hilti FS One Intumescent Firestop Sealant
3. 3M Fire Barrier FS-195 Wrap Strip
4. Metacaulk Wrap Strip, Firestop Collars, Metacaulk 1000, 950 & 835.
5. Biostop Wrap Strip, Collar, and Biostop 500+.

D. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following materials are acceptable:

1. STI SpecSeal lightweight mortar SSM22B or putty
2. Hilti FS635 Trowelable Firestop Compound
3. 3M Fire Barrier FS-195 Composite Sheet
4. Biofireshield K-10 & K2 mortar
5. Metacaulk Firestop Mortar

E. For fire-rated construction joints and other gaps with movement, the following materials are acceptable:

1. Hilti FS 601 Elastomeric Firestop Sealant
2. STI Pensil 300
3. 3M (Dow Corning Fire Stop Sealant 2000)
4. Fyre-Sil, Tremco, Inc.
5. Biofireshield, Biostop 700, Biostop 500+
6. Metacaulk 1000 & 1100

F. Provide a firestopping system with an "F" rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
1. Remove all foreign materials form surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agent from concrete.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designate through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent

components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
   1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
   2. Apply materials so they contact and adhere to substrate formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with the manufacturer's installation instructions and drawings pertaining to products and application indicated.

3.05 CLEANING

A. Clean off excess fill materials and sealant adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

END OF SECTION 07 84 13

SECTION 07 91 00 - JOINT FILLERS AND GASKETS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. The extent of each type of joint filler and gasket work is indicated on the drawings and by provisions of this section, and is hereby defined to include required fillers and gaskets not specified in other sections of these specifications.

B. The required applications of joint fillers and gaskets include, but are not necessarily limited to, the following general types and locations:

1. Pavement, curb and sidewalk joint fillers.
2. Isolation and expansion joint fillers in structural concrete.
3. Exterior wall component joint fillers.
4. Floor construction/expansion joint fillers.
5. Joint fillers around penetrations of equipment and services through walls, floors, and roofs.

C. Related Work Specified Elsewhere:

1. Gaskets for Glazing: Section 088000.

1.03 SUBMITTALS:

A. Product Data:

1. Submit manufacturer's specifications, installation instructions and recommendations for each type of material required.

B. Samples:

1. Submit three, 12" long samples of each joint filler or gasket.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL:

A. Size and Shape: Provide sizes and shapes of units as shown or, if not shown, as recommended by manufacturer for joint size and condition shown. Where joint movement is a factor in a determination of size, consult with Architect to determine nature and magnitude of anticipated joint movements for the temperature and condition of project at time of installation.

B. Compressibility: Specified hardness and compressibilities are intended to establish requirements for normal or average conditions of installation and use. Where a range of hardness or compressibility is available for a product, comply with manufacturer's recommendations for specific condition of use.

C. Color: Provide each concealed material in manufacturer's standard color which has best overall performance characteristics for application shown. Provide exposed materials in black, except where another color is indicated.

D. Compatibility: Before purchase of each filler or gasket material, confirm that it is compatible with substrate, sealants, and other materials in joint system.

E. Adhesives: Pressure sensitive adhesives, compatible with each material in joint system may be applied (at installer's option) to one face of joint fillers and gaskets to facilitate installation and permanent anchorage. Do not allow adhesives to contaminate sealant bond surface (if any) in joint system.

2.02 CONCRETE CONTROL/EXPANSION JOINT FILLERS:

A. Bituminous and Fiber Joint Filler:

1. Provide resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type 1 and AASHO M 213.
2. Provide one of the following products:
   a. Flexcell-Celotex Corporation

b. Sonoflex Cane Fiber; Contec/Sonneborn
c. Cane Fiber 1390; A.C. Horn Corporation
d. Tex-Lite; J & P Petroleum Products, Inc.
e. Fiber; Q.R. Meadows, Inc.
f. Flex-JT and Gray-Flex; Old North Mfg. Co., Inc.

2.03 CELLULAR/FOAM EXPANSION JOINT FILLERS:

A. Closed-Cell PVC Joint Filler:

1. Provide flexible expanded polyvinyl chloride complying with ASTM D 1667. Grade VE 41 BL (3.0 psi compression deflection); except provide higher compression deflection grades as may be necessary to withstand installation forces.

2. Provide one of the following products:
a. Vinylfoam: Contech/Sonneborn
b. Rodofoam: A.C. Horn Company
c. FF2 PVC: Progress Unlimited, Inc.
d. Vinyl "U": Williams Products, Inc.

2.04 GASKETS:

A. Molded Neoprene Gasket:

1. Provide extruded neoprene or EPDM gaskets complying with ASTM D 2000, Designation 2BC 415 to 3BC 620, black (40 to 60 Shore A durameter hardness); of the profile shown or, if not shown, as required by the joint shape, size and movement characteristics to maintain a watertight and airtight seal.

2. Provide products by one of the following manufacturers:
a. D.S. Brown Company
b. Construction Gaskets, Inc.
c. Hohmann & Barnard, Inc.
d. Kirkhill Rubber Company
e. F.H. Maloney Company
f. Progress Unlimited, Inc.
g. Standard Products Company
h. Williams Products, Inc.

2.05 MISCELLANEOUS MATERIALS:

A. Oakum Joint Filler:

1. Provide untreated hemp or jute fiber rope, free of oil, tar and other compounds which might stain surfaces, contaminate joint walls, or not be compatible with sealants.

B. Fire-Resistant Joint Filler:

1. Glass fiber or other inorganic non-combustible fiber formed with minimum of binder into resilient joint filler strips or blankets of sizes and shapes indicated, recommended by manufacturer specifically for increasing fire resistance or endurance of joint systems of type indicated, for service temperatures up to 2300 degrees F, 80% (min.) recovery 50% compression.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Installer must examine joint surfaces of units to receive fillers or gaskets and conditions under which the work is to be performed and notify Contractor, in writing, of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations for installation of each type of joint filler or gasket required, unless more stringent requirements are shown or specified.

B. Set units at proper depth of position in joint to coordinate with other work, including installation of bond breakers, backer rods, and sealants. Do not leave voids or gaps between ends of joint filler units.

C. Recess exposed edges or faces of gaskets and exposed joint filler slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.

D. Bond ends of gaskets together with adhesive or by means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners except where molded corner units are provided.

END OF SECTION 07 91 00

SECTION 07 92 00 - SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Attention is directed to Division 0, Bidding and Contract Requirements, and to Division 1, General Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK:

A. The extent of each type of sealant and caulking work is indicated on the drawings, and by provisions of this section.

B. The required applications of sealants and caulking include, but are not necessarily limited to, the following general locations:

1. Isolation joints, between structure and other elements.
2. Paving and sidewalk joints.
3. Joints at penetrations of walls, decks and floors by piping and other services and equipment.
4. Joints between items of equipment and other construction.
5. Joints between dissimilar materials.

1.03 QUALITY ASSURANCE:

A. Manufacturers: Firms with not less than 5 years of successful experience in production of types of sealants and caulking compounds required for this project.

1. Obtain elastomeric sealants from a manufacturer which will, upon request, send a qualified technical representative to the project site for purpose of advising installer on proper procedures for use of products.

B. Installer: A firm with a minimum of 5 years of successful experience in application of types of materials required.

1.04 SUBMITTALS:

A. Product Data:

1. Submit manufacturer's specifications, recommendations and installation and instructions for each type of sealant, caulking compound and associated miscellaneous material required.

B. Samples:

1. Submit three, 12" long samples of each color required (except black) for each type of sealant and caulking compound exposed to view. Install sample between two strips of material similar to or representative of typical surfaces where compound will be used, held apart to represent typical joint widths.

1.05 JOB CONDITIONS:

A. Pre-Installation Meeting: At Contractor's direction, installer, sealant manufacturer's technical representative, and other trades involved in coordination with sealant work shall meet with Contractor at project site to review procedures and time schedule proposed for installation of sealants in coordination with other work. Review each major sealant application required on project.

B. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended temperature range for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Where joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in lower third of the manufacturer's recommended installation temperature range, so that sealant will not be subjected to

excessive elongation and bond stress at subsequent low temperatures. Coordinate time schedule with Contractor to avoid delay of project.

C. Statement of Non-Compliance: Where it is necessary to proceed with installation of sealants or caulking compound under conditions which do not fully comply with requirements (because of time schedule or other reasons which contractor determines to be crucial to project), prepare written statement for Owner's record (with copy to Architect) indicating the nature of non-compliance, reasons for proceeding, precautionary measures taken to ensure best possible work, and names of individuals concurring with decision to proceed with installation.

1.06 SPECIAL PROJECT WARRANTY (GUARANTEE):

A. Sealant Warranty: Provide written warranty, signed by contractor and installer, agreeing to, within warranty period of 10 years after date of substantial completion, replace/repair defective materials and workmanship defined to include: Instances of significant leakage of water or air; failures in joint adhesion, material cohesion, abrasion resistance, strain resistance or general durability; failure to perform as required, and the general appearance of deterioration in any other manner not clearly specified in manufacturer's published product literature as an inherent characteristic of the sealant material. Warranty includes responsibility for removal and replacement of other work (if any) which conceals or obstructs the replacement of sealants.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL:

A. Colors: Provide black or other natural color where no other standard or custom color is available. Where material is not exposed to view, provide manufacturer's standard color which has best overall performance characteristics for application shown.

1. Provide manufacturer's standard colors as selected by Architect from manufacturer's standard colors.

B. Hardnesses shown and specified are intended to indicate general range necessary for overall performance. Consult manufacturer's technical representative to determine actual hardness recommended for conditions of installation and use. Upon request, Architect will furnish information concerning anticipated joint movement related to actual joint width and installation temperature. Except as otherwise indicated or recommended, provide compounds within the following range of hardness (Shore A, fully cured, at 75 degrees F.).

1. 5 to 20 for high percentage of movement and minimum exposure to weather and abrasion (including no exposure to vandalism).

2. 15 to 35 for moderate percentage of movement and moderate exposure to weather and abrasion.

3. 30 to 60 for low percentage of movement and maximum exposure to weather and abrasion (including foot traffic on horizontal joints).

C. Modulus of Elasticity: For joints subjected to movement, either thermal expansion of dynamic movement, select sealants from among available variations which have lowest modulus of elasticity which is consistent with exposure to abrasion or vandalism. For horizontal joints subject to traffic, select sealants with high modulus of elasticity as required to withstand indentation by stiletto heels. Comply with manufacturer's recommendations where no other requirements are indicated.

D. Compatibility: Before selection and purchase of each specified sealant, investigate its compatibility with joint surfaces, joint fillers and other materials in joint system. Provide only materials (manufacturer's recommended variation of specified materials) which are known to be fully compatible with actual installation conditions as shown by manufacturer's published data or certification.

2.02 SEALANTS:

A. One Part Elastomeric Sealant (Silicone)

1. One component elastomeric sealant, complying with ASTM C 920, Class 25, Type NS (nonsag), unless Type S (self-leveling) recommended by manufacturer for the application shown.

a. Acceptable Standard
   1. "Pecora 864 Architectural Silicone Sealant; Pecora Corp.
   2. Dow Corning 791; Dow Corning Corp.
   3. Silpruf; General Electric
   4. Omniseal; Sonneborn Building Products, Inc.
   5. Spectrem 2; Tremco Mfg. Co.

2. One-Component mildew resistant silicone sealant: (Around countertops and backsplashes and other wet interior locations).

a. Acceptable Standard
   1. Rhodorsil 6B white; Rhone-Poulenc Inc.
   2. Dow Corning 786; Dow Corning Corp.
   3. Sanitary 1700; General Electric

3. One Component high movement joints (+100/-50): Where locations of high movement are indicated.

a. Dow Corning 790; Dow Corning Corp.,
b. Spectrem 1; Tremco

B. Elastomeric Sealant (Polyurethane)
1. One component polyurethane sealant, complying with ASTM C 920, Type S, Grade NS, Class 25 (nonsag).

a. Acceptable Standard
   1. Sonolastic NP 1; Sonneborn Building Products Inc.
   2. Dymonic; Tremco Mfg. Co.
   3. Dynatrol I; Pecora Corp.
   4. Vulkem 921; Mameco
   5. CS 2130; Hilti

2. Two Component polyurethane sealant, complying with ASTM C 920, Type M, Grade NS, Class 25 (nonsag).

a. Acceptable Standard
   1. Sonolastic NP 2; Sonneborn Building Products Inc.
   2. Dymeric; Tremco Mfg. Co.
   3. Dynatrol II; Pecora Corp.
   4. Vulkem 922; Mameco

C. One-part self-leveling polyurethane sealant (for traffic areas).
1. One Component polyurethane self-leveling sealant, complying with ASTM C 920, Type S, Grade P, Class 25.

a. Acceptable Standard
   1. Sonolastic SL 1; Sonneborn Building Products Inc.
   2. NR-201 Urexpan; Pecora Corp.
   3. Vulkem 45; Mameco

2. Two-component polyurethane self-leveling sealant, complying with ASTM C 920, Type M, Grade P, Class 25.

a. Acceptable Standard
   1. Sonolastic SL 2; Sonneborn Building Products Inc.
   2. NR-200 Urexpan; Pecora Corp.
   3. Vulkem 245; Mameco
4. THC900/THC901; Tremco

2.04 CAULKING COMPOUNDS:

A. Caulking Compounds: (Acrylic Sealant)
   1. Acrylic emulsion polymer sealant compound; manufacturer's standard, one part, nonsag, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior locations involving joint movement of not more than plus or minus 5 percent.
   2. All interior caulking are to be non-latex product designed and made for medical surgical applications, with approved health department rating.

3. Acceptable Manufactures
   a. Sonneborn Building Products Inc.
   b. Tremco Inc.
   c. DAP
   d. Pecora Corp.

2.05 MISCELLANEOUS MATERIALS:

A. Joint Cleaner: Provide type of joint cleaning compound recommended by sealant or caulking compound manufacturer, for joint surfaces to be cleaned.

B. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer, for joint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer.

E. Provide size and shape of rod which will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. The installer must examine joint surfaces, backing and anchorage of units forming sealant rabbet and condition under which sealant work is to be performed and notify Contractor in writing of conditions detrimental to proper completion of the work and performance by sealants. Do not proceed with sealant work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 SELECTION OF MATERIAL

A. Caulking compounds shall be used for interior nonmoving joints and at locations indicated.

B. One component elastomeric silicone sealants shall be used at exterior and interior joints where thermal or dynamic movement is anticipated including, but not limited to, the following locations:

   1. Metal to metal joints.
   2. Sheet metal flashing, coping, preformed metal caps, fascias, extenders, trim, and panels.

C. One or two component elastomeric polyurethane sealants shall be used at exterior and interior joints where weatherproofing or waterproofing is required and at exterior joints between dissimilar materials including, but not limited to, the following locations:

   1. Expansion and control joints.
   2. Exterior side of hollow metal frames to adjacent materials.
   3. Exterior side of aluminum frames to adjacent dissimilar materials.
   4. Exterior insulation and finish system.
      a. Joints, including actual and false joints in system, at openings and penetrations in system, and joints where wall system abuts other materials.
   5. Lintels and shelf angles to masonry construction.

6. Louvers to adjacent construction.
7. Vertical interior expansion joints and horizontal interior and exterior control joints and expansion joints in the building.
8. Joints in concrete site improvements (sidewalks, ramps, plaza construction, retaining walls) and the joint between the concrete slabs and dissimilar materials.
9. Sealant in pipe sleeves where materials must perforate the floor slab.
10. Perimeter of floor slabs or concrete curbs which abut vertical surfaces.
11. 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 the various methods of construction to make watertight.
12. Exterior locations which are noted "caulked" or "sealant" and not specifically listed herein or included in the work of other sections of the Specifications.
13. Interior joints between dissimilar materials where the joining of the 2 surfaces leave a gap between the meeting materials and components.

D. One or two part self-leveling polyurethane sealants shall be used for exterior and interior horizontal joints subject primarily to pedestrian traffic and light and moderate vehicular traffic.

E. Security sealant shall be used in vertical control joints in the interior side of building.

3.03 JOINT SURFACE PREPARATION:

A. Clean joint surfaces immediately before installation of sealant or caulking compound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound.

B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with paragraph 4.3.9. of FS TT-S-00227 has successfully demonstrated that sealant bond is not impaired by coating or treatment. If laboratory test has not been performed or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

D. Roughen joint surfaces on vitreous coated and similar non-porous materials, where sealant manufacturer's data indicated lower bond strength than for porous surfaces. Rub with fine abrasive to produce a dull sheen.

3.04 INSTALLATION:

A. Comply with sealant manufacturer's printed instructions except where more stringent requirements are shown or specified and except where manufacturer's technical representative directs otherwise.

B. Prime or seal joint surfaces where shown or recommended by sealant manufacturer. Do not allow primer/sealer to spill or migrate onto adjoining surfaces.

C. Install sealant backer rod for liquid sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

D. Install bond breaker tape where shown and where required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

E. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface,

slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

F. Install sealants to depths as shown or if not shown as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead.

1. For sidewalks, pavement and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width and neither more than 5/8" deep nor less than 3/8" deep.

2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.

3. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in the range of 75% to 125% of joint width.

G. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces or to migrate into voids of adjoining surfaces including exposed aggregate panels and similar rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces but either primer/sealer or the sealant/caulking compound.

H. Remove excess and spillage of compounds promptly as the work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage without damage to adjoining surfaces or finishes.

I. Polysulfide Sealant Installation: Comply with standards issued by Thiokol Chemical Corp., except where more stringent requirements have been shown or specified, or have been issued by sealant manufacturer as either requirements or recommendations.

3.04 CURE AND PROTECTION:

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability. Do not cure in a manner which would significantly alter materials modulus of elasticity or other characteristics.

B. Installer shall advise Contractor of procedures required for curing and protection of sealants and caulking compounds during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of Owner's acceptance.

END OF SECTION 07 92 00

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. Access doors and frames for walls and ceilings.

1.2 SUBMITTALS

A. Product Data: For each type of access door and frame indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material in specified finish.

D. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 QUALITY ASSURANCE

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   1. NFPA 252 or UL 10B for vertical access doors and frames.
   2. ASTM E 119 or UL 263 for horizontal access doors and frames.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron- alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating.

D. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Factory-Primed Finish: Manufacturer's standard shop primer.

E. Drywall Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet to receive joint compound.

F. Plaster Beads: 0.0299-inch (0.76-mm) zinc-coated steel sheet with flange of expanded metal lath.

G. Manufacturer's standard finish.

2.2 ALUMINUM MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6, mill finish.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6, mill finish.

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M).

1. Mill finish.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acudor Products, Inc.
2. Babcock-Davis; A Cierra Products Co.
3. Bar-Co, Inc. Div.; Alfab, Inc.
4. Cendrex Inc.
5. Dur-Red Products.
6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
7. Jensen Industries.
8. J. L. Industries, Inc.
9. Karp Associates, Inc.
10. Larsen's Manufacturing Company.
11. MIFAB, Inc.
12. Milcor Inc.
13. Nystrom, Inc.
14. Williams Bros. Corporation of America (The).

steel sheet.

1. Locations: Masonry walls.
2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal.
3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-1/4-inch- (32-mm-) wide, surface- mounted trim.
4. Hinges: Continuous piano.
5. Lock: Slotted cam-latch.

C. Flush Access Doors and Frames with recess for gypsum board infill and taped-in flange @ gypsum board walls and ceilings: Fabricated from metallic coated steel sheet and gypsum board to be finished to match adjacent surface.

1. Locations: Gypsum board walls and ceilings.
2. Door: Minimum 0.080-inch- thick sheet metal with recess for gypsum board with door.
3. Frame: Minimum 0.080-inch- thick sheet metal with 1” gypsum board flange.
4. Hinges: Concealed and continuous pivoting rod.
5. Lock: Slotted cam-latch.

D. Fire-Rated, Insulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal with a minimum thickness of 0.036 inch (0.9 mm). At gypsum board provide with recess for gypsum board with door.
5. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-inch- (25-mm-) wide, surface- mounted trim.
6. Hinges: Concealed and continuous pivoting rod.
7. Automatic Closer: Spring type.
8. Lock: Self-latching device.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed. Provide keyed cylinder locks on all access doors.
1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 41 00 - FRP ENTRANCE DOORS-ALUMINUM FRAMING SYSTEMS

1. GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and General Provisions of contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work in this section.

1.2. DESCRIPTION OF WORK

A. The extent of each type of door and frame is shown on the drawings and in schedules.

B. The following types of doors and frames are required:
1. FRP flush doors.

1.3. RELATED WORK SPECIFIED ELSEWHERE

A. For Finish Hardware, see Section 08710.

B. For Sealants & Caulking, see Section 07920.

C. For Glass & Glazing, see Section 08800.

1.4. SYSTEM PERFORMANCE
FRP AND ALUMINUM FLUSH DOORS

A. Provide door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below, as demonstrated by testing manufacturer's corresponding stock systems according to test methods designated.

B. Thermal Transmission (exterior doors); U-value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.01.

C. Flame Spread/Smoke Developed: Provide [FRP or AMP] doors and panels with the following ratings in accordance with ASTM E 84-79a: Flame Spread: Exterior faces not greater than 145 (Class C); interior faces not greater than 10 (Class A). Smoke Developed: Exterior faces not greater than 345 (Class C); interior faces not greater than 320 (Class A).

D. Additional Criteria: Provide FRP doors and panels with the following performance:

ASTM D 256 - nominal value of 13.5
ASTM D 1242 - nominal value of .23 percent
ASTM D 570 - nominal value of .20 to .40 percent
ASTM D 2583 - nominal value of 50

1.5. QUALITY ASSURANCE - **ALL BIDDERS SHALL BE FACTORY DIRECT AUTHORIZED DISTRIBUTORS OF THE SPECIFIED PRODUCTS.**

A. Standards: Comply with the requirements and recommendations in applicable specification and standards by NAAMM and AAMA, including the terminology definitions and specifically including the "Entrance Manual" by NAAMM, except to the extent more stringent requirements are indicated.

B. Performance: A minimum ten year record of production of frames, doors and panels and completion of similar projects in type and size.

C. Instruction: The manufacturer or his representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.

D. Field Measurement: Field verify all information prior to fabrication and furnish of materials. Furnish and install materials omitted due to lack of verification at no additional cost to Owner.

E. Regulation and Codes: Comply with the current edition in force at the project location of all local, state and federal codes and regulations, including the Americans with Disabilities Act of 1992.

1.6. SUBMITTALS

A. Product Data: Submit Manufacturer's product data, specifications and instructions for each type of door and frame required in accordance with Section 01340 and the following:

1. Include details of core, stile and rail construction, trim for lites, internal muntins and all other components.

2. Include details of finish hardware mounting.
3. Include sample of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.

4. Include one sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.

B. Submit shop drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include glazing details and finish hardware schedule.

1.7. PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to jobsite in their original, unopened packages with labels intact. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.

B. Package door assemblies in individual corrugated cartons so no portion of the door has contact with the outer shell of the container. Package and ship frames preassembled to the greatest possible extent.

1.8. PROJECT WARRANTY

A. Provide a written warranty signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the Owner, any doors, frames or factory hardware installation which fail in materials or workmanship, within the warranty period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish, or construction in excess of normal weathering and defects in hardware installation. The minimum time period of warranty is ten (10) years from acceptance.

2. PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of the following:
1. Special-Lite, Inc., Decatur, Michigan.

2. Equals as approved by Architect.

2.2. MATERIALS AND ACCESSORIES

A. Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.125".

B. Components: Furnish door and frame components from the same manufacturer. "Splitting" of door and frame components is not permitted.

C. Fasteners: Aluminum non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide oval Phillips head screws with finish matching the item to be fastened.

2.3. FABRICATION

A. Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.

B. Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.

C. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64”.

D. No welding of doors or frames is acceptable.

E. Maintain continuity of line and accurate relation of planes and angles. Secure attachments support at mechanical joints, with hairline fit at contacting members.

F. Attachment of all hardware shall be made using machine screws which are supplied by the manufacturer.

G. All holes shall be drilled and tapped using the recommended drill size for the tap required.

H. Frames stops shall be applied stops, Minimum 5/8” high x Minimum 1 ¼” wide.

I. Door attachment points shall be minimum of 1/8” thickness.

J. Where hardware is to be attached to frame stop (Example: exit device strike, door closer shoe, O.H. stop & Etc.) a piece of solid bar stock aluminum sized to fill the frame stop void x 18” long shall be securely attached to the frame tube

K. Where it is not practical to have solid bar stock reinforcement at attachment points, use “RIV-NUTS for

attachment of hardware items.

2.4. FIBERGLASS REINFORCED POLYESTER FRP FLUSH DOORS

A. Materials and Construction

1. Construct 1-3/4” thickness doors of 6063 T5 aluminum alloy stiles and rails minimum 25/16” depth. Provide joinery of 3/8” diameter full width tie rods through extruded splines top and bottom as standard .125” tubular shaped stiles and rails reinforced to accept hardware as specified.

2. Extrude top and bottom rail legs for interlocking continuous rail rigidity weather bar. Lock face sheet material in place with extruded interlocking edges to be flush with aluminum stiles and rails.

3. Door face sheeting. Spec Lite 3, 120” thickness fiberglass reinforced polyester. SL17 doors with pebble-like embossed pattern. Color: custom color as selected by Architect/Owner.

4. Core of Door Assembly: Minimum five pounds per cubic foot density poured-in–place polyurethane free of CFC and HCFC. Minimum “R” value of 11. Ballistic rating is as indicated. Meeting stiles on pairs of doors, and weather bars with nylon brush weather-stripping.

5. Manufacture doors with cutouts for visor-lites, louvers or panels as scheduled. Factory furnish and install all glass, louvers and panels prior to shipment.

6. Premachine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware.

2.5 ALUMINUM FRAMING SYSTEMS

A. Tubular Framing

1. Framing system from the door manufacturer of the size and type shown. .125" minimum wall thickness and type 6063-T5 aluminum alloy .625" high applied stops with screws and weather-stripping. Frame members are to be box type with four (4) enclosed sides. Open back framing will not be acceptable.

2. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using "stick" material is not acceptable.

3. Applied stops for side, transom and borrowed lites and panels, with fasteners exposed on interior or unsecure portion only. Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule. Factory install hardware.

4. Anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'4" on jamb members, and one additional anchor for each foot over 7'4". Secure head and sill members of transom, sidelites and similar conditions.

2.6 Aluminum Finishes

A. All exposed aluminum to be factory finished with AK20 Nobel “Trinar”, custom color as selected by Architect/Owner.

3. EXECUTION

3.1. Installation

A. Comply with manufacturer's recommendations and specifications for the installation of the doors and frames. Factory install hardware, glass and louvers in doors. Factory assemble sidelites and transoms to the greatest extent possible.

B. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by architect.

C. Set thresholds in a bed of mastic and backseal.

D. Clean surfaces promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.

D. Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

F. Provide Owner with all adjustment tools and instruction sheets. Arrange an inservice session to Owner at Owner's convenience. Provide a minimum one-year written warranty on all labor related to this section. Any workmanship which is defective or deficient shall be corrected to the Owner's satisfaction and at no additional cost to the Owner.

END OF SECTION 08 41 00

SECTION 08 71 00 – FINISH HARDWARE

PART 1 - GENERAL

1.1 Refer to "General and Special Conditions", and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.

1.2 Work Included:

A. Furnish all items of Finish Hardware specified, scheduled, shown or required herein except those items specifically excluded from this section of the specification.

B. Related work:

1. Division 1 – General Requirements
2. Division 6 – Rough Carpentry
3. Division 8 – Steel Doors and Frames
4. Division 8 – Aluminum Framed Entrances and Storefronts

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

1. Access doors and panels
2. Overhead and Coiling doors

1.3 Quality Assurance

A. Requirements of Regulatory Agencies:

1. Furnish finish hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
2. Furnish finish hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.
3. Provide hardware for fire-rated openings in compliance with NFPA 80 and state and local building code requirements. Provide only hardware that has been tested and listed by UL for types and sizes of doors required and complies with requirements of door and door frame labels.

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builders' hardware. He must have adequate inventory, qualified personnel on staff and be located within 100 miles of the project. The distributor must be a factory-authorized dealer for all materials required. The supplier shall be or have in employment an Architectural Hardware Consultant (AHC).

C. Pre-installation Meeting:

1. Before hardware installation, General Contractor/Construction Manager will request a hardware installation meeting be conducted on the installation of hardware; specifically that of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products, in conjunction with the hardware supplier for the project, shall conduct the meeting. Meeting to be held at job site and attended by installers of hardware for aluminum, hollow metal and wood doors. Meeting to address proper coordination and installation of hardware, per finish hardware schedule for this specific project, by using installation manuals, hardware schedule, templates, physical product samples and installation videos.
2. Convene one week or more prior to commencing work of this Section.
3. The Hardware Supplier shall include the cost of this meeting in his proposal.

D. Manufacturer:

1. Obtain each type of hardware (latch and locksets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

1.4 Submittals:

A. Hardware Schedule

1. Submit number of Hardware Schedules as directed in Division 1.
2. Follow guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule unless noted otherwise.
3. Schedule will include the following:
   a. Door Index including opening numbers and the assigned Finish Hardware set.
   b. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

CATEGORY	SPECIFIED	SCHEDULED
Hinges	Manufacturer A	Manufacturer B
Lock sets	Manufacturer X	Manufacturer X
Kick Plates	Open	Manufacturer Z

   c. Hardware Locations: Refer to Article 3.1 B.2 Locations.
   d. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
   e. Hardware Description: Quantity, category, product number, fasteners, and finish.
   f. Headings that refer to the specified Hardware Set Numbers.
   g. Scheduling Sequence shown in Hardware Sets.
   h. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
   i. "Vertical" scheduling format only. "Horizontal" schedules will be returned "Not Approved."
   j. Typed Copy.
   k. Double-Spacing.
   l. 8-1/2 x 11 inch sheets
   m. U.S. Standard Finish symbols or BHMA Finish symbols.

B. Product Data:

1. Submit, in booklet form Manufacturers Catalog cut sheets of scheduled hardware.
2. Submit product data with hardware schedule.

C. Samples:

1. Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample, if required, of each type of exposed hardware unit, finished as required and tagged with full description for coordination with schedule.
2. Samples will be returned to the supplier. Units, which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. Key Schedule:

1. Submit detailed schedule indicating clearly how the Owner's final keying instructions have been followed.
2. Submit as a separate schedule.

E. Submit to General Contractor/Construction Manager, the factory order acknowledgement numbers for the various hardware items to be used on the project. The factory order acknowledgement numbers shall help to facilitate and expedite any service that may be required on a particular hardware item. General Contractor/Construction Manager shall keep these order acknowledgement numbers on file in the construction trailer.

1.5 Product Delivery, Storage, and Handling:

A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the contractor.

1.6 Warranties:

A. Refer to Division 1 for warranty requirements.

B. During the warranty period, replace defective work, including labor, materials and other costs incidental to the work. Replace work found to be defective as defined in the General Conditions.

PART 2 - PRODUCT

2.1 Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.

2.2 Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, it is understood that this is the owner’s Building Standard and "no substitution" is allowed.

A. Hinges:

1. Furnish hinges of class and size as listed in sets.
2. Numbers used are Ives (IVE).
3. Products of a BHMA member are acceptable.

B. Continuous Gear Hinge:

1. Manufacture to template, uncut hinges non-handed, pinless assembly, three interlocking extrusions, full height of door and frame, lubricated polyacetal thrust bearing, fasteners 410 stainless steel plated and hardened. All hinge profiles to be manufactured to template bearing locations, with standard duty bearing configurations at 5-1/8” spacing with a minimum of 16

bearings: and heavy duty at 2-9/16” spacing with a minimum of 32 bearings. Anodizing of material shall be done after fabrication of components so that all bearing slots are anodized.

2. Length: 1" less than door opening height. Fastener 12-24 x 1/2" #3 Phillips keen form stainless steel self-tapping at aluminum and hollow metal doors, 12- 1/2" #3 Philips, flathead full thread at wood doors.
3. Furnish fire rated hinges "FR" at labeled openings.
4. Numbers used are Select Products, Ltd.

C. Locksets and Latchsets - Mortise Type:

1. Locksets shall be manufactured from heavy gauge steel, minimum lockcase thickness 1/8”, containing components of steel with a zinc dichromate plating for corrosion resistance.
2. Locks are to have a standard 2 ¾” backset with a full ¾” throw two-piece stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1” throw, constructed of stainless steel.
3. Lockcase shall be easily handed without chassis disassembly by removing handing screw on lockcase and installing in opposite location on reverse side. Changing of door hand bevel from standard to reverse hand shall be done by removing the lockcase scalp plate, and pulling and rotating the latchbolt 180 degrees.
4. Lock trim shall be through-bolted to the door to assure correct alignment and proper operation. Lever trim shall have external spring cage mechanism to assist in support of the lever weight. Thumb turns shall have “EZ” thumbturn equal to IR-Schlage L583-363.
5. Function numbers are IR-Schlage.
   a. IR-Schlage L9000
6. Lockset Trim:
   a. IR-Schlage 17A
7. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond door frame trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors.

D. Locksets and Latchsets – Standard Duty Cylindrical Type:

1. Function numbers listed are IR-Schlage.
2. Provide 2-3/4 inch backset.
3. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips that do not project more than 1/8" beyond doorframe trim at single doors and have 7/8" lip to center at pairs of 1-3/4" doors.
4. Locksets and Latchsets:
   a. IR-Schlage AL
5. Lockset Trim:
   a. IR-Schlage Neptune

E. Overhead Holders and Stops:

1. Type, function and fasteners must be same as Glynn-Johnson specified. Size per manufacturer's selector chart. Plastic end caps, hold open mechanisms and shock blocks are not allowed. End caps must be finished same as balance of unit.
2. Manufacture products using base material of Brass/Bronze for US3, US4, & US10B finished products and 300 Stainless Steel for US32 & US32D finished products.
3. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's selector chart.
   a. IR-Glynn-Johnson
   b. Equal products of any BHMA manufacturer

F. Wall Stops:

1. Length to exceed projection of all other hardware. Provide with threaded studs and expansion shields for masonry wall construction. Install with slope at top.
   a. IR-Ives WS447
   b. BHMA L12011 or L12021

G. Thresholds:

1. 1/2" high - 5" wide. Cope at jambs.
2. Furnish full wall opening width when frames are recessed.
3. Cope in front of mullions if thresholds project beyond door faces.
4. Furnish with non-ferrous Stainless Steel Screws and Lead Anchors.
   a. National Guard as listed in sets
   b. Equal of Zero or Reese

H. Door Sweeps:

1. Surface Sweeps:
   a. National Guard as listed in sets
   b. Equal by Zero or Reese

I. Weather-stripping:

1. Apply to head and jamb stops.
2. Solid Bar stock all sides
   a. National Guard as listed in sets
   b. Equal by Zero or Reese

J. Miscellaneous:

1. Furnish items not categorized in the above descriptions but specified by manufacturer's names in Hardware Sets.

K. Fasteners:

1. Furnish fasteners of the proper type, size, quantity and finish. Use machine screws and expansion shields for attaching hardware to concrete or masonry, and wall grip inserts at hollow wall construction. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames. Furnish full thread wood screws for attachment to solid wood doors and frames. "TEK" type screws are not acceptable.
2. **Sex bolts will not be permitted on reinforced metal doors or wood doors where blocking is specified.**

2.3 Finishes:

A. Generally, Dull Chrome, US26D / BHMA 626. Provide finish for each item as indicated in sets.

2.4 Templates and Hardware Location:

A. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.

B. Furnish metal template to frame/door supplier for continuous hinge.

C. Refer to Article 3.1 B.2, Locations, and coordinate with templates.

2.5 Cylinders and Keying:

A. All cylinders for this project will be supplied by one supplier regardless of door type and location.

B. The Finish Hardware supplier will meet with Architect and/or Owner to finalize keying requirements and obtain keying instructions in writing.
   1. Supplier shall include the cost of this service in his proposal.

C. Provide a cylinder for all hardware components capable of being locked.

D. Provide cylinders master keyed to according to Owner's instructions. Provide two change keys for each cylinder, master keys as required by Owner.

E. Provide Construction Core Cylinder, Than provide Oakland County Parks and Rec Standard "Small Formatted Interchangeable" core

PART 3 - EXECUTION

3.1 Installation

A. General:

1. Install hardware according to manufacturers installations and template dimensions. Attach all items of finish hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacture of the item.
2. Provide blocking/reinforcement for all wall mounted Hardware.
3. Reinforced hollow metal doors and frames and reinforced aluminum door and frames will be drilled and tapped for machine screws.
4. Solid wood doors and frames: full thread wood screws. Drill pilot holes before inserting screws.
5. Continuous gear hinges attached to hollow metal doors and frames and aluminum doors and frames: 12-24 x 1/2" #3 Phillips Keenform self-tapping. Use #13 or 3/16 drill for pilot.
6. Continuous Gear Hinges require continuous mortar guards of foam or cardboard 1/2" thick x frame height, applied with construction adhesive.
7. Install weather-strip gasket prior to parallel arm closer bracket, rim exit device or any stop mounted hardware. Gasket to provide a continuous seal around perimeter of door opening. Allow for gasket when installing finish hardware. Door closers will require special templating. Exit devices will require adjustment in backset.

B. Locations:

1. Dimensions are from finish floor to center line of items.
2. Include this list in Hardware Schedule.

CATEGORY	DIMENSION
Hinges	Door Manufacturer's Standard
Flush Bolt Levers	72" and 12"
Levers	Door Manufacturer's Standard
Exit Device Touchbar	Per Template
Push Plates	52"
Pull Plates	42"
Wall Stops/Holders	At Head

C. Final Adjustment:

1. Provide the services of a representative to inspect material furnished and its installation and adjustment, to make final hardware adjustment, and to instruct the Owner's personnel in adjustment, care and maintenance of hardware.
2. Locksets, closers and exit devices shall be inspected by the factory representative and adjusted after installation and after the HVAC system is in operation, to insure correct installation and proper

adjustment in operation. The manufacturer's representative shall prepare a written report stating compliance, and also recording locations and kinds of noncompliance. The original report shall be forwarded to the Architect with copies to the Contractor, hardware distributor, hardware installer and building owner.

D. Technical and Warranty Information:

1. At the completion of the project, the technical and warranty information coalesced and kept on file by the General Contractor/Construction Manager shall be given to the Owner or Owner's Agent. In addition to both the technical and warranty information, all factory order acknowledgement numbers supplied to the General Contractor/Construction Manager during the construction period shall be given to the Owner or Owner's Agent. The warranty information and factory order acknowledgement numbers shall serve to both expedite and properly execute any warranty work that may be required on the various hardware items supplied on the project.
2. Submit to General Contractor/Construction Manager, two copies each of parts and service manuals and two each of any special installation or adjustment tools. Include for locksets, exit devices, door closers and any electrical products.

3.2 Hardware Sets:

HW SET: 01

1 ea.	Continuous Gear Hinge	SL11HD	DKBRZ	SEL
1 ea.	Storeroom Lockset	L9080P 03N	626	SCH
1 ea.	Cylinder	MORTISE	626	SCH
1 ea.	Threshold	425 HD	AL	NGP
1 set	Weather Seal	700NA	AL	NGP
1 ea.	Door Sweep	600A	AL	NGP
1 ea.	Wall Stop and Latch	467	626	RCK

Door and frame prep by manufacture, weather stripping and door bottom sweeps by manufacture.

END OF SECTION 08 71 00

SECTION 08 80 00 – GLASS AND GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. High performance glass of the following types:
   1. Low-e insulating glass.
   2. Monolithic float glass..

1.2 REFERENCES

A. ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

B. ASCE 7 - "Minimum Design Loads for Buildings and Other Structures".

C. ASTM International (ASTM):
1. ASTM C 162 - Standard Terminology of Glass and Glass Products.
2. ASTM C 1036 - Standard Specification for Flat Glass.
3. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass -- Kind HS, Kind FT Coated and Uncoated Glass.
4. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.
5. ASTM C 1376 - Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass.
6. ASTM E 2188 - Standard Test Method for Insulating Glass Unit Performance.
7. ASTM E 2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.
8. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or other specified gas.

D. Sealed Insulating Glass Unit Surface Designations:
1. Surface 1 - Exterior surface of the outer glass lite.
2. Surface 2 - Interspace surface of the outer glass lite.
3. Surface 3 - Interspace surface of the inner glass lite.
4. Surface 4 - Interior surface of the inner glass lite.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glass capable of withstanding thermal movement and wind and impact loads (where applicable) as specified in paragraph B following.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
a. Design Wind Loads: Determine design wind loads applicable to the Project according to ASCE 7, "Minimum Design Loads for Buildings and Other

Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

1) Basic Wind Speed: 90 mph.
2) Importance Factor: III.
3) Exposure Category: B.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from ambient and surface temperatures changes acting on glass framing members and glazing components.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 1/4 inch (6.0 mm) thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
   a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. per h per degree F.
   b. Solar Heat Gain Coefficient: NFRC 200.
   c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: For each glass product and glazing material indicated.

C. Verification Samples: For the following products, in the form of 12 inch (305 mm) square samples for insulating glass units.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
   1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Qualification Data: For installers.

G. Product Test Reports: For each of the following types of glazing products.
   1. Tinted float glass.
   2. Coated float glass.
   3. Insulating glass.

H. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Sustainable Design Certification: Glass shall be Cradle to Cradle Certified, minimum Level, Cradle to Cradle Innovation Institute.

B. Fabricator Qualifications: Vitro Certified Fabricator Network, as acceptable to the manufacturer.

C. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level-2 (Senior Glaziers) or Level-3 (Master Glaziers).

D. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: Clear float glass, coated float glass and insulating glass.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and industry organizations, including but not limited to those 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. FGIA Publication for Insulating Glass: SFGIA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."
   2. NGA Publications: “Laminated Glazing Reference Manual”; “Glazing Manual.”
   3. AAMA: “Sloped Glazing Guidelines.”
   4. FGIA: “Guidelines for Sloped Glazing.”

G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:
   1. Insulating Glass Certification Council.
   2. Associated Laboratories, Inc.
   3. Fenestration and Glazing Industry Alliance.

H. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, Fenestration and Glazing Industry Alliance ANSI Z97.1.
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
   2. Lites more than 9 sq ft (0.84 sq m) in area are required to be Category II materials.
   3. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sf (0.84 sq m) in area, provide glazing products that comply with Category II materials, and for lites 9 sf (0.84 sq m) or less in area, provide glazing products that comply with Category I or II materials.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 WARRANTY

A. Manufacturer's Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the glass fabricator in which the coated glass manufacturer agrees to replace coated glass units that deteriorates during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discoloration that is not attributed to glass breakage, seal failure, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions.
   1. Warranty Period: 10 years from date of manufacture.

B. Manufacturer's Warranty on Insulating Glass: Manufacturer's standard form in which the insulating glass unit manufacturer agrees to replace insulating-glass units that deteriorate during normal use within the specified warranty period. Deterioration of insulating glass units is defined as an obstruction of vision by dust, moisture, or a film on the interior surfaces of the glass caused by a failure of the hermetic seal that is not attributed to glass breakage, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions.
   1. Warranty Period: 10 years from date of manufacture.

C. Manufacturer’s Warranty on Laminated Glass: Manufacturer’s standard form in which the laminated glass manufacturer agrees to replace laminated glass units that deteriorate during normal use within the specified warranty period. Deterioration of laminated glass is defined as defects, such as discoloration, edge separation, or blemishes exceeding those allowed by ASTM C 1172 that are not attributed to glass breakage, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions.
   1. Warranty Period: 10 years from date of manufacture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Vitro Architectural Glass; Glass Technology Center, 400 Guys Run Rd., Cheswick, PA 15024. ASD. Toll Free Tel: (855) 887-6457. Fax: (800) 367-2986. Web: http://www.vitroglazings.com.

B. Substitutions: As approved by Architect / Owner

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated or required.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 2188 / E 2189 for and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated or required.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Comply with requirements in Section 07920 - Joint Sealants. Dual seal, with primary and secondary sealants of polyisobutylene and silicone.
5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

a. Spacer Material: Aluminum with mill or clear anodic finish.
b. Desiccant: Molecular sieve or silica gel, or blend of both.
c. Corner Construction: Manufacturer's standard corner construction.

2.3 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.4 GLASS SCHEDULE, INSULATING GLASS

A. Type: Low-E Tinted Insulating Glass – Tinted to match existing, low-reflective exterior appearance.
1. Solarban 70 (2) + Clear by Vitro Architectural Glass (contractor to verify in field match to existing)
2. Performance Values: VLT 39 percent; SHGC 0.20; shading coefficient 0.23; exterior reflectance 8 percent; U-value winter 0.28; U-value summer 0.26.
3. Insulating Glass Unit Construction: 1/4 inch (6 mm) glass, Solarban 70 solar control (sputtered) on second surface (2) + 1/2 inch (13 mm) air space + 1/4 inch (6 mm) Clear glass.

2.5 GLASS SCHEDULE, MONOLITHIC GLASS

A. Type: Uncoated Monolithic Low Iron Float Glass. Outdoor Appearance: Ultra Clear.
1. Tint Color: Acuity by Vitro Architectural Glass.
2. Performance Values for 1/4 inch (6 mm) Glass:
a. VLT: 90 percent. U-Value Winter: 1.02. U-Value Summer: 0.93. SHGC: 0.87 Shading Coefficient: 1.00 Outdoor Visible Light reflectance: 8 percent.

PART 3 EXECUTION

3.1 INSTALLATION

EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

D. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

GLAZING, GENERAL

E. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

F. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

G. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

H. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

I. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

J. Provide spacers for glass lites where length plus width is larger than **50 inches**.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide **1/8-inch-** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

K. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

L. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

M. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

N. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or

gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

O. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

TAPE GLAZING

P. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

Q. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

R. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

S. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

T. Do not remove release paper from tape until right before each glazing unit is installed.

U. Apply heel bead of elastomeric sealant.

V. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

W. Apply cap bead of elastomeric sealant over exposed edge of tape.

GASKET GLAZING (DRY)

X. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

Y. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

Z. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

AA. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal

gasket joints with sealant recommended in writing by gasket manufacturer.

BB. Install gaskets so they protrude past face of glazing stops.

SEALANT GLAZING (WET)

CC. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

DD. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

EE. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

CLEANING AND PROTECTION

FF. Immediately after installation, remove nonpermanent labels and clean surfaces.

GG. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

HH. Remove and replace glass that is damaged during construction period.

II. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 88 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each texture finish indicated on same backing indicated for Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation. SHEETROCK® BRAND GLASS-MAT PANELS MOLD TOUGH® AR FIRECODE® X

B. Moisture and Mold-Resistant and Abuse-Resistance Gypsum Board:

1. Core: As indicated.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. 5/8 in. (15.9 mm) Type X glass-mat panels with abuse, moisture and mold resistance
5. Offer greater resistance to surface indentation and impact damage than 5/8 in. (15.9 mm) Sheetrock® Brand Mold Tough® Firecode® X Panels
6. Suitable for use in pre dry-in (fast track or pre-rock) and similar applications of wallboard before the building envelope is fully enclosed
7. Tested to ASTM C1629 for surface abrasion and indentation resistance, and soft- and hard-body impact
8. Comply with ASTM C1658 specifications for 5/8 in. (15.9 mm), Type X and glass mat water-resistant gypsum panels
9. When tested in accordance with ASTM D32732 , the panels meet or exceed ASTM C1658 specifications
10. UL Classification as to fire resistance, surface-burning characteristics and noncombustibility
11. Achieved GREENGUARD Gold Certification and qualifies as a low VOC emitting material (meets CA 01350)
12. Can be exposed to weather for up to 12 months and guaranteed three years against manufacturing defects

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. L-Bead: L-shaped; exposed long flange receives joint compound.
    e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    f. Expansion (control) joint.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072500 "Weather Barriers."

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

B. Comply with ASTM C 840.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

E. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile and where indicated on drawings.
3. Level 4: Walls exposed to view.

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 09 29 00

SECTION 09 51 13 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes

1. Acoustical ceiling panels
2. Exposed grid suspension system
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings
4. Perimeter Trim

C. Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, proposed product substitutions may be submitted no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review of the proposal for acceptability and approved products will be set forth by the Addenda. If included in a Bid are substitute products that have not been approved by Addenda, the specified products shall be provided without additional compensation.

2. Submittals that do not provide adequate data for the product evaluation will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); Underwriters' Laboratories Classified Acoustical performance; Panel design, size, composition, color, and finish; Suspension system component profiles and sizes; Compliance with the referenced standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
2. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

3. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

4. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

5. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

6. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

7. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

8. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material

A. Armstrong Fire Guard Products

10. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint

11. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems

12. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum

13. ASTM E 1264 Classification for Acoustical Ceiling Products

B. International Building Code

C. ASHRAE Standard 62.1-2004, Ventilation for Acceptable Indoor Air Quality

D. NFPA 70 National Electrical Code

E. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures

F. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components

G. International Code Council-Evaluation Services Report - Seismic Engineer Report

1. ESR 1308 - Armstrong Suspension Systems

H. International Association of Plumbing and Mechanical Officials - Seismic Engineer Report

1. 0244 - Armstrong Single Span Suspension System

I. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.1 2010

J. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings

1.4 SYSTEM DESCRIPTION

Continuous/Wall-to-Wall

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.

B. Samples: Minimum 6 inch x 6 inch samples of specified acoustical panel; 8 inch long samples of exposed wall molding and suspension system, including main runner and 4 foot cross tees.

C. Shop Drawings: Layout and details of acoustical ceilings show locations of items that are to be coordinated with, or supported by the ceilings.

D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.

E. If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the architect's or owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the work.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

1. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

2. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 Classification.

3. Fire Resistance: As follows tested per ASTM E119 and listed in the appropriate floor or roof design in the Underwriters Laboratories Fire Resistance Directory

B. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

C. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. Space Enclosure:

HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel, aluminum or stainless steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.9 ALTERNATE CONSTRUCTION WASTE DISPOSAL

A. Ceiling material being reclaimed must be kept dry and free from debris

B. Contact the Armstrong Recycle Center a consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycling of the ceiling.

C. Recycling may qualify for LEED Credits:

a. LEED 2024 - Category 4: Material and Resources (MR)

i. Credit MRc2: Construction Waste Management

b. LEEDv4 - MRp2 - Construction Waste Management Planning Qualifies as a material stream (non-structural) targeted for diversion. Ceilings will be source-separated and diverted through the Armstrong Ceiling Recycling Program.

c. LEEDv4-MRc5 -

i. Option 1: Divert ceilings to qualify for one of the 3 material streams (50%)

ii. Option 2: Divert ceilings to qualify for one of the 4 material streams (75%)

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:

1. Acoustical Panels: Sagging and warping

2. Grid System: Rusting and manufacturer's defects

B. Warranty Period:

1. Acoustical panels: Ten (10) years from date of substantial completion.

2. Grid: Ten (10) years from date of substantial completion.

3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Acoustical Ceiling Units: Furnish quality of full-size units equal to 5.0 percent of amount installed.

2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Ceiling Panels:

1. Armstrong World Industries, Inc.

B. Suspension Systems:

1. Armstrong World Industries, Inc.

C: Perimeter Systems

1. Armstrong World Industries, Inc.

2.2.1 ACOUSTICAL CEILING UNITS

A. Office (to match existing)

Acoustical Panels Type **(OPTIMA TEGULAR 15/16” #3250 PB)**

1. Surface Texture: Fine
2. Composition: Mineral Fiber
3. Color: White
4. Size: 24IN x 24IN
5. Edge Profile: Angled Tegular 15/16IN for interface with Prelude XL 15/16" Exposed Tee grid.
6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.75.
7. Ceiling Attenuation Class (CAC) : ASTM C 1414; Classified with UL label on product carton 35.
8. Sabin: N/A
9. Articulation Class (AC): ASTM E 1111; 170
10. Flame Spread: ASTM E 1264; Class A (UL)
11. Light Reflectance White Panel: ASTM E 1477; 0.85
12. Dimensional Stability: HumiGuard Plus
13. Recycle Content: Post-Consumer - 0% Pre-Consumer Waste - 73%
14. Acceptable Product: Cirrus High-NRC, 556 as manufactured by Armstrong World Industries

2.3.1 METAL SUSPENSION SYSTEMS

A. Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

a. Structural Classification: ASTM C 635 Heavy Duty

b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.

c. Acceptable Product: **Office Prelude XL 15/16"** Exposed Tee as manufactured by Armstrong World Industries

d. Acceptable Products: **Lobby Extension Interlude XL 9/16 Dimensional** Tee Suspension System as manufactured by Armstrong World Industries (contractor required to match existing verify in field)

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. (Exception: HumiGuard Max Ceilings)

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

A. Follow manufacturer installation instructions.

B. Install suspension system and panels in accordance with the manufacturer's instructions, and in compliance with ASTM C 636 and with the authorities having jurisdiction.

C. Suspend main beam from overhead construction with hanger wires spaced 4-0 on center along the length of the main runner. Install hanger wires plumb and straight.

D. Install wall moldings at intersection of suspended ceiling and vertical surfaces. Miter corners where wall moldings intersect or install corner caps.

E. For reveal edge panels: Cut and reveal or rabbet edges of ceiling panels at border areas and vertical surfaces.

F. Install acoustical panels in coordination with suspended system, with edges resting on flanges of main runner and cross tees. Cut and fit panels neatly against abutting surfaces. Support edges by wall moldings.

3.4 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove any ceiling products that cannot be successfully cleaned and or repaired. Replace with attic stock or new product to eliminate evidence of damage.

C. Before disposing of ceilings, contact the Armstrong Recycling Center at 877-276-7876, select option #1 then #8 to review with a consultant the condition and location of building where the ceilings will be removed. The consultant will verify the condition of the material and that it meets the Armstrong requirements for recycling. The Armstrong consultant with provide assistance to facilitate the recycle of the ceiling.

END OF SECTION 09 51 13

SECTION 09 90 00 –
INTERIOR, EXTERIOR AND HIGH PERFORMANCE PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior paint and coating commercial systems including surface preparation.

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 04 20 00 - Unit Masonry: Concrete Masonry Units (CMU) and brick.

C. Section 05 12 16 - Fabricated Fireproofed Steel Columns.

D. Section 05 50 00 - Metal Fabrications.

E. Section 06 20 00 - Finish Carpentry.

F. Section 06 40 00 - Architectural Woodwork.

G. Section 08 11 13.16 - Custom Hollow Metal Doors and Frames.

H. Section 09 21 16.23 - Gypsum Board Shaft Wall Assemblies.

I. Section 23 05 00 - Common Work Results for HVAC.

J. Section 26 05 00 - Common Work Results for Electrical.

1.3 REFERENCES

A. Steel Structures Painting Council (SSPC):
1. SSPC-SP 1 - Solvent Cleaning.
2. SSPC-SP 2 - Hand Tool Cleaning.
3. SSPC-SP 3 - Power Tool Cleaning.
4. SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
5. SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
6. SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
7. SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
8. SSPC-SP11, Power Tool Cleaning to Bare Metal.
9. SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating.
10. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

C. California Department of Public Health (CDPH):
1. CDPH v1.1-2010 and V1.2-2017

D. LEEDv4 EQ Credit: Indoor Environmental Quality-Low Emitting Materials

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

E. Only submit complying products based on project requirements (i.e. LEED). One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

F. USGBC LEED V4 Submittals:
   1. MRc2 Environmental Product Declaration Product Language: Products shall be selected with a preference to products that have product-specific environmental product declaration documentation.
   2. EQc2 Low Emitting Materials: The VOC content of all adhesives, sealants, paints and coatings in this Section shall not exceed the VOC limits established in Division 01 Sustainable Design sections.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish surfaces for verification of products, colors and sheens.
   2. Finish area designated by Architect.
   3. Provide samples that designate primer and finish coats.
   4. Do not proceed with remaining work until the Architect approves the mock-up.

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 and use instructions.
   3. Surface preparation.

4. VOC content.
5. Environmental handling.
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.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. 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 install products under environmental conditions outside manufacturer's recommended limits.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Sherwin-Williams, which is located at: 101 Prospect Ave.; Cleveland, OH 44115; ASD Toll Free Tel: 800-524-5979; Tel: 216-566-2000; Fax: 440-826-1989; Email: request info specifications@sherwin.com; Web: www.swspecs.com.

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS/SCOPE

A. Interior Paint and Coating Commercial Systems:
1. Concrete: Poured, precast, tilt-up, cast-in-place, cement board, plaster.
2. Concrete: Non-vehicular floors.
3. Masonry: Concrete masonry units, including split-face, scored, and smooth block.
4. Metal: Aluminum, galvanized steel.
5. Metal: Structural steel, joists, trusses, beams, partitions and similar items.
6. Wood: Walls, ceilings, doors, trim and similar items.
7. Drywall: Drywall board, Gypsum board.

2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings:
   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 procedure is specifically described in manufacturer's product instructions.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

E. LEED Requirements: LEED V4 and V4.1 EQ Credit: Indoor Environmental Quality-Low Emitting Materials.

2.4 INTERIOR PAINT AND COATING COMMERCIAL SYSTEMS

A. Masonry CMU: Concrete, Split Face, Scored, Smooth, High Density, Low Density, and Fluted.

   1. Epoxy Systems; Waterbased:

      a. Eg-Shel/Low Luster Finish:
         1) 1st Coat: S-W Loxon Block Surfacer, LX01W200 (50-100 sq ft/gal).
         2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45- Series.
         3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45- Series (4.0 mils wet, 1.5 mils dry per coat).

B. Metal: Aluminum and Galvanized.

   1. Epoxy Systems; Waterbased:

      a. Eg-Shel/Low Luster Finish:
         1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils wet, 2.0 mils dry).
         2) 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy, B73-360 Series.
         3) 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

C. Metal; Galvanized: Duct work.
   1. Multi-Surface Acrylic Coating System:
      a. Gloss Finish High Performance:

1) 1st Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-1500 Series.
2) 2nd Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-1500 Series (5.0 mils wet, 2.0 mils dry per coat).

D. Wood: Trim.
1. Latex Systems:
a. Semi - Gloss Finish:
1) 1st Coat: S-W Premium Wall and Wood Primer, B28W8111 (4 mils wet, 1.8 mils dry).
2) 2nd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series.
3) 3rd Coat: S-W ProClassic Waterborne Acrylic Semi-Gloss, B31 Series (4 mils wet, 1.3 mils dry per coat).

E. Drywall: Walls, Ceilings, Gypsum Board and similar items.

1. Epoxy Systems; Waterbased:

a. Eg-Shel/Low Luster Finish:
1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils wet, 1.5 mils dry).
2) 2nd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy, B73-360 Series.
3) 3rd Coat: S-W Pro Industrial Waterbased Catalyzed Epoxy, B73-360 Series (5.0 mils wet, 2.0 mils dry per coat).

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. 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.

C. 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. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
1. Prior to attempting to remove mildew, it is 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 are advised.
2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow surface to dry before painting. Wear protective glasses or goggles, 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.

3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.

C. 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 degrees F (24 degrees C). 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.

D. 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.

E. 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.

F. Copper and Stainless Steel: Remove all oil, grease, dirt, oxide and other foreign material by cleaning per SSPC-SP 2, Hand Tool Cleaning.

G. 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.

H. 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.

I. Drywall - Interior: 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.

J. 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.

K. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.

L. Steel: Structural, Plate, And Similar Items: 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.
   1. 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.
   2. 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.
   3. 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.
   4. 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 SSPC-SP1 or other agreed upon methods.
   5. 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.
   6. 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.
   7. 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.

8. 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.
9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
10. Water Blasting, SSPC-SP12/NACE No. 5: 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.

M. Vinyl Siding, Architectural Plastics, EIFS and Fiberglass: Clean vinyl siding thoroughly by scrubbing with a warm, soapy water solution. Rinse thoroughly. Do not paint vinyl siding with any color darker than the original color unless the paint system features Sherwin-Williams VinylSafe technology. Painting with darker colors that are not Sherwin-Williams VinylSafe may cause siding to warp. Follow all painting guidelines of the vinyl manufacturer when painting. Only paint properly installed vinyl siding. Deviating from the manufacturer's painting guidelines may cause the warranty to be voided.

N. 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.

O. Wood: Must be clean and dry. Prime and paint as soon as possible. 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.

3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. 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. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with

consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 09 90 00

SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Primers
2. Wood stains.
3. Transparent finishes.

B. Related Requirements:

1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.
2. Section 099600 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

1. Size: [8 inches square]
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

E. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.
3. Environmental Product Declaration: For each product.

4. Health Product Declaration: For each product.
5. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
6. Environmental Product Declaration: For each product.
7. Environmental Product Declaration: For each product.
8. Environmental Product Declaration: For each product.
9. Third-Party Certifications: For each product.
10. Third-Party Certified Life Cycle Assessment: For each product.
11. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials[, from the same product run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: [5] percent, but not less than [**1 gal.**] of each material and color applied.

1.4 MOCKUPS

A. Apply mockups of each finish system indicated and each color selected

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

   a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft.**.
   b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

   a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than **45 deg F**.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between **50 and 95 deg F**.

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than **5 deg F** above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Obtain each coating product from single source from single manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: [9] percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to

reinstall items that were removed. Remove surface-applied protection if any.

B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

C. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, [Wood Trim] [Architectural woodwork] [Doors]

1. Solid-Color, Water-Based Stain System MINI-Wax:

a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, water based, solid hide.

B. Wood Substrates, Wood-Based Panel Products:

1. Solid-Color, Water-Based Stain System MINI Wax:

a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, water based, solid hide.

END OF SECTION 09 93 00

SECTION 20 0500 - COMMON WORK RESULTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Access Doors.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Mechanical Demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.

3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.
5. EPDM: Ethylene-propylene-diene terpolymer rubber.
6. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

C. Shop drawings: Submit for all major equipment including, but not limited to the items listed in Division 20, 21, 22, 23. Submittals shall be provided in electronic format.

D. As-built Drawings: Submit as-built drawings that include accurate dimensioned record drawings of all underground work, above ground piping, and ductwork systems. As-built drawings shall be submitted in electronic format.

E. Operation and Maintenance Manuals: When the building is substantially complete and before the building is taken over by the Owner for maintenance purposes, the contractor shall provide four sets of complete operation and maintenance manuals. The manual shall consist of an indexed loose-leaf binder containing the equipment data, manufacturer's installation, operating, maintenance, repair parts manual for each system component, test reports, and as-built temperature control diagrams. Refer to Divisions 20, 21, 22, and 23 for additional submittal requirements. Provide an electronic copy of the operation and maintenance manual in addition to three (3) sets of loose-leaf hard copy binders. Schedule of preliminary submittal will be reviewed with Commissioning Agent at the commissioning kick off meeting. Manuals shall be edited to be project specific, including applicable model numbers, options, configurations, controls, etc. Generic manuals will not be accepted.

F. Substitutions: The contractors' base bid must be in accordance with the materials or products specified. Any exceptions to this must be approved in writing by the Architect/Engineer, 10 days or more prior to bidding. Voluntary alternates may be submitted for consideration on the proposal, with listed addition or deductions to the base bid, but will not affect the awarding of the contract.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform all Work in accordance with applicable Federal, State and local codes rules, ordinances and regulations. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standards, Rules and Regulations of NFPA, UL, and as follows unless otherwise indicated.

1. Boiler Code
2. Elevator Code
3. USGBC
4. ASHRAE 55

5. ASHRAE 62.1
6. ASHRAE 90.1

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Electrical Characteristics for Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

E. Permits and inspections: Obtain and pay for all permits (temporary and permanent), fees, and inspections as required by any applicable laws and ordinances. Post such permits and inspection Certificates in a prominent place adjacent to the work. Deliver all certificates of final inspection or approval to the Architect/Engineer. Do not cover any concealed work until final inspection has been made and approval certificates obtained.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver ductwork, pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent ductwork and pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

D. Under provisions of commissioning documentation; testing of mechanical equipment, as well as training of owner’s operation and maintenance personnel, shall be required in cooperation with the commissioning agent.

E. Refer to the Owner/Utility tie-in schedule.

F. Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work.

G. Each contractor shall coordinate its operations with operations, included in different sections, which depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

1.8 WARRANTIES

A. In the event that any part of the work or equipment fails (abuse and causes beyond control of the contractor excepted), within this period of guarantee, it shall be replaced by the contractor at no cost to the owner.

1.9 SYSTEM STARTUP

A. Special mechanical equipment such as pumps, etc., shall have initial start-up of equipment assigned to a trained manufacturer's representative who can check and report on items such as installation, lubrication, alignment, etc., and see that the equipment starts and operates properly.

B. Activation of the heating, ventilating and air conditioning equipment for testing and balancing will be allowed only after the construction is substantially complete, or by permission of the owner's construction representative.

C. Air handling systems used prior to final acceptance shall have specified filters installed during temporary use. Replace the temporary filters if the filters become loaded to capacity during system activation. Install replacement filters upon completion of the work and prior to final acceptance. Record the dates when the filters are changed for system start-up and when spare filters are provided with the commissioning agent documents.

1.10 MAINTENANCE

A. Contractor shall be responsible for maintenance of equipment and systems installed until final acceptance by Owner.

B. Lubricate rotating equipment in accordance with manufacturer's recommendations before activation. Re-lubricate as required during activation and prior to final acceptance.

C. Provide readily accessible and secured copper extensions to bearing lubrication fittings on equipment bearings.

1.11 SITE INSPECTION

A. Contractor shall visit the site prior to submitting Proposal and examine and verify existing conditions. Additional charges will not be allowed due to failure to complete site visit or to

include necessary materials and labor to complete the work. Proposal being submitted implies site visit has occurred and contractor understands the conditions which the work will be conducted.

1.12 CONSTRUCTION DOCUMENT INTERPRETATION

A. Any conflict within the documents shall be included with the highest cost.

1.13 DRAWINGS AND MEASUREMENTS

A. The Drawings show the general arrangement, general design and location of equipment. The Drawings are to be considered diagrammatic and are not intended to be scaled for rough-in measurements, or to serve as shop drawings.

B. Follow the Drawings in laying out the work, consult Architectural, Structural and Electrical Construction Documents to become familiar with all conditions affecting the work and verify all spaces in which work will be installed. Field measurements shall be taken, where necessary, for ordering material and fitting the installation to the building construction.

C. The Drawings are not intended to be scaled for rough-in measurements, or to serve as shop drawings

D. Where the bidder feels conflicting information is indicated on drawings and/or specifications, or where drawings and/or specification requirements are contradictory, the bidder shall submit a request for clarification during the project bid period. If a request for clarification is not submitted, the bidder will be responsible to provide the more costly of the conflicting designs and or installations, unless otherwise agreed to by the project engineer and/or architect.

E. Where job conditions require reasonable changes in indicated locations or arrangement, such changes shall be made without extra cost to the Contract.

1.14 DOCUMENT REVIEW

A. Before submitting a Proposal, this Contractor shall review the documents (plans, and specifications) of all trades in order to arrive at a clear understanding of the project requirements and the work required. The bidder shall have reviewed the documents to arrive at a clear understanding of the work required and the conditions under which work is to be performed. He/she shall be held to have compared the electrical documents and the documents of other trades to have satisfied him/her self as to the interfaces and electrical work and materials required to accommodate systems, equipment, devices, etc. furnished or furnished and installed by other trades.

B. Prior to submitting the bid, request clarification, in writing, of any ambiguities, questions, uncertainties, etc. Requests shall be made in writing to the construction manager a minimum of ten (10) days before the bid due date.

C. Requests for material substitutions or for material consideration as an equal shall be made in writing to the construction manager a minimum of ten (10) days before the bid due date.

D. No allowances or extra consideration in behalf of the Contractor will subsequently be allowed because of error or failure on the part of the Contractor to conform to the requirements described herein.

1.15 ELECTRONIC DOCUMENTS

A. Mechanical drawings in a CAD format will be made available to the mechanical contractor for use in preparing layout drawings, shop drawings, as-built drawings, etc at the cost of $50.00 per drawing payable to Lawrin Engineering (LE). The mechanical contractor shall include in his/her bid, costs for electronic drawings, which they or their vendors, suppliers, etc. will require for the project.

B. Drawings will be provided via email or on compact disc, at the contractor preference in the format and version in which they were prepared.

C. Drawings will include all addendums, bulletins or revisions issued as of the date of transmission or transmittal of the electronic media to the Contractor. LE assumes no responsibility for providing the contractor with future revisions or drawing updates in an electronic format. Additional or future requests for updated or revised electronic drawings will be provided if so requested at the cost of $50.00 per drawing payable to Lawrin Engineering.

D. Vendors or suppliers desiring CAD documents should request same from the mechanical contractor.

E. Because data stored as electronic media can be modified without Lawrin Engineering knowledge, the contractor agrees that LE will not be held liable for the completeness or correctness of the electronic media after an acceptance period of 10 days after delivery of the electronic files. LE stands by the accuracy of the hardcopy (prints, etc.) which are included with documents distributed for the project. Any drawings produced from the electronic file(s) provided by LE shall not be considered property of LE, nor will LE be held liable for such drawings. Contractor in using the electronic documents agrees to the provisions of this section.

F. All drawing produced from the electronic files should be checked against the hard copy supplied to ensure accuracy and consistency.

G. Due to the ever increasing complexity and growth of electronic media viruses, it is mandatory that the contractor scan any disk or email received from LE. While LE takes great strides in trying to keep our system clean of viruses, occasionally one may be passed undetected. If any virus is detected by the contractor on any media received from LE, please contact us immediately.

1.16 MATERIALS LIST

A. Submit a complete list of all materials and equipment and their manufacturers, for approval within two (2) weeks after award of Contract, prior to submittal of shop drawings.

B. Shop drawings will not be reviewed until the materials list has been reviewed and approved by the Architect/Engineer.

1.17 APPROVED MANUFACTURERS

A. Approved manufacturers shall be as indicated herein and in accordance with the requirements of Division 20, 21, 22 and 23. All manufacturers shall be subject to the approval of the Engineer. Such approval concerns the manufacturer only and does not, in any way, act to permit any deviation from strict compliance with the requirements of these Specifications.

1.18 MANUFACTURER'S INSTRUCTIONS

A. All operating instructions, service instructions, parts lists, etc., which are shipped with mechanical equipment are to be retained and on completion of the work and turned over to the Architect/Engineer for the Owner's use. If this information is not shipped, this Contractor shall obtain said information from the manufacturer at this Contractors cost.

1.19 ALTERNATE MANUFACTURERS

A. Products and materials for use on this project shall be based on one of the manufacturers listed on plan or specified. Base bid shall be based on using the listed manufacturers only. Alternate manufacturers, if desired shall be indicated in a voluntary alternate to be submitted by the contractor. The Owner reserves the right to reject any alternates.

1.20 TESTING, ADJUSTING AND BALANCING MOTOR PULLEY REQUIREMENTS

A. For all constant speed belt driven fans greater than 5 hp, Contractor shall provide and install two sets of fixed motor pulleys. First set shall be installed for initial start-up and shall be based on scheduled data. Factory provided motor pulley may be used if properly sized. The second set shall be installed after system balance is complete and shall be based on actual field conditions as determined by the TAB contractor.

B. For all constant speed belt driven fans through 5 hp, Contractor shall provide and install two sets of adjustable motor pulleys. First set shall be installed for initial start-up and shall be based on scheduled data. Factory provided motor pulley may be used if properly sized. The second set shall be installed after the balance is complete and shall be based on actual field conditions as determined by the TAB contractor. Select motor pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

C. For all belt driven variable frequency drive operated fans, contractor shall provide and install one set of fixed motor pulleys sized to allow full utilization of fan motor horsepower provided, with VFD at 100 percent of fan motor RPM

D. Furnish motor pulleys of machined cast iron or carbon steel, bushing type of fixed bore, secured to the shaft by key and keyway.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACCESS DOORS

A. Access doors in walls or ceilings shall be of 24”X24” in size, unless specified otherwise or space restricted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Larson.
    b. Milcor Inc.

B. Non-labeled door shall be 16 gauge prime painted steel frame; 14 gauge prime painted steel panel; concealed spring type hinges; and flush, screwdriver operated metal cam lock.

C. Labeled doors shall be UL listed; 16 gauge, prime painted steel frame; sandwich type with 20 gauge face sheets, flush design with filler panels; continuous hinges with stainless steel pins and flush, self-latching cylinder locks with two keys per lock. Coordinate doors and accessories with Division 08 ACCESS DOORS AND FRAMES.

D. All access doors shall have flush mounted handles.

2.3 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21, 22, and 23 piping sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.4 JOINING MATERIALS

A. Refer to individual Division 21, 22, and 23 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8-inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall

thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.5 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:

a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:

a. NIBCO INC.
b. NIBCO, Inc.; Chemtrol Div.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum pressure as required to suit system pressures.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.

d. Victaulic Co. of America.

2.7 MECHANICAL SLEEVE SEALS

A. Manufacturers:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral water stop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.9 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.10 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.11 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, water stop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber water stop collar with center opening to match piping OD.

2.12 ESCUTCHEONS

A. Description: Manufactured chrome plated wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

C. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

D. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

E. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

F. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.13 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.14 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Sections "Selective Demolition" and "Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove Fire Protection systems, HVAC systems, Plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 WORK IN EXISTING BUILDINGS

A. Access to the existing building will be provided by the owner as required and a project schedule will identify access requirements to occupied buildings. Work shall be completed by the Contractor without interruption once Work has begun to facilitate returning the areas of work

back to the Owner as soon as possible.

B. Provide adequate protection of all existing and newly installed Work. Contractor shall promptly repair any damage to new or existing Work at Contractor's expense.

C. Contractor shall consult with the Owner on methods of performing Work so the Owner's operation is not disrupted more than absolutely necessary. The Owner shall designate when interruption of existing services may occur. Contractor shall leave all services in operation until such time.

D. All items and equipment removed as part of the demolition process shall remain property of the owner unless possession rights are waived. Contractor shall meet with Owner prior to start of demolition to determine which items are to be salvaged. Contractor shall remove remaining items from the site.

3.3 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21, 22, 23 sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping indicated to be exposed in finished areas as high as possible unless noted otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Install piping to permit valve servicing. Valves shall be located not more than 24 inches above the suspended ceiling grid.

H. Install piping at indicated slopes.

I. Install piping free of sags and bends. Piping shall be installed level and plumb where piping slopes are not required.

J. Install fittings for changes in direction and branch connections.

K. Install piping to allow application of insulation.

L. Select system components with pressure rating equal to or greater than system operating pressure.

M. Install escutcheons for penetrations of walls, ceilings, and floors:

1. New Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel typeand set screw.
    h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.
    j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
    l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

2. Existing Piping: Use the following:

    a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
    b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and spring clips.
    e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge and set screw.
    g. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with polished chrome-plated finish.
    h. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.
    i. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
    j. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with set screw or spring clips.
    k. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

N. Sleeves are not required for core-drilled holes.

O. Permanent sleeves are not required for holes formed by removable PE sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

Q. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
    b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

        1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
5. Sleeves through floors and walls shall be sized so that the required pipe insulation is continuous through the sleeve.

R. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in

requirements.

3.4 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 21, 22, and 23 sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

J. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.

1. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
3. PVC Nonpressure Piping: Join according to ASTM D 2855.

K. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

L. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

M. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each control valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to each control valve and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.6 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated or coordination with other services dictates different mounting heights.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC, Plumbing, and Fire Protection equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.7 ACCESS DOOR INSTALLATION

A. Access doors shall be provided in all pipe chases, soffits, walls, ceilings, and ductwork to give access to valves, dampers, both sides of booster coils in ductwork or VAV terminals, control devices, etc.

B. All access doors shall be within 24 inches of any fire damper.

C. Coordinate the exact location with other trades.

D. Verify the exact quantity, size and location of the required access panels after the installation of systems and equipment requiring access, and prior to the closure of affected ceilings and building assemblies.

3.8 PAINTING

A. Painting of mechanical systems, equipment, and components is specified in Division 09 Section " Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

1. Provide all supplementary steel to provide proper drainage for gravity flow systems.

C. Field Welding: Comply with AWS D1.1.

3.10 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.11 GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout around anchors.

G. Cure placed grout.

END OF SECTION 20 0500

SECTION 20 0513 - COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination apply to this section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Section does not include motors for fire pumps, elevators, centrifugal chillers, sealed refrigeration equipment, submersible sump pumps, and vertical hollow or solid shaft motors used with vertical turbine pumps.

C. Related Sections include the following:

1. Section 20 "Variable Frequency Drives".
2. Section 26 "Fuses".
3. Section 26 "Enclosed Switches and Circuit Breakers".
4. Section 26 “Enclosed Controllers".

1.3 DEFINITIONS

A. ABMA: American Bearing Manufacturers Association.

B. IEEE: Institute of Electrical and Electronics Engineers.

C. NEMA: National Electrical Manufacturers Association.

D. MG 1: (NEMA) Motors and Generators Standard.

E. VFD: Variable frequency drive.

1.4 SUBMITTALS

A. Submit the following product data for approval:

1. Manufacturer information.
2. Dimensions and elevations.

3. Complete NEMA nameplate electrical data including design type, insulation, service factor, and efficiency.
4. Materials of construction.

    1) Bearing type, L10 bearing life, and seal construction (open, single, or double shielded).

5. Certification that VFD driven motors comply with all parts of NEMA MG-1 Part 31.

1.5 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Baldor Electric Company
2. Dayton.
3. General Electric.
4. Leeson Electric.
5. Marathon Electric.
6. Reliance Electric.
7. Toshiba Corporation.
8. U.S. Electrical Motors.

2.2 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in Fire Protection, Plumbing or HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

D. Comply with ABMA 9 for bearing life calculations. For belted applications, calculations shall be based on maximum external side load limits per NEMA MG 1 Table 14-1A. L10 life calculations for vertical motors and horizontal motors mounted in the vertical position shall consider the application’s thrust loading.

2.3 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level. Maximum hot spot temperature shall not exceed the insulation temperature limit, when operated in an ambient temperature of 40 deg C, except as otherwise indicated.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Noise: Motors shall not exceed dBA levels listed in NEMA MG 1 section 12.54 at all speeds.

2.4 POLYPHASE MOTORS (1/2 HP and larger)

A. Description: NEMA MG 1, Design B, squirrel cage, medium induction motor with open drip proof enclosure unless noted otherwise in equipment specifications of schedules. When totally enclosed fan cooled motors are specified or scheduled, provide external shaft slinger on drive end.

B. Efficiency: Nominal (nameplate) full load efficiency and corresponding minimum efficiency equal to or greater than that stated in NEMA MG 1 Table 12-12 – Premium Efficient Motors Nominal Full Load Efficiencies.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material and Bearings:

1. Motors less than 3 HP: Steel or cast iron motor frames, cast aluminum, cast iron, or steel end plates, steel or cast iron terminal box, copper windings.

a. Bearings shall be regreasable with relief plugs, pre-lubricated ball bearings suitable for radial and thrust loading of the application, with grease fittings, selected for a minimum L10 bearing life of 26,280 hours, for belted and direct drive.

2. Motors 3 HP and above: Cast iron motor frames and mounting feet, cast iron end plates (bells), steel or cast iron terminal box, copper windings.

    a. Bearings shall be regreasable with relief plugs, pre-lubricated ball bearings suitable for radial and thrust loading of the application, with grease fittings. Rated for a minimum L10 bearing life of 40,000 hours for belted or 130,000 hours for direct drive.

2.5 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
5. For VFD driven motors up to 100 HP, provide a maintenance free, circumferential conductive micro-fiber ground ring installed on the motor to discharge stray shaft currents to ground. Grounding ring shall be AEGIS SGR (shaft grounding ring). Motors protected by AEGIS SGR shall be warranted for the term of the manufacturer’s motor warranty from induced current bearing damage.
6. For VFD driven motors 100 HP and greater, provide a maintenance free, circumferential conductive micro-fiber ground ring installed on the motor to discharge stray shaft currents to ground. Grounding ring shall be AEGIS SGR (shaft grounding ring). In addition, motors shall utilize an insulated ceramic bearing assembly on the non-drive end of the motor, in conformance with the AEGIS installation requirements.
7. Motors protected by AEGIS SGR shall be warranted for the term of the manufacturer’s motor warranty from induced current bearing damage.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.6 SINGLE-PHASE MOTORS (less than 1/2 HP)

A. Motors larger than 1/20 HP shall be one permanent-split-capacitor type, to suit starting torque and requirements of specific motor application:

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor

insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

F. Furnish with sliding base/slotted mounting holes adequate for proper belt tensioning and alignment of motor or motor/load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and align motors in accordance with the equipment manufacturer's recommendations.

B. For VFD driven motors using a shaft grounding ring: Install grounding ring in accordance with the manufacturer's recommendations, including application of a colloidal silver shaft coating on the motor shaft.

3.2 ADJUSTING, CLEANING, PROTECTION

A. Assure motor nameplate is legible and properly affixed.

B. Verify bearings are factory lubricated before starting motors. Lubricate per manufacturer's instructions. Do not over lubricate bearings.

C. Check motors for unusual heating, noise, or excessive vibration during operation. Correct any such deficiencies.

1. Any motors with vibration exceeding specified limits, as noted in the Testing, Adjusting, and Balancing Section, or manufacturer's recommendations, whichever is more stringent, shall be corrected, at no cost to the Owner, until reduced below those limits.

D. Clean the motor prior to start-up and immediately prior to final turn-over to the Owner.

END OF SECTION 20 0513

SECTION 20 0514 – VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 DEFINITIONS

A. ANSI: American National Standards Institute.

B. FCC: Federal Communications Commission.

C. IEEE: Institute of Electrical and Electronics Engineers.

D. NEMA: National Electrical manufacturer's Association.

E. UL: Underwriters Laboratory.

F. VFD: Variable Frequency Drive.

1.3 SUBMITTALS

A. Product Data: Include dimensions and elevations, complete product data listing all included features, electrical rating for each VFD, matched to each piece of driven equipment, and fault current rating.

B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

a. Line/load connection points.
b. Main input and inverter input disconnect switches.
c. VFD/bypass switch circuit.
d. Fusing/circuit breakers.
e. Auxiliary control transformer.
f. Local/remote circuit.
g. Hand-off-auto circuit.
h. Safety interlock, run permissive, and drive initiated external circuits.
i. Analog inputs and outputs.
j. Pilot lights.
k. Each wire on the wiring diagram shall be labeled with a distinct wire identifier.

2. VFD panel face diagram indicating the location of the main and inverter disconnect switches, local/remote and H-O-A switches, VFD/bypass switch, pilot lights, digital display, keypad, programmable carrier frequency limitations (4-5 kHz or 2-14 kHz) and any other face mounted device, along with the panel face labeling.

C. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. VFD shall comply with NFPA 90 (National Electrical Code), IEEE 519, UL 508, and FCC compliance for Radio Frequency Interference (RFI) and Electro-Mechanical Interference (EMI).

B. Unit shall be UL listed, as an entire assembly, and bear the UL label.

C. All circuit boards shall be completely tested and burned-in prior to assembly into the completed VFD.

D. Factory test complete VFD to ANSI/UL Standard 508. Functionally test all options, perform dynamometer test at full load, cycle load and speed during factory test.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace VFCs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A.B.B.
2. Danfoss Inc; Danfoss Drives Div.
3. Yaskawa Electric America, Inc.

2.2 GENERAL

A. Unit shall be dead front construction.

B. All relays shall be a plug-in style base.

C. All fuses shall be mounted in fuse blocks with insulated covers. Covers shall shield fuse ends and wire terminations.

D. The VFD shall be marked with its short circuit current rating in compliance with UL.

E. The unit, including all specified accessories, shall have a minimum efficiency of 85% at any speed from 50 to 100%. The unit shall have a power factor of 0.9 or higher when operating at any speed from 50 to 100%.

F. The VFD shall be a variable torque type and shall provide full motor torque at any operating speed from 40 to 100%.

G. The VFD shall provide variable torque V/Hz control when operating at speeds less than 100%.

H. The VFD must be capable of operating in the following service conditions:

1. Ambient Temperature: 0º to 40ºC (32º to 104ºF).
2. Relative Humidity: 0 to 95%, non-condensing.
3. Elevation: 0 to 3300 ft. (100 meters) above mean sea level (MSL).
4. AC line voltage variation:

a. 480 V: 440 - 10% to 500 + 10%; 45-65 Hz
b. 230 V: 200 - 10% to 230 + 10%; 45-65 Hz

I. Provide the drive with a main input disconnect switch, accessible without opening the drive cabinet, equipped with current limiting fuses and fuse rejection clips, or circuit breakers. All other fuse blocks with current limiting fuses installed shall be equipped with fuse rejection clips. It shall be possible to padlock the disconnect in the “off” position.

J. Provide minimum 6 pulse-width modulation (PWM) type drives.

K. Provide the necessary electronics to avoid audible noise generated from the motor due to frequency change. The unit shall not increase the motor audible noise by more than 3 dB above the motor’s across-the-line noise at any motor speed from 50 to 100%.

L. The unit shall include self diagnostics with a digital display that identifies fault conditions and trouble shooting. Fault indication shall be retained even after a power outage or an input over-current protective device trip.

M. Unit shall be provided with RFI/EMI filters.

N. VFD shall include current sensors on all three output phases to accurately measure motor current.

O. Provide minimum 3% AC input line reactors and/or minimum 5% DC link reactors to limit the maximum current total harmonic distortion (THD) to not more than 100% of the variable speed drive (VSD) input current waveform at any VSD operating speed from 20 to 100%. Reactors shall be integral to the VSD. The reactors shall not be active when the drive is in the bypass mode. If testing reveals the maximum THD is exceeded, the manufacturer shall provide and install additional reactors at no cost to reduce the THD to within these specified limits.

P. The unit shall have a dedicated terminal block for all external inputs and outputs.

Q. Provide a factory mounted and wired 115 V, 1 Ph, 60 Hz control power transformer sized for handling an additional 30 VA inductive load. Limit fuse size for the control transformer to 3 amps maximum.

R. The VFD input and output shall be rated at 480 volt, 3 phase or 208 volt, 3 phase.

S. Provide a factory mounted and wired manual bypass device.

1. Manual Bypass

a. Manual transfer to line power shall be via three (3) contactors sized for applicable voltage and motor current. One (1) contactor shall be between the VFD output and the motor. The second shall be between the bypass power line and the motor, providing across-the-line starting. The third contactor shall be between the line voltage and VFD input. Transferring load via contactors shall disconnect VFD inputs from line voltage and outputs from the motor, thus providing the ability to safely trouble shoot and test the VFD while operating in the bypass mode. A fused disconnect switch shall be required. Bypass and VFD output contactors shall be electrically and mechanically interlocked to prevent both being closed at the same time. Include motor thermal overload protection in bypass and VFD modes.

2. Provide two (2) 3-position selector switches to control bypass contactor and the VFD input and output contactors: 1) Normal-Off-Test and 2) Drive-Off-Bypass. Selector switches shall have padlockable switch covers.
3. Door mounted status lights shall include power on, drive, bypass, and safety.
4. Provide terminal strip for connection of fire, smoke contacts, external start command, and VFD control signal. All external interlocks shall function in hand, auto, or bypass. External start/stop signal shall be functional in auto and bypass modes.
5. The 120 volt ac control power shall be supplied by the fused transformer.
6. Provide a NEMA 1 enclosure for bypass components and a NEMA 4 enclosure is required for outdoor applications. Bypass and VFD enclosures shall be factory wired and assembled on a common backplate.
7. Manual bypass and accessories shall be furnished and mounted by the VFD manufacturer.
8. Two (2) contactor bypasses and knife switches are not acceptable.
9. The bypass device shall allow the load to run across-the-line while electrically isolating the VFD so that maintenance can be performed on the drive components.

2.3 CONTROL FEATURES

A. The VFD shall be provided with the following control features:

1. Factory mounted and wired Hand-Off-Auto selector switch that allows local or remote starting or stopping of the drive. Separate start and stop buttons, electronic circuits that “virtually” provide this capability or other alternative devices are <u>not acceptable</u>.
2. Factory mounted and wired VFD-Bypass switch.
3. Factory mounted and wired Local-Remote speed control switch, that allows either local or remote control of the drive speed. Key pad buttons are also acceptable provided that permanently labeled, dedicated buttons are provided for the local and the remote speed control functions.
4. Main input disconnect switch.
5. Inverter input and output disconnect switch, accessible without opening the drive cabinet, if a bypass device is provided.
6. Manual speed potentiometer or keypad control, for local speed control with the Local-Remote speed control switch in the Local position.
7. VFD shall accept an input reference (feedback) signal, 4-20 mA analog input, for remote speed control with the Local-Remote speed control switch in the Remote position. Provide input signal; isolation to isolate input signal ground from the VFD internal ground control. Coordinate required 4-20 mA analog input with DDC control system supplier.
8. A remote start/stop contact input that functions in the automatic mode only.

9. A safety interlock circuit that functions in drive and bypass modes. All safety and limit controls must function in both automatic and manual operating modes.
10. A run permissive circuit, separate from the safety interlock circuit, which prevents motor operation whether in drive or bypass mode. This circuit, via the customer's external contact device, signals the motor may run, provided the safety interlock contact(s) is made. A typical application would be for a time delay before motor start to allow some external event to occur. The run permissive circuit shall be jumpered from the factory.
11. Provide the following drive initiated external circuits:

    a. Powered run mode: A circuit that is powered after the motor is started in drive or bypass modes.
    b. Powered run request: A circuit that is powered whenever the drive safety interlock contact(s) are closed, and the drive H-O-A is in hand, or the drive H-O-A is in auto and the remote start/stop contact is closed.

12. A standard USB port for direct connection of a Personal Computer (PC) to the VFD. The manufacturer shall provide PC software to allow complete setup and access to the VFD through the USB port. It shall be possible to communicate to the VFD through this USB port without interrupting VFD communications to the Building Management System (BMS).
13. An integral proportional-integral-derivative (PID) controller that, when activated, controls drive speed to maintain a programmed set point based on a remote analog input feedback signal.
14. ogrammed set point based on a remote analog input feedback signal.

    a. The VFD shall be able to apply a scaling factor to the feedback signal.
    b. The VFD shall be able to calculate the square root of the feedback signal so that a pressure sensor can be used to measure flow.
    c. The analog feedback signal must be linear in nature when inputting to the on-board (PID) controller using this feature.

15. A real-time clock shall be an integral part of the VFD.

    a. It shall be possible to use this to display the current date and time on the VFD's display.
    b. The clock shall include a time clock function with 7 day programmability and a minimum of four (4) programmable time periods per day, with individually selectable ON and OFF functions. The time clock function shall be programmable to control start/stop functions, constant speeds, PID parameter set points and output relays. The time clock function shall be programmable through the controller display and keypad, or by included software that allows programming via a PC and a USB connection.

16. VFD shall be capable of starting a coasting load. Provide a bi-directional auto speed search to allow starting into rotating loads spinning in either direction.
17. VFD shall automatically attempt to restart a minimum of three (3) times during an adjustable time period of no less than 30 seconds after shutting off for any reason, except for a short circuit or motor overload.
18. The VFD shall have adjustable motor acceleration and deceleration rates from 0.1 to 1,800 seconds. Provide maximum Hz speed settings. Provide current limiting feature.
19. The VFD shall have the ability to lock-out a minimum of four (4) critical frequency ranges to prevent the VFD from operating the load at a speed that causes vibration in the driven equipment.
20. The VFD shall be configured as required to meet system operational requirements including:

a. Provide an additional set of N.O. contacts on the VFD-bypass switch that close when the switch is set to bypass.
b. Provide one (1) normally open and one (1) normally closed auxiliary contacts to actuate when the motor is started in any mode.
c. Provide a minimum of one (1) 4-20 mA analog output signal selectable to proportionally indicate drive output frequency, current, or power, or to indicate the VFD input reference/feedback signal, for monitoring by the DDC control system or the Building Management System.
d. Provide remote communication to the building DDC/BMS control system.

1) The drive shall be configured to communicate with several different fieldbuses, making it easy to communicate with a variety of control systems. Fieldbus options are as follows: ● BACnet ● N2 / Modbus ● LonWorks
2) The DDC system shall be capable of receiving all VFD fault and trips, current, voltage, and power consumption through the communication interface. The communication capabilities shall include but not be limited to the following:

a) Output Frequency / Speed
b) Motor Current
c) Output voltage
d) Motor Power (kW)
e) Analog Input Valves
f) Drive Status
g) Motor Speed / Torque
h) Run Time
i) Accel / Decel Time Adjustments
j) VFD Fault Status
k) Start / Stop Control (if not required to be hardwired)

2.4 INDICATORS

A. Provide an indicating lamp for “POWER AVAILABLE” and for “MOTOR ON BYPASS”. Lights shall be LED type.

B. A motor RPM and AMP display shall be factory mounted on the face of the unit, either as a separate indicator or via the controller display.

2.5 SAFETIES

A. Provide LED type status lights or digital display indication of the cause of any shutdown.

B. The VFD shall be provided with the following safety features:

1. VFD over voltage and under voltage protection and protection against temporary power outages.
2. VFD over temperature protection.
3. Motor over temperature protection per NEC 430.126(A) (2).
4. Short circuit and ground fault protection.
5. Separate motor overload protection functional in bypass and normal operation. For VFD’s controlling multiple motors, provide overload protection for each motor.
6. Integral phase-loss protection
7. Adjustable current limiter.

2.6 LABELING

A. Provide engraved plastic labels permanently attached to the VFD panel face indicating the function of all switches and indicators, and the equipment served.

B. Tag all wiring in the drive. Tag nomenclature shall match the corresponding wire identification nomenclature indicated on the approved drive submittal.

C. For VFD's serving smoke purge, stair pressurization, or other smoke control systems, include an engraved permanently attached red faced label, minimum 8" x 8", with the following nomenclature: "CAUTION: THIS VFD IS PART OF A LIFE SAFETY SMOKE CONTROL SYSTEM. NOTIFY THE OWNER PRIOR TO ANY CHANGE OR MAINTENANCE ACTIVITY TO THIS DRIVE".

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unit installation, including mounting, supports, and wiring to motor, shall be by the Electrical Trades, in compliance with Division 26. Coordinate with the Mechanical Trades and the Control Trades, as required.

B. Install the VFD as close as possible to the motor. The load side power cables to the motor shall be kept as short as possible and shall not be run in the same conduit as the line side power cables. Control wiring shall be in separate conduit from power wiring. Where applicable, control wires from the motor disconnect early break contacts may be installed with the motor power wiring.

C. Provide "shaft grounding" since modern AC or DC variable speed motors develop an electrical potential between the shaft and the frame of the motor. It has been found that shaft-to-frame voltages above three (3) volts generally cause current flow across the bearings. When current flows across a bearing, metal is transferred causing frosting, pitting, and fluting of the bearing races resulting in premature failure of the bearings. Grounding the shaft to the frame provides a path for the current to flow around the bearings eliminating the bearing damage caused by shaft potentials. Therefore all installed VFD's shall include a shaft grounding brush as manufactured by "Shaft Grounding Systems, Inc." (SGS) on all fan and pump motors. The products manufactured by SGS contain only stable materials and are not believed to constitute a hazardous material as defined under the Office of Safety and Health Act (OSHA) regulations. Specifically developed proprietary carbon compounds are used by SGS to ensure sustained performance. At present, the brush wear life expectancy is from 3 to 5 years based upon data obtained from running these brushes for over two (2) years in continuous industrial applications. In systems designed for wet or severe environment applications, the brush contact area shall be sealed to keep contaminants from entering the shaft grounding system. The shaft grounding system shall be designed to reduce shaft voltage levels to less than the three (3) volts typically required for current to pass through bearings. Shaft voltages without a shaft grounding system typically range from 3 to 30 volts, or higher.

D. Protect the unit from dirt, dust, water, and physical damage prior to and during construction. If the inside of the unit becomes dirty or dusty before acceptance by the Owner, it shall be thoroughly cleaned by the unit manufacturer at the contractor's expense.

3.2 QUALITY ASSURANCE

A. Upon completion of manufacturing, each VFD unit shall be inspected and load tested prior to shipment. The Owner's representative may be present for factory-acceptance tests. Tests to be conducted shall include but are not limited to simulating system logic. All associated costs for said tests shall be included in the manufacturers bid. Certification that the factory inspections and load tests have been successfully performed shall be submitted to the Owner after completion of the tests.

3.3 CHECK, TEST AND START

A. After installation of the system at the site a field acceptance test shall be performed by the Mechanical trades in conjunction with the manufacturer of the drive equipment, who will provide the services of a factory trained and certified technician to supervise the check, test and start.

B. The mechanical contractor shall notify the Owner's representative five (5) days prior to the start-up procedure.

C. The field acceptance test shall consist of a repeat of the factory test. Functional tests shall demonstrate satisfactory operation of all interlocks, alarms, and normal operational sequences. The drive manufacturer shall use suitable test equipment to locate and correct all malfunctions. Repeated failure of any component will cause the test to be terminated and restarted when the equipment has been fixed. Harmonic distortion tests shall be run on the drives and the bus to determine the voltage and current distortion. IEEE 519-1992 standards shall be used as the guide to test results. Measurements shall be made utilizing a Dranetz analyzer or a BMI analyzer capable of indicating snapshots of the current and voltage distortions. Measurements shall include phase to phase, phase to neutral, and neutral to ground. The test shall be run the full range of the drive operation. The graphs of the test results shall be submitted for speed values of 60%, 80%, and 100%. Also, test shall be done with no units running, then one unit, then two units, etc. Tests shall be conducted by a qualified technician acceptable to the Owner. Included in the scope of this specification shall be an allowance for a factory-trained service engineer, other than sales representatives, to inspect, perform final adjustments and operational checks, perform functional checks, and prepare a final report for record purposes. A minimum of one day shall be allowed for this start-up service.

D. The "Capacity Test" to insure that energy use is minimized, the HVAC system must be balanced at design conditions at the lowest possible static pressure (SP). This requires that the lowest possible SP be found at the sensor that will allow full design flow at the Terminal Air Unit (TAU) most difficult to satisfy. This system minimum SP found is what the VFD should control to. To accomplish this verify that the TAU on the critical leg has its damper 90% or more open when all TAU's taking off upstream of the static pressure sensor are in full cooling. The "Capacity Test" to minimize energy usage in the hydronic system, it must be balanced at design conditions at the lowest differential pressure (DP) possible. This requires that the lowest possible DP at the sensor be found that will allow the delivery of design flow through the valve most difficult to satisfy. This system minimum DP found is what the VFD should control to. This is accomplished by changing the temperature setpoint for all zones to 55ºF for cooling or 85ºF for heating coils, causing all AHU coil valves to be calling for full cooling or heating, as applicable. Each coil's flow is then measured against the design flow. The coil that is receiving the lowest the lowest fraction of design is identified. The current DP at the controlling sensor is noted. A calculation is made, giving the DP required at the sensor to allow the identified most critical coil to meet its design flow.

E. The Mechanical trades shall submit a "Certificate of Proper Installation" to the Owner confirming that all equipment was inspected, operation checked, and installation approved in writing by the manufacturer's representative.

F. UNDER NO CIRCUMSTANCES ARE ANY PORTIONS OF THE VARIABLE FREQUENCY DRIVE SYSTEM TO BE ENERGIZED WITHOUT AUTHORIZATION FROM THE MANUFACTURER'S REPRESENTATIVE.

3.4 TRAINING

A. Conduct a minimum of four (4) hours training for maintenance staff on operation, programming, and service of VFD's. Training shall be conducted by a factory trained service technician.

B. Training shall not be performed until system is operational and functional and two (2) weeks after receiving approved job specific technical manuals.

END OF SECTION 20 0514

SECTION 20 0529 - HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for fire protection system, plumbing system, and HVAC system piping and equipment:

1. Steel pipe hangers and supports.

B. Related Sections include the following:

1. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. ASCE: American Society of Civil Engineers.

B. ASME: American Society of Mechanical Engineers.

C. ASTM: American Society for Testing and Materials.

D. AWS: American Welding Society.

E. IAPMO: International Association of Plumbing and Mechanical Officials.

F. MFMA: Metal Framing Manufacturers Association.

G. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry Inc.

H. SSPC: Steel Structures Painting Council now the Society for Protective Coatings.

I. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel." AWS D1.3, "Structural Welding Code--Sheet Steel." AWS D1.4, "Structural Welding Code--Reinforcing Steel." ASME Boiler and Pressure Vessel Code: Section IX.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.3, "Structural Welding Code--Sheet Steel."
4. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
5. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre galvanized or hot dipped.

D. Non-metallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and non-metallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use non-metallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Holes shall not be drilled or punched in beams and supporting members. Do not support piping from roof deck, other piping, ducts, or equipment.

F. Hangers and supports shall also be provided at every change in direction and within 12 inches of any pipe fitting and valves.

G. Hanger components shall not be used for purposes other than for which they were designed.

H. Vertical runs of piping not subject to appreciable expansion shall be supported by approved wrought steel clamps or collars, securely clamped to the risers. Where required, spring supports and guides shall be provided.

I. Where negligible movement of pipe occurs at hanger locations, rod hangers may be used for suspended lines. For piping supported from below, braces, brackets or structural cross members may be used.

J. If the vertical angle of the hanger is greater than 4 degrees, a traveling device shall be provided for horizontal movement. For piping supported from below, rollers or roll carriages shall be used.

K. Where significant vertical movement of the pipe occurs at the hanger location, a resilient support shall be used. Spring cushion hangers may be used where vertical movement does not exceed 1/4 inches.

L. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

M. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

N. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

O. Building Attachments: Use of “C” clamps and beam clamps of “C” pattern and any modification thereof for pipe sizes 2-1/2 inches and larger is prohibited unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
5. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
6. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
7. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
8. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
9. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
10. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

11. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
12. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
13. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

P. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

3.2 HANGER AND SUPPORT INSTALLATION

A. Provide necessary piping and equipment supporting elements including building structure attachments, supplementary steel, hanger rods, stanchions and fixtures, vertical pipe attachments, horizontal pipe attachments, anchors, guides, spring supports in accordance with the referenced codes, standards, and requirements specified. Support piping and equipment from building structure, not from roof deck, floor slab, or other pipes, ducts, or equipment.

B. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

C. MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

E. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

F. Install lateral bracing with pipe hangers and supports to prevent swaying.

G. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

H. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

3.3 SUPPLEMENTARY STEEL

A. Where it is necessary to frame structural members between existing structural steel members or where structural steel members are used in lieu of commercially rated supports, install such supplementary steel in accordance with American Institute of Steel Construction Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Connection to the existing steel shall be with clamps unless otherwise approved by the Engineer.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 20 0529

SECTION 20 0553 – MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

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

1. Brady Co.
2. Bramer.
3. Craftmark.
4. Emed.
5. Marking Services, Inc.
6. Seton Name Plate Corp.

2.2 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Natural Gas Piping:

a. Background Color: Yellow.
b. Letter Color: Black.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 20 0553

SECTION 20 0593 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. This Section includes TAB to produce design objectives for the following:

1. Air Systems:

    a. Variable-air-volume systems.

2. HVAC equipment quantitative-performance settings.
3. Space pressurization testing and adjusting.
4. Indoor-air quality measuring.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

J. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

K. TAB: Testing, adjusting, and balancing.

L. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

M. Test: A procedure to determine quantitative performance of systems or equipment.

N. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days from Contractor's Notice to Proceed, submit 6 copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 45 days from Contractor's Notice to Proceed, submit 6 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit two sets of sample TAB report forms.

F. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC, NEBB, TABB.

B. Acceptable TAB Firms: Subject to compliance with requirements, select from one of the following TAB firms:

1. Absolut Balance Co.
2. Air Flow Testing, Inc.
3. Barmatic Inspecting Co.
4. EnviroAire – Total Balance, Inc.
5. International Test & Balance, Inc

C. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

a. Submittal distribution requirements.
b. The Contract Documents examination report.
c. TAB plan.
d. Work schedule and Project-site access requirements.
e. Coordination and cooperation of trades and subcontractors.
f. Coordination of documentation and communication flow.

D. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

E. TAB Report Forms: Use standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

F. Instrumentation Type, Quantity, and Accuracy: As described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."

G. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

H. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."

I. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

B. Special Guarantee: Provide a guarantee on NEBB or TABB forms stating that NEBB or TABB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of systems and equipment.

C. Examine Project Record Documents described in Division 01 Section "Project Record Documents."

D. Examine design data, including system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about system and equipment controls.

E. Examine equipment performance data including fan curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

G. , use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

H. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

I. Examine system and equipment test reports.

J. Examine system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

K. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

L. Examine equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

M. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

N. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

O. Examine equipment for installation and for properly operating safety interlocks and controls.

P. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.

4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

Q. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. s, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

E. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

L. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

C. e systems as follows:

1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. es.
4. Measure total system airflow. Adjust to within indicated airflow.
5. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.

6. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
7. for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

8. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
9. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
10. Record the final fan performance data.

D. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance systems similar to constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan, if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

E. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.

7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.

3.6 GPROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 PROCEDURES FOR HEAT-TRANSFER COILS

A. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

B. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.8 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.9 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS

A. Before testing for space pressurization, observe the space to verify the integrity of the space boundaries. Verify that windows and doors are closed and applicable safing, gaskets, and sealants are installed. Report deficiencies and postpone testing until after the reported deficiencies are corrected.

B. Measure, adjust, and record the pressurization of each room, each zone, and each building by adjusting the supply, return, and exhaust airflows to achieve the indicated conditions.

C. Measure space pressure differential where pressure is used as the design criteria, and measure airflow differential where differential airflow is used as the design criteria for space pressurization.

1. For pressure measurements, measure and record the pressure difference between the intended spaces at the door with all doors in the space closed. Record the high-pressure side, low-pressure side, and pressure difference between each adjacent space.
2. For applications with cascading levels of space pressurization, begin in the most critical space and work to the least critical space.
3. Test room pressurization first, then zones, and finish with building pressurization.

D. To achieve indicated pressurization, set the supply airflow to the indicated conditions and adjust the exhaust and return airflow to achieve the indicated pressure or airflow difference.

E. For spaces with pressurization being monitored and controlled automatically, observe and adjust the controls to achieve the desired set point.

1. Compare the values of the measurements taken to the measured values of the control system instruments and report findings.
2. Check the repeatability of the controls by successive tests designed to temporarily alter the ability to achieve space pressurization. Test overpressurization and underpressurization, and observe and report on the system's ability to revert to the set point.
3. For spaces served by variable-air-volume supply and exhaust systems, measure space pressurization at indicated airflow and minimum airflow conditions.

F. In spaces that employ multiple modes of operation, such as normal mode and emergency mode or occupied mode and unoccupied mode, measure, adjust, and record data for each operating mode.

3.10 Record indicated conditions and corresponding initial and final measurements. Report deficiencies.PROCEDURES FOR INDOOR-AIR QUALITY MEASUREMENTS

A. After air balancing is complete and with HVAC systems operating at indicated conditions, perform indoor-air quality testing.

B. Observe and record the following conditions for each HVAC system:

1. The distance between the outside-air intake and the closest exhaust fan discharge, flue termination, or vent termination.
2. Specified filters are installed. Check for leakage around filters.
3. Cooling coil drain pans have a positive slope to drain.
4. Cooling coil condensate drain trap maintains an air seal.
5. Evidence of water damage.

6. Insulation in contact with the supply, return, and outside air is dry and clean.

C. Measure and record indoor conditions served by each HVAC system. Make measurements at multiple locations served by the system if required to satisfy the following:

1. Most remote area.
2. One location per floor.
3. One location for every 5000 sq. ft.

D. Measure and record the following indoor conditions for each location two times at two-hour intervals, and in accordance with ASHRAE 113:

1. Temperature.
2. Relative humidity.
3. Air velocity.
4. Concentration of carbon dioxide (ppm).
5. Concentration of carbon monoxide (ppm).
6. Nitrogen oxides (ppm).
7. Formaldehyde (ppm).

3.11 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.12 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.

2. Air Outlets and Inlets: 0 to minus 10 percent.

3.13 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

C. describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.14 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB firm who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

a. Indicated versus final performance.
b. Notable characteristics of systems.
c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

a. Settings for outside-, return-, and exhaust-air dampers.
b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Face and bypass damper settings at coils.
e. Fan drive settings including settings and percentage of maximum pitch diameter.
f. Inlet vane settings for variable-air-volume systems.
g. Settings for supply-air, static-pressure controller.
h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems and domestic hot water recirculation systems. Present each system with single-line diagram and include the following as applicable:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Filter static-pressure differential in inches wg.
    f. Preheat coil static-pressure differential in inches wg.
    g. Cooling coil static-pressure differential in inches wg.
    h. Heating coil static-pressure differential in inches wg.
    i. Outside airflow in cfm.
    j. Return airflow in cfm.
    k. Outside-air damper position.
    l. Return-air damper position.
    m. Vortex damper position.

G. Apparatus-Coil Test Reports:

1. Coil Data:

    a. System identification.
    b. Location.
    c. Coil type.
    d. Number of rows.
    e. Fin spacing in fins per inch o.c.
    f. Make and model number.
    g. Face area in sq. ft.
    h. Tube size in NPS.
    i. Tube and fin materials.
    j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

    a. Airflow rate in cfm.
    b. Average face velocity in fpm.
    c. Air pressure drop in inches wg.
    d. Outside-air, wet- and dry-bulb temperatures in deg F.
    e. Return-air, wet- and dry-bulb temperatures in deg F.
    f. Entering-air, wet- and dry-bulb temperatures in deg F.
    g. Leaving-air, wet- and dry-bulb temperatures in deg F.
    h. Water flow rate in gpm.
    i. Water pressure differential in feet of head or psig.
    j. Entering-water temperature in deg F.
    k. Leaving-water temperature in deg F.
    l. Refrigerant expansion valve and refrigerant types.
    m. Refrigerant suction pressure in psig.
    n. Refrigerant suction temperature in deg F.
    o. Inlet steam pressure in psig.

H. Gas-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

    a. System identification.

b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btuh.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btuh.
i. High-fire fuel input in Btuh.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btuh.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btuh.

I. Electric-Coil Test Reports: For electric duct coils, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btuh.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft..
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btuh.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

J. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

K. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft.
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

L. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Test apparatus used.

d. Area served.
e. Air-terminal-device make.
f. Air-terminal-device number from system diagram.
g. Air-terminal-device type and model number.
h. Air-terminal-device size.
i. Air-terminal-device effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

M. Compressor and Condenser Reports: For refrigerant side of unitary systems, stand-alone refrigerant compressors, air-cooled condensing units, or water-cooled condensing units, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Unit make and model number.
d. Compressor make.
e. Compressor model and serial numbers.
f. Refrigerant weight in lb.
g. Low ambient temperature cutoff in deg F.

2. Test Data (Indicated and Actual Values):

a. Inlet-duct static pressure in inches wg.
b. Outlet-duct static pressure in inches wg.
c. Entering-air, dry-bulb temperature in deg F.
d. Leaving-air, dry-bulb temperature in deg F.
e. Condenser entering-water temperature in deg F.
f. Condenser leaving-water temperature in deg F.
g. Condenser-water temperature differential in deg F.
h. Condenser entering-water pressure in feet of head or psig.
i. Condenser leaving-water pressure in feet of head or psig.
j. Condenser-water pressure differential in feet of head or psig.
k. Control settings.
l. Unloader set points.
m. Low-pressure-cutout set point in psig.
n. High-pressure-cutout set point in psig.
o. Suction pressure in psig.
p. Suction temperature in deg F.
q. Condenser refrigerant pressure in psig.
r. Condenser refrigerant temperature in deg F.
s. Oil pressure in psig.
t. Oil temperature in deg F.
u. Voltage at each connection.
v. Amperage for each phase.
w. Kilowatt input.

x. Crankcase heater kilowatt.
y. Number of fans.
z. Condenser fan rpm.
aa. Condenser fan airflow rate in cfm.
bb. Condenser fan motor make, frame size, rpm, and horsepower.
cc. Condenser fan motor voltage at each connection.
dd. Condenser fan motor amperage for each phase.

N. Indoor-Air Quality Measurement Reports for Each HVAC System:

1. HVAC system designation.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Room number or similar description for each location.
5. Measurements at each location.
6. Observed deficiencies.

O. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.15 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Measure sound levels at two locations.
e. Measure space pressure of at least 10 percent of locations.
f. Verify that balancing devices are marked with final balance position.
g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total

measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.16 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

END OF SECTION 20 0593

SECTION 20 0700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

    a. Mineral fiber.

2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.
14. Protective shielding guards

B. Related Sections:

1. Division 23 Section "Metal Ducts" for duct liners.

1.3 DEFINITIONS

A. ASHRAE/IESNA: American Society of Heating, Refrigeration, Air Conditioning Engineers/Illuminating Engineering Society of North America.

B. ASTM: American Society for Testing and Materials.

C. CFC: Chlorinated Fluorocarbon.

D. HCFC: Hydrogenated Chlorofluorocarbon.

E. LEED: Leadership in Energy and Environmental Design.

F. MIL: Military.

G. NPS: Nominal Pipe Size.

H. VOC: Volatile Organic Compound.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Qualification Data: For qualified Installer.

C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 20 Section "Hangers and Supports for Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation [without factory-applied jacket] [with factory-applied ASJ] [with factory-applied FSK jacket]. For equipment applications, provide insulation [without factory-applied jacket] [with factory-applied ASJ] [with factory-applied FSK jacket]. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; CertaPro Commercial Board.
b. Fibrex Insulations Inc.; FBX.
c. Johns Manville; 800 Series Spin-Glas.

d. Knauf Insulation; Insulation Board.
e. Manson Insulation Inc.; AK Board.
f. Owens Corning; Fiberglas 700 Series.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Super-Stik.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Thermokote V.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive 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."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
b. Eagle Bridges - Marathon Industries; 570.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
c. Vimasco Corporation; 713 and 714.

3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F.
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-70.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.

3. Materials shall be compatible with insulation materials, jackets, and substrates.
4. Permanently flexible, elastomeric sealant.
5. Service Temperature Range: Minus 100 to plus 300 deg F.
6. Color: White or gray.
7. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
8. Sealants 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."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants 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."

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, Kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with Kraft-paper backing; complying with ASTM C 1136, Type II.

4. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas No. 5.

C. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for duct, equipment, and pipe.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
b. Vimasco Corporation; Elastafab 894.

2.9 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.10 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with Kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Finish and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: [1-mil- thick, heat-bonded polyethylene and Kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and Kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Material, finish, and thickness are indicated in field-applied jacket schedules.
    c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and Kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and Kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.

4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Polyguard Products, Inc.; Alumaguard 60.

F. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); Saran 560 Vapor Retarder Film.

G. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.11 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 491 AWF FSK.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
    c. Compac Corporation; 110 and 111.
    d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 370 White PVC tape.
    b. Compac Corporation; 130.
    c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. ABI, Ideal Tape Division; 488 AWF.
    b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
    c. Compac Corporation; 120.
    d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.

2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.12 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.
4. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.
2) GEMCO; CD.
3) Midwest Fasteners, Inc.; CD.
4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CHP-1.
2) GEMCO; Cupped Head Weld Pin.
3) Midwest Fasteners, Inc.; Cupped Head.
4) Nelson Stud Welding; CHP.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Aluminum or Stainless steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) GEMCO; Nylon Hangers.
      2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

   b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
   c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
      2) GEMCO; Peel & Press.
      3) Midwest Fasteners, Inc.; Self Stick.

   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   c. Spindle: Copper- or zinc-coated, low carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; RC-150.
      2) GEMCO; R-150.
      3) Midwest Fasteners, Inc.; WA-150.
      4) Nelson Stud Welding; Speed Clips.

   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

   a. Products: Subject to compliance with requirements, provide one of the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C & F Wire.

2.13 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

C. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. emove materials that will adversely affect insulation application.

C. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation,

install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturers recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.6 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
2. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
3. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in nonconditioned space.
3. Indoor, exposed return located in nonconditioned space.
4. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
5. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
6. Outdoor, concealed supply and return.
7. Outdoor, exposed supply and return.
8. Indoor, concealed supply, return and relief located in attic.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb./cu. ft. nominal density.

B. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 1-1/2 inches thick and 1.5-lb./cu. ft. nominal density.

C. Concealed, round and flat-oval, supply-air and return-air duct insulation located in attic shall be one of the following:

1. Mineral-Fiber Blanket: 3 inches thick and 3-lb./cu. ft. nominal density.

D. Concealed, rectangular, supply-air and return-air duct insulation located in attic shall be one of the following:

1. Mineral-Fiber Blanket: 3 inches thick and 3-lb./cu. ft. nominal density.

E. Exposed, rectangular, supply-air/return-air/outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Board: 1-1/2 inches thick and 2.25-lb./cu ft. nominal density.

3.10 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Exposed, rectangular, supply-air/return-air duct insulation shall be the following:

1. Mineral-Fiber Board: 3 inches thick and 3-lb./cu. ft. nominal density.

3.11 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Corrugated 0.040 inch thick.

END OF SECTION 20 0700

SECTION 21 1313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Sprinklers.

B. Related Sections:

1. Division 20 Sections.

1.3 DEFINITIONS

A. ASCE/SEI: American Society of Civil Engineers/Structural Engineering Institute.

B. ASME: American Society of Mechanical Engineers.

C. ASTM: American Society for Testing and Materials.

D. AWS: American Welding Society.

E. AWWA: American Water Works Association.

F. EPDM: Ethylene-propylene-diene terpolymer rubber.

G. FDA: Food and Drug Administration.

H. FM: Factory Mutual.

I. IBC: International Building Code.

J. MSS: Manufacturers Standardization Society for the Valve and Fitting Industry Inc.

K. NFPA: National Fire Protection Association.

L. NPS: Nominal Pipe Size.

M. OS&Y: Outside Stem and Yoke.

N. PE: Polyethylene.

O. PVC: Polyvinyl Chloride.

P. UL: Underwriters Laboratories.

1.4 PRESSURE CLASSIFICATION

A. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig maximum.

1.5 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm check valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.6 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Sprinkler Occupancy Hazard Classifications:

a. General Storage Areas: Ordinary Hazard, Group 1.
b. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
c. Office and Public Areas: Light Hazard.

2. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.

3. Maximum Protection Area per Sprinkler: Per UL listing.

D. Sprinkler system shall be hydraulically designed to have a density of at least that required by the hazard rating of the area to be protected.

E. Materials and components shall be UL listed and labeled.

F. Pipe size shall be no less than 1 inch. The velocity of water in pipe shall not exceed 20 feet per second.

1.7 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Qualification Data: For qualified Installer and professional engineer.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

F. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of a recent summer season fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

1.9 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Notify Architect no fewer than seven days in advance of proposed interruption of sprinkler service.
2. Do not proceed with interruption of sprinkler service without Architect's written permission.

1.10 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies. Coordinate with structural plans and architectural reflected ceiling plans for soffits, ceiling elevation changes, beam pockets, and other obstructions to the sprinkler discharge pattern.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Schedule 40, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 5 and smaller; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Uncoated Steel Couplings: ASTM A 865, threaded.

E. Uncoated Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Tyco Fire & Building Products LP.
    b. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Uncoated Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Reliable Automatic Sprinkler Co., Inc.
b. Tyco Fire & Building Products LP.
c. Victaulic Company.
d. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Residential Sprinklers: 175 psig maximum.
3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
4. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

2.5 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. Split-Casting, Cast-Brass Escutcheons: Polished chrome-plated finish with concealed hinge and set-screw.

E. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.2 PIPING INSTALLATION

A. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

B. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install unions adjacent to each valve in pipes NPS 2 and smaller.

D. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

E. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements in Division 20 Section “Hangers and Supports for Piping and Equipment” for hanger materials.

F. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.

3.5 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors. Refer to Division 20 Section “Common Work Results”.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.8 PIPING SCHEDULE

A. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray or malleable-iron threaded fittings; and threaded joints.

B. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and larger, shall be one of the following:

1. Schedule 40, black-steel pipe with threaded ends; uncoated, gray or malleable-iron threaded fittings; and threaded joints.
2. Schedule 10 black-steel pipe with cut or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

3.9 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Rooms with Gypsum Ceilings: Concealed sprinklers with factory-painted custom color cover plates selected by architect..

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate unless noted otherwise. Cover plate shall be flat plate.
2. Pendent Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 21 1313

SECTION 23 0900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings lineup and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

D. Specifications:

1. Section 23 31 13 – Metal Ducts
2. Section 23 33 00 – Air Duct Accessories
3. Section 23 36 00 – Air Terminal Units

1.2 DEFINITIONS

A. BAS: Building Automation System

B. DDC: Direct Digital Control

C. EMS: Energy Management System consisting of BAS (typically with a PC and support software), DDC controllers, and networking software/hardware/wiring.

D. I/O: Input/output

E. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks licensed by Echelon Corp.

F. BACnet: A communications protocol for implementing interoperable controllers established by ASHRAE

G. MS/TP: Master-slave/token-passing network for BACnet

H. PC: Personal computer

I. PID: Proportional plus integral plus derivative

1.3 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

1. Provide Building Automation System (BAS) as shown in the contract documents and described herein.

2. Provide interface to BAS via BACnet or LonTalk as shown in the contract documents and described herein.
3. Provide DDC System as shown in the contract documents and described herein.
4. Sequences modified as a result of start-up, checkout, fine tuning, and/or commissioning shall be resubmitted to the Architect for record.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 30 dynamic points with current data within 5 seconds.
2. Graphic Refresh: Update graphic with minimum 30 dynamic points with current data within 2 seconds.
3. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 15 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
7. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
8. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

    a. Space Temperature: Plus or minus 1-degree F.
    b. Ducted Air Temperature: Plus or minus 1-degree F.
    c. Outside Air Temperature: Plus or minus 2-degrees F.
    d. Averaging Air Temperature: Plus or minus 2-degrees F.
    e. Dew Point Temperature: Plus or minus 2.7-degrees F.
    f. Temperature Differential: Plus or minus 0.27-degrees F.
    g. Relative Humidity: Plus or minus 5-percent relative humidity (% RH).
    h. Airflow (Pressurized Spaces): Plus or minus 2-percent of full scale (% FS).
    i. Airflow (Measuring Stations): Plus or minus 3-% FS.
    j. Airflow (Terminal): Plus or minus 5-% FS.
    k. Air Pressure (Space): Plus or minus 0.0005-inches wg.
    l. Air Pressure (Ducts): Plus or minus 0.02-inches wg.
    m. Carbon Monoxide: Plus or minus 1-part per million (ppm) CO.
    n. Carbon Dioxide: Plus or minus 50-ppm CO2.
    o. Electrical: Plus or minus 2-percent of reading (volts/amps/watts).

1.5 SEQUENCE OF OPERATION

A. Sequences of Operation are included on the temperature control drawings (plans).

1.6 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. Building Automation System: Include technical data for operator workstation, operating system software, color graphics; editors for graphics, point database, and programming; software licensing, software updates during construction, and other third-party applications.
2. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for remote operator's terminal, operator display menus, interface equipment to BAS, DDC Controllers, Unitary Controllers, Application Specific Controllers (e.g. Air Terminal Controller), transducers/transmitters, sensors, control dampers, damper actuators, relays/switches, auxiliary control panels.
3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, dampers, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
    a. Coordinate dampers sizes with sheet metal and/or mechanical contractor before submitting.
7. Schedule of Terminal Equipment Controllers; e.g. air terminals, etc.
8. DDC System Hardware:
    a. Wiring diagrams for control units with termination numbers.
    b. Schematic diagrams and floor plans for field sensors and control hardware.
    c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.

D. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

E. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals
2. Program Software Backup: On a DVD (CD-ROM) complete with data files

3. Device address list
4. Printout of software application and graphic screens
5. Software licenses required by and installed for DDC workstations and control systems

F. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

G. Qualification Data:

1. Manufacturer’s product line being submitted shall be in full production for at least two years.
2. Installer shall be factory trained and authorized in the installation, startup, check-out and commissioning of the manufacturer’s product line being submitted. Installer’s field personnel shall have at least three years’ experience in the installation of DDC-style temperature control systems.

H. Field quality control test reports

I. Installing contractor’s commissioning reports

J. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and list of spare parts for each type of control device and the compressed air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
5. Calibration records and list of set points.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. 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.

C. Comply with ASHRAE 135 for DDC system components.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, DDC control sensors, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Division 28 Section "Fire Detection and Alarm" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

D. Coordinate equipment with Division 26 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.

E. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

F. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

G. Coordinate installation of control dampers, smoke dampers, HVAC equipment isolation dampers, and pipe-mounted sensors and instruments with the mechanical and/or plumbing contractor.

H. Coordinate installation of duct, space, outdoor, or building static pressure sensors with the finished surfaces, installing contractor and the Architect prior to installation.

I. Coordinate installation of any exterior wall or roof-mounted sensors, instruments, photocells, or controllers required for the temperature control system with the General Contractor and the Architect prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONTROL SYSTEM

A. BAS and DDC Manufacturers:

1. Automated Logic Corporation
2. Honeywell International Inc.
3. Johnson Controls Inc.
4. Siemens Building Technologies Inc.
5. Trane

B. Control system shall consist of sensors, indicators, dampers, damper actuators, final control elements, interface equipment, other apparatuses and accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

2.3 BAS EQUIPMENT

A. BACnet Advanced Workstation (B-AWS): Enterprise server application capable of monitoring and controlling multiple buildings and conforming to the BACnet Advanced Workstation device profile. B-AWS shall be web-based and accessible by multiple users simultaneously via web-browser from any computer connected to the Owner's network infrastructure.

1. BAS Application Software:

a. I/O capability from operator station
b. System security for each operator via software password and access levels
c. Automatic system diagnostics; monitor system and report failures
d. Field DDC database creation (editing) and support

1) Automatic and manual database save and restore.
2) Automatic and manual database transfer to field panels

e. Dynamic color graphic displays

1) Up to 10 screens displays at once.
2) Custom graphics generation (editing) and graphics library of HVAC equipment and symbols.
3) Ability to print color graphic on a color printer

f. DDC program creation (editing) and support.

1) Automatic and manual database save and restore.
2) Automatic and manual database transfer to field panels

g. Time of Day Program (Scheduling)

1) Includes override scheduling and holiday scheduling
2) Automatic and manual database save and restore.
3) Automatic and manual database transfer to field panels

h. Alarm processing, messages, and reactions.
i. Trend logs retrievable in spreadsheets and database programs.
j. Alarm and event processing.

1) Alarms shall "break-though" and provide audible annunciation (may be turned off)

k. Object and property status and control.
l. Automatic restart of field equipment on restoration of power.
m. Data collection, reports, and logs. Include standard reports for the following:

1) Current values of all objects.

2) Current alarm summary.
3) Disabled objects.
4) Alarm lockout objects.
5) Logs.

n. Custom report development.
o. Utility and weather reports.
p. Workstation application editors for controllers and schedules.
q. Maintenance Management.

2. Custom Application Software:

a. English language oriented.
b. Full-screen character editor/programming environment.
c. Allow development of independently executing program modules with debugging/simulation capability.
d. Support conditional statements.
e. Support floating-point arithmetic with mathematic functions.
f. Contains predefined time variables.

B. Diagnostic Terminal Unit: Portable notebook-style, PC-based, microcomputer capable of accessing system data by connecting to system network with minimum configuration as follows:

1. System: With one integrated USB 2.0 port, integrated Intel Pro 10/100 (Ethernet), integrated audio, bios, and hardware monitoring.
2. Processor: Intel Core i7 2.2Ghz
3. Random-Access Memory: 16GB DDR3 – 1600 RAM
4. Graphics: Video adapter, minimum NVIDIA GeForce GT 750, 2GB video memory.
5. Monitor: 24 inches LCD color.
6. Keyboard: QWERTY 105 keys, (in ergonomic shape – customer preference).
7. Hard-Disk Drive: .5TB
8. DVDRW Drive
9. Pointing Device: Touch pad or other internal device; or optical mouse if intended for desktop use.
10. Software:

a. Provide laptop with Windows Operating System (OS) to comply with Owner's IT requirements for current and future support. Coordinate with the Owner repr3esentative.
b. Provide all software necessary, including 3rd party, to provide Owner access to HVAC and equipment controllers (DDC controllers, Unitary Controllers, Terminal Equipment Controllers, and Application Specific Controllers).

11. Cables: Provide necessary cables (including proprietary) to connect laptop to each controller as required in the project.

C. IPad with installed communication software :

D. Direct Digital Control (DDC) Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

2. Stand-alone mode control functions operate regardless of network status. Functions include the following:

    a. Global communications.
    b. Discrete/digital, analog, and pulse I/O.
    c. Monitoring, controlling, or addressing data points.
    d. Software applications, scheduling, and alarm processing.
    e. Testing and developing control algorithms without disrupting field hardware and controlled environment.

3. Standard Application Programs:

    a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization.
    b. HVAC Control Programs: Night setback/setup, on-off control with differential sequencing, staggered start, equipment lead/lag sequencing, anti-short cycling control, PID control, DDC with fine loop tuning, optimal run time, supply air reset, static pressure reset, and dry bulb/enthalpy economizer.
    c. Chiller Control Programs: Control function of condenser water reset, chilled water reset, and equipment lead/lag sequencing.
    d. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run time totalization; and security access.
    e. Remote communications.
    f. Maintenance management.
    g. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
5. ASHRAE 135 Compliance:

    a. Control units shall be certified as compliant with ASHRAE 135 protocol and shall bear the BACnet Testing Laboratories (BTL) seal.
    b. Control units shall conform to the BACnet Building Controller (B-BC) device profile and support the minimum BACnet Interoperability Building Blocks (BIBBs) as defined by the B-BC device profile.
    c. Control units shall have the ability to communicate using ISO 8802-3 (Ethernet) data-link/physical layer protocol for BACnet over IP communications or RS-485 twisted pair for BACnet MS/TP communications.

6. Enclosure:

    a. Indoor - Dustproof rated for operation at 32- to 120-degrees F.

7. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

    a. Binary Inputs: Allow monitoring of on-off signals without external power.
    b. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
    c. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4- to 20-mA), or resistance signals.
    d. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.

e. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4- to 20-mA) or resistance (0- to 135-ohms) with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer.
f. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
g. Universal I/O's: Provide software selectable binary or analog outputs.

8. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

a. Output ripple of 5.0 mV maximum peak-to-peak.
b. Combined 1 percent line and load regulation with 100-microsecond response time for 50 percent load changes.
c. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

9. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

a. Minimum dielectric strength of 1000-V.
b. Maximum response time of 10 nanoseconds.
c. Minimum transverse-mode noise attenuation of 65-dB.
d. Minimum common-mode noise attenuation of 150-dB at 40- to 100-Hz.

2.4 UNITARY CONTROLLERS

A. Controllers shall be provided for (but not limited to) Unit Ventilators, Fan Coils Units, Heat Pumps, etc.

B. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. I/O Interface: Hardwired inputs and outputs into system through controller
3. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms.
4. Perform automatic controller diagnostics; monitor controller and report failures.
5. ASHRAE 135 Compliance:

a. Control units shall be certified as compliant with ASHRAE 135 protocol and shall bear the BACnet Testing Laboratories (BTL) seal.
b. Control units shall conform to the BACnet Advanced Application Controller (B-AAC) device profile and support the minimum BACnet Interoperability Building Blocks (BIBBs) as defined by the B-AAC device profile.
c. Control units shall have the ability to communicate using RS-485 twisted pair for BACnet MS/TP communications.

6. Enclosure:

a. Indoor - Dustproof rated for operation at 32- to 120-degrees F.
b. Outdoor - Weatherproof rated for operation at minus 10- to 150-degrees F.

C. Air Terminal Unit Equipment Controllers (TEC)

1. Variable Air Volume (VAV) and Constant Air Volume (CAV). CAV are indicated when minimum and maximum design cfms are scheduled the same.
2. Other equipment controllers that are similar are Series Fan-Powered and Parallel Fan-Powered VAV Terminals, and dual-duct air terminals.
3. Modular construction, comprising processor board with programmable, nonvolatile, random access memory; and integral interface equipment.
4. Units execute commands from DDC control units and download from or upload to diagnostic terminal unit.
5. Controllers shall operate in stand-alone mode and control functions operate regardless of BACnet status. Functions include the following:
    a. BACnet communications
    b. Discrete digital input/outputs and analog input/out
    c. Hardware for sensing air flow from flow measuring device
    d. Monitoring and controlling points
    e. HVAC software application programs that are application specific (e.g. VAV) and alarm processing
    f. Terminal port for program selection, addressing, air balance, and firmware updates.
6. Application Specific Programs:
    a. VAV and CAV air terminal control algorithms as needed to perform the sequences on the drawings.
    b. Series and Parallel Fan-Powered air terminal control algorithms as needed to perform the sequences on the drawings.
    c. Dual-duct air terminal control algorithms as needed to perform the sequences on the drawings.
7. Units of Measure: Inch-Pound
8. Remote communications to DDC Controllers.
9. Local terminal plug for field service and air balancer use. Provide air balance subcontractor with software necessary for air balance work.
10. Protocol Compliance: Control units shall communicate using existing BACnet protocol.
11. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
    a. Binary Inputs: Allow monitoring of on-off signals without external power.
    b. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
    c. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4- to 20-mA), or resistance signals.
    d. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
    e. Analog Outputs: Provide modulating signal, low voltage (0- to 10-V dc) or current (4- to 20-mA); with status lights, two-position (auto-manual) switch, and manually adjustable potentiometer or selector switch.
    f. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
    g. Universal I/O’s (optional as needed): Provide software selectable binary or analog outputs.
    h. Airflow probed connections for sensing airflow through terminal.
12. Power Supply: Class 2 transformers located in DDC Auxiliary Panel shall provide 24 VAC (current-limited) with fuse protection to TEC’s.
13. Power Line Filtering: Transient voltage and surge suppression for controllers.
14. Enclosure:

a. Indoor – Dust-proof rated for operation at 32- to 120-degrees F.

2.5 ELECTRONIC SENSORS

A. DESCRIPTION

1. Vibration and corrosion resistant, for wall, immersion, or duct mounting as required.
2. All sensors provided with a guard or cover shall submit color samples to the Architect before ordering sensors.
3. Room Sensor Cover Construction: Manufacturer's standard locking covers. This applies to all wall mounted sensors.
    a. Color: Submit color selection to Architect prior to ordering.
    b. Orientation: Vertical
    c. Setpoint Adjustment: Concealed
    d. Setpoint Indication: Concealed
    e. Thermometer: Concealed
    f. Electronic display: LCD
4. Room sensor accessories include the following:
    a. Insulating Base: For sensors located on exterior walls and cold surfaces.
    b. Guard: Locking; heavy-duty, transparent plastic; mounted on separate base.
    c. Adjusting Device: As required for calibration and cover screws.

B. THERMISTORS

1. Manufacturers:
    a. MINCO
    b. MAMAC Systems, Inc.
    c. RDF Corporation
2. Sensor type and accuracy:
    a. Negative temperature coefficient (NTC) sensor with 10K-ohms or less resistance.
3. Wiring requirement: Twisted, shielded-pair cable.
4. Accuracy: Plus or minus 0.5-degrees F at calibration point.
5. Insertion Elements in Ducts: Single point, 8-inches or 18-inches long; use where not affected by temperature stratification or where ducts are smaller than 9-sq. ft.
6. Averaging Elements in Ducts: 36- inches long, flexible, 72- inches long, flexible, 18-inches long, rigid] use where prone to temperature stratification or where ducts are larger than 10-sq. ft.
7. Insertion Elements for Liquids: Brass well (for copper, brass, or plastic pipe) with minimum insertion length of 2-1/2-inches. Stainless steel well for ferrous pipe.
8. Outside Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTD AND TRANSMITTERS

1. Manufacturers:
    a. MINCO
    b. MAMAC Systems, Inc.

c. RDF Corporation.
d. Acceptable DDC System Manufacturer.

2. Sensor element:

a. Platinum
b. Nickel

3. Accuracy: Plus or minus 0.5-degrees F at calibration point.
4. Wiring requirement: Twisted, shielded-pair cable.
5. Insertion Elements in Ducts: Single point, 8-inches or 18- inches long; use where not affected by temperature stratification or where ducts are smaller than 9-sq. ft.
6. Averaging Elements in Ducts: 18-inches long, rigid, 24- inches] long, rigid, 48-inches long, rigid, 24-feet long, flexible; use where prone to temperature stratification or where ducts are larger than 9-sq. ft.; length as required.
7. Insertion Elements for Liquids: Brass well (for copper or brass pipe) with minimum insertion length of 2-1/2-inches. Stainless steel well for ferrous pipe.
8. Room Sensor Cover Construction: Manufacturer's standard locking covers.

a. Setpoint Adjustment: Concealed, providing plus or minus 2.0-degrees F adjustment
b. Setpoint Indication: Concealed.
c. Thermometer: Concealed.
d. Color: Submit color prior to installation.
e. Orientation: Vertical.

9. Outside Air Sensors: Watertight, electrical inlet fitting; sensors are shielded from direct sunlight.
10. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.
11. Transmitter output shall be 4- to 20-mA, nominal 24-V dc. Output impedance must meet DDC input requirements.

D. HUMIDITY SENSORS

1. Manufacturers:

a. General Electric (General Eastern Instruments)
b. MAMAC Systems, Inc.
c. ROTRONIC Instrument Corp.
d. TCS/Basys Controls
e. Vaisala Inc.
f. Acceptable DDC System Manufacturer.

2. Sensor: Bulk polymer sensor element
3. Accuracy: [5] [**2**] % RH with linear output.
4. Wiring requirement: Twisted, shielded-pair cable.
5. Room Sensor Range: 5- to 95-% RH.
6. Room Sensor Cover Construction: Manufacturer's standard locking covers.

a. Setpoint Adjustment: Controlled through DDC controller
b. Display: [Concealed] [Exposed], [LED] [LCD]
c. Color: Submit color prior to installation.
d. Orientation: [Vertical.

7. Duct Sensor Range: 5- to 95-% RH with element guard and mounting plate.

8. Outside Air Sensor Range: 5- to 95-% RH with mounting enclosure/sunshield, suitable for operation at outdoor temperatures of [32- to 120-degrees F[minus 22- to 185-degrees F.
9. Transmitter output shall be 4- to 20-mA, nominal 24-V dc. Output impedance must meet DDC input requirements.

E. PRESSURE TRANSMITTERS/TRANSDUCERS

1. Manufacturers:

   a. BEC Controls Inc.
   b. General Electric (General Eastern Instruments)
   c. MAMAC Systems, Inc.
   d. Rotronic Instrument Corp.
   e. Setra Systems Inc.
   f. TCS/Basys Controls
   g. Vaisala

2. Sensors: Appropriate sensing chamber for medium being sensed.

3. Wiring requirement: twisted, shielded-pair cable for wiring unless specified otherwise by the manufacturer.

4. Air Static Pressure Transmitter: Non-directional sensor with suitable range for expected input, and temperature compensated.

   a. Accuracy: 2-% full scale with repeatability of 0.5 percent.
   b. Output: 4- to 20-mA. Output impedance must meet input requirements.
   c. Building Static Pressure Range: Minus 0.05- to 0.05-inches wg.
   d. Duct Static Pressure Range: 0- to 2.5-inches wg.

5. Air Differential Pressure Switch: Snap acting, pilot-duty rated contact, and with suitable scale range and setting adjustment.

   a. SPDT or DPDT, dry contact style device
   b. Range: Adjustable from 1- to 10- inches wg
   c. Differential: Adjustable from 2-psig to 10-psig

6. Air Differential Pressure Switch: Snap acting, pilot-duty rated contact, and with suitable scale range and setting adjustment.

   a. SPDT or DPDT, dry contact style device
   b. Range: Adjustable from 1- to 10- inches wg (249- to 2490-Pa)
   c. Differential: Adjustable from 0.1- to 0.25-inches wg (25- to 62-Pa)

7. Process Pressure and Differential Pressure Transmitters: Direct acting for gas or steam service; range suitable for system; linear output.

   a. Accuracy: 1-% FS with repeatability of 0.5-% FS.
   b. Output: 4- to 20-mA, nominal 24-V dc, loop-powered. Output impedance must meet DDC input requirements.
   c. Air Pressure Range: 0- to 100-psig.
   d. Velocity Pressure Range: 0- to 0.5-inches wg.

2.6 STATUS SENSORS AND DEVICES - ELECTRIC

A. Status Input for Fan: Differential pressure switch with pilot-duty rated contacts and adjustable range of 0- to 5-inch wg.

1. Manufacturers:

a. Cleveland Controls

B. Sensing Inputs for Electric Motors:

1. Manufacturers:

a. American Aerospace Controls

2. Current Transformer/Transmitter: Comply with ISA 50.00.01, current-sensing, fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current and 1 percent full-scale accuracy, for AC or DC applications.
3. Voltage Transformer/Transmitter (100- to 600-V AC): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy, for AC or DC applications.
4. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor, for AC and DC applications.

C. Current Switch: Self-powered, current-sensing, split-core, solid-state devices with adjustable trip current and indicating LED, selected to match motor current and DDC input requirements.

1. Manufacturers:

a. Nielsen-Kuljian
b. Veris Industries

D. Electronic Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

1. Manufacturer’s

a. DDC equipment manufacturer’s recommended product

E. Control Relay: Monitors or controls AC or DC motors or other equipment (as required), with cover, with visual indicator when energized, and two SPDT contacts rated 120/250 VAC at 8 Amps.

1. Manufacturers:

a. Dayton
b. Omron
c. Functional Devices

F. Damper End Switch (limit switch): Fully encapsulated, mercury-type, damper end switch with two contacts per switch; one for interlock wiring and one for DDC input.

1. Manufacturers:

a. KELE Controls part number TS-470-2

2.7 THERMOSTATS

A. Manufacturers:
1. Acceptable DDC System Manufacturer.

B. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 55- to 85-degrees F setpoint range, and 2-degrees F maximum differential.

C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed setpoint adjustment, 55- to 85-degrees F setpoint range, and 2-degrees F maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual, On-Off-Auto.

D. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.
6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

E. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable setpoint.

F. Airstream Thermostats: Two-pipe, fully proportional, single-temperature type; with adjustable setpoint in middle of range, adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

G. Electric, Low-Limit, Duct Thermostat (Freezestat): Snap-acting, single-pole, single-throw, manual-reset-only switch, that trips when the air temperature sensed across any 12-inches of capillary length is equal to or below setpoint, concealed setpoint adjustment for low and high setting, and provides 15- to 55-degrees F setpoint range and fixed differential.

1. Bulb Length: Minimum 20-feet.
2. Quantity: One thermostat for every 20-sq. ft. of coil surface.

H. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- reset switch that trips if temperature sensed across any 12-inches of bulb length is equal to or above setpoint.

1. Bulb Length: Minimum 20-feet.
2. Quantity: One thermostat for every 20-sq. ft. of coil surface.

2.8 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Motor characteristics such as NEMA designation, temperature rating, service factor, enclosure type, and efficiency are specified in Division 23 Section "Common Motor

Requirements for HVAC Equipment." If different characteristics are required, insert additional subparagraphs below to suit Project.

3. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
4. Non-spring Return motors for dampers larger than 25 Sq. Ft.: Size for running torque of 150-in. x lbf. and breakaway torque of 300-in. x lbf..
5. Spring-Return motors for dampers larger than 25-Sq. Ft.: Size for running and breakaway torque of 150-in. x lbf..

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:

   a. Belimo Aircontrols (USA), Inc.
   b. Acceptable DDC System Manufacturer.

2. Dampers: Size for running torque calculated as follows:

   a. Parallel-Blade Damper with Edge Seals: 7-inch-lb/sq. ft. of damper cross-sectional area.
   b. Opposed-Blade Damper with Edge Seals: 5-inch-lb/sq. ft. of damper cross-sectional area.
   c. Parallel-Blade Damper without Edge Seals: 4-inch-lb/sq. ft. of damper cross-sectional area.
   d. Opposed-Blade Damper without Edge Seals: 3-inch-lb/sq. ft. of damper cross-sectional area.
   e. Dampers with 2- to 3-inches wg of Pressure Drop or Face Velocities of 1000- to 2500-fpm: Increase running torque by 1.5.
   f. Dampers with 3- to 4-inches wg of Pressure Drop or Face Velocities of 2500- to 3000-fpm: Increase running torque by 2.0.

3. Coupling: V-bolt and V-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual, gear release on non-spring-return actuators.
6. Manual Operation: Provided for all valve actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: Minus 22- to 122-degrees F.
11. Temperature Rating (Smoke Dampers): Minus 22- to 250-degrees F.
12. Run Time: 95 seconds open, 20 seconds closed.

2.9 DAMPERS

A. Manufacturers:

1. American Warming and Ventilating
2. Mestek, Inc.
3. TAMCO

4. United Enertech Corp.
5. Ruskin
6. Greenheck.

B. Dampers: AMCA-rated, parallel-blade per the design requirements; 0.108-inch- minimum thickness, galvanized-steel or 0.125-inch- minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- thick galvanized steel with maximum blade width of 8-inches and length of 48-inches.

1. Secure blades to 1/2-inch- diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated, sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40- to 200-degrees F.
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene or silicone.
4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals.
5. Jamb Seals: spring-loaded, stainless steel, only.
6. Leakage ratings or dampers shall be less than 10 cfm per sq. ft. of damper area, at differential pressure of 4-inches wg when damper is held by torque of 50 in. x lbf; when tested according to AMCA 500D.

2.10 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 27 Section "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that a commercial power supply is available to control units and operator workstation.

B. Verify that emergency power supply is available to control units and operator workstation if required for project.

C. Verify that equipment-mounted devices are installed properly before proceeding with wiring installation.

3.2 INSTALLATION

A. Install software and/or custom programming in DDC control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Install DDC controller panels in locations noted on plans or coordinate with Architect. Coordinate with Electrical Contractor for power.

D. Install DDC temperature control instruments and devices on all controlled equipment per control plans and provide supply air and control branch air piping as required for a complete installation.

E. DDC control system wiring in conduit, J-hooks, or installed in bridle rings (when allowed) shall:

1. Run conduit runs along building and steel sight-lines (not diagonal or where support is improper).
2. Support all conduit with independent hangers, not from ductwork/piping or from ductwork/piping hangers/trays/supports/Unistrut; and independent of other trade's work.
3. Anchor J-hooks to walls or suspend J-hooks using 1/4-inch minimum diameter threaded rod hangers. Do not support J-hooks from ceiling or equipment hangers. J-hooks shall not impede removal of accessible ceiling tiles.

F. Control wiring in conduit or installed exposed (when allowed) shall:

1. Run conduit runs along building and steel sight lines (not diagonal or where support is not proper).
2. Support all conduit with independent hangars, not from ductwork/piping or from ductwork/piping hangars/trays/supports and independent of other trade's work.
3. Anchor J-hooks to walls or suspend J-hooks using 1/4-inch minimum diameter threaded rod hangers. Do not support J-hooks from ceiling or equipment hangers. J-hooks shall not impede removal of accessible ceiling tiles.

G. Install temperature control panels in locations noted on plans or coordinate with Architect. Coordinate with Electrical Contractor for power.

H. Install temperature control instruments and devices on all controlled equipment per control plans and provide supply air and control branch air piping as required for a complete installation.

I. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Installation height of devices shall comply with the Architect's "standard mounting heights and conventions".

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

J. Install guards on thermostats in the following locations:

1. Building Entrances
2. Public areas and restrooms
3. Where indicated on drawings

K. Furnish automatic dampers according to Division 23 Section "Air Duct Accessories" to installing contractor for installation.

L. Install damper motors on outside of ductwork in warm areas, not in locations exposed to outdoor temperatures.

M. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

O. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Route conduit and plenum cables along building and steel lines (not diagonal) and do not hang conduit or bridle rings from ductwork and piping or their support means

D. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multi-conductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

E. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 GRAPHIC DISPLAY GENERATION

A. Provide the following graphic displays as a minimum at the BACnet Advanced Workstation, arranged in logical penetration paths:

1. Building layout or isometric connected to the system.
2. Floor plans for each floor within the building, with display of present values of space conditions sensed by connected space sensors, display of the name of the air handler associated with each space sensor, and display of the room number in which the sensor is located. TC Contractor shall confirm Owner desired room names prior to graphics generation which may differ from the room names indicated on construction documents.
3. Schematic diagram for each HVAC system. Each system schematic display shall include at least the following:

a. Schematic arrangement of ductwork, fans, dampers, coils, valves, piping, pumps, equipment etc.
b. System name.
c. Area served.
d. Present value or status of all inputs, along with present setpoint.
e. Present percent open for each damper, valve, etc. based on commanded position.
f. Reset schedule parameters for all points, where applicable.
g. Present occupancy mode.

h. Present economizer mode, where applicable.
i. Present outside air temperature.
j. Associated space conditions and setpoints, where applicable.
k. Status of application programs (e.g., warm-up, night cycle, duty cycle, etc.).
l. Color coding to indicate normal and abnormal values, alarms, etc.

4. Manual override capability for each on/off or open/closed controlled digital output (for fans, 2-position dampers, etc.) and each modulating analog output (for dampers, VFD speed modulation type points, etc.) shall be provided. Graphic display of output point auto or manual override status shall be provided.
5. Sequence of operation in written (text) format for each HVAC system.
6. Overall BAS system schematic.
7. System management graphic for each network device and/or DDC panel.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect test, and adjust field-assembled components and equipment installation, including connections , and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
5. Test each point through its full operating range to verify that safety and operating control setpoints are as required.
6. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
7. Test each system for compliance with sequence of operation.
8. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check that insertion instruments are located in the correct section of piping.
5. Check instrument piping for proper fittings, slope, material, and support.
6. Check instrument tubing for proper fittings, material, and support.
7. Check airflow instruments. Inspect tag number and ductwork size, verify that upstream/downstream dimensions are per manufacturer’s requirements, and that instruments are installed correctly.
8. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
9. Check temperature instruments, material, and length of sensing elements.
10. Check control dampers. Verify that proper blade alignment, either parallel or opposed, has been provided. Verify that valves are installed in the correct direction.

11. Check electric-operated dampers. Verify that proper blade alignment, either parallel or opposed, has been provided. Verify that valves are installed in the correct direction. Verify end switches and/or feedback devices are installed properly.
12. Check DDC system as follows:

    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.6 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate installed devices and instruments, whether electric or pneumatic.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

    a. Check analog inputs at 0, 50, and 100 percent of span.
    b. Check analog outputs using milli-ampere meter at 0, 50, and 100 percent output.
    c. Check digital inputs using jumper wire.
    d. Check digital outputs using ohmmeter to test for contact making or breaking.
    e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Pressure:

    a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

6. Temperature:

    a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    b. Calibrate temperature switches to make or break contacts.

7. Stroke and adjust dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
8. Stroke and adjust dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
9. Provide diagnostic and test instruments for calibration and adjustment of system.
10. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature, CO, CO_2, static pressure, humidity, etc., set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

D. Controls contractor shall work with test and balance contractor and verify calibration of airflow measuring devices, static pressure sensors and differential pressure sensors.

E. Test and balance contractor shall determine and provide control contractor static pressure control set points for all variable air volume systems and differential pressure control set points for all variable flow systems.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative of the manufacturer (or manufacturers authorized and trained installation representative) to demonstrate the system's operational status in all modes of control. This shall be arranged for the following:

1. Every control drawing Mxxx: Demonstrate system in all modes of operation per Sequence of Operation stated.
2. Where there are multiple devices (VAV box, unit heater, cabinet unit heater, fan coil unit, etc.) installed identically, perform demonstration on 25% of the installed quantity, in all modes of operation per Sequence of Operation stated.

B. Refer to Division 01 Section "Demonstration and Training."

3.8 OWNER TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel on how to operate, maintain, and adjust HVAC instrumentation and controls.

1. Training shall be provided for 6 people for a period of 40 hours in 4-hour increments; to be scheduled with the Owner's representative at least 2-weeks in advance.
2. Provide all training materials needed for a complete training session including but not limited to Operation and Maintenance Manuals, product catalogs, and "record drawings" of the controls installation.
3. Training shall be a combination of classroom (printed material and electronic presentations) and mechanical room (hands-on) instruction.

B. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 0900

SECTION 23 1123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section and will require the contractors' participation in the Above Ceiling Coordination Program.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.3 DEFINITIONS

A. ASCE: American Society of Civil Engineers.

B. ANSI/IAS: American National Standards Institute/International Accreditation Service.

C. ASME: American Society of Mechanical Engineers.

D. ASTM: American Society for Testing and Materials.

E. AWS: American Welding Society.

F. CSA: Canadian Standards Association.

G. CWP: Cold Working Pressure.

H. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

I. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

J. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

K. LEED: Leadership in Energy and Environmental Design.

L. MPI: Master Painters Institute.

M. MSS: Manufacturers Standardization Society for the Valve and Fitting Industry, Inc.

N. NFPA: National Fire Protection Association.

O. NPS: Nominal Pipe Size.

P. NRTL: Nationally Recognized Testing Laboratory.

Q. PE: Polyethylene.

R. SAE: Society of Automotive Engineers.

S. TFE: Tetrafluorethylene plastic.

T. UL: Underwriters Laboratories Inc.

U. WOG: Water/Oil/Gas.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Dielectric fittings.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot.

C. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

D. Welding certificates.

E. Field quality-control reports.

F. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

B. Interruption of Existing Natural-Gas Service: Do not interrupt natural-gas service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide purging and startup of natural-gas supply according to requirements indicated:

1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of natural-gas service.
2. Do not proceed with interruption of natural-gas service without Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum O-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

2.2 PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. Refer to "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig.
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BrassCraft Manufacturing Company; a Masco company.
    b. Conbraco Industries, Inc.; Apollo Div.
    c. Lyall, R. W. & Company, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flowserve.
b. Homestead Valve; a division of Olson Technologies, Inc.
c. McDonald, A. Y. Mfg. Co.
d. Milliken Valve Company.
e. Mueller Co.; Gas Products Div.
f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Actaris.
b. American Meter Company.
c. Eclipse Combustion, Inc.
d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
e. Invensys.
f. Maxitrol Company.
g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.

11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 50 PSIG.

2.6 DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. McDonald, A. Y. Mfg. Co.
    e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
    f. Wilkins; Zurn Plumbing Products Group.

2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Capitol Manufacturing Company.
    b. Central Plastics Company.
    c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
    d. Wilkins; Zurn Plumbing Products Group.

2. Minimum Operating-Pressure Rating: 150 psig.
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Minimum Operating-Pressure Rating: 150 psig.
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.

5. Insulating materials suitable for natural gas.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.7 SLEEVES

A. Refer to Division 20 Section “Common Work Results” for requirements.

2.8 MECHANICAL SLEEVE SEALS

A. Refer to Division 20 Section “Common Work Results” for requirements.

2.9 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.

B. Refer to Division 20 Section “Common Work Results” for requirements.

2.10 GROUT

A. Refer to Division 20 Section “Common Work Results” for requirements.

2.11 LABELING AND IDENTIFYING

A. Refer to Division 20 Section “Mechanical Identification” for requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

C. Install fittings for changes in direction and branch connections.

D. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

E. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

F. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Division 20 Section "Meters and Gages."

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

Q. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

R. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.

b. Do not install natural-gas piping in solid walls or partitions.

S. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

T. Connect branch piping from top or side of horizontal piping.

U. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

V. Do not use natural-gas piping as grounding electrode.

W. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

X. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Division 20 Section "Meters and Gages."

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

C. Install zone valves and gages in valve boxes. Arrange valves so largest valve is lowest. Rotate valves to angle that prevents closure of cover when valve is in closed position.

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

G. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 20 Section "Hangers and Supports for Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.
5. NPS 4 and Larger: Maximum span, 10 feet; minimum rod size, 5/8 inch.

3.8 CONNECTIONS

A. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

B. Install piping adjacent to appliances to allow service and maintenance of appliances.

C. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

D. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 20 Section "Identification for Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 PAINTING

A. Comply with requirements in Division 09 painting Sections for painting interior and exterior natural-gas piping.

B. or natural-gas piping.

C. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

a. Prime Coat: Alkyd anticorrosive metal primer.
b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
c. Topcoat: Exterior alkyd enamel.
d. Color: Yellow.

D. Damage and Touchup: Repair marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.12 OUTDOOR PIPING SCHEDULE

A. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.13 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.14 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG AND LESS THAN 5 PSIG

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with steel welding fittings and welded joints.

3.15 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be the following:

1. Two-piece, full port, bronze ball valves with bronze trim.

B. Valves for pipe sizes NPS 2-1/2 and larger at service meter shall be one of the following:

1. Two-piece, full port, bronze ball valves with bronze trim.
2. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

1. Two-piece, full port, bronze ball valves with bronze trim.

D. Distribution piping valves for pipe sizes NPS 2-1/2 and larger shall be one of the following:

1. Two-piece, full port, bronze ball valves with bronze trim.
2. Cast-iron, nonlubricated plug valve.

E. Valves in branch piping for single appliance shall be the following:

1. Two-piece, full port, bronze ball valves with bronze trim.

END OF SECTION 23 1123

SECTION 23 3113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

1.3 DEFINITIONS

A. ASCE/SEI: American Society of Civil Engineers/Structural Engineers Institute.

B. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.

C. AWS: American Welding Society.

D. CFR: Code of Federal Regulations.

E. EPA: Environmental Protection Agency.

F. EPDM: Ethylene-propylene-diene terpolymer rubber.

G. ICC: International Code Council.

H. IESNA: Illuminating Engineers Society of North America.

I. HEPA: High Efficiency Particulate Arrestor.

J. LEED: Leadership in Energy and Environmental Design.

K. NADCA: National Air Duct Cleaners Association.

L. NAIMA: North American Insulation Manufacturers Association.

M. NFPA: National Fire Protection Association.

N. NRTL: Nationally Recognized Testing Laboratory.

O. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

P. SPIDA: Spiral Duct Manufacturers Association.

Q. UL: Underwriters Laboratories, Inc.

R. VOC: Volatile Organic Compound.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Fire alarm devices.

g. Perimeter moldings.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6.4.4 - "HVAC System Construction and Insulation."

E. NFPA Compliance; Comply with the following NFPA Standards:

1. NFPA 90A, “Standard for the Installation of Air conditioning and Ventilation Systems.” Except as indicated otherwise.
2. NFPA 90B, “Standard for the installation of Warm Air Heating and Air Conditioning Systems.

F. Comply with UL standards listed within this section. Provide mastic and tapes that are listed and labeled in accordance with 181A and marked according to type.

G. National Air Duct Cleaners Association, Inc. (NADCA): Clean ductwork system in accordance with the standards Assessment, cleaning and Restoration of HVAC System (ACR 2002)

1.6 PROTECTION AND REPLACEMENT

A. Protect ductwork during shipping and storage from dirt, debris and moisture damage. Provide plastic covers over ends of ductwork during shipping, storage and installation.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," 2005 Edition, Tables 2-1 through 2-28, including their associated details, based on indicated static-pressure class unless otherwise indicated. Conform to the requirements in the reference standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.

1. Fabricate rectangular ductwork of minimum 26 gauge sheet metal.
2. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.

3. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Crossbreaking or Cross Beading: Crossbreak or bead duct sides are 19 inches and larger are 20 gauge or less, with more than 10 sq ft. unbraced panel area, as indicated in SMACNA “HVAC Duct Construction Standards,” 2005 Edition, Figure 2-9, unless they are lined or are externally insulated.

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. Single wall round ducts and fittings may be factory fabricated or shop fabricated.

B. Provide round ducts in lengths not less than 12 feet. Fabricate round and flat oval spiral ductwork of minimum 26 gauge sheet metal. No longitudinal seam ductwork allowed

C. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eastern Sheet Metal, Inc.
    b. Lindab Inc.
    c. McGill AirFlow LLC.
    d. SEMCO Incorporated.
    e. Sheet Metal Connectors, Inc.
    f. Spiral Manufacturing Co., Inc.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.

F. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.
e. Maximum Thermal Conductivity:

1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

    a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.

9. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; and when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Sealant: Modified styrene acrylic.
3. Water resistant.
4. Mold and mildew resistant.
5. Maximum Static-Pressure Class: 10-inch w.g. and negative.
6. Service: Indoor and outdoor.
7. Service Temperature: Minus 40 to plus 200 deg F.
8. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
9. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch w.g., positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch w.g. and shall be rated for 10-inch w.g. static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

E. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through required exit stairwells, elevator hoistways and machinery rooms, transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch w.g. and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch w.g.: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch w.g. and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch w.g.: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch w.g.: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
    b. Supply Ducts with a Pressure Class of 3-Inch w.g. or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.
    c. Return Ducts with a Pressure Class of 2-Inch w.g. or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.

d. Exhaust Ducts with a Pressure Class of 2-Inch w.g. or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.
e. Outdoor Air Ducts with a Pressure Class of 2-Inch w.g. or Higher: Test representative duct sections totaling no less than 50 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements in Division 20 Section "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Terminal Units:

a. Pressure Class: Positive 2-inch w.g.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 6-inch w.g.

b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 3.
d. SMACNA Leakage Class for Round and Flat Oval: 3.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 6-inch w.g.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 3.
d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Negative 2-inch w.g.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Negative 2-inch w.g.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 3.
d. SMACNA Leakage Class for Round and Flat Oval: 3.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch w.g.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

F. Liner (where indicated on drawings):

1. Supply Air Ducts: Fibrous glass, Type I 1 inch thick.
2. Return Air Ducts: Fibrous glass, Type I, 1 inch thick.
3. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch thick.
4. Supply Fan Plenums: Fibrous glass, Type II, 1 inch thick.
5. Return- and Exhaust-Fan Plenums: Fibrous glass, Type II, 2 inches thick.
6. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

    a. Velocity 1000 fpm or Lower: 90-degree tap.
    b. Velocity 1000 to 1500 fpm: Conical tap.
    c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 3113

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:
1. Manual volume dampers.
2. Flange connectors.
3. Duct silencers.
4. Turning vanes.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.3 DEFINITIONS

A. AMCA: Air Movement and Control Association International, Inc.

B. ASHRAE: American Society of Heating, Refrigeration, and Air Conditioning Engineers.

C. ASTM: American Society for Testing and Materials.

D. LEED: Leadership in Energy and Environmental Design.

E. NFPA: National Fire Protection Association.

F. NRTL: Nationally Recognized Testing Laboratory>

G. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

H. STC: Sound Transmission Class.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. Source quality-control reports.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with applicable portions of SMACNA “Duct Construction Standards, metal and Flexible”, 2005 Edition.

B. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.

C. UL Compliance:

1. Construct, test and label fire dampers in accordance with current edition of UL Standard 555 “First Dampers”. Construct flexible ductwork in compliance with UL Standard 181 “Factory-Made Air Ducts and Connections”.
2. Duct tape shall be labeled in accordance with UL Standard 180B and marked 181B-FX. Non-metallic duct clamps shall be labeled in accordance with UL Standard 181B and marked 181B-C

D. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

E. Comply with AMCA 500-D testing for damper rating.

F. Products shall have flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 “Surface Burning Characteristics” (NFPA 225) method.

PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. METALAIRE, Inc.
    f. Nailor Industries Inc.
    g. Pottorff; a division of PCI Industries, Inc.
    h. Ruskin Company.
    i. Vent Products Company, Inc.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch w.g. or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.3 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.4 DUCT SILENCERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Industrial Noise Control, Inc.
2. McGill AirFlow LLC.
3. Price Industries, Inc.
4. Ruskin Company.
5. Vibro-Acoustics.
6. VAW Systems

B. General Requirements:

1. Factory fabricated.
2. Fire-Performance Characteristics: Adhesives, sealants, packing materials, and accessory materials shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

C. Shape:

1. Rectangular straight with splitters or baffles.
2. Rectangular elbow with splitters or baffles.
3. Rectangular transitional with splitters or baffles.

D. Rectangular Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel, 0.034 inch thick.

E. Round Silencer Outer Casing: ASTM A 653/A 653M, G90, galvanized sheet steel.

1. Sheet Metal Thickness for Units up to 24 Inches in Diameter: 0.034 inch thick.
2. Sheet Metal Thickness for Units 26 through 40 Inches in Diameter: 0.040 inch thick.
3. Sheet Metal Thickness for Units 42 through 52 Inches in Diameter: 0.052 inch (1.3 mm) thick.
4. Sheet Metal Thickness for Units 54 through 60 Inches in Diameter: 0.064 inch thick.

F. Inner Casing and Baffles: ASTM A 653/A 653M, G90 galvanized sheet metal, 0.034 inch thick, and with 1/8-inch- diameter perforations.

G. Special Construction:

1. Suitable for outdoor use.

2. High transmission loss to achieve STC 45.

H. Connection Sizes: Match connecting ductwork unless otherwise indicated.

I. Principal Sound-Absorbing Mechanism:

1. Controlled impedance membranes and broadly tuned resonators without absorptive media.
2. Film-lined type with fill material.

a. Fill Material: Inert and vermin-proof fibrous material, packed under not less than 5 percent compression.
b. Erosion Barrier: Polymer bag enclosing fill, and heat sealed before assembly.

3. Lining: Mylar.

J. Fabricate silencers to form rigid units that will not pulsate, vibrate, rattle, or otherwise react to system pressure variations. Do not use mechanical fasteners for unit assemblies.

1. Lock form and seal or continuously weld joints.
2. Suspended Units: Factory-installed suspension hooks or lugs attached to frame in quantities and spaced to prevent deflection or distortion.
3. Reinforcement: Cross or trapeze angles for rigid suspension.

K. Accessories:

1. Factory-installed end caps to prevent contamination during shipping.
2. Removable splitters.
3. Airflow measuring devices.

L. Source Quality Control: Test according to ASTM E 477.

1. Testing to be witnessed by Architect.
2. Record acoustic ratings, including dynamic insertion loss and generated-noise power levels with air velocity of at least 2000-fpm face velocity.
3. Leak Test: Test units for airtightness at 200 percent of associated fan static pressure or 6-inch w.g. static pressure, whichever is greater.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.6 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ruskin.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:

a. Access Doors Less than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
d. Access Doors Larger than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.7 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch w.g. positive or negative.

2.8 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.9 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. Thermaflex

B. Construction: Provide flexible ductwork conforming to UL 181-Class I, NFPA 90A and NFPA 90B and as follows. Duct types of manufacturers are indicated for reference in regards to required quality of construction and materials.

1. Low Pressure (duct pressure class up and including 2” w.g.) and medium pressure (duct pressure class 2.1” to 6” w.g.) flexible duct shall have fire retardant polyethylene (Flexmaster Type 8B, Thermaflex Type G-KM) or reinforced metalized (Flexmaster Type 8M, Thermaflex Type M-KE) protective vapor barrier. High pressure (duct pressure class over 6” w.g.) flexible duct shall have fire retardant polyethylene (Flexmaster Type 4B) or reinforced metalized (Flexmaster Type 4M, Thermaflex Type M-KC) protective vapor barrier.
2. Flexible ductwork shall have CPE liner with steel wire helix mechanically locked or permianetly bonded to the liner.
3. Provide acoustical, fiberglass insulated duct with minimum R-value of R-6.
4. Connect each end with duct clamps and duct tape as specified in part 3. Duct clamps shall be labeled in accordance with UL-181B and marked 181B-C. Duct tape shall be labeled in accordance with UL 181B and marked 181B-FX.

C. Flexible Duct Connectors

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

D. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.

2.10 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of Pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Connect ducts to duct silencers rigidly.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. At outdoor-air intakes and mixed-air plenums.
3. At drain pans and seals.
4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
5. At each change in direction and at maximum 50-foot spacing.
6. Upstream from turning vanes.
7. Upstream or downstream from duct silencers.
8. Control devices requiring inspection.
9. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

J. Label access doors according to Division 20 Section "Identification for Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. For fans developing static pressures of 5-inch w.g. and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect terminal units to supply ducts with maximum 6-inchlengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect flexible ducts to metal ducts with draw bands.

O. Install duct test holes where required for testing and balancing purposes.

P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Inspect turning vanes for proper and secure installation.
4. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 3300

SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Ceiling-mounting ventilators.
2. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 PRODUCTS

2.1 CEILING MOUNTING VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Breidert Air Products.
2. Broan Mfg. Co., Inc.

3. Carnes Company HVAC.
4. Greenheck.
5. Loren Cook Company.
6. NuTone Inc.
7. Penn Ventilation.

B. Description: Centrifugal fans designed for installing in ceiling or wall or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Manual Starter Switch: Single-pole rocker switch assembly with cover and pilot light.
3. Time-Delay Switch: Assembly with single-pole rocker switch, timer, and cover plate.
4. Motion Sensor: Motion detector with adjustable shutoff timer.
5. Ceiling Radiation Damper: Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
6. Filter: Washable aluminum to fit between fan and grille.
7. Isolation: Rubber-in-shear vibration isolators.
8. Manufacturer's standard roof jack or wall cap, and transition fittings.

2.2 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corp.
2. Carnes Company HVAC.
3. Greenheck.
4. Hartzell Fan, Inc.
5. Loren Cook Company.
6. Penn Ventilation.

B. Description: In-line, direct-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

2.3 MOTORS

A. Comply with requirements in Division 20 Section "Common Motor Requirements for Fire Suppression, Plumbing, and HVAC Equipment."

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and spring hangers

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 20 Section "Identification for Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct

connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 20 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 3423

SECTION 23 3600 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Shutoff single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.
2. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. 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.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.5 COORDINATION

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHUTOFF SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers:

1. Anemostat; a Mestek Company.
2. Carnes.
3. Environmental Technologies, Inc.; Enviro-Air Div.
4. Krueger.
5. METALAIRE, Inc.; Metal Industries Inc.
6. Nailor Industries of Texas Inc.
7. Price Industries.
8. Titus.
9. Tuttle & Bailey.

B. Configuration: Volume-damper assembly inside unit casing with control components located inside a protective metal shroud.

C. Casing: 0.034-inch steel.

1. Casing Lining: 1-inch- thick, coated, fibrous-glass duct liner complying with ASTM C 1071; secured with adhesive. Cover liner with nonporous foil.
2. Casing Lining: Adhesive attached, 3/4-inch- thick, polyurethane foam insulation complying with UL 181 erosion requirements, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
3. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
4. Air Outlet: S-slip and drive connections.
5. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket.

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

D. Regulator Assembly: Extruded-aluminum or galvanized-steel components; key damper blades onto shaft with nylon-fitted pivot points located inside unit casing.

1. Automatic Flow-Control Assembly: Combined spring rates shall be matched for each volume-regulator size with machined dashpot for stable operation.
2. Factory-calibrated and field-adjustable assembly with shaft extension for connection to externally mounted control actuator.

E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 3-inch w.g. inlet static pressure.
2. Damper Position: Normally open.

F. Electric Heating Coil: Slip-in-type, open-coil design with integral control box factory wired and installed. Include the following features:

1. Primary and secondary overtemperature protection.
2. Nickel chrome 80/20 heating elements.
3. Airflow switch.
4. Noninterlocking disconnect switch.
5. Fuses (for coils more than 48 A).
6. Mercury contactors.
7. Pneumatic-electric switches and relays.
8. Magnetic contactor for each step of control (for three-phase coils).

G. DDC Controls: Single-package unitary controller and actuator specified in Division 23 Section "Instrumentation and Control for HVAC."

2.3 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

B. Verification of Performance: Rate air terminal units according to ARI 880.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

3.2 CONNECTIONS

A. Connect ducts to air terminal units according to Division 23 Section "Metal Ducts."

B. Ground units with electric heating coils according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect , test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions and do the following:

a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
b. Verify that controls and control enclosure are accessible.
c. Verify that control connections are complete.
d. Verify that nameplate and identification tag are visible.
e. Verify that controls respond to inputs as specified.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 3600

SECTION 23 3713 DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01, Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Ceiling diffusers.
2. Registers and grilles.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Source quality-control reports.

PART 2 PRODUCTS

2.1 CEILING DIFFUSERS

A. Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Hart & Cooley Inc.
d. Krueger.
e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Price Industries.
h. Titus.
i. Tuttle & Bailey.

2. Except as otherwise indicated, provide manufacturers standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and provide with accessories as required for complete installation.
3. Provide ceiling air diffusers that have a minimum temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
4. Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffusers.
5. Accessories:

a. Equalizing grid.
b. Plaster ring.
c. Sectorizing baffles.
d. Operating rod extension

2.2 REGISTERS AND GRILLES

A. Registers and Grilles:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Hart & Cooley Inc.
d. Krueger.
e. METALAIRE, Inc.
f. Nailor Industries Inc.
g. Price Industries.
h. Titus.
i. Tuttle & Bailey.

2. Except as otherwise indicated, provide manufacturers standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and provide with accessories as required for complete installation.
3. Provide ceiling air diffusers that have a minimum temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
4. Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and

adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffusers.

5. Accessories:

   a. Equalizing grid.
   b. Plaster ring.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

D. Support flexible duct connectors at connection to air diffusion devices with “FLEXFLOW ELBOW” elastomeric duct elbow support as manufacturered by Thermaflex or approved equal.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers and grilles, inspect exposed finish. Clean exposed surfaces to remove dirt and smudges. Replace any air device that has damaged finishes.

END OF SECTION 23 3713

SECTION 23 3723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

C. Division 01 Project Management and Coordination, apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Roof hoods.

1.3 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): 120 deg F, ambient, material surfaces.

B. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For gravity ventilators. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.

C. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

D. Fabricate supports, anchorages, and accessories required for complete assembly.

E. Perform shop welding by AWS-certified procedures and personnel.

2.3 ROOF HOODS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acme Engineering & Mfg. Corporation.
2. Aerovent.
3. Carnes.
4. Greenheck Fan Corporation.
5. Loren Cook Company.
6. PennBarry.

B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 6-6 and 6-7.

C. Materials: Aluminum sheet, minimum 0.063-inch-; suitably reinforced.

D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.

1. Configuration: Self-flashing without a cant strip, with mounting flange.

E. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire

F. Galvanized-Steel Sheet Finish:

1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.

B. Install gravity ventilators with clearances for service and maintenance.

C. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

D. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during installation.

E. Label gravity ventilators according to requirements specified in Division 20 Section "Identification for Piping and Equipment."

F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

G. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in Section 23 31 13 "Metal Ducts" and Section 23 31 16 "Nonmetal Ducts." Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

A. Adjust damper linkages for proper damper operation.

END OF SECTION 23 3723

SECTION 23 7413 - PACKAGED UNITARY ROOFTOP UNITS – AHU-1, 2

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

1.2 SUMMARY

A. This Section includes packaged, outdoor-mounted air conditioning units 25 tons and smaller with the following components and accessories:

1. Direct-expansion cooling.
2. Gas furnace.
3. Economizer outdoor- and return-air damper section.
4. Integral, space temperature controls.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

H. VVT: Variable-air volume and temperature.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

C. Field quality-control test reports.

D. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fan Belts: One set] for each belt-driven fan.
2. Filters: One set of filters for each unit.

1.7 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. 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.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than fifteen years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 Manufacturer

A. Products shall be provided by the following manufacturers:

1. AAON
2. Carrier Corporation.
3. Daikin Applied.
4. Johnson Controls.
5. Trane.

2.2 Rooftop Units

A. General Description

1. Packaged rooftop unit shall include compressors, evaporator coils, filters, supply fans, dampers, exhaust fans, and unit controls.
2. Unit shall be factory assembled and tested including leak testing of the DX coils, and run testing of the completed unit. Run test report shall be supplied with the unit in the service compartment’s literature pocket.

B. Construction

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 210/240. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between

panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coils, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.
11. Unit shall include factory installed, painted galvanized steel condenser coil guards on the face of the condenser coil.

C. Electrical

1. Unit shall have a 5kAIC SCCR.
2. Unit shall be provided with factory installed and factory wired, non-fused disconnect switch.
3. Unit shall be provided with a factory installed and factory wired 115V, 12 amp GFI outlet disconnect switch in the unit control panel.
4. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include direct drive, unhoused, backward curved, plenum supply fans.
2. Blowers and motors shall be dynamically balance and mounted on rubber isolators.

E. Cooling Coils

1. Evaporator Coils

a. Coils shall be designed for use with R-454B refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.
b. Coil shall be standard capacity.
c. Coils shall be hydrogen or helium leak tested.
d. Coils shall be furnished with factory installed expansion valves.
e. Refrigeration circuit shall be equipped with a liquid line sight glass.

F. Refrigeration System

1. Unit shall be factory charged with R-454B refrigerant.
2. Compressors shall be scroll type with thermal overload protection and carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory.
3. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam insulated panels to prevent the transmission of noise outside the cabinet.

4. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of noise from the compressors into the building area.
5. Each refrigeration circuit shall be equipped with expansion valve type refrigerant flow control.
6. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and factory installed liquid line filter driers.

    a. Unit shall include a variable capacity scroll compressor on the refrigeration circuit which shall be capable of modulation from 10-100% of its capacity.
    b. Each refrigeration circuit shall be equipped with a liquid line sight glass.

G. Condensers

1. Air-Cooled Condenser

    a. Condenser fans shall be vertical discharge, axial flow, direct drive fans.
    b. Coils shall be designed for use with R-454B refrigerant. Coils shall be multi-pass and fabricated from aluminum microchannel tubes.
    c. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.

        1) Condenser fans shall be high efficiency electronically commutated motor driven with factory installed head pressure control module. Condenser airflow shall continuously modulate based on head pressure and cooling operation shall be allowed down to 35°F with adjustable compressor lockout.

H. Gas Heating

1. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.
2. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.
3. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.
4. Unit shall include a single gas connection in the outside cabinet wall.

    a. High Turndown Modulating Natural Gas Furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment. Gas heater shall be capable of capacity turndown ratio as shown on the unit rating sheet. Heat trace shall be include on the condensate drain line.

I. Filters

1. Unit shall include 4 inch thick, pleated panel filters with an ASHRAEMERV rating of 13, upstream of the cooling coil. Unit shall also include 2 inch thick, pleated panel pre filters with an ASHRAE MERV rating of 8, upstream of the 4 inch standard filters.
2. Unit shall include a clogged filter switch.

J. Outside Air/Economizer

1. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 20 cfm of leakage per sq ft. at 4 in. w.g. air pressure differential across the damper. Low leakage dampers shall be Class 2 AMCA certified, in accordance with AMCA Standard 511. Damper assembly shall be controlled by spring return sensible temperature activated fully modulating enthalpy activated fully modulating actuator. Unit shall include outside air opening bird screen and outside air hood. Unit, except for horizontal series, shall also include barometric relief dampers.
2. Economizer shall be furnished with return air CO2 override.

K. Controls

1. Factory Installed and Factory Provided Controller

   a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
   b. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
   c. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
   d. Variable Air Volume Controller
   e. Constant Volume Controller

      1) Unit shall modulate cooling with constant airflow to meet space temperature cooling loads.

   f. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a Lon Works or BACnet network.

L. Accessories

1. Unit shall be provided with a safety shutdown terminal block for field installation of a smoke detector which shuts off the unit's control circuit.

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 RTUs.

B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 20, Division 22, and Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

C. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Division 23 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

D. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit according to manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.

d. Measure flue-gas temperature at furnace discharge.
e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and firestat alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 23 7413

SECTION 23 8239 - CABINET UNIT HEATERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Division 20, Common Work Results for Mechanical, requirements apply to this section.

1.2 SUMMARY

A. Section includes cabinet unit heaters with centrifugal fans and electric resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluorethylene plastic.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Unit-Heater Filters: Furnish one spare filter(s) for each filter installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko; Marley Engineered Products
2. Indeeco
3. Markel
4. QMark; Marley Engineered Products
5. Sterling.
6. Trane Inc.
7. Rittling.
8. Vulcan

2.2 DESCRIPTION

A. Factory-assembled and -tested unit complying with AHRI 440.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 2021.

2.3 PERFORMANCE REQUIREMENTS

A. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

2.4 CABINETS

A. Material: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 16-ga. galvanized sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Recessed Flanges: Steel, finished to match cabinet.
3. Base: Minimum 18-ga.steel sub-base, finished to match cabinet, 6 inches high with leveling bolts.

2.5 FILTERS

A. Minimum Arrestance: According to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 90 percent arrestance and MERV 7.

2.6 COILS

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

2.7 CONTROLS

A. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal, directly connected to motor; thermoplastic or painted-steel wheels and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 20 Section "Common Motor Requirements for Fire Suppression, Plumbing and Mechanical Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

B. Control devices and operational sequences are specified in Section 23 "Instrumentation and Control for HVAC" and on the drawings."

C. Basic Unit Controls:

1. Control voltage transformer.

D. Unit-mounted thermostat

E. Electrical Connection: Factory-wired motors and controls for a single field connection.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive cabinet unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit-heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Section 079200 "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Comply with safety requirements in UL 1995.

B. Ground equipment according to Section 16.

C. Connect wiring according to Section 16.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Units will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Prior to substantial completion, clean unit’s exposed surfaces and vacuum clean internal components including fan wheel, coil sections, and filters.

B. Adjust initial temperature set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 INSTALLATION

A. Locate cabinet unit heaters as indicated, coordinate with other trades to assure correct recess size of recessed cabinet unit heaters.

3.7 ELECTRICAL WIRING

A. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer’s wiring diagram submittal to Electrical installer.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters.

END OF SECTION 23 8239

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on Drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for the completion of electrical systems.

B. These Specifications and the accompanying Drawings contemplate the furnishing and installation of all materials, equipment, supplies, labor and supervision required for the complete performance of all operations relating to the Electrical Trades work.

C. The work shall be done in accordance with best practice so as to contribute to efficiency of operation and minimum maintenance and shall be installed with proper accessibility. The materials and equipment, including all necessary accessories, shall be put into proper adjustment so that the component parts function together as a workable system. The Electrical Contractor shall provide all equipment, materials and operations as indicated either on the Drawings or contained herein or as may be reasonably implied by either to accomplish a complete electrical system.

D. All work shall be performed in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved. None but experienced persons in the work to be performed shall be allowed to do the work. This applies particularly to items such as cable splicing, control work, systems connections, etc.

E. Work shall include but shall not be limited to the following, refer to plans and all specifications sections for complete project requirements:
   1. Provide temporary electrical facilities to facilitate construction.
   2. Provide electrical demolition as required to facilitate the addition and renovation.
   4. Provide all conduit, boxes, raceways, etc. required for project for all systems.
   5. Provide all branch circuit and power wiring 120 volts and greater required for project.
   6. Provide separate neutral conductors for all 120 volt non-lighting circuits.
   7. Provide a ground conductor for all conduits serving power wiring 120 volts or greater.
   8. Provide a complete grounding system as required for code conformance.
   9. Modify the existing lightning protection system, including lightning protection for the addition, as required for a complete system.
   10. Provide all electrical distribution equipment required for the project including, overcurrent protective devices, lighting and power panels, etc.
   11. Provide disconnect switches for all building and mechanical equipment unless specifically indicated otherwise.
   12. Provide motor starters for all building and mechanical equipment unless specifically indicated otherwise.
   15. Provide exterior lighting.
   16. Provide exterior lighting control.
   17. Provide interior lighting.
   18. Provide all lighting controls.
   19. Provide all emergency and exit lighting systems.
   20. Provide all electrical services required for project mechanical equipment and building equipment.
   22. Provide all equipment foundations and supports for all equipment, conduit, boxes, light fixtures, etc. installed under this contract.
   23. Provide identification and nameplates for all electrical equipment, panels, disconnects, starters, etc.
   24. Label all receptacles to indicate the panel and circuit from which they are served.

25. Label all junction boxes serving power 120 volts and greater with the panel and circuit of the wiring installed in the junction box.
26. Label all building equipment, mechanical equipment, etc. with the panel and circuit from which it is served.
29. Provide empty conduit raceways to serve voice and data distribution and cabling.
30. Provide empty conduit raceways to serve security system equipment and wiring including CCTV and door locking/access control.

31. Provide all above ceiling coordination with other trades as required for the installation of light fixtures, conduits, boxes, etc.
32. Provide thru wall conduit sleeves required for the passage of low voltage wiring.
33. Provide fireproofing of all conduits, conduit sleeves and penetrations installed under this contract regardless of what trade or contractor installs the actual wiring. Fireproofing shall include both inside and outside the conduit or raceway.
34. Provide complete shop drawings for all materials, systems and equipment.
35. Provide all installation instructions, operating manuals, spare parts lists, etc. for all materials, systems and equipment.
36. Provide record as built drawings of all work installed under this contract.
37. Provide Owner training.
38. Provide complete testing of all electrical systems and equipment. Submit test report for review and approval.

1.2 DEFINITIONS

A. In the Electrical Sections of the Specifications, and on drawings, the terms "Electrical Trades", "The Contractor", or "This Contractor" shall mean the Electrical Subcontractor.

B. "Provide" shall mean "furnish and install" or "furnish all labor and materials required for the installation of".

1.3 CODES, PERMITS, AND FEES

A. All required permits, licenses, inspections and approvals shall be secured and all fees for same paid by this Contractor.

B. References to standards, codes, specifications, recommendations, etc., shall mean the latest edition of such publications adopted and published at date of invitation to submit Bid Proposals.
   1. Applicable Standards and Codes:
      a. In addition to requirements shown or specified, comply with the applicable standards, specifications, and codes listed below. Where requirements of the Contract Documents are in excess of these standards or code requirements, the Contract Documents shall govern.
      b. Listing of associations, codes, standards and abbreviations:

CBM	Certified Ballasts Manufacturers Association
NEC	National Electrical Code
ANSI	American National Standards Institute
IEEE	Institute of Electrical and Electronics Engineers
ASTM	American Society for Testing Materials
IPCEA	Insulated Power Cable Engineers Association
NEMA	National Electrical Manufacturers Association
UL	Underwriters Laboratories, Inc.
NFPA	National Fire Protection Association
ETL	Electrical Testing Laboratories

C. For all codes, the edition of the code, or year code, shall be that enforced by the authority having jurisdiction at the time of permit application. The contractor shall verify with the authority having jurisdiction the edition of the code in effect.

1.4 ALTERNATIVES

A. For a complete listing of all alternatives, and requirements related to the alternatives, refer to "Alternatives" described and listed in the specification front end.

B. All work performed on Alternatives shall be in accordance with applicable Trade Sections of the Specifications and Alternative details as shown in Contract Documents.

C. Alternatives contain references to principal trades affected. This reference is for convenience only and is not intended to define the limits of work or Trades involved. It shall be the responsibility of each Bidder to determine to his/her own satisfaction, and for his/her own purpose, the limits and extent of the work affected by the Alternatives, and to make full and proper allowance therefore in the Alternative Bid Amount.

1.5 BARRIER FREE DESIGN

A. The Contractor shall revise installation requirements for conforming to the Handicapped Barrier Free regulations. In particular, mounting heights of outlets and accessibility of controls shall be complied with.

1.6 DRAWINGS AND MEASUREMENTS

A. The Drawings show the general arrangement, general design and location of equipment. The Drawings are to be considered diagrammatic and are not intended to be scaled for rough-in measurements, or to serve as shop drawings.

B. Outlets connected by lines show switch control or circuiting only and are not actual runs of conductors. All light and receptacle outlets are lettered and numbered; the letter indicates the panel from which the circuit is to be controlled. All outlets bearing the same letter and number shall be connected to the same circuit.

C. Follow the Drawings in laying out the work, consult Architectural, Structural and Mechanical Construction Documents to become familiar with all conditions affecting the work and verify all spaces in which work will be installed. Field measurements shall be taken, where necessary, for ordering materials and fitting the installation to the building construction.

D. The Drawings are not intended to be scaled for rough-in measurements, or to serve as shop drawings.

E. Where job conditions require reasonable changes in indicated locations or arrangement, such changes shall be made without extra cost to the Contract.

1.7 DOCUMENT REVIEW

A. Before submitting a Proposal, this Contractor shall review the documents (plans, and specifications) of all trades in order to arrive at a clear understanding of the project requirements and the work required. The bidder shall have reviewed the documents to arrive at a clear understanding of the work required and the conditions under which work is to be performed. He/she shall be held to have compared the electrical documents and the documents of other trades to have satisfied himself/herself as to the interfaces and electrical work and materials required to accommodate systems, equipment, devices, etc. furnished or furnished and installed by other trades.

B. Prior to submitting the bid, request clarification, in writing, of any ambiguities, questions, uncertainties, etc. Requests shall be made in writing to the construction manager a minimum of ten (10) days before the bid due date.

C. Requests for material substitutions or for material consideration as an equal shall be made in writing to the construction manager a minimum of ten (10) days before the bid due date.

D. No allowances or extra consideration in behalf of the Contractor will subsequently be allowed

because of error or failure on the part of the Contractor to conform to the requirements described herein.

1.8 MATERIALS LIST

A. Submit a complete list of all materials and equipment and their manufacturers, for approval within two (2) weeks after award of Contract, prior to submittal of shop drawings.

B. Shop drawings will not be reviewed until the materials list has been reviewed and approved by the Architect/Engineer.

1.9 APPROVED MANUFACTURERS

A. Approved manufacturers shall be as indicated herein and in accordance with the requirements of Division 26. All manufacturers shall be subject to the approval of the Engineer. Such approval concerns the manufacturer only and does not, in any way, act to permit any deviation from strict compliance with the requirements of these Specifications.

1.10 ALTERNATE MANUFACTURERS

A. Products and materials for use on this project shall be based on one of the manufacturers listed on plan or specified. Base bid shall be based on using the listed manufacturers only. Alternate manufacturers, if desired shall be indicated in a voluntary alternate to be submitted by the contractor. The Owner reserves the right to reject any alternates.

1.11 MANUFACTURER'S INSTRUCTIONS

A. All operating instructions, service instructions and parts lists, etc., which are shipped with electrical equipment are to be retained and on completion of the work, turned over to the Architect/Engineer for the Owner's use. If this information is not shipped, this Contractor shall obtain said information from the manufacturer at this Contractors cost.

1.12 GRADE OF MATERIALS AND/OR EQUIPMENT

A. Do not purchase any used or second-hand material of any kind for use on this project.

B. All items purchased for this Contract shall be new, unused material and shall be manufacturer's first or specification grade and meet the approval of the Architect/Engineer. No commonly called "competitive" grade wiring devices shall be purchased or installed.

C. In all instances where materials or methods indicate higher quality than the minimum required by codes, the Plans and Specifications shall govern.

D. All equipment of the same or similar systems shall be of the same manufacturer. Receive, handle and move to required locations all materials and equipment for the electrical work.

E. All materials and equipment shall be listed by Underwriter Laboratories, Inc., and shall show their label wherever standards have been established.

1.13 ASSEMBLY OF EQUIPMENT

A. The Contract Drawings and Specifications make mention of numerous items to be purchased and installed and are noted by a manufacturer's name, catalog number, series and/or brief description.

B. The catalog number as mentioned may not be complete to designate all the accessory parts and appurtenances required for the particular use or function.

C. It shall be the responsibility of the Electrical Contractor to provide the equipment complete with all accessories as required for a complete and operable system including all special finishes as indicated.

1.14 USE OF EQUIPMENT

A. The use of any equipment or any part thereof for purposes other than testing, even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, or to be construed to obligate the Owner in any way to accept improper work or defective materials.

B. Owner's lamps shall not be used for temporary lighting except as allowed and directed by Owner. All lighting fixtures shall be equipped with new lamps when project is turned over to the Owner.

1.15 EQUIPMENT CONNECTIONS/ELECTRICAL ARRANGEMENTS

A. This Contractor shall be responsible for final electrical connections to all light fixtures and all equipment provided by this contractor as well as equipment provided by the Owner or other trades and all equipment provided by the Architectural, Mechanical, Elevator and medical equipment trades. This contractor shall also be responsible for the arrangement of electrical equipment installed to serve equipment provided by these trades.

B. Final connections and the arrangement of electrical equipment, boxes, conduit, raceways, disconnects, etc. shall be made in accordance with (when available) equipment shop drawings and rough in measurements furnished by the manufacturer of the particular equipment furnished.

C. Any and all additional connections not shown on plan but called for by the equipment manufacturer's shop drawings or required for the successful operation of the particular equipment furnished shall be installed as part of this contract at no additional charge to the Owner.

D. Prior to installing equipment services (including conduit, wiring, boxes, etc.) or releasing equipment shop drawings for distribution equipment that will serve equipment services, including mechanical, elevator, medical and building equipment, Electrical Contractor shall verify with the specific equipment shop drawings, equipment data sheet and trade (or owner) providing equipment that the proper electric service will be provided and electrical equipment will be properly arranged and ordered in order to service the equipment nameplate rating and equipment requirements not withstanding information indicated on plan or specified. Should it be found that improper service is indicated for the particular piece of equipment, this Contractor shall immediately notify the Owner's Representative or Engineer of the apparent discrepancy in order for verification and clarification. If improper electric service(s) is installed due to failure by the Electrical Contractor to verify equipment requirements, the Electrical Contractor shall remove the installed service and provide the proper service at no additional cost to the owner. The electric service shall include over current protective device, conduit, wire, motor starting, safety switch and/or receptacle as applicable.

1.16 COORDINATION WITH OTHER TRADES

A. Install all work so as to avoid interference with the work of other Trades, including Architectural and Mechanical Trades. This Contractor shall be responsible for removing and relocating any Electrical work which, in the opinion of the Construction Manager or Architect/Engineer, causes interference.

1.17 STRUCTURAL DIFFICULTIES

A. Should any construction conditions prevent the proper installation of panel boards, transformers, switches, conduit, outlet boxes, junction boxes, conductors, lighting fixtures and/or other related equipment at locations shown on Drawings, minor deviations may be permitted as directed by the Construction Manager or Architect/Engineer and made without any additional cost to Owner.

1.18 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. All cutting and patching of finished surfaces, necessary for the installation of electrical work shall be performed by the Trade who installed, or who regularly installs the surface, at the direction of the Construction Manager.

B. All cutting and patching of unfinished surfaces, necessary for the installation of electrical work shall be performed by the Electrical Trades as directed by the Construction Manager.

C. All costs for cutting and patching as required for the installation of electrical work shall be borne by the Electrical Contractor and included in the Electrical Bid.

D. The Electrical Contractor will be held responsible for Coordination with the Construction Manager for sizes and location of all openings, recesses, repairing, etc.

1.19 SETTING DRAWINGS AND TEMPLATES

A. Provide all necessary templates, patterns, etc., for installing work and for the purpose of making adjoining work conform. Furnish setting plans and shop details to other trades as required. Templates, setting plans, etc. shall all be furnished in time to meet all construction schedules.

1.20 ROOF CONDUIT PENETRATIONS

A. Conduits penetrating the roof serving mechanical equipment shall be routed through the roof within the mechanical equipment curb where ever possible. Where a roof penetration portal is provided by the mechanical trades, conduit shall penetrate the roof within the portal. Refer to mechanical documents for roof penetration portals.

B. Where a roof curb or roof penetration portal is not provided by the mechanical trades, the electrical contractor shall furnish a conduit penetration portal to accommodate the routing of electrical conduit(s). Roof penetration portal shall be furnished to the architectural trades for installation but the cost of same shall be included in the electrical bid.

1.21 PROTECTION, HANDLING AND CLEANING

A. Responsibility for care and protection of electrical work including assigned equipment rests with Electrical Trades until the installation has been accepted.

B. After delivery, before and after installation, protect equipment and materials against dampness, theft, injury or damage from all causes.

C. Protect lighting fixtures and other equipment with finished enamel or glazed surfaces from damage by covering as approved or directed by the Construction Manager.

D. Protect equipment outlets, conduit openings, etc., with temporary plugs or caps.

E. Provide adequate storage space for all electrical equipment conduit and materials delivered to the job site under a weather protected enclosure. Location of the space will be designed by the General Contractor. Equipment set in place in unprotected areas must be provided with temporary protection.

F. Receive, properly house, handle, hoist, and deliver to proper location, equipment and other material required under Division 16, including "Owner Furnished" equipment.

G. Be responsible for keeping the premises free from accumulations of waste materials and rubbish. At completion of work, remove all rubbish from and about the building and leave the electrical systems and equipment clean and ready for use, including lighting fixtures, panels, fire alarm equipment, etc. Clean and flush the interior of all conduits and accessible equipment of all mud, debris, oils, welding slag, loose mill scale and other extraneous material.

1.22 AS-BUILT DRAWINGS

A. After completion of the work, provide a complete set of "As-Built" drawings to the Architect.

Show the exact locations of all buried services both inside and outside of the building, with dimensions given from fixed reference points. "As-Built" drawings shall be kept up to date as the job progresses and shall be kept at the job site for inspection at any time by the Architect's Field Representative.

1.23 PARTS RECEIPT

A. Retain all portable and detachable portions of the installations such as keys, tools, manuals, etc., until the completion of the work and turn them over to the Owner and obtain itemized receipt. This receipt shall be attached to the "Final Application" for payment.

1.24 TEMPORARY FACILITIES

A. Refer to the appropriate Section of the Architectural Specifications for Temporary Facilities.

B. Provide 120/240 volt or 120/208 volt, single phase, 3 wire service and branch wiring per OSHA Lighting Standard, Subpart D, Rule 1926.56 (a) and (b) for 120 volt lighting and small tool power outlets throughout the area of construction. General lighting shall consist of 150 watt (minimum) lamps in weatherproof sockets and safety type power outlets consisting of 120 volt, pendant type cord connectors for fractional horsepower electrical tools shall be install as directed.

C. 120 volt power outlets shall be located such that no point in the area of construction is over 50 feet from an outlet. 240 volt power outlets shall be located at each end of the building at grade level.

D. One (1) 60 Amp., 240 or 208 volt power outlet shall be provided at four (4) places, located as required for larger construction tools or as directed by the Construction Manager.

E. All rooms, as they become enclosed and usable, shall have temporary lighting and power installed. All lamp holders and cords shall be constructed as approved by OSHA Standard and lighting units shall be "Plas-Socket" P660W/111.

F. Provide maintenance service for temporary power and lighting facilities including lamps, during regular working hours. Any additional maintenance serviced required during overtime work, on Saturdays, Sundays or holidays shall be arranged for and paid for by the Contractors requiring the facilities.

G. If any Contractor requires additional extension, he shall furnish his/her own portable cords, lamps and connectors from the above locations in order to properly complete his/her work.

H. Building panel boards may be used for construction power, use of permanent building switches or circuit breakers shall not exceed their capacity for any power tools.

I. Complete installation shall be in compliance with all applicable codes.

J. All temporary 120 volt, 1 phase receptacles (15A. and 20A.) shall be protected by a ground fault circuit interrupter (GFCI).

1.25 INTERRUPTION OF THE PRESENT SYSTEMS

A. When an interruption of any existing service, system or equipment is required to facilitate electrical work or revisions to existing systems, this Electrical Contractor shall notify the Construction Manager in writing, a minimum of fourteen (14) days prior to the planned interruption.

B. Receive the Construction Managers/Owners permission prior to the actual scheduling of the interruption.

C. Provide temporary wiring and equipment services where required to maintain the operation of the Owners equipment and operations, include all costs for same in the Electrical bid.

D. Following the restoration of service or equipment operation, the Electrical Contractor shall be responsible for resetting all time clocks, restarting all motors as required and assisting the Owner with restoring normal operations. Employ the services of other Trades and Utility Companies where required and include all costs for same in the Electrical bid.

1.26 WORK AND CHANGES IN PRESENT BUILDING

A. Provide all labor, materials and supervision required to complete all demolition, alterations or modifications of existing electrical work necessary to complete the work as indicated on the Drawings and specified herein.

B. The Electrical Contractor shall direct such miscellaneous cutting and patching of the existing building construction as made necessary by the installation of his work, same to be accomplished under the direction and supervision of the Architect.

C. The cutting of holes through the existing building construction shall only be done by the use of abrasive saws and a rotary coring machine similar to Molco Drilling Machines, Inc. The use of hammer and drill points will not be permitted. The openings shall not be cut larger than necessary for the installation of the electrical services. All openings shall then be grouted in. Where present piping, etc., is removed, the unused openings shall be grouted in.

D. The drilling or punching of structural members, such as holes through beams or columns, shall not be done without the specific permission of the Architect. Burning of holes through columns is not acceptable.

E. Cutting of holes through floors and walls shall be done only at such locations as may be agreed upon between the Contractor and the Architect.

F. The Electrical Contractor shall cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.

G. Materials salvaged from this work shall not be reused except where reuse is specifically indicated.

H. The installation of all steel conduit in finished areas shall be concealed in walls and above ceiling. Where the project Architect and/or Engineer agrees that the installation of concealed conduit is not possible due to the existing building construction a finished surface mounted raceway "Wiremold" (or approved equal) shall be installed. Surface raceways shall be installed perpendicular to and/or parallel to walls and ceilings. Finished surface raceways shall, where possible, be ran low on the wall. Where this is not possible due to door openings, mechanical units and air conditioning units, the surface raceway shall be installed on the wall at the intersection of the ceiling and wall.

I. It is the intention of this specification that exposed steel conduit not be used in any finished area but rather the steel conduit be concealed, where this is not possible, a finished surface mounted raceway "Wiremold" (or approved equal) be installed as inconspicuously as possible.

J. Prior to the installation of any finished surface mounted raceway "Wiremold" (or approved equal) the routing shall be reviewed with and approved by the project Architect. Failure to gain such approval will cause the Electrical Contractor, at his own expense, to remove and reinstall the finished raceway as directed by the project Architect.

K. All conduit installed in unfinished areas without ceilings shall be run exposed, parallel or perpendicular to walls, etc., as noted above. Ceiling drops for outlets, switches, etc., shall be run concealed in the wall construction and enter the wall as high as possible.

L. As previously mentioned, Bidders are expected to visit the premises and thoroughly check for themselves any and all existing conditions in any manner affecting the work covered by these Specifications and the accompanying Drawings.

M. Any and all electrical work which may interfere with changes in, or be necessitated by the installation of new apparatus, piping, ducts or other mechanical equipment, as well as conduits and outlets that may be uncovered by the cutting of new openings in present building, shall be removed at the direction of the Engineer.

N. The electrical work and revisions in the existing building shall be as indicated on the Plans, but shall not be limited to the same, as the work shall be complete in all details and requirements and ready for proper operation.

O. Installation of all electrical equipment shall be correlated with the installation of mechanical ducts, units, piping, etc., and adjustments in locations shall be made to suit all field conditions. Disconnect, remove or relocate present equipment, outlets, fixtures, etc., as indicated on the Plans, as herein specified or as required to conform to the Mechanical, Electrical and Architectural revisions.

P. Removed conduit, wire, receptacles, toggle switches, etc., shall not be reused, shall become the property of this Contractor and he shall remove same from the premises. Where re-wiring or recircuiting is indicated or required, the old wire shall be pulled out and new wire used.

Q. Present fixtures removed and not reused shall be disposed of away from the site.

R. Where equipment or fixtures are removed, outlets shall be properly blanked off, and conduits capped. After alterations are done, the entire installation shall present a "finished" look, as approved by the Architect.

S. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or shown on the Plans.

T. Any disruptive work, such as saw-cutting or power disruptions shall be completed during non-school hours.

1.27 TESTING, ACCEPTANCES AND GUARANTEE

A. When the systems are completed, the Contractor shall operate equipment as directed by Architect/Engineer/Inspector. Replace all faulty equipment and make necessary adjustments before final acceptance. Upon final acceptance of work, the Contractor shall give the Construction Manager a written guarantee that he will make good, at his/her own expense, any defects in materials or workmanship which develop within one (1) year from date of final acceptance.

B. Tests shall include all installed equipment.

C. Refer to Section 26 94 00 Electrical Acceptance Testing for additional requirements.

D. Occupancy will not be granted until such tests are made to the satisfaction of the project engineer and local inspection authority.

E. Provide four (4) complete operating instructions, operating manuals and repair parts list for the Owner's personnel. Instruct Owner's personnel in the operation of all systems.

F. Each receptacle shall be checked for polarity, opens, grounds, etc., using an approved receptacle tester, Hubbell #5200 or equal. Provide a letter to the Engineer stating that all equipment has been tested and adjusted properly.

G. Perform all tests required by Owner, state, city, county and/or other agencies having jurisdiction.

H. Provide all materials, equipment etc., and labor required for the tests.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 260500

SECTION 31 05 13 - SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

1.2 UNIT PRICES - MEASUREMENT AND PAYMENT

A. Subsoil:
   1. Basis of Payment: Includes excavating existing subsoil, supplying subsoil materials, stockpiling shall be included in the Lump Sum amount for the Building Expansion.

B. Topsoil:
   1. Basis of Payment: Includes excavating existing topsoil, supplying topsoil materials, stockpiling shall be included in the Lump Sum amount for the Building Expansion.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit, in air-tight containers, 10 lb sample of each type of soils to be utilized for fill to testing laboratory.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products to meet or exceed specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable designsubmittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable designrequirements.
   1. Materials Resources Certificates:
      a. Certify source for local and regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Local and regional products.

1.6 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work.

B. Sustainable Design Requirements:
   1. Regional Materials: Furnish materials extracted, processed, and manufactured within 100miles of Project site.

C. Perform Work in accordance with the Michigan Department of Transportation Standard Specifications for Construction.

D. Maintain one copy on site.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Subsoil shall be free of all organic materials in excess of three (3%) percent loss by ignition, peat, muck, marl, blue and grey clays.

B. Imported Subsoil or Salvaged Materials.
   1. Excavated and re-used material, imported borrow and select or local borrow shall meet Section 2.1.A.
   2. Grading shall be within 0.10 feet of proposed line and grade.
   3. Free of lumps larger than 3 inches, rocks larger than 2 inches and debris.

2.2 TOPSOIL MATERIALS

A. Topsoil Furnished and Applied.
   1. Imported borrow.
   2. Friable loam.

3. Reasonably free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreignmatter.
   a. Screening: Double screened.
4. Acidity range (pH) of 5.5 to 7.5.
5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.
6. Conforming to ASTM D2487 Group Symbol.
7. Limit decaying matter to 5 percent of total content by volume.

2.3 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services Testing and analysis ofsoil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D1557 and AASHTO T180.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D1557 and AASHTO T180.

D. When tests indicate materials do not meet specified requirements, change material and retest.

E. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials subsoil and topsoil not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materialsfrom site.

3.2 STOCKPILING

A. Stockpile materials on site at locations designated by Owner.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Prevent intermixing of soil types or contamination.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

F. Stockpile unsuitable and hazardous materials on impervious material and cover to prevent erosionand leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent freestanding surface water.

END OF SECTION 31 05 13

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Stripping and stockpiling rock.
6. Removing above- and below-grade site improvements.
7. Disconnecting, capping or sealing, and removing site utilities.
8. Temporary erosion and sedimentation control.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

1.2 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Topsoil stripping and stockpiling program.

C. Rock stockpiling program.

D. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

E. Burning: Documentation of compliance with burning requirements and permitting of authorities having jurisdiction. Identify location(s) and conditions under which burning will be performed.

1.6 QUALITY ASSURANCE

A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

B. Rock Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as directed by the Owner or the Owner’s representative.

D. Utility Locator Service: Notify MISS DIG before site clearing.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

F. Tree- and Plant-Protection Zones: Protect according to requirements in Section 015639 "Temporary Tree and Plant Protection."

G. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #23 (surface-tolerant, anticorrosive metal primer)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been identified.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site not marked for removal.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or

abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than (2) two working days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods or air spade for grubbing within protection zones.
4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth required for proposed pavement section placement in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots,

and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 STOCKPILING ROCK

A. Remove from construction area naturally formed rocks that measure more than 1 foot across in least dimension. Do not include excavated or crushed rock.

1. Separate or wash off non-rock materials from rocks, including soil, clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

B. Stockpile rock away from edge of excavations without intermixing with other materials. Cover to prevent windblown debris from accumulating among rocks.

1. Limit height of rock stockpiles to 36 inches.
2. Do not stockpile rock within protection zones.
3. Dispose of surplus rock. Surplus rock is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus rock to allow later use by the Owner.

3.8 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's

property.

B. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. Burning of other waste and debris is prohibited.

C. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks, pavements, turf and grasses.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 310513 “Soils for Earthwork” for subsoil and topsoil materials.
3. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines

and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock:

1. Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

    a. Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch- maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
    b. Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.

2. Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D1586.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.
c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.
d. Extent of trenching by hand or with air spade.
e. Field quality control.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches.
2. Warning Tape: 12 inches long; of each color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify Miss Dig for area where Project is located before beginning earth-moving operations.

D. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in Section 311000 "Site Clearing" are in place.

E. The following practices are prohibited within areas outside the construction impact area:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soils as identified in Section 310513 “Soils for Earthwork”.

C. Unsatisfactory Soils: Those not meeting the requirements of Section 310513 “Soils for Earthwork”.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Michigan Department of Transportation Class III or Class IIIa granular material.

E. Base Course: As identified in Section 321123 “Aggregate Base Course”.

F. Engineered Fill: Michigan Department of Transportation Class II granular material.

G. Bedding Course: Subbase Material: Michigan Department of Transportation granular or aggregate material as indicated on the plans.

H. Sand: Michigan Department of Transportation Class II granular material.

I. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Provide geotextiles of the type indicated on the plans in accordance with Section 910 of the Michigan Department of Transportation Standard Specifications for Construction, 2020 edition.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, flowable concrete material produced from the following:

1. Portland Cement: ASTM C150/C150M, Type I or Type II.
2. Fly Ash: ASTM C618, Class C or F.
3. Normal-Weight Aggregate: ASTM C33/C33M, 3/4-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C869/C869M.
5. Water: ASTM C94/C94M.
6. Air-Entraining Admixture: ASTM C260/C260M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

A. Explosives:

1. Do not use explosives.
2. Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.

a. Perform blasting without damaging adjacent structures, property, or site improvements.
b. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

    a. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
    b. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
    c. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
    d. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

2. Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

    a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of granular material, to a height of 12 inches over the pipe or conduit.

    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

2. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
2. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent (under concrete) or 98 percent (under hot-mix asphalt) of maximum dry unit weight according to ASTM D698.

3.18 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material classification and maximum lift thickness comply with requirements.
3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished

surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 31 22 13 - ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, compacting, and site balance the site for structures, building pads, and associated parking lots, walks, landscape areas and associatedimprovements.

1.2 MEASUREMENT AND PAYMENT

A. Topsoil Furnished and Applied:

All work required by this specification shall be included in the lump sum bid amount for the Building Expansion.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Manufacturer's Certificate: Certify Products that will meet or exceed the specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable designsubmittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable designrequirements.
   1. Materials Resources Certificates:
      a. Certify recycled material content for recycled content products.
      b. Certify source for local and regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Products with recycled material content.
      b. Local and regional products.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136.

B. Sustainable Design Requirements:
   1. Recycled Content Materials: Furnish materials with recycled content including:

Material	Minimum Recycled Content (Percent)	
	Post Consumer	Pre Consumer
Pulverized Aggregate Base	100%	100%

   2. Regional Materials: Furnish materials extracted, processed, and manufactured within 100miles of the Project site.

C. Perform Work in accordance with State, County, and Local standards.

D. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: Furnish and applied as specified in Section 31 05 13.

B. Subsoil Fill: Granular Material, Class III as specified in Section 31 05 13.

C. Structural Fill: Granular Material, Class II as specified in Section 31 05 13 and 31 05 16.

D. Granular Fill: Granular Material, Class II as specified in Section 31 05 16

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Local Utility Line Information service at 1-800-MISS-DIG 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.

C. Notify utility company to remove and relocate utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns, and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, andcurbs from excavating equipment and vehicular traffic.

3.3 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded without mixingwith foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site and protect from erosion. Stockpile unsuitable or hazardous material on impervious material 36 mil Hypalon material and cover over with same material, until disposal.

D. Remove excess topsoil not intended for reuse, from site.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regarded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisturecontent.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Benching Slopes: Horizontally bench existing slopes greater than 1: 4 to key placed fill material to slope to provide firm bearing.

F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Place material in continuous layers as follows:
   1. Subsoil Fill: Maximum 12 inches compacted depth.
   2. Structural Fill: Maximum 12 inches compacted depth.
   3. Granular Fill: Maximum 12 inches compacted depth.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless noted otherwise.

E. Make grade changes gradual. Blend slope into level areas.

F. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements:Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557 or AASHTO T180.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556, ASTM D2167.

2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: 1 test per 100 square feet of each foot lift of material being placed.

END OF SECTION 31 22 13

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Backfilling building perimeter to subgrade elevations.
   2. Backfilling site structures to subgrade elevations.
   3. Fill under slabs-on-grade.
   4. Fill under paving.
   5. Fill for over-excavation.

1.2 MEASUREMENT AND PAYMENT

All work required by this specification shall be included in the lump sum bid amount for the Building Expansion.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for geotextile fabric indicating fabric and construction.

C. Samples: Submit, in air-tight containers, 10 lb sample of each type of proposed fill to be utilized on the project to the testing laboratory.

D. Materials Source: Submit name of imported fill materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
   1. Materials Resources Certificates:
      a. Certify source and origin for salvaged and reused products.
      b. Certify recycled material content for recycled content products.
      c. Certify source for local and regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Salvaged products.
      b. Reused products.
      c. Products with recycled material content.
      d. Local and regional products.

1.6 QUALITY ASSURANCE

A. Sustainable Design Requirements:
   1. Recycled Content Materials: Furnish materials with recycled content.

B. Perform Work in accordance with State, County, and Local standards.

C. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: Granular Material, Class III as specified in Michigan Department of Transportation Standard Specifications for Construction, Current Edition.

B. Structural Fill: Granular Material, Class II as specified in Michigan Department of Transportation Standard Specifications for Construction, Current Edition..

C. Granular Fill: Class II as specified in the Michigan Department of Transportation Standard Specifications for Construction, Current Edition.

D. Concrete: Structural concrete as specified in Section 03 30 00 with compressive strength of 3,500 psi as 28 day strength.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, non-woven.
   1. Alkzo Nobel Geosynthetic Co.
   2. Huesker, Inc.

3. TC Mirafi
4. Tenax Corp.
5. Tensar Earth Technologies, Inc.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 8 inch.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen 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 where indicated within the Contract Drawings.

D. Place fill material in continuous layers and compact to a minimum of 95% of maximum density utilizing ASTM D-1557.

E. Employ placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

I. Slope grade away from building minimum 2 percent slope for minimum distance of 10 ft, unless

noted otherwise.

J. Make gradual grade changes. Blend slope into level areas.

K. Remove surplus backfill materials from site.

L. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling within Building Areas: Plus or minus 0.10 feet with the summary of plus and minus equalization zero from required elevations.

C. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements:Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557 or AASHTO T180.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D1556.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Tests: One test per one foot lift per 100 square feet of area.

F. Proof roll compacted fill surfaces under slabs-on-grade, pavers, paving, and sidewalks.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION 31 23 23

SECTION 31 25 13 - EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Diversion Channels.
   2. Rock Energy Dissipator.
   3. Paved Energy Dissipator.
   4. Rock Basin.
   5. Rock Barriers.
   6. Sediment Ponds.
   7. Sediment Traps.

1.2 MEASUREMENT AND PAYMENT

All costs incurred with installation, maintenance and removal upon final restoration shall be included in the lump sum bid amount for the Building Expansion.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
   1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:
   1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on joint filler joint sealer admixtures curing compounds and geotextile.

C. Submit proposed mix design for review prior to commencement of Work.

D. Samples:
   1. Submit two samples or rock, minimum 5 tons each or one half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide other sample at quarry. Construction site sample may be incorporated into the Work. Samples will be used as reference for judging size, and graduation of rock supplied and placed.

E. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

F. Manufacturer's Certificate: Certify Products meet or exceed the specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable designsubmittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable designrequirements.
   1. Materials Resources Certificates:
      a. Certify recycled material content for recycled content products.
      b. Certify source for local and regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Products with recycled material content.
      b. Local and regional products.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of the Michigan Department of Transportation Standard Specifications for Construction, Current Edition.

B. Sustainable Design Requirements:
   1. Recycled Content Materials: Furnish materials with recycled content.

2. Regional Materials: Furnish materials extracted, processed, and manufactured within 100miles of Project site.

C. Perform Work in accordance with State, County, and Local standards.

D. Maintain one copy of each document on site.

1.8 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place grout when air temperature is below freezing.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wetor frozen.

PART 2 PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials in accordance with State, County and Local standards.

B. Geotextile Fabric: As specified in Section 31 37 00.

2.2 CONCRETE MATERIALS AND REINFORCEMENT

A. Cement: MDOT Type 35P as specified in Section 03 30 00 Furnish in accordance with MDOT Standard Specifications for Construction, Current Edition.

B. Fine and Coarse Aggregates as specified in Section 03 30 00

C. Lightweight Aggregate: MDOT 5G as specified in Section 03 30 00 Furnish in accordance with Michigan Department of Transportation’s Standard Specifications for Construction, Current Edition.

D. Water: Clean and not detrimental to concrete.

E. Aggregate, Sand, Water, Admixtures - Precast: Determined by precast fabricator, as appropriateto design requirements and PCI MNL-116S.

F. Reinforcement Steel shall be as indicated on the Construction Drawings.

G. Welded Steel Wire Fabric shall be as indicated on the Construction Drawings.

2.3 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specifiedrequirements and materials indicated on the Contract Drawings.

C. Test samples in accordance with ACI 301.

D. Make materials available for inspection at producer's point of production prior to shipment. Notify Owner at least seven days before inspection is allowed.

E. Allow witnessing of inspections and test at manufacturer's test facility. Notify Owner at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade granular base and stabilized soil is acceptable and ready to supportdevices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in Section 32 92 19.

D. Mulch seeded areas with hay as specified in Section 32 92 19.

3.3 ROCK ENERGY DISSIPATOR

A. Excavate to indicated depth of rock lining or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope Provide aminimum overlap of 3 feet. Offset adjacent roll ends a minimum of 2 feet when lapped. Cover

fabric as soon as possible and in no case leave fabric exposed more than 4 weeks. Fabric shall be pegged into position with wooden stakes for all slopes that exceed one foot vertical for two feet horizontal.

C. Carefully place rock on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile.

D. Unless indicated otherwise, place full course thickness in one operation to prevent segregationand to avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

3.4 PAVED ENERGY DISSIPATOR

A. Excavate to required paving depth. Remove loose, unsuitable material below bottom of paving, then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Place forms and reinforcement in accordance with Section 32 13 13. Hold reinforcement firmly in position during placing of concrete.

C. Mix, place, finish, and cure concrete, as specified in Section 32 13 13.

D. Embed stones or blocks 4 inches in plastic concrete at indicated separation on slopes and channelbottom.

E. Pave in uniform 10 foot lengths or sections.

F. Pave in shorter sections as necessary for closures or curves.

G. Place premolded expansion joint filler, 1/2 inch thick, cut to conform to paving cross sections, at ends of curved sections at intervals of not more than 50 feet, at end of day’s work, and where paving is adjacent to rigid structure. Use joint filler with depth of 1/2 inch less than paving depth and press firmly against adjacent concrete.

H. Form intermediate joints between sections, with two thicknesses of bituminous paper cut neatly to paving cross section.

I. Seal joint top with joint sealer.

3.5 ROCK BASIN

A. Construct generally in accordance with rock energy dissipator requirements to indicated shape and depth. Rock courses may be placed in several operations but minimum depth of initial coursemust be 1 foot or greater.

3.6 ROCK BARRIER

A. Determine length required for ditch or depression slope and excavate, compact and foundationarea to firm, even surface.

B. Produce an even distribution of rock pieces, with minimum voids to the indicated shape, height and slope.

C. Construct coarse aggregate filter blanket against upstream face of rock barrier to the indicatedthickness.

3.7 SEDIMENTATION POND

A. Clear and grub storage area and embankment foundation area site as specified in Section31 10 00.

B. Excavate key trench for full length of dam. Excavate emergency spillway in natural ground.

C. Install pipe spillway, with anti-seep collar attached, at location indicated.

D. Place forms, and reinforcing for concrete footing at bottom of riser pipe [with trash rack and anti-vortex device], as specified in Section 03 10 00, and Section 03 20 00. Construction of embankment and trench prior to placing pipe is not required.

E. Mix, place, finish, and cure concrete, as specified in Section 03 30 00.

F. Do not use coarse aggregate as backfill material around pipe. Backfill pipe with suitable embankment material to prevent dam leakage along pipe.

G. Construct rock basin at outlet end of pipe, as specified in this Section. Place embankmentmaterial, as specified in Section 31 23 23. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 23.

H. On entire sedimentation pond area, apply soil supplements and sow seed as specified in Section32 92 19.

I. Mulch seeded areas with hay as specified in Section 32 92 19.

3.8 SEDIMENT TRAPS

A. Clear site, as specified in Section 31 10 00.

B. Construct trap by excavating and forming embankments as specified in Section 31 23 16, andSection 31 23 23.

C. Place coarse aggregate or rock at outlet as indicated on Drawings.

D. Place geotextile fabric, as specified for rock energy dissipator.

E. When required, obtain borrow excavation for formation of embankment, as specified in Section 31 23 16.

F. On entire sediment trap area, apply soil supplements and sow seed as specified in Section32 92 19.

G. Mulch seeded areas with hay as specified in Section 32 92 19.

3.9 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliestpracticable time.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 15 feet. Slope stockpile sides at 2: 1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased andwhich will remain exposed for more than 15 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 at 50 percent of permanent application rate with no topsoil.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.

E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.10 FIELD QUALITY CONTROL

A. Sections 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements:Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessaryrepairs to ensure erosion and sediment controls are in good working order.

C. Field test concrete in accordance with Section 03 30 00.

D. Compaction Testing: In accordance with ASTM D1557 and AASHTO T180.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

F. Frequency of Compaction Testing: One test per 100 square feet of area for each twelve inch lift.

3.11 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth ofsediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.12 PROTECTION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finishedWork.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit construction traffic over paving for 7 days minimum after finishing until 75 percent design strength of concrete has been achieved.

D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION 31 25 13

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate subbase.
   2. Aggregate base course.

1.2 MEASUREMENT AND PAYMENT

All work required under this specification shall be included in the lump sum bid amount for the Building Expansion.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   6. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
   7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for geotextile fabric and herbicide.

C. Samples: Submit, in air-tight containers, 10 lb sample of each type of aggregate fill to testing laboratory.

D. Materials Source: Submit name of aggregate materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable designsubmittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable designrequirements.
   1. Materials Resources Certificates:
      a. Certify source and origin for salvaged and reused products.
      b. Certify recycled material content for recycled content products.
      c. Certify source for local and regional materials and distance from Project site.

C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Salvaged products.
      b. Reused products.
      c. Products with recycled material content.
      d. Local and regional products.

1.6 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

A. Subbase Aggregate: ASTM D2940; graded type per Contract Drawings.

2.2 ACCESSORIES

A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate with 7-to-10-ton roller in minimum two perpendicular passes to identify soft spots.
   2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Install geotextile fabric over subgrade in accordance with manufacturer's instructions.
   1. Lap ends and edges minimum 6 inches.
   2. Anchor fabric to subgrade when required to prevent displacement until aggregate is installed.

B. Spread aggregate over prepared substrate to total compacted thickness indicated on Drawings.

C. Place aggregate equal thickness layers to total compacted thickness indicated on Drawings.
   1. Maximum Layer Compacted Thickness: 6 inches.

D. Roller compact aggregate to 97 percent maximum density indicated on Drawings.

E. Level and contour surfaces to elevations, profiles, and gradients indicated.

F. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

G. Maintain optimum moisture content of fill materials to attain specified compaction density.

H. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/4 inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements 01 70 00 - Execution and Closeout Requirements: Fieldinspecting, testing, adjusting, and balancing.

B. Compaction testing will be performed in accordance with ASTM D1557 Modified Proctor.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: One test for every 1000 square yards of each layer compacted aggregate.

END OF SECTION 32 11 23

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Concrete pavement joint sealants.
2. Joint-sealant backer materials.

B. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For Installer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Performed by a qualified testing agency.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.3 COLD-APPLIED JOINT SEALANTS

A. In accordance with the 2020 Michigan Department of Transportation Standard Specifications for Construction.

2.4 HOT-APPLIED JOINT SEALANTS

1. In accordance with the 2020 Michigan Department of Transportation Standard

Specifications for Construction.

2.5 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or

prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If,

despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

END OF SECTION 32 13 73

SECTION 32 20 00 - CONCRETE SIDEWALK, RAMPS AND STEPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This work shall consist of constructing portland cement concrete sidewalks, sidewalk ramps and steps on a prepared base as shown on the plans or as authorized. Backfilling will be considered part of the work, unless otherwise provided.

PART 2 – PRODUCTS

2.1 MATERIALS

A. The materials shall conform to the following 2020 Michigan Department of Transportation Standard Specifications for Construction, Section 803.02.

Sound Earth…….	205
Concrete, Grade P2, P1……..…….	601
Concrete, Grade S3, S2……	701
Granular Material Class II……	902
Curing Compound……..……	903
Steel Reinforcement……..	905
Joint Fillers……..	914

PART 3 – EXECUTION

3.1 CONSTRUCTION METHODS

A. This work of constructing Concrete Sidewalks, Sidewalk Ramps and Steps of the size and kind specified shall include excavation and backfilling and shall conform to the 2020 Michigan Department of Transportation Specification Section 803 Concrete Sidewalks, Sidewalk Ramps and Steps.

B. Concrete sidewalks with integral curb shall be constructed in accordance with Michigan Department of Transportation 2020 Standard Specifications for Construction Section 803 and as specified herein.

SECTION 32 84 00 – PLANTING IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
1. Landscape irrigation systems.
2. Irrigation controllers and accessories.

1.2 DEFINITIONS

A. Definitions pertaining to sustainable development: As defined in ASTM E2114 and as specified herein.

B. Controllers, Climate-based: Weather-based irrigation controls that use real-time or historical weather information along with landscape parameters entered by the vendor to schedule or allow for irrigation when plants need water.

C. Controllers, Sensor-based: Soil-moisture-based irrigation controls that are inserted into the soil to measure moisture enabling irrigation when the plants need water.

D. Rain Sensors: A rain shut-off device designed to interrupt a scheduled cycle of an automatic irrigation system controller (i.e. timer) when a certain amount of rainfall has occurred.

1.3 SUBMITTALS

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:
1. Recycled Content:
a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
b. Indicate relative dollar value of recycled content product to total dollar value of product included in project.
c. If recycled content product is part of an assembly, indicate the percentage of recycled content product in the assembly by weight.
d. If recycled content product is part of an assembly, indicate relative dollar value of recycled content product to total dollar value of assembly.

2. Local/Regional Materials:
a. Sourcing location(s): Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.
b. Manufacturing location(s): Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
c. Product Value: Indicate dollar value of product containing local/regional materials; include materials cost only.
d. Product Component(s) Value: Where product components are sourced or manufactured in separate locations, provide location information for each component. Indicate the percentage by weight of each component per unit of product.

3. Water efficiency:
a. Indicate water consumption rates in gallons per day (gpd) per unit for the following:
1) Irrigation Systems.
b. Water Budget: Submit water budget statement; include calculations used in development of water budget and, indicate how irrigation system complies with approved water budget.

B. Submit environmental data in accordance with Table 1 of ASTM E2129 for products provided under work of this Section.

C. Submit evidence of installer certification as a WaterSense Certified Irrigation Contractor.

1.4 QUALITY ASSURANCE

A. Water flow and consumption rates:
   1. Water Budget: Provide irrigation system in accordance with approved water budget for landscape.
      a. Water schedule: Provide two irrigation watering schedules consistent with overall project Water Budget. One schedule shall address the initial establishment phase of the landscape and the second schedule shall be designed to address an established landscape. Both schedules shall be seasonal in nature. Post both schedules on controller.
   2. Provide WaterSense labeled products for:
      a. Irrigation controls.

B. Installer Qualifications: Engage an experienced Installer with minimum 3 years experience with work similar in material, design, and extent to that indicated for this Project and certified as a Certified Irrigation Contractor (CIC)

C. Pre-Installation Meetings:
   1. Convene a pre-installation meeting minimum one week prior to commencing work of this Section.
   2. Require attendance of parties directly affecting Work of this Section.
      a. Coordinate with installation of planting materials.
   3. Review conditions of operations, procedures and coordination with related Work.
   4. Agenda:
      a. Tour, inspect, and discuss conditions of planting materials.
      b. Review planting schedule and maintenance.
      c. Review required inspections.
      d. Review environmental procedures.

D. Post-Installation Audit: Conduct an audit of the irrigation system after one year of operation by a Irrigation Partner.
   1. Performance: Assess system performance; verify proper scheduling; identify deficiencies including deficiencies due to damage or modification of system, growth of landscape, or an aging system; identify opportunities to employ new technologies
   2. Review maintenance documentation.
   3. Leaks: Check for leaks during the post-installation audit.
   4. Runoff/overspray: Irrigation systems shall be designed to sustain the landscape without creating runoff or direct overspray during a minimum operating duration. Verify that there is no runoff or overspray during the post-installation audit. Determine the minimum operating duration based on landscape conditions and irrigation system design.
   5. Distribution uniformity: Irrigation systems shall achieve a lower quarter distribution uniformity (DULQ) of 70 % or greater. Measure distribution uniformity during the post-installation audit.

E. Operation and Maintenance Manuals Submittals:
   1. Instructions indicating procedures for routine operation and maintenance of the irrigation system, including controllers:
      a. During first year of plant establishment.
      b. During one typical year including variations of maintenance for climatic conditions throughout the year.

1.4 MAINTENANCE

A. Provide regular maintenance for minimum one year from date of Substantial Completion
   1.

PART 2 - PRODUCTS

2.1 WATER

A. Water: [Potable]

2.2 IRRIGATION SYSTEMS

A. Micro-irrigation system: Equip with pressure regulators, filters, and flush end assemblies. Provide one of the following:
1. Micro-spray jets
2. Micro-sprinklers.

2.3 CONTROLLERS

A. Irrigation systems shall be equipped with irrigation controllers that contain the following features:
1. Multiple programming capabilities – shall be capable of storing a minimum of three different programs to allow for separate schedules.
2. Multiple start times (cycling, cycle/soak, stackable start times) – shall be capable of a minimum of three different start times to allow for multiple irrigation cycles on the same zone for areas prone to runoff.
3. Variable run times – shall be capable of varying run times, for example one minute to a minimum of one hour.
4. Variable scheduling – shall be capable of interval scheduling (minimum of 14 days) to allow for watering on even day scheduling, odd day scheduling, calendar day scheduling, and interval scheduling.
5. Percent adjust (water budget) feature – shall include a “Percent Up/Down Adjust” feature (or “Water Budget” feature) such as a button or dial that permits the user to increase or decrease the run-times or application rates for each zone by a prescribed percentage, by means of one adjustment without modifying the settings for that individual zone.
6. Capability to accept external soil moisture and/or rain sensors.
7. Non-volatile memory or self-charging battery circuit.
8. Complete shutoff capability for total cessation of outdoor irrigation.

B. Smart Water Application Technologies (SWAT): Provide controllers that comply with the most current definitions and testing protocols published by SWAT for:
1. Controllers, Climate-based

C. Rain Sensors: Equip irrigation systems with rain sensors.

PART 3 - EXECUTION

3.1 PREPARATION

3.X FIELD QUALITY CONTROL

A.
1. Assess potential effects of soil management practices on soil loss in accordance with ASTM D6629. Assess erodibility of soil with dominant soil structure less than 7 to 8 cm in accordance with ASTM D5852.

END OF SECTION 32 84 00

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Plugging.
5. Sprigging.
6. Turf renovation.
7. Erosion-control materials.

1.2 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 NFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
3. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Lawn Care Manager.
    c. Landscape Industry Certified Lawn Care Technician.

4. Pesticide Applicator: State licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly.

Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods, or as directed by the Architect. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.

1. Spring Planting: April 15-May 30.
2. Fall Planting: September 1-October 10.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Provide seed mixture THM in accordance with Michigan Department of Transportation Standard Specification Section 816.

2.2 FERTILIZERS

A. Provide Class A Fertilizer in accordance with Michigan Department of Transportation Standard Specification Section 816.

2.3 MULCHES

A. Provide Mulch in accordance with Michigan Department of Transportation Standard Specification Section 816.

B. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

D. Asphalt Emulsion: ASTM D977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.4 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

C. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 3-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint

washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 816 of the 2020 Michigan Department of Transportation Standard Specifications for Construction.

B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in Section 208 of the 2020 Michigan Department of Transportation Standard Specifications for Construction.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine in accordance with Section 816 of the 2020 Michigan Department of Transportation Standard Specifications for Construction. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 220 lbs/acre.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.

F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch in accordance with Section 816 of the 2020 Michigan Department of Transportation Standard Specifications for Construction.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch

(hydromulching) at a rate of 1000 lb/acre.

3.7 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.8 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow to a height of 1-1/2 to 2 inches.

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

3.9 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.10 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.11 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved

areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 32 92 00

SECTION 32 92 20 TOPSOIL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Attention is directed to Bidding and Contract Requirements, General and Supplemental Requirements, which are hereby made a part of this Section.

1.02 DESCRIPTION OF WORK

A. Extent of Topsoil Work is shown on drawings and by provisions of this section.

B. Topsoil for lawn work shall be provided by Contractor from off-site sources free of herbicides.

C. Related Work Specified Elsewhere:

1. Section 329210: Lawns and Grasses

1.03 QUALITY ASSURANCE

A. Testing and Inspection: For supplied topsoil. Performed by a qualified independent testing laboratory, under the supervision of a registered professional Engineer, specializing in soils engineering. Obtain samples of stockpiled topsoil before completely stripping from the interior of stockpile.

B. Provide and pay for testing and inspection during topsoil operations. Laboratory shall be acceptable to the Construction Manager.

C. Test representative material samples for proposed use.

D. Topsoil: (Supplied - see Materials 2.01)

1. pH factor
2. Lime requirement
3. Mechanical analysis (P.K. Ca. mg) and cation ratios
4. Percentage of organic content and loss by ignition
5. Soil series classification
6. Clay content
7. Herbicide residue

E. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

F. Submit test reports.

1.04 PROJECT CONDITIONS

A. Known underground and surface utility lines are indicated on the civil drawings.

B. Protect existing trees, plants, lawns and other features designated to remain as part of the landscaping work.

C. Promptly repair damage to adjacent facilities caused by topsoil operations. Cost of repair at Contractor's expense.

D. Promptly notify the Construction Manager of unexpected sub-surface conditions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Supplied topsoil proposed for use must meet testing criteria results specified and conform to adjustments as recommended by soil test and Construction Manager.

B. Provide topsoil as required to complete the job. Topsoil must meet testing criteria results specified. All processing, cleaning and preparation of this topsoil to render it acceptable for use is the responsibility of this Contractor.

C. Supplied topsoil shall be fertile, friable and representative of local productive soil, capable of sustaining vigorous plant growth and screened free of clay lumps, subsoil, noxious weeds or other foreign matter such as stones greater than 1" in diameter in any dimension, roots, sticks and other extraneous materials: not frozen or muddy. Ph of existing or supplied soil to range between 5.0 and 7.5. Adjusted to not more than 7.0 by additives as required by soil test. Topsoil shall contain not less than 3% and not greater than 10% organic matter. Clay content as determined by Bouyoucous Hydrometer Test shall range between 5 and 15 percent. Mechanical analysis as follows:

PASSING	RETAINED ON	PERCENTAGE
1" Screen		100%
1" Screen	1/4" screen (gravel)	Not more than 3%
1/4" Screen	No. 140 USS Mesh Sieve	40-60%
No. 140 USS	Percentage based on dry weight of the samples	30-35% (Very fine sand, silt, and clay)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine rough grades and installation conditions. Do not start topsoil work until unsatisfactory conditions are corrected.

3.02 FINISH GRADING

A. Perform topsoiling within contract limits, including adjacent transition areas, to new elevations, levels, profiles, and contours indicated. Provide uniform levels and slopes between new elevations and existing grades.

B. Grade surfaces to assure areas drain away from building structures and to prevent ponding and pockets of surface drainage.

C. Lawn Areas: Supply and spread topsoil to a minimum uniform depth of 4” or as noted. Incorporate into existing subsoil by disc, rototill or other approved method to a minimum 6” depth. No layering of soils is to exist after tilling. Remove clumps larger than 1” in diameter.

D. Grade lawn areas to a smooth, free draining even surface with a loose, moderately coarse texture ready to accept seed or sod.

E. For trees, shrubs, ground cover beds and backfill for beds see Trees, Shrubs and Ground Cover Section.

F. Provide earth crowning where indicated on drawings.

G. Crowning/mounding to be free flowing in shape and design, as indicated, and to blend into existing grades gradually so that toe of slope is not readily visible. Construction Manager to verify final contouring before planting.

H. Regardless of finish grading elevations indicated, it is intended that grading be such that proper drainage of surface water will occur and that no low areas are created to allow ponding. Contractor to consult with Owner or Construction Manager regarding minor variations in grade elevations before rough grading is completed.

3.03 CLEANING

A. Upon completion of topsoiling operations, clean areas within contract limits, remove tools and equipment. Site shall be clear, clean, free of debris and suitable for site work operations.

END OF SECTION 32 92 20

Presque Isle County Annex Court Bldg.
HVAC, Roof and Bldg. Renovations

151 E. Huron Ave., Rogers City, Michigan 49779

Owner:

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(Phone) 989-734-3288
piclerk@picounty.org

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Structural Engineer:

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Pelkie, MI 49958
(Phone) 906-353-6112
nate@jurmuengineering.com

Mechanical Engineer:

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(Phone) 586-601-4219
mlawrin@lawrinengineering.com

Electrical Engineer:

Iron Core Engineering
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Ortonville, MI 48462
(Phone) 810-919-2120
jfrench@ironcoreengineering.com

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C1-02	New Work - Partial Architectural Site Plan
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A2-02	Demolition - 1st Floor and RCP Plans
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M0.1	Mechanical - First Floor Demo Plan
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BUILDING CODE INFORMATION

OWNER: PRESQUE ISLE COUNTY

PROJECT: ANNEX COURT BUILDING
HVAC UNIT REPLACEMENT

ADDRESS: 151 E. HURON AVE., ROGERS CITY, MICHIGAN 49779

GOVERNING CODE: REHABILITATION: 2021 MICHIGAN REHABILITATION BUILDING CODE FOR EXISTING BUILDINGS

BUILDING: 2021 MICHIGAN BUILDING CODE

MECHANICAL: 2021 MICHIGAN MECHANICAL CODE

PLUMBING: 2021 MICHIGAN PLUMBING CODE

ELECTRICAL: 2023 NATIONAL ELECTRICAL CODE W/ 2021 MICHIGAN AMENDMENTS PART 8

BUILDING USE: EXISTING BUILDING (CIVIC ADMINISTRATION)
SECTION 304.1 BUSINESS "B" USE GROUP

SECTION 303.1 TENANT SPACES
TENANT SPACES USED FOR ASSEMBLY PURPOSE WITH AN OCCUPANT LOAD OF LESS THAN 50 PERSONS SHALL BE CLASSIFIED AS A GROUP B

SECTION 303.1.2 SMALL ASSEMBLY SPACES
THE FOLLOWING ROOMS AND SPACES SHALL NOT BE CLASSIFIED AS ASSEMBLY OCCUPANCIES

1. A ROOM OR SPACE USED FOR ASSEMBLY PURPOSE WITH AN OCCUPANT LOAD LESS THAN 50 PERSONS AND ACCESSORY TO ANOTHER OCCUPANCY SHALL BE CLASSIFIED AS A GROUP "B" OCCUPANCY.
2. A ROOM OR SPACE USED FOR ASSEMBLY PURPOSE THAT IS LESS THAN 750 SQUARE FEET IN AREA AND ACCESSORY TO ANOTHER OCCUPANCY SHALL BE CLASSIFIED AS A GROUP "B" OCCUPANCY.

CONSTRUCTION TYPE: EXISTING BUILDING
SECTION 602.5 "5-B" COMBUSTIBLE / UNPROTECTED

BUILDING AREA: EXISTING BUILDING HEIGHT ALLOWABLE PER 2021 MBC TABLE 504.4
3 STORIES ALLOWED, ACTUAL 2 STORIES EXISTING

BUILDING AREA ALLOWABLE PER 2021 MBC TABLE 506.2
ALLOWED 27,000 SF
ACTUAL: 4,452 1st FLOOR 4,630 2nd FLOOR

PROJECT SCOPE / SUMMARY:

REMOVAL AND REPLACEMENT OF EXISTING HVAC ROOF TOP MECHANICAL UNITS WITH NEW HIGH EFFICIENCY GROUND MOUNTED HVAC EQUIPMENT AND SYSTEMS.

REPLACEMENT OF THE EXISTING EPDM ROOF SYSTEM AFTER REMOVAL OF OLD EQUIPMENT.

INCLUDES ANY ASSOCIATED ARCHITECTURAL, CIVIL, STRUCTURAL, MECHANICAL, ELECTRICAL AND PLUMBING WORK AS REQUIRED IS ALSO INCLUDED.

BUILDING CODE:

2021 MICHIGAN REHABILITATION CODE:

REPAIRS (CHAPTER 6)
MRC SECTION 502.1

... "INCLUDES THE REPLACEMENT OF EQUIPMENT"... REPAIRS SHALL COMPLY WITH THE PROVISIONS OF CHAPTER 6

ALTERATIONS LEVEL 1 (CHAPTER 7)
MRC SECTION 503.1

..."REMOVAL AND REPLACEMENT OF EXISTING MATERIALS, ELEMENTS, EQUIPMENT AND FIXTURES USING NEW MATERIALS"...

CHAPTER 9 FIRE PROTECTION SYSTEMS:
(2021 MICHIGAN BUILDING CODE)

THE EXISTING BUILDING HAS A FULL AUTOMATIC FIRE PROTECTION SYSTEM INSTALLED

MBC 901.6.1 AUTOMATIC SPRINKLER SYSTEM SHALL BE MONITORED BY AN APPROVED SUPERVISING STATION IN ACCORDANCE WITH NFPA 72

MBC 901.6.2 FIRE ALARM SYSTEM SHALL BE MONITORED BY AN APPROVED SUPERVISING STATION IN ACCORDANCE WITH NFPA 72

MBC 906.1 PORTABLE FIRE EXTINGUISHERS
TABLE 906.3.1
MAXIMUM TRAVEL DISTANCE TO EXTINGUISHER = 75'-0"

LOCATION MAP



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Statement of Intellectual Property

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CONSULTANT:

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: jr
CHECKED BY: JFR

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
OWNER REVIEW	10/29/24
COUNTY BOARD MEETING	11/27/24
V.E. REDESIGN	12/02/24
OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: COVER SHEET and INDEX OF DRAWINGS

SHEET NO.: G0-01

GENERAL NOTES - DEMOLITION PLANS:

1. ALL DEMOLITION DRAWINGS AND DEMOLITION DETAILS ARE PROVIDED TO SHOW THE GENERAL SCOPE OF THE DEMOLITION WORK, BUT ARE NOT TO BE CONSIDERED AS 100% COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PERFORM ALL DEMOLITION WORK NECESSARY TO ACCOMPLISH NEW WORK. THE DEMOLITION DRAWINGS AND DETAILS MAY NOTE TYPICAL ITEMS IN SOME AREAS, WHICH APPLY IN OTHER AREAS (AND ARE DESIGNATED WITH DASHED, HIDDEN OR STRUCK THRU LINES). COORDINATE ALL DEMOLITION WORK WITH ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. REFER TO THESE DRAWINGS FOR ADDITIONAL DEMOLITION WORK AS REQUIRED.
2. CONTRACTOR REQUIRED TO COORDINATE NECESSARY DEMOLITION WITH WORK SCOPE ON NEW CONSTRUCTION PLANS, SOME REQUIRED DEMOLITION WORK SCOPE IS SHOWN IN NEW WORK SCOPE PLANS AND SPECIFICATIONS, TYPICAL FOR ALL TRADES.
3. ALL CONSTRUCTION AND DEMOLITION MEANS, METHODS AND SAFETY PRECAUTIONS SHALL BE SOLE RESPONSIBILITY OF THE CONTRACTOR.
4. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
5. PROVIDE PROTECTION FOR EXISTING CONSTRUCTION TO REMAIN. PATCH AND REPAIR ALL AREAS DAMAGED DURING DEMOLITION/CONSTRUCTION; MATCH EXISTING CONSTRUCTION, MATERIALS AND FINISHES (TYPICAL ALL LOCATIONS).
6. ASBESTOS AND OTHER HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER PRIOR TO START OF CONSTRUCTION. IF ANY SUSPECTED HAZARDOUS MATERIAL IS ENCOUNTERED, STOP WORK IN THAT AREA AND IMMEDIATELY CONTACT THE ARCHITECT/OWNER FOR DIRECTION FROM OWNER'S ABATEMENT CONSULTANT.
7. REMOVE ALL EXISTING CONSTRUCTION AS NOTED ON DRAWINGS AND ALL CONSTRUCTION AND MATERIALS WHICH ARE INCIDENTAL TO THE PROPOSED NEW CONSTRUCTION WORK.
8. ALL CONSTRUCTION DEMOLITION AND DEBRIS ARE TO BE PROMPTLY AND LEGALLY DISPOSED OF OFF SITE.
9. ALL RAW EDGES RESULTING FROM DEMOLITION WORK SHALL BE PREPARED TO MATCH EXISTING CONSTRUCTION AND PROVIDE FINISH CONSTRUCTION.
10. DIMENSIONS SHOWN FOR DEMOLITION AND AREAS ARE APPROXIMATE ONLY. CONTRACTOR SHALL COORDINATE FULL EXTENTS OF DEMOLITION IN THESE AREAS.
11. CONFIRM EXTENT OF DEMOLITION WITH SCOPE OF NEW WORK.
12. WALL REMOVAL THAT TERMINATES INTO A WALL OR CEILING TO REMAIN SHALL BE COMPLETELY REMOVED, FREE OF PROJECTIONS, READY TO RECEIVE NEW FINISHES.
13. CONTRACTOR SHALL PLACE ANY ITEMS OR MATERIALS TO BE SALVAGED AND/OR RETAINED AS DIRECTED BY OWNER.
14. PATCH AND REPAIR ALL SURFACES TO REMAIN TO MATCH EXISTING ADJACENT SURFACES AS REQUIRED TO RECEIVE NEW FINISHES
15. REMOVAL OF ANY MECHANICAL, ELECTRICAL AND MISCELLANEOUS ITEMS WILL REQUIRE PATCH AND REPAIR OF ADJACENT MATERIALS TO REMAIN.

DEMOLITION FLOOR PLAN KEY NOTES:

NOTE:
COORDINATE WITH STRUCTURAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATIONS OF EXISTING STRUCTURAL AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION, AND RELOCATION OF ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

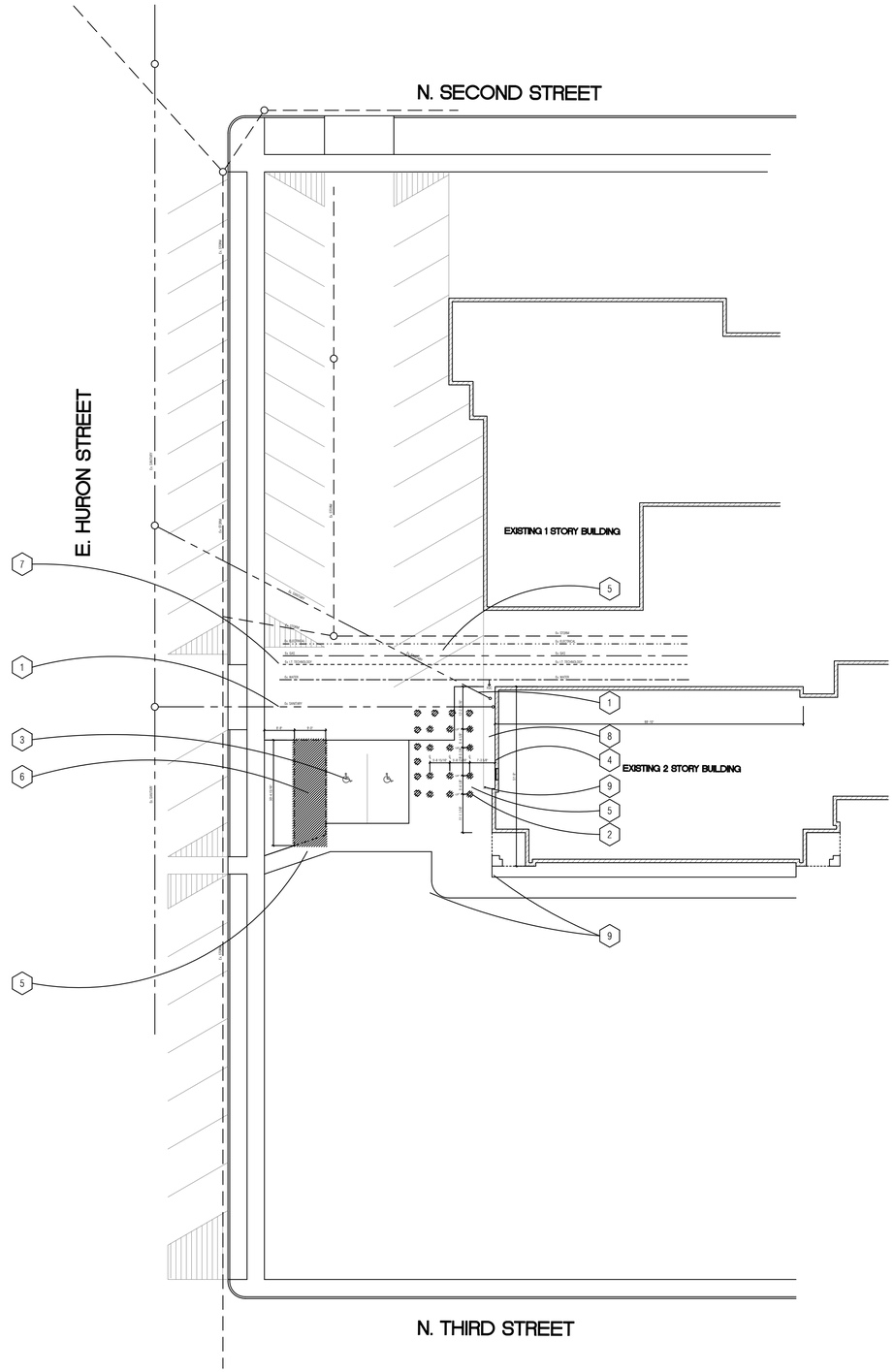
NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATION OF MECHANICAL FANS, FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

1. EXISTING UNDERGROUND UTILITIES, CONTRACTOR TO VERIFY ALL UTILITIES WITH "MISS DIG" AND OWNER SUPPLIED EQUIPMENT BEFORE CONSTRUCTION, CONTRACTOR WILL BE REQUIRED TO HAND DIG ALL NEW CONSTRUCTION AS REQUIRED FOR PROTECTION OF EXISTING UNDERGROUND UTILITIES AND SERVICES, TYPICAL AT ALL UNDERGROUND UTILITIES AND SERVICES
2. "SELECTIVE DEMOLITION" OF EXISTING EXTERIOR PAVEMENT SURFACE AND SUB-GRADE AND BASE AS REQUIRED FOR NEW FOUNDATION SYSTEM, CONTRACTOR TO VERIFY "MISS DIG" AND UNDERGROUND UTILITIES BEFORE DEMOLITION, CONTRACTOR TO PROVIDE HAND DIGGING AS REQUIRED FOR UNDERGROUND UTILITIES AND SERVICES, COORDINATE LOCATIONS AND QUANTITY WITH NEW WORK SCOPE PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS
3. REMOVE EXISTING PAVEMENT MARKINGS, PARKING SPACE STRIPPING AND PAINTED SYMBOLS COMPLETELY FROM SURFACE OF EXISTING PAVEMENT, CONTRACTOR TO PREP SURFACES FOR NEW WORK SCOPE MARKINGS, TYPICAL AT ALL LOCATIONS
4. "SELECTIVE DEMOLITION" OF EXISTING EXTERIOR WALL CONSTRUCTION AS REQUIRED FOR NEW H.V.A.C. DUCT WORK PENETRATIONS INTO BUILDING, REFER TO DEMOLITION PLANS AND NEW WORK SCOPE PLANS AS REQUIRED, TYPICAL AT ALL LOCATIONS
5. EXISTING CONCRETE SIDEWALK AND PAVEMENT SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, CONTRACTOR TO AVOID DRIVING AND PARKING HEAVY EQUIPMENT ON EXISTING SURFACE AT ALL LOCATIONS, CONTRACTOR WILL BE RESPONSIBLE FOR REPLACEMENT OF ALL DAMAGED SURFACES TO MATCH EXISTING, TYPICAL AT ALL LOCATIONS
6. REMOVE EXISTING LANDSCAPING, TOP SOIL AND SUB BASE AS REQUIRED FOR NEW CONSTRUCTION, CONTRACTOR TO PREP AREA FOR NEW PARKING LOT PAVEMENT SYSTEM, TYPICAL ALL LOCATIONS
7. EXISTING ASPHALT PAVEMENT PARKING LOT SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, CONTRACTOR TO AVOID DRIVING AND PARKING HEAVY EQUIPMENT ON EXISTING SURFACE AT ALL LOCATIONS, CONTRACTOR WILL BE RESPONSIBLE FOR REPLACEMENT OF ALL DAMAGED SURFACES TO MATCH EXISTING, TYPICAL AT ALL LOCATIONS
8. EXISTING RIVER ROOK STONE MAINTENANCE STRIP ALONG EDGE OF BUILDING WALL TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION
9. EXISTING LANDSCAPE IRRIGATION SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, PATCH AND REPAIR AS REQUIRED FOR NEW WORK

UTILITY INFORMATION, AS SHOWN INDICATES APPROXIMATE LOCATIONS AND TYPES OF EXISTING FACILITES ONLY, AS DISCLOSED BY RECORDS PROVIDED TO THIS FIRM FROM THE VARIOUS UTILITY COMPANIES. NO GUARANTEE IS GIVEN OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF.

PRIOR TO CONSTRUCTION, ALL LCOATIONS AND DEPTHS OF EXISTING OVERHEAD AND UNDERGROUND UTILITES (IN CONFLICT WITH THE CONSTRUCTION OF THESE PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD DURING THE CONSTRUCTION. THE CONTRACTOR SHALL PROTECT AND SUPPORT ALL UTILITIES THAT ARE ENCOUNTERED. (ALL COSTS FOR UTILITY LOCATION VERIFICATION, SUPPORT AND PROTECTION SHALL BE INCLUDED IN THE PROPOSED PAY ITEM CONFLICTING WITH THAT UTILITY).

DURING CONSTRUCTION THE CONTRACTOR SHALL USE EXTREME CAUTION WHEN OPERATING NEAR ANY AND ALL OVERHEAD AND/OR BURIED UTILITES.



N 1 / C1-01 Existing / Demolition - Partial Site Plan
1" = 20'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

811 Know what's below. Call before you dig.

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PRESQUE ISLE COUNTY
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151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

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OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: ARCHITECTURAL SITE EXISTING / DEMOLITION

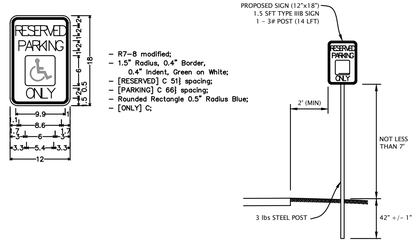
SHEET NO.: C1-01

SITE PLAN KEY NOTES

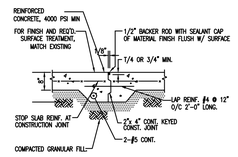
1. APPROXIMATE LOCATION AND SIZE OF NEW MECHANICAL UNIT SYSTEM AND DUCT WORK. CONTRACTOR TO COORDINATE WITH MECHANICAL SHOP DRAWINGS AND MANUFACTURE FOR EXACT SIZE AND LOCATION OF NEW EQUIPMENT, TYPICAL AT ALL LOCATIONS
2. NEW REINFORCED POURED CONCRETE RAISED SONO TUBE FOUNDATION SYSTEM FOR MECHANICAL, STEEL SUPPORT FRAME SYSTEM, REFER TO STRUCTURAL DRAWINGS (TYPICAL FOR 6 FOOTINGS PER UNIT = TOTAL OF 12 FOOTINGS) CONTRACTOR TO HAND DIG AS REQUIRED FOR EXISTING UNDERGROUND UTILITIES, CONTRACTOR TO COORDINATE WITH MECHANICAL SHOP DRAWINGS AND MANUFACTURE FOR EXACT SIZE AND LOCATION OF NEW EQUIPMENT, TYPICAL AT ALL LOCATIONS
3. NEW CONCRETE FOUNDATION AND 6" STEEL AND CONCRETE FILLED GUARD POST BOLLARD PROTECTION AROUND OUTSIDE PERIMETER OF NEW MECHANICAL UNIT LOCATIONS, PROVIDE 9 GUARD POST EQUALLY SPACED AROUND PERIMETER AS INDICATED, REFER TO DETAIL THIS SHEET, TYPICAL AT ALL LOCATIONS
4. EXISTING RIVER ROCK STONE MAINTENANCE STRIP ALONG BUILDING WALL TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION
5. EXISTING LANDSCAPE IRRIGATION SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, PATCH AND REPAIR AS REQUIRED FOR NEW WORK, CONTRACTOR TO MODIFY, REPAIR AND EXTEND EXISTING LAWN IRRIGATION SYSTEM AT ALL LOCATIONS DUE TO NEW CONSTRUCTION AND NEW FOUNDATION SYSTEM, COORDINATE WITH OWNER ON EXISTING HEADS AND UNDERGROUND SYSTEM REQUIREMENTS, REFER TO SPECIFICATIONS AND DETAILS
6. EXTEND / EXPANDED PAVED CONCRETE PAVED PARKING AREA TO BE PROVIDE NEW 4000 PSI MIN. 8" THICK WITH STEEL REINFORCED AND FIBER REINFORCED CONCRETE PAVEMENT ON 10" DEEP MIN. COMPACTED 21AA STONE AGGREGATE FILLED SUB BASED (COMPACTED TO 95% DENSITY) ON 1 LAYER OF TENSAR GEO-TEXTILE FABRIC #NX850, PROVIDE NEW 1/2" EXPANSION JOINT BETWEEN EXISTING CONCRETE PAVEMENT AND CONCRETE SIDEWALK CONTINUOUS ALONG EDGE OF NEW AND EXISTING, TYPICAL ALL LOCATIONS
7. EXISTING CONCRETE PAVEMENT TO REMAIN, PROVIDE NEW 12" LONG #4 EPOXY COATED DOWEL BETWEEN NEW AND EXISTING CONSTRUCTION AT 36" O.C. ALONG INTERSECTION EDGE, TYPICAL AT ALL NEW CONCRETE LOCATIONS
8. EXISTING UNDERGROUND SANITARY LINES AND BUILDING CLEAN OUTS TO REMAIN, CONTRACTOR TO LOCATE AND AND COORDINATE NEW CONSTRUCTION WITH EXISTING, CONTRACTOR TO PROTECT EXISTING DURING CONSTRUCTION, CONTRACTOR TO REPAIR ANY DAMAGE TO MATCH EXISTING AS REQUIRED
9. CONTRACTOR TO RESTORE ALL AREAS WITH NEW 4" TOPSOIL AND PROVIDE NEW GRASS HYDRO - SEEDS AND / OR GRASS SEED MIX WITH STRAW COVER AT ALL AREAS OF DISTURBED SITE AND CONSTRUCTION AREAS, TYPICAL AT ALL DISTURBED ARES AND AROUND NEW CONSTRUCTION, REFER TO SPECIFICATIONS AND DETAILS
10. TURF GRASS MIX: SEEDING RATE, 10 TO 12 LBS PER 1,000 SQUARE FEET, SEED SPECIES, TURF-TYPE TALL FESCUE OF 2 IMPROVED VARIETIES 35%, PERENNIAL RYE OF AT LEAST 2 IMPROVED VARIETIES 35%, KENTUCKY BLUEGRASS OF AT LEAST 2 IMPROVED VARIETIES 30%. SOW ANNUAL COVER CROP WITH SEED MIX, SEEDING RATE AT 6 TO 7 LBS PER 1,000 SQUARE FEET
11. EXISTING UNDERGROUND UTILITIES, GAS LINE, WATER SERVICE LINE, STORM AND SANITARY SEWER LINES, TECHNOLOGY AND T-1 FIBER LINES, AND ELECTRICAL CONDUITS TO BE PROTECTED AND NOT DAMAGED DURING CONSTRUCTION, CONTRACTOR TO VERIFY ALL UTILITIES WITH "MISS DIG" AND OWNER SUPPLIED EQUIPMENT BEFORE CONSTRUCTION, CONTRACTOR WILL BE REQUIRED TO HAND DIG ALL NEW CONSTRUCTION AS REQUIRED FOR PROTECTION OF EXISTING UNDERGROUND UTILITIES AND SERVICES, TYPICAL AT ALL UNDERGROUND UTILITIES AND SERVICES
12. PROVIDE CONTINUOUS SEALANT CAP AT ALL SAW CUT EXPANSION JOINTS, TYPICAL AT ALL LOCATIONS.
13. PROVIDE CONTINUOUS 1/2" CONTROL / COLD JOINT EXPANSION MATERIAL AND SEALANT CAP OF ALL CONTROL / COLD JOINTS IN SLAB SURFACE, TYPICAL AT ALL LOCATIONS
14. NEW EXTERIOR INSULATED SUPPLY AIR AND RETURN AIR DUCT WORK SYSTEM AT BOTH END OF UNIT AND UNDER UNIT, FROM NEW GROUND MOUNTED MECHANICAL UNIT TO INSIDE EXISTING BUILDING, PROVIDE UNI-STRUT SUPPORT FRAMING AND BRACKETS FOR NEW DUCT WORK AS REQUIRED, COORDINATE WITH MECHANICAL DRAWINGS, TYPICAL AT ALL LOCATIONS
15. PROVIDE NEW PRE-CAST CONCRETE WHEEL STOP / BLOCKER (5500 PSI CONCRETE 7'-0" LONG x 5" TALL x 7.5" WIDE AT 240 LBS EACH PAINTED BARRIER FREE BLUE) ANCHORED TO GRADE WITH 30" LONG #5 RE-BAR AT EACH END OF PRE-CAST WHEEL STOP, TYPICAL AT TWO (2) LOCATIONS
16. PROVIDE NEW "HANDICAP BLUE" PAINTED PAVEMENT MARKINGS, PROVIDE 5'-0" WIDE ANGLED STRIPED LOADING AND UN-LOADING ZONE ON EACH SIDE OF NEW BARRIER FREE PARKING SPACE, TYPICAL AT ALL LOCATIONS
17. PROVIDE NEW BARRIER FREE HANDICAP PARKING SIGN, GROUND MOUNTED, REFER TO DETAIL, TYPICAL AT TWO (2) LOCATIONS
18. PROVIDE NEW "HANDICAP BLUE" PAINTED PAVEMENT MARKINGS, ADA ANSI UNIVERSAL SYMBOL LOCATED IN CENTER OF PARKING SPACE , TYPICAL AT ALL LOCATIONS
19. RE-PAINT AND RE-FRESH EXISTING "YELLOW" PAVEMENT MARKINGS ON EXISTING PARKING LOT TO MATH EXISTING, PROVIDE NEW "NO PARKING ZONE_ ANGLED STRIPING AS DIRECTED BY OWNER IN FIELD, TYPICAL AT ALL LOCATIONS

GENERAL SITE CONSTRUCTION NOTES

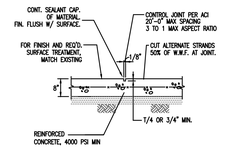
1. ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.
2. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VISITING THE JOB SITE AND FAMILIARIZING THEMSELVES WITH EXISTING CONDITIONS PRIOR TO START OF WORK. ALL DIMENSIONS AND FIELD CONDITIONS SHALL BE VERIFIED, AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO THE RECEIPT OF BIDS. FAILURE OF THE CONTRACTOR TO VERIFY ALL CONDITIONS PRIOR TO THE AWARD OF BID WILL NOT BE CONSIDERED AS GROUNDS FOR AN EXTRA.
3. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THE CONTRACT. PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE SAFETY OF THE WORKERS AND GENERAL PUBLIC DURING CONSTRUCTION.
4. ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT.
5. SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION / APPLICATION.
6. ALL DEBRIS SHALL BE LEGALLY DISPOSED OF OFF THE SITE BY THE CONTRACTOR.
7. CONTRACTOR SHALL KEEP NOISE, DUST, ETC., TO A MINIMUM STANDARD AS SET FORTH BY THE OWNER.
8. CONTRACTOR SHALL COORDINATE INSTALLATION AND PHASING OF WORK WITH THE ARCHITECT AND OWNER'S REPRESENTATIVE PRIOR TO THE START OF WORK.
9. NOTE ALL DIMENSIONS ARE + / - AND ARE TO BE FIELD VERIFIED
10. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
11. PROVIDE PROTECTION FOR EXISTING CONSTRUCTION TO REMAIN. PATCH AND REPAIR ALL AREAS DAMAGED DURING DEMOLITION / CONSTRUCTION; MATCH EXISTING CONSTRUCTION, MATERIALS AND FINISHES (TYPICAL ALL LOCATIONS)
12. NOTE TO CONTRACTORS: 3 (THREE) WORKING DAYS BEFORE YOU DIG, CALL MISS DIG @ TOLL FREE 1-800-482-7171 FOR UTILITY LOCATIONS ON THE GROUND.
13. REMOVE EXISTING VEGETATION AS REQUIRED TO COMPLETE CONTRACT AREAS.
14. MAINTAIN GENERAL DRAINAGE PATTERNS UNLESS NOTED OTHERWISE.
15. DO NOT SCALE DRAWINGS.
16. EXISTING UNDERGROUND UTILITIES, GAS LINE, WATER SERVICE LINE, STORM AND SANITARY SEWER, TECHNOLOGY AND T-1 FIBER LINES, AND ELECTRICAL CONDUITS TO BE PROTECTED AND NOT DAMAGED DURING CONSTRUCTION, TYPICAL AT ALL LOCATIONS, CONTRACTOR IS REQUIRED TO HAND DIG AS NECESSARY AND REPAIR ALL DAMAGED UNDERGROUND UTILITIES



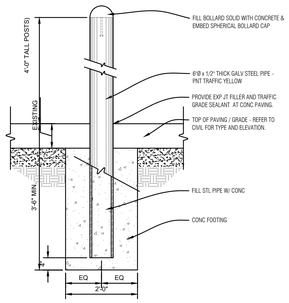
7 / C1-02 Typical ADA Parking Sign Detail
NO SCALE



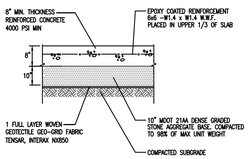
5 / C1-02 Typical Slab Construction Joint Detail
NO SCALE



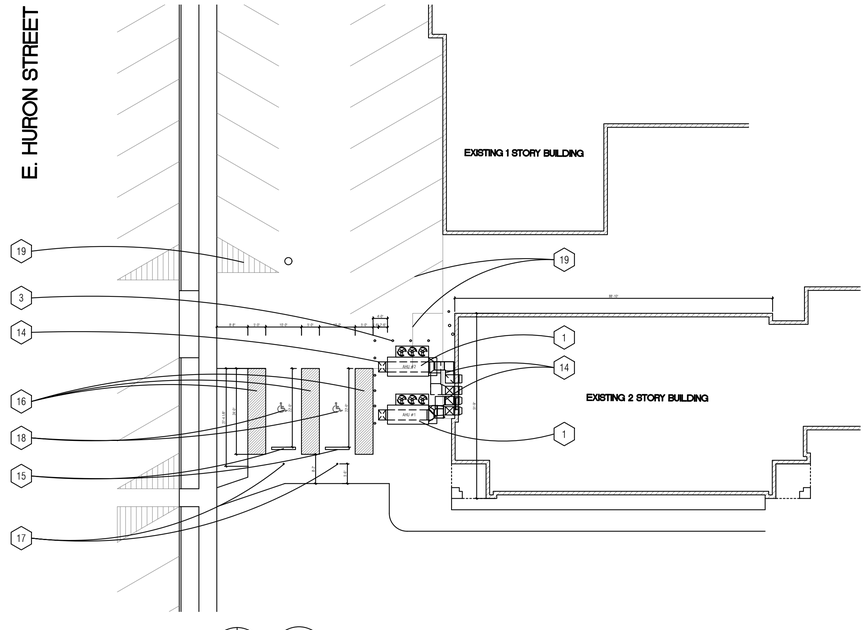
4 / C1-02 Typical Slab Control Joint Detail
NO SCALE



6 / C1-02 Typical Guard Post Bollard Detail
NO SCALE

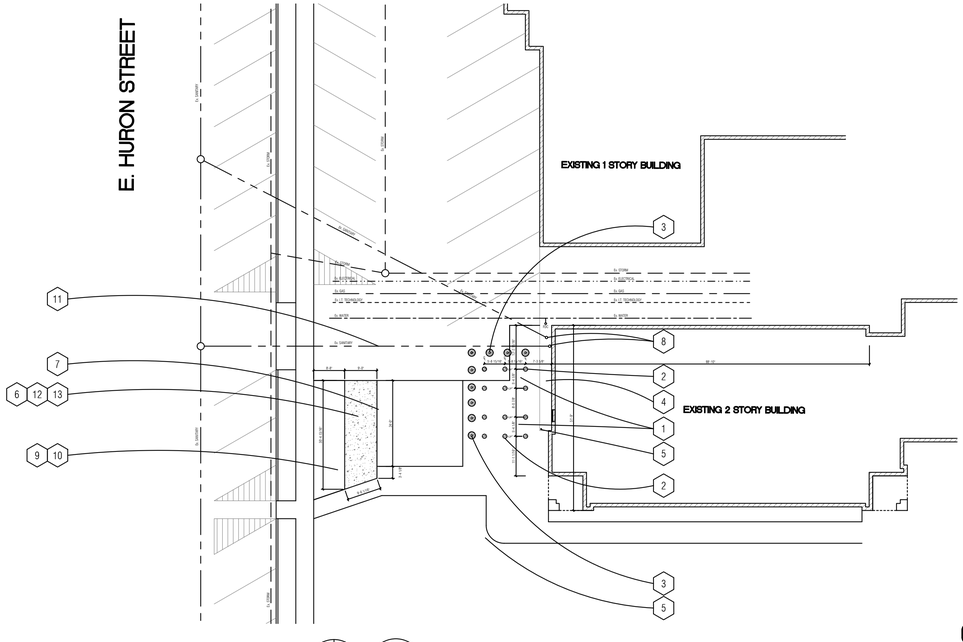


3 / C1-02 Typical Concrete Slab Detail
NO SCALE



N / 2 / C1-02 New Mechanical Equipment - Layout Plan
1" = 20'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.



N / 1 / C1-02 New Work - Partial Architectural Site Plan
1" = 20'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

811 Know what's below. Call before you dig.

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PROJECT NAME:

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PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
OWNER REVIEW	10/29/24
COUNTY BOARD MEETING	11/27/24
V.E. REDESIGN	12/02/24
OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: ARCHITECTURAL SITE PLAN

SHEET NO.: C1-02

GENERAL NOTES - DEMOLITION PLANS:

1. ALL DEMOLITION DRAWINGS AND DEMOLITION DETAILS ARE PROVIDED TO SHOW THE GENERAL SCOPE OF THE DEMOLITION WORK, BUT ARE NOT TO BE CONSIDERED AS 100% COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PERFORM ALL DEMOLITION WORK NECESSARY TO ACCOMPLISH NEW WORK. THE DEMOLITION DRAWINGS AND DETAILS MAY NOTE TYPICAL ITEMS IN SOME AREAS, WHICH APPLY IN OTHER AREAS (AND ARE DESIGNATED WITH DASHED, HIDDEN OR STRUCK THRU LINES). COORDINATE ALL DEMOLITION WORK WITH ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. REFER TO THESE DRAWINGS FOR ADDITIONAL DEMOLITION WORK AS REQUIRED.
2. CONTRACTOR REQUIRED TO COORDINATE NECESSARY DEMOLITION WITH WORK SCOPE ON NEW CONSTRUCTION PLANS, SOME REQUIRED DEMOLITION WORK SCOPE IS SHOWN IN NEW WORK SCOPE PLANS AND SPECIFICATIONS, TYPICAL FOR ALL TRADES.
3. ALL CONSTRUCTION AND DEMOLITION MEANS, METHODS AND SAFETY PRECAUTIONS SHALL BE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
4. PROVIDE PROTECTION FOR EXISTING CONSTRUCTION TO REMAIN. PATCH AND REPAIR ALL AREAS DAMAGED DURING DEMOLITION/CONSTRUCTION; MATCH EXISTING CONSTRUCTION, MATERIALS AND FINISHES (TYPICAL ALL LOCATIONS).
5. ASBESTOS AND OTHER HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER PRIOR TO START OF CONSTRUCTION. IF ANY SUSPECTED HAZARDOUS MATERIAL IS ENCOUNTERED, STOP WORK IN THAT AREA AND IMMEDIATELY CONTACT THE ARCHITECT/OWNER FOR DIRECTION FROM OWNER'S ABATEMENT CONSULTANT.
6. REMOVE ALL EXISTING CONSTRUCTION AS NOTED ON DRAWINGS AND ALL CONSTRUCTION AND MATERIALS WHICH ARE INCIDENTAL TO THE PROPOSED NEW CONSTRUCTION WORK.
7. ALL CONSTRUCTION DEMOLITION AND DEBRIS ARE TO BE PROMPTLY AND LEGALLY DISPOSED OF OFF SITE.
8. ALL RAW EDGES RESULTING FROM DEMOLITION WORK SHALL BE PREPARED TO MATCH EXISTING CONSTRUCTION AND PROVIDE FINISH CONSTRUCTION.
9. IN AREAS INDICATED FOR DEMOLITION REMOVE ALL LIGHT FIXTURES, LIGHT SWITCHES, CONVENIENCE OUTLETS ETC. AND ALL RELATED WIRING AND CONDUIT BACK TO PANEL SOURCE, COORDINATE WITH ELECTRICAL PLANS, TYPICAL
10. AT AREAS INDICATED FOR DEMOLITION ALL PLUMBING FIXTURES TO BE REMOVED SHALL HAVE PLUMBING LINES CAPPED BELOW EXISTING SLAB AND PATCH TO MATCH EXISTING , COORDINATE WITH MECHANICAL PLANS, TYPICAL.
11. DIMENSIONS SHOWN FOR DEMOLITION AND AREAS ARE APPROXIMATE ONLY. CONTRACTOR SHALL COORDINATE FULL EXTENTS OF DEMOLITION IN THESE AREAS.
12. CONFIRM EXTENT OF DEMOLITION WITH SCOPE OF NEW WORK.
13. WALL REMOVAL THAT TERMINATES INTO A WALL OR CEILING TO REMAIN SHALL BE COMPLETELY REMOVED, FREE OF PROJECTIONS, READY TO RECEIVE NEW FINISHES.
14. CONTRACTOR SHALL REMOVE EXISTING DOORS, FRAMES AND ALL ASSOCIATED MATERIAL AS REQUIRED FOR NEW CONSTRUCTION. PREP OPENING REFER TO FLOOR PLAN. (VIF)
15. CONTRACTOR SHALL PLACE ANY ITEMS OR MATERIALS TO BE SALVAGED AND/OR RETAINED AS DIRECTED BY OWNER.
16. PATCH AND REPAIR ALL SURFACES TO REMAIN TO MATCH EXISTING ADJACENT SURFACES AS REQUIRED TO RECEIVE NEW FINISHES
17. REMOVE EXISTING UNUSED NAILS, SCREWS AND OTHER WALL PROTRUSIONS FROM EXISTING SURFACES TO REMAIN. PATCH AND REPAIR TO MATCH EXISTING ADJACENT SURFACES AS REQUIRED TO RECEIVE NEW FINISHES.
18. REMOVAL OF ANY MECHANICAL, ELECTRICAL AND MISCELLANEOUS ITEMS WILL REQUIRE PATCH AND REPAIR OF ADJACENT MATERIALS TO REMAIN.
19. DISCONNECT ALL MISCELLANEOUS FEATURES (I.E. ELECTRICAL, MECHANICAL, PLUMBING, ETC.) ASSOCIATED WITH ITEMS TO BE DEMOLISHED (I.E. PARTITIONS, WALLS, CEILINGS, CABINETS ETC.).

DEMOLITION FLOOR PLAN KEY NOTES:

NOTE:
COORDINATE WITH STRUCTURAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATIONS OF EXISTING STRUCTURAL AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION, AND RELOCATION OF ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATION OF MECHANICAL FANS, FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

NOTE:
OWNER TO REMOVE EXISTING SECURITY AND I.T. TECHNOLOGY SYSTEMS AS REQUIRED FOR NEW ABOVE CEILING CONSTRUCTION, CONTRACTOR TO COORDINATE IN FIELD AS REQUIRED WITH OWNERS VENDOR WORK AND OPERATIONS FOR NEW CONSTRUCTION WORK SCOPE, TYPICAL AT ALL LOCATIONS.

1. EXISTING MECHANICAL H.V.A.C. DUCT WORK, DIFFUSERS, GRILLS AND ALL ASSOCIATED MATERIALS TO BE REMOVED, CONTRACTOR TO PREP FOR NEW CONSTRUCTION, REFER TO MECHANICAL PLANS AND SPECIFICATIONS AS REQUIRED, TYPICAL AT ALL AREAS
2. EXISTING ACOUSTICAL CEILING PADS / TILES BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK , CONTRACTOR TO SAVE AND "SALVAGE" CEILING PADS / TILES IN GOOD CONDITIONS FOR RE-USES AS POSSIBLE IN NEW CONSTRUCTION WORK SCOPE, TYPICAL AT ALL AREAS
3. EXISTING ACOUSTICAL METAL TEE-GRID SUSPENDED CEILING SYSTEM TO BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK , CONTRACTOR TO COORDINATE WITH NEW WORK SCOPE, TYPICAL AT ALL LOCATIONS
4. EXISTING ELECTRICAL LIGHTING FIXTURES, EXIT SIGN EMERGENCY BATTERY UNITS TO BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AS REQUIRED, TYPICAL AT ALL LOCATIONS
5. EXISTING FIRE PROTECTION / SUPPRESSION SYSTEM, PIPING AND HEADS TO REMAIN , CONTRACTOR TO PROTECT DURING CONSTRUCTION, TYPICAL AT ALL LOCATIONS

ALL TRADES / DISCIPLINE COORDINATION NOTES:

A. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL ASSUME THE LEAD RESPONSIBILITY FOR COMPLETE COORDINATION OF ALL BUILDING COMPONENTS TO ENSURE A COMPLETE INSTALLATION OF NEW MECHANICAL SYSTEMS.

B. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR UPON AWARD OF PROJECT CONTRACT SHALL IMMEDIATELY PERFORMED A COMPLETE AND THROUGH FIELD INVESTIGATION OF THE ENTIRE BUILDING TO DOCUMENT ALL EXISTING BUILDING AND SYSTEMS CONDITIONS FOR PREPARATION OF DETAILED SHOP / LAYOUT DRAWING SUBMITTALS.

C. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND STRUCTURAL FRAMING AND TRUSSES COORDINATION OF NEW DUCT WORK, PIPING, CONDUIT , LIGHTING , ARCHITECTURAL CEILING SYSTEMS IN ORDER TO ACCOMMODATE THE NECESSARY CEILING SPACE AND TRUSS OTHER SPACE CONDITIONS.

D. LAYOUTS INDICATED ON PLANS ARE PROVIDED TO CONVEY THE DESIGN INTENT AND SHALL NOT BE USED AS INSTALLATION DRAWINGS.

E. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL PROVIDE ALL NECESSARY TRANSACTIONS, OFFSETS, ANGLES, FITTINGS AS REQUIRED FOR THE INSTALLATION OF DUCT WORK, PIPING, CONDUITS, LIGHTING AND OTHER UTILITIES AND EQUIPMENT AS REQUIRED TO ACCOMMODATE BUILDING CONDITIONS AND PROVIDE COMPLETE OPERATING SYSTEMS.

F. ALL DUCT WORK , THERMAL UNITS, PIPING, CONDUITS, BOXES SHALL BE INSTALLED AS HIGH AS POSSIBLE WITHIN THE CEILING SPACE AND STRUCTURAL FRAMING AND TRUSS SPACES.

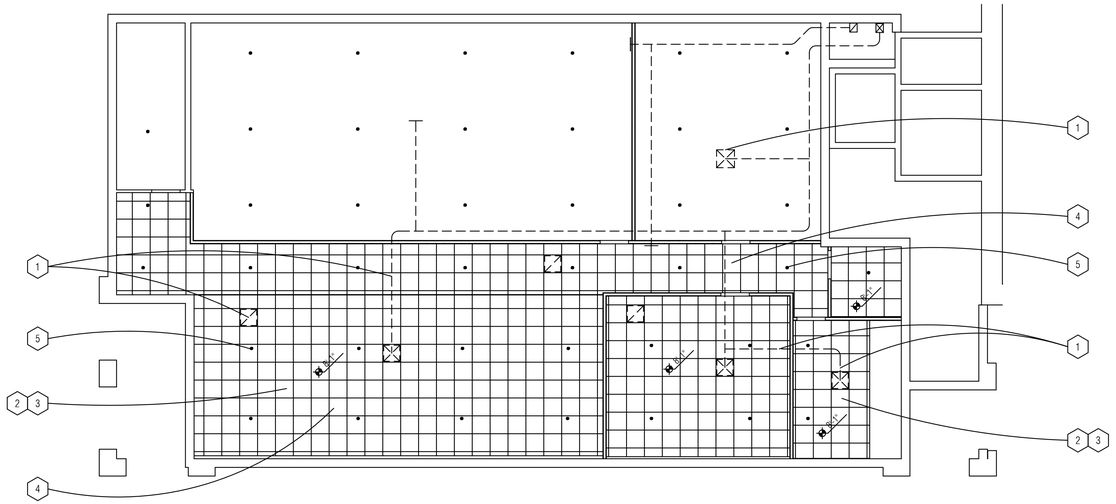
G. ALL EQUIPMENT SHALL BE INSTALLED TO PROVIDE SUFFICIENT CLEARANCES AND ACCESS AS REQUIRED FOR MAINTENANCE AND IN ACCORDANCE WITH THE MANUFACTURES RECOMMENDATIONS AND CLEARANCES INCLUDING EQUIPMENT ABOVE CEILING AND IN STRUCTURAL FRAMING AND TRUSSES SPACES.

H. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL SUBMIT FOR REVIEW AND APPROVAL BY ARCHITECT / ENGINEER / OWNER FULL CEILING SPACE COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS INDICATING THE INSTALLATION AND ACTUAL LOCATION AND ACTUAL SIZE OF DUCT WORK (MAINS AND BRANCHES) , TERMINAL BOXES, GAS PIPING, FIRE PROTECTION PIPING, LIGHTS, CONDUITS ETC. AS REQUIRED FOR COORDINATED INSTALLATION, INCLUDING COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS FOR STRUCTURAL STEEL , JOISTS AND TRUSSES CROSS BRACING , CEILING SUSPENSION SYSTEMS ETC. AS OPENING AND PENETRATIONS , ROOF OPENINGS SHALL BE BASED ON ACTUAL EQUIPMENT MANUFACTURES SHOP DRAWINGS.

J. CEILING SPACE / TRUSSES SPACE COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL BY ARCHITECT / ENGINEER / OWNER PRIOR TO INSTALLATION AND FABRICATION OF EQUIPMENT AND MATERIALS TO BE INSTALLED.

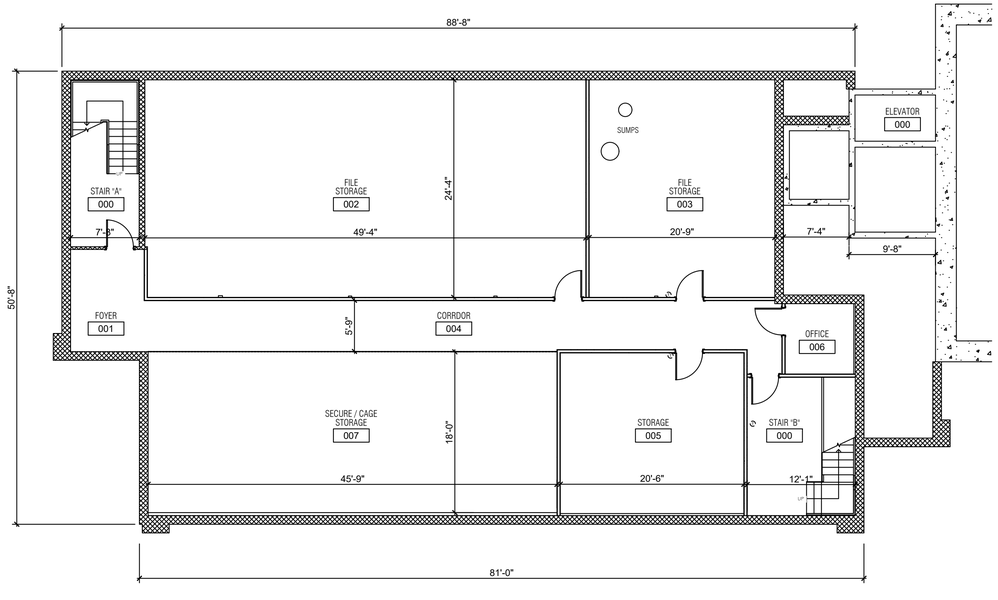
K. ALL COST ASSOCIATED WITH CEILING SPACE AND STRUCTURAL FRAMING AND TRUSS SPACE COORDINATION AS WELL AS PREPARATION OF THE CEILING SPACE AND STRUCTURAL FARMING AND TRUSS SPACE COORDINATION SHOP DRAINAGE , LAYOUT SUBMITTALS SHALL BE INCLUDED IN ALL BID PROPOSALS.

L. NOTE: LIMITED SPACE EXISTING IN THE EXISTING CONDITIONS FOR INSTALLATION OF NEW MECHANICAL SYSTEMS SHOP LAYOUT DRAIN SUBMITTALS PREPARED BY GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL BE UTILIZED AS FABRICATION AND INSTALLATION DRAWINGS COMPLETE ACCURACY IS REQUIRED FOR PREPARATION OF SHOP / LAYOUT DRAWING SUBMITTALS FOR SEAMLESS INSTALLATION.



N 2 / A2-01 Basement - Demolition Reflected Ceiling Plan
1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.



N 1 / A2-01 Basement - Demolition Floor Plan
1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

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PROJECT NAME:

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PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

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DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
OWNER REVIEW	10/29/24
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V.E. REDESIGN	12/02/24
OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME:
BASEMENT
DEMOLITION
FLOOR and RCP

SHEET NO.:
A2-01

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1. ALL DEMOLITION DRAWINGS AND DEMOLITION DETAILS ARE PROVIDED TO SHOW THE GENERAL SCOPE OF THE DEMOLITION WORK, BUT ARE NOT TO BE CONSIDERED AS 100% COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PERFORM ALL DEMOLITION WORK NECESSARY TO ACCOMPLISH NEW WORK. THE DEMOLITION DRAWINGS AND DETAILS MAY NOTE TYPICAL ITEMS IN SOME AREAS, WHICH APPLY IN OTHER AREAS (AND ARE DESIGNATED WITH DASHED, HIDDEN OR STRUCK THRU LINES). COORDINATE ALL DEMOLITION WORK WITH ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. REFER TO THESE DRAWINGS FOR ADDITIONAL DEMOLITION WORK AS REQUIRED.
2. CONTRACTOR REQUIRED TO COORDINATE NECESSARY DEMOLITION WITH WORK SCOPE ON NEW CONSTRUCTION PLANS, SOME REQUIRED DEMOLITION WORK SCOPE IS SHOWN IN NEW WORK SCOPE PLANS AND SPECIFICATIONS, TYPICAL FOR ALL TRADES.
3. ALL CONSTRUCTION AND DEMOLITION MEANS, METHODS AND SAFETY PRECAUTIONS SHALL BE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
4. PROVIDE PROTECTION FOR EXISTING CONSTRUCTION TO REMAIN. PATCH AND REPAIR ALL AREAS DAMAGED DURING DEMOLITION/CONSTRUCTION; MATCH EXISTING CONSTRUCTION, MATERIALS AND FINISHES (TYPICAL ALL LOCATIONS).
5. ASBESTOS AND OTHER HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER PRIOR TO START OF CONSTRUCTION. IF ANY SUSPECTED HAZARDOUS MATERIAL IS ENCOUNTERED, STOP WORK IN THAT AREA AND IMMEDIATELY CONTACT THE ARCHITECT/OWNER FOR DIRECTION FROM OWNER'S ABATEMENT CONSULTANT.
6. REMOVE ALL EXISTING CONSTRUCTION AS NOTED ON DRAWINGS AND ALL CONSTRUCTION AND MATERIALS WHICH ARE INCIDENTAL TO THE PROPOSED NEW CONSTRUCTION WORK.
7. ALL CONSTRUCTION DEMOLITION AND DEBRIS ARE TO BE PROMPTLY AND LEGALLY DISPOSED OF OFF SITE.
8. ALL RAW EDGES RESULTING FROM DEMOLITION WORK SHALL BE PREPARED TO MATCH EXISTING CONSTRUCTION AND PROVIDE FINISH CONSTRUCTION.
9. IN AREAS INDICATED FOR DEMOLITION REMOVE ALL LIGHT FIXTURES, LIGHT SWITCHES, CONVENIENCE OUTLETS ETC. AND ALL RELATED WIRING AND CONDUIT BACK TO PANEL SOURCE, COORDINATE WITH ELECTRICAL PLANS, TYPICAL
10. AT AREAS INDICATED FOR DEMOLITION ALL PLUMBING FIXTURES TO BE REMOVED SHALL HAVE PLUMBING LINES CAPPED BELOW EXISTING SLAB AND PATCH TO MATCH EXISTING , COORDINATE WITH MECHANICAL PLANS, TYPICAL.
11. DIMENSIONS SHOWN FOR DEMOLITION AND AREAS ARE APPROXIMATE ONLY. CONTRACTOR SHALL COORDINATE FULL EXTENTS OF DEMOLITION IN THESE AREAS.
12. CONFIRM EXTENT OF DEMOLITION WITH SCOPE OF NEW WORK.
13. WALL REMOVAL THAT TERMINATES INTO A WALL OR CEILING TO REMAIN SHALL BE COMPLETELY REMOVED, FREE OF PROJECTIONS, READY TO RECEIVE NEW FINISHES.
14. CONTRACTOR SHALL REMOVE EXISTING DOORS, FRAMES AND ALL ASSOCIATED MATERIAL AS REQUIRED FOR NEW CONSTRUCTION. PREP OPENING REFER TO FLOOR PLAN. (VIF)
15. CONTRACTOR SHALL PLACE ANY ITEMS OR MATERIALS TO BE SALVAGED AND/OR RETAINED AS DIRECTED BY OWNER.
16. PATCH AND REPAIR ALL SURFACES TO REMAIN TO MATCH EXISTING ADJACENT SURFACES AS REQUIRED TO RECEIVE NEW FINISHES
17. REMOVE EXISTING UNUSED NAILS, SCREWS AND OTHER WALL PROTRUSIONS FROM EXISTING SURFACES TO REMAIN. PATCH AND REPAIR TO MATCH EXISTING ADJACENT SURFACES AS REQUIRED TO RECEIVE NEW FINISHES.
18. REMOVAL OF ANY MECHANICAL, ELECTRICAL AND MISCELLANEOUS ITEMS WILL REQUIRE PATCH AND REPAIR OF ADJACENT MATERIALS TO REMAIN.
19. DISCONNECT ALL MISCELLANEOUS FEATURES (I.E. ELECTRICAL, MECHANICAL, PLUMBING, ETC.) ASSOCIATED WITH ITEMS TO BE DEMOLISHED (I.E. PARTITIONS, WALLS, CEILINGS, CABINETS ETC.).

DEMOLITION FLOOR PLAN KEY NOTES:

NOTE:
COORDINATE WITH STRUCTURAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATIONS OF EXISTING STRUCTURAL AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION, AND RELOCATION OF ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR REMOVAL, DEMOLITION AND RELOCATION OF MECHANICAL FANS, FIXTURES AND EQUIPMENT AND PREP FOR NEW CONSTRUCTION, TYPICAL AT ALL LOCATIONS.

NOTE:
OWNER TO REMOVE EXISTING SECURITY AND I.T. TECHNOLOGY SYSTEMS AS REQUIRED FOR NEW ABOVE CEILING CONSTRUCTION, CONTRACTOR TO COORDINATE IN FIELD AS REQUIRED WITH OWNERS VENDOR WORK AND OPERATIONS FOR NEW CONSTRUCTION WORK SCOPE, TYPICAL AT ALL LOCATIONS.

1. EXISTING MECHANICAL H.V.A.C. DUCT WORK, DIFFUSERS, GRILLS AND ALL ASSOCIATED MATERIALS TO BE REMOVED, CONTRACTOR TO PREP FOR NEW CONSTRUCTION, REFER TO MECHANICAL PLANS AND SPECIFICATIONS AS REQUIRED, TYPICAL AT ALL AREAS
2. EXISTING ACOUSTICAL CEILING PADS / TILES BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK , CONTRACTOR TO SAVE AND "SALVAGE" CEILING PADS / TILES IN GOOD CONDITIONS FOR RE-USES AS POSSIBLE IN NEW CONSTRUCTION WORK SCOPE, TYPICAL AT ALL AREAS
3. EXISTING ACOUSTICAL METAL TEE-GRID SUSPENDED CEILING SYSTEM TO BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK , CONTRACTOR TO COORDINATE WITH NEW WORK SCOPE, TYPICAL AT ALL LOCATIONS
4. EXISTING ELECTRICAL LIGHTING FIXTURES, EXIT SIGN EMERGENCY BATTERY UNITS TO BE REMOVED AS REQUIRED FOR NEW ABOVE CEILING MECHANICAL WORK, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AS REQUIRED, TYPICAL AT ALL LOCATIONS
5. EXISTING FIRE PROTECTION / SUPPRESSION SYSTEM, PIPING AND HEADS TO REMAIN , CONTRACTOR TO PROTECT DURING CONSTRUCTION, TYPICAL AT ALL LOCATIONS
6. EXISTING SOFFIT AND CEILING SYSTEM IN EXIST STAIR AREA TO BE REMOVED AS REQUIRED FOR NEW H.V.A.C. SYSTEMS AND NEW CONSTRUCTION WORK SCOPE, COORDINATE WITH MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS
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9. REMOVE EXISTING METAL CEILING GRID SYSTEM AND ACOUSTICAL CEILING TILE SYSTEM. REMOVE EXISTING BATT. INSULATION ABOVE CEILING TILE AND AT UPPER TRANSOM PANELS COMPLETELY IN ENTRY VESTIBULE AREA, TYPICAL AT ALL AREAS IN OUTDOOR ENTRY VESTIBULE
10. REMOVED EXISTING ALUMINUM WINDOW, ENTRY DOOR AND GLASS STORE FRONT SYSTEMS, CONTRACTOR TO CLEAN AND REMOVE ALL ASSOCIATED ANCHORS, PERIMETER SEALANT AND BACKER ROD SYSTEM COMPLETELY, PREP AREA FOR NEW CONSTRUCTION, TYPICAL AT ALL AREAS IN OUTDOOR ENTRY VESTIBULE
11. COORDINATE EXTENT OF REMOVAL REQUIRED OF EXISTING WINDOW SYSTEM WITH SIZES OF NEW H.V.A.C. DUCT WORK AND PENETRATION LOCATION IN FIELD, REVIEW WITH ARCHITECT / OWNER / ENGINEERS IF EXISTING WINDOW SYSTEM CAN REMAIN, TYPICAL AT ALL LOCATIONS

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B. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR UPON AWARD OF PROJECT CONTRACT SHALL IMMEDIATELY PERFORMED A COMPLETE AND THROUGH FIELD INVESTIGATION OF THE ENTIRE BUILDING TO DOCUMENT ALL EXISTING BUILDING AND SYSTEMS CONDITIONS FOR PREPARATION OF DETAILED SHOP / LAYOUT DRAWING SUBMITTALS.

C. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND STRUCTURAL FRAMING AND TRUSSES COORDINATION OF NEW DUCT WORK, PIPING, CONDUIT , LIGHTING , ARCHITECTURAL CEILING SYSTEMS IN ORDER TO ACCOMMODATE THE NECESSARY CEILING SPACE AND TRUSS OTHER SPACE CONDITIONS.

D. LAYOUTS INDICATED ON PLANS ARE PROVIDED TO CONVEY THE DESIGN INTENT AND SHALL NOT BE USED AS INSTALLATION DRAWINGS.

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F. ALL DUCT WORK , THERMAL UNITS, PIPING, CONDUITS, BOXES SHALL BE INSTALLED AS HIGH AS POSSIBLE WITHIN THE CEILING SPACE AND STRUCTURAL FRAMING AND TRUSS SPACES.

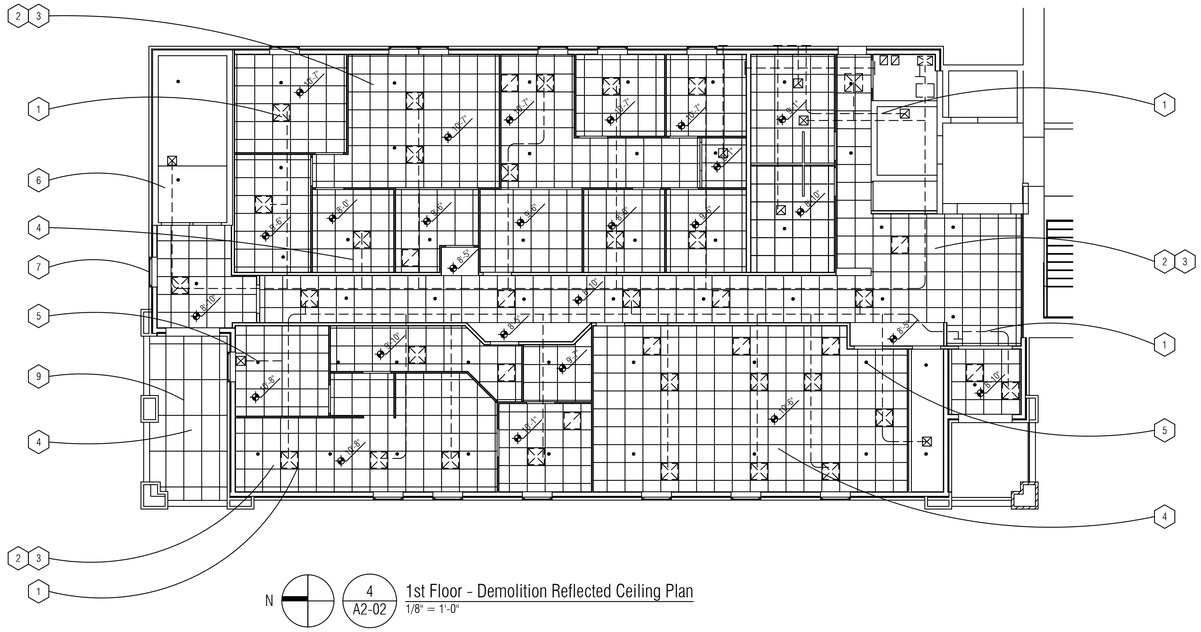
G. ALL EQUIPMENT SHALL BE INSTALLED TO PROVIDE SUFFICIENT CLEARANCES AND ACCESS AS REQUIRED FOR MAINTENANCE AND IN ACCORDANCE WITH THE MANUFACTURES RECOMMENDATIONS AND CLEARANCES INCLUDING EQUIPMENT ABOVE CEILING AND IN STRUCTURAL FRAMING AND TRUSSES SPACES.

H. GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL SUBMIT FOR REVIEW AND APPROVAL BY ARCHITECT / ENGINEER / OWNER FULL CEILING SPACE COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS INDICATING THE INSTALLATION AND ACTUAL LOCATION AND ACTUAL SIZE OF DUCT WORK (MAINS AND BRANCHES) , TERMINAL BOXES, GAS PIPING, FIRE PROTECTION PIPING, LIGHTS, CONDUITS ETC. AS REQUIRED FOR COORDINATED INSTALLATION, INCLUDING COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS FOR STRUCTURAL STEEL , JOISTS AND TRUSSES CROSS BRACING , CEILING SUSPENSION SYSTEMS ETC. AS OPENING AND PENETRATIONS , ROOF OPENINGS SHALL BE BASED ON ACTUAL EQUIPMENT MANUFACTURES SHOP DRAWINGS.

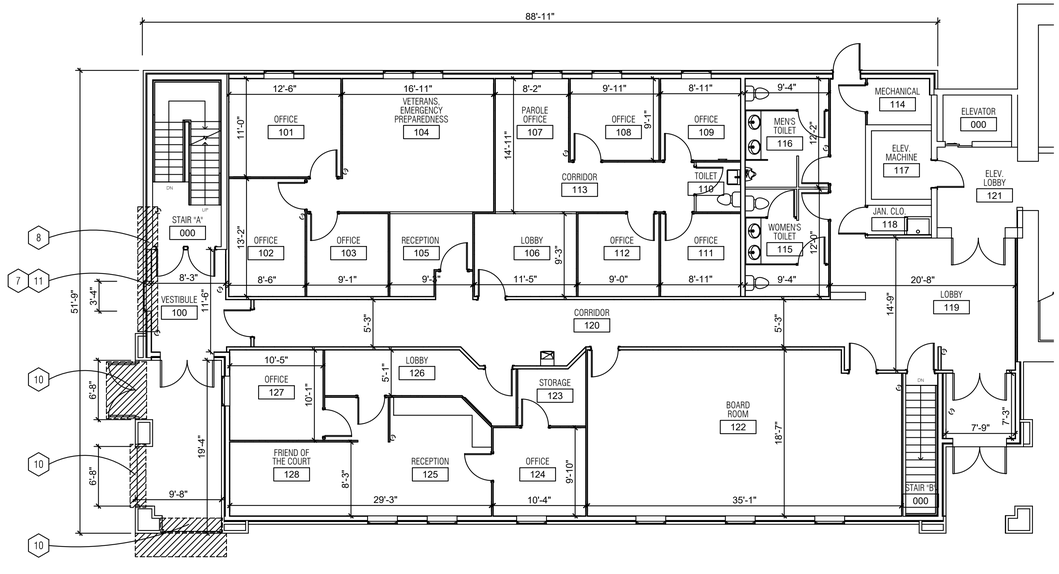
J. CEILING SPACE / TRUSSES SPACE COORDINATION SHOP / LAYOUT DRAWING SUBMITTALS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL BY ARCHITECT / ENGINEER / OWNER PRIOR TO INSTALLATION AND FABRICATION OF EQUIPMENT AND MATERIALS TO BE INSTALLED.

K. ALL COST ASSOCIATED WITH CEILING SPACE AND STRUCTURAL FRAMING AND TRUSS SPACE COORDINATION AS WELL AS PREPARATION OF THE CEILING SPACE AND STRUCTURAL FARMING AND TRUSS SPACE COORDINATION SHOP DRAINAGE . LAYOUT SUBMITTALS SHALL BE INCLUDED IN ALL BID PROPOSALS.

L. NOTE: LIMITED SPACE EXISTING IN THE EXISTING CONDITIONS FOR INSTALLATION OF NEW MECHANICAL SYSTEMS SHOP LAYOUT DRAIN SUBMITTALS PREPARED BY GENERAL CONTRACTOR AND MECHANICAL CONTRACTOR SHALL BE UTILIZED AS FABRICATION AND INSTALLATION DRAWINGS COMPLETE ACCURACY IS REQUIRED FOR PREPARATION OF SHOP / LAYOUT DRAWING SUBMITTALS FOR SEAMLESS INSTALLATION.



N 4 A2-02 1st Floor - Demolition Reflected Ceiling Plan
1/8" = 1'-0"



N 3 A2-02 1st Floor - Demolition Floor Plan
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151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

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DESIGN DEVELOPMENT	08/06/24
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COUNTY BOARD MEETING	11/27/24
V.E. REDESIGN	12/02/24
OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: FIRST FLOOR DEMOLITION FLOOR and RCP

SHEET NO.: A2-02

GENERAL NOTES - DEMOLITION PLANS:

1. ALL DEMOLITION DRAWINGS AND DEMOLITION DETAILS ARE PROVIDED TO SHOW THE GENERAL SCOPE OF THE DEMOLITION WORK, BUT ARE NOT TO BE CONSIDERED AS 100% COMPLETE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PERFORM ALL DEMOLITION WORK NECESSARY TO ACCOMPLISH NEW WORK. THE DEMOLITION DRAWINGS AND DETAILS MAY NOTE TYPICAL ITEMS IN SOME AREAS, WHICH APPLY IN OTHER AREAS (AND ARE DESIGNATED WITH DASHED, HIDDEN OR STRUCK THRU LINES). COORDINATE ALL DEMOLITION WORK WITH ALL ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS. REFER TO THESE DRAWINGS FOR ADDITIONAL DEMOLITION WORK AS REQUIRED.
2. CONTRACTOR REQUIRED TO COORDINATE NECESSARY DEMOLITION WITH WORK SCOPE ON NEW CONSTRUCTION PLANS, SOME REQUIRED DEMOLITION WORK SCOPE IS SHOWN IN NEW WORK SCOPE PLANS AND SPECIFICATIONS, TYPICAL FOR ALL TRADES.
3. ALL CONSTRUCTION AND DEMOLITION MEANS, METHODS AND SAFETY PRECAUTIONS SHALL BE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING EXISTING CONDITIONS PRIOR TO SUBMITTING BID.
4. PROVIDE PROTECTION FOR EXISTING CONSTRUCTION TO REMAIN. PATCH AND REPAIR ALL AREAS DAMAGED DURING DEMOLITION/CONSTRUCTION; MATCH EXISTING CONSTRUCTION, MATERIALS AND FINISHES (TYPICAL ALL LOCATIONS).
5. ASBESTOS AND OTHER HAZARDOUS MATERIALS WILL BE REMOVED BY OWNER PRIOR TO START OF CONSTRUCTION. IF ANY SUSPECTED HAZARDOUS MATERIAL IS ENCOUNTERED, STOP WORK IN THAT AREA AND IMMEDIATELY CONTACT THE ARCHITECT/OWNER FOR DIRECTION FROM OWNER'S ABATEMENT CONSULTANT.
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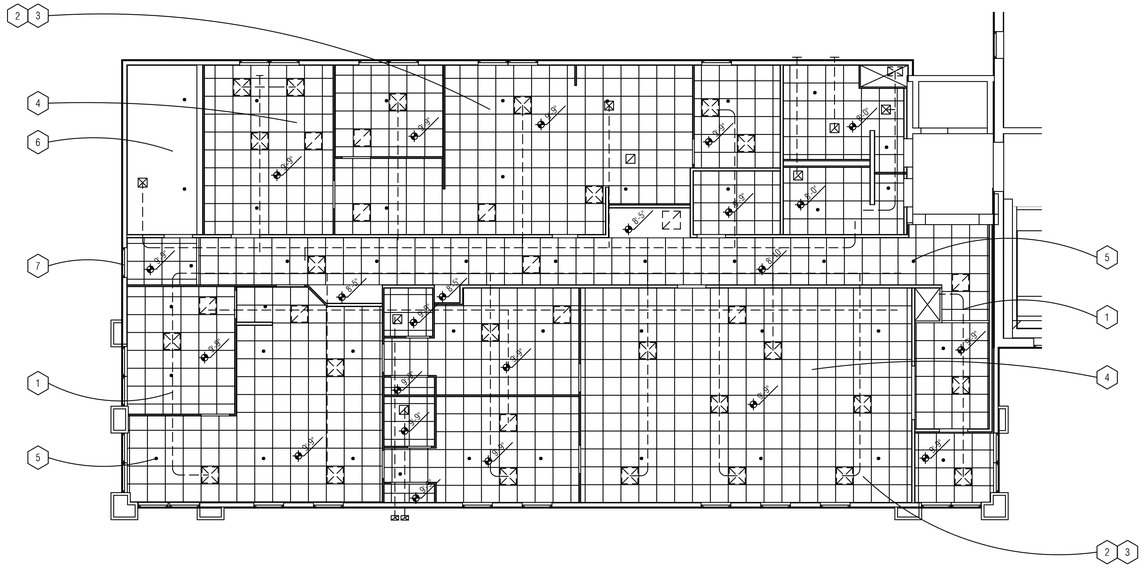
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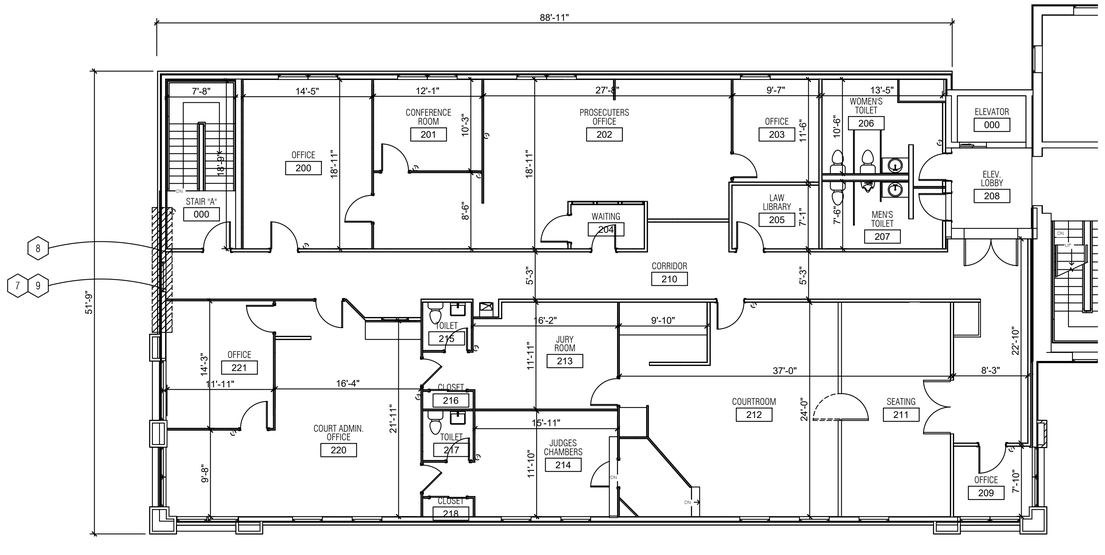
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N 6 A2-03 2nd Floor - Demolition Reflected Ceiling Plan
1/8" = 1'-0"



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DRAWN BY:	jr
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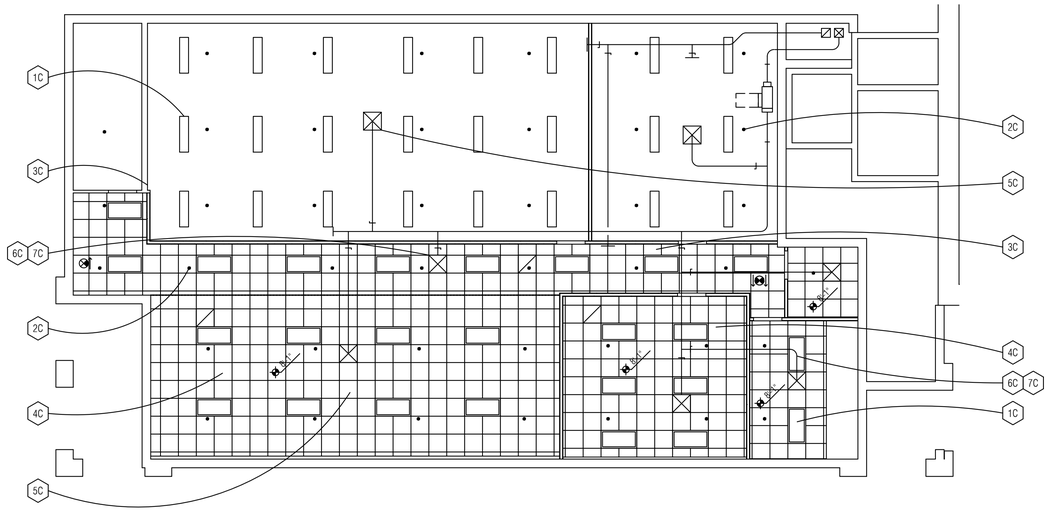
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OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME:
SECOND FLOOR
DEMOLITION
FLOOR and RCP

SHEET NO.:
A2-03



N 2 / A3-01 Basement - Reflected Ceiling Plan

1/8" = 1'-0"

NOTE: CONTRACTOR TO COORDINATE NEW CEILING HEIGHTS WITH EXISTING AND WITH NEW H.V.A.C. EQUIPMENT AND DUCT WORK AND ELECTRICAL LIGHTING FIXTURES AND SPRINKLER PIPING IN FIELD AS REQUIRED, TYPICAL AT ALL LOCATIONS

GENERAL FLOOR PLAN NOTES :

1. ALL PLAN DIMENSIONS ARE NOMINAL TO FACE OF WALL. WALL THICKNESS ARE SHOWN NOMINAL
2. COORDINATE SIZE AND LOCATION OF ALL DUCT AND SHAFT OPENINGS IN WALLS, CEILINGS AND FLOORS WITH MECHANICAL AND ELECTRICAL. PROVIDE ALL REQUIRED LINTELS FOR OPENINGS.
3. DO NOT SCALE DRAWINGS. USE DIMENSIONS PROVIDED. IF A CONFLICT IS ENCOUNTERED OR A REQUIRED DIMENSION IS NOT PROVIDED, REQUEST A CLARIFICATION FROM THE ARCHITECT.
4. ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.
5. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VISITING THE JOB SITE AND FAMILIARIZING THEMSELVES WITH EXISTING CONDITIONS PRIOR TO START OF WORK. ALL DIMENSIONS AND FIELD CONDITIONS SHALL BE VERIFIED, AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO THE RECEIPT OF BIDS. FAILURE OF THE CONTRACTOR TO VERIFY ALL CONDITIONS PRIOR TO THE AWARD OF BID WILL NOT BE CONSIDERED AS GROUNDS FOR AN EXTRA.
6. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THE CONTRACT. PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE SAFETY OF THE WORKERS AND GENERAL PUBLIC DURING CONSTRUCTION.
7. ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT AND ENGINEER AND AS APPROVED BY THE OWNER.
8. SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT AND ENGINEER AND OWNER FOR REVIEW PRIOR TO INSTALLATION / APPLICATION.
9. ALL DEBRIS SHALL BE LEGALLY DISPOSED OF OFF THE SITE BY THE CONTRACTOR.
10. ALL PRECAUTIONS SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING MATERIALS AND CONSTRUCTION TO REMAIN.
11. CONTRACTOR SHALL KEEP NOISE, DUST, ETC., TO A MINIMUM STANDARD AS SET FORTH BY THE OWNER.
12. CONTRACTOR SHALL COORDINATE INSTALLATION AND PHASING OF WORK WITH THE OWNER'S REPRESENTATIVE PRIOR TO THE START OF WORK.
13. NOTE ALL DIMENSIONS ARE + / - AND ARE TO BE FIELD VERIFIED
14. CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL NEW WORK AS REQUIRED FOR ELECTRICAL MECHANICAL AND STRUCTURAL WITH ARCHITECTURAL IF A CONFLICT IS ENCOUNTERED, REQUEST CLARIFICATIONS FROM THE ARCHITECT. REFER TO ELECTRICAL PLANS FOR LIGHT FIXTURE TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO MECHANICAL PLANS FOR DIFFUSER, REGISTERS AND RETURN GRILLES TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO STRUCTURAL FOR NEW SYSTEMS DETAILS AND SPECIFICATIONS.

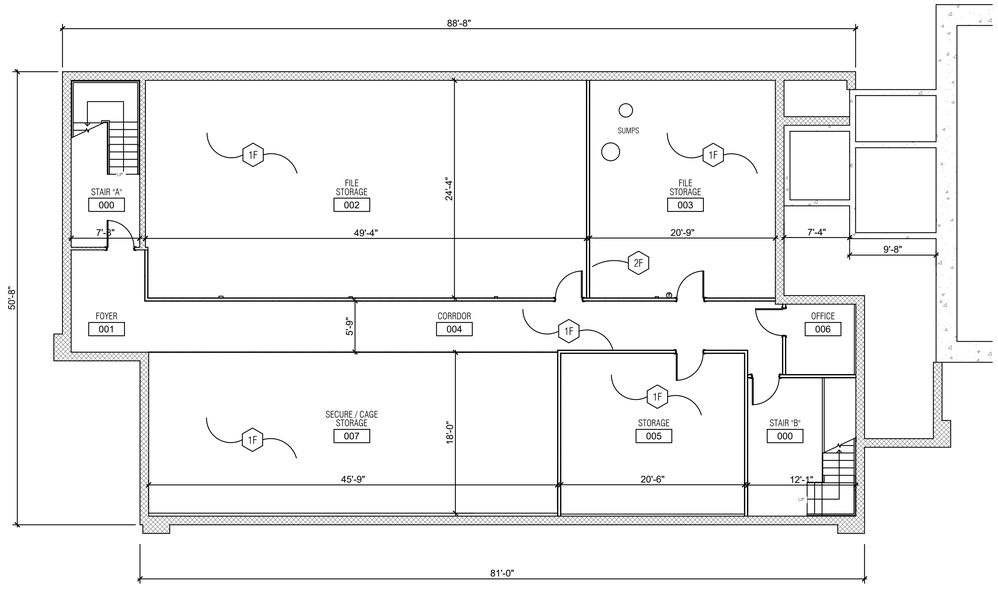
FLOOR PLAN KEY NOTES :

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW MECHANICAL FANS, DUCT WORK, GRILLS, DIFFUSERS, EXHAUST FANS, FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

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2F LOCATION OF NEW T- STAT's AND H.V.A.C. CONTROLS TO BE COORDINATE WITH COURT BUILDING FACILITY STAFF AND MECHANICAL DRAWINGS AND SPECIFICATIONS IN FIELD AS REQUIRED TO MEET OWNERS NEEDS, TYPICAL AT ALL LOCATIONS



N 1 / A3-01 Basement - Composite Floor Plan

1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
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REFLECTED CEILING GENERAL NOTES :

A. REFER TO FLOOR PLANS FOR ROOM NAMES, NUMBERS AND ROOM DIMENSIONS.

B. REFER TO ELECTRICAL FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.

C. REFER TO MECHANICAL FOR DIFFUSERS, REGISTERS, AND RETURNS.

D. ALL LIGHT FIXTURES ARE TO BE CENTERED WITHIN CEILING TILE AND GYP SOFFIT U.O.N.

E. CEILING GRID IS TO BE CENTERED IN ROOM U.O.N.

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PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

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CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

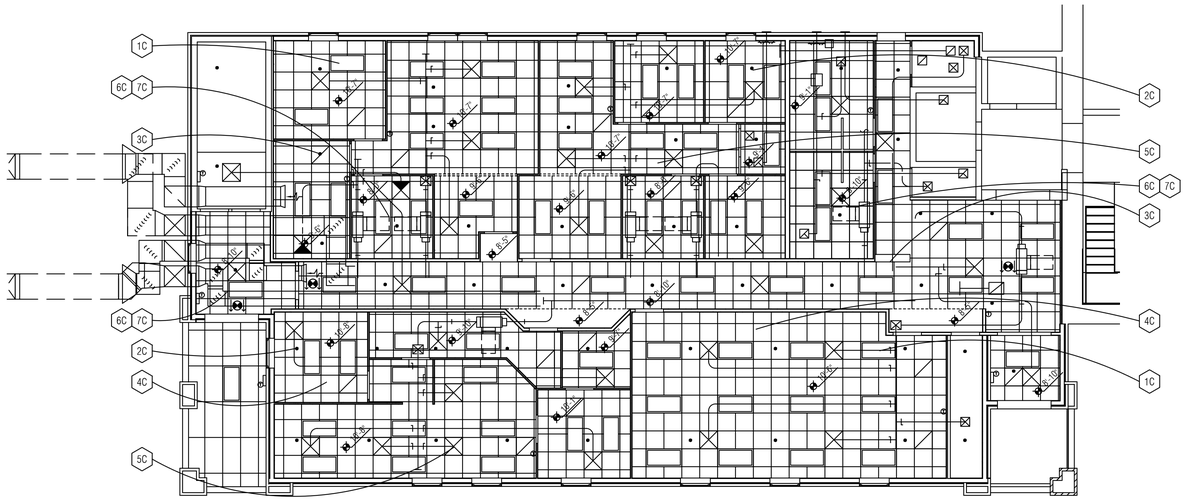
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DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: BASEMENT FLOOR PLAN and RCP

SHEET NO.: A3-01



N 4 A3-02

1st Floor - Reflected Ceiling Plan

1/8" = 1'-0"

NOTE: CONTRACTOR TO COORDINATE NEW CEILING HEIGHTS WITH EXISTING AND WITH NEW H.V.A.C. EQUIPMENT AND DUCT WORK AND ELECTRICAL LIGHTING FIXTURES AND SPRINKLER PIPING IN FIELD AS REQUIRED, TYPICAL AT ALL LOCATIONS

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2F LOCATION OF NEW T- STAT's AND H.V.A.C. CONTROLS TO BE COORDINATE WITH COURT BUILDING FACILITY STAFF AND MECHANICAL DRAWINGS AND SPECIFICATIONS IN FIELD AS REQUIRED TO MEET OWNERS NEEDS, TYPICAL AT ALL LOCATIONS

3F NEW ALUMINUM STORE FRONT FRAMING SYSTEM ENTRY VESTIBULE (COLOR AND FRAME TO MATCH EXISTING), REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE THERMALLY BROKE FRAMING #SL-450TB / SL-245 FG) PROVIDE 1" LOW 'E' INSULATED TINTED (MATCH EXISTING) GLASS GLAZING IN LOCATIONS AS INDICATED AND 1/2" INSULATION DOUBLED SIDED FRP TEXTURED PANEL IN LOCATIONS AS INDICATED, PROVIDE BACKER ROOD AND SEALANT ALL AROUND / BOTH SIDES OF FRAMING SYSTEM IN EXISTING OPENING

4F NEW DOUBLE ENTRY DOOR SYSTEM WITH REMOVABLE CENTER POST MULLION (COLOR AND FRAME TO MATCH EXISTING) , REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE DOOR AND FRAME #SL-17 WITH RECESSED DOOR HARDWARE PULL SL-82 ON EXTERIOR SIDE AND PANIC EGRESS HARDWARE ON INTERIOR EXIT SIDE)

5F EXISTING EXTERIOR WINDOW SYSTEM TO BE REMOVED AS REQUIRED FOR NEW H.V.A.C. SYSTEMS AND NEW CONSTRUCTION WORK SCOPE, COORDINATE WITH MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

6F "SELECTIVE DEMOLITION" PORTION OF EXISTING EXTERIOR WALL SYSTEM (STUD CONSTRUCTION WITH BRICK VENEER AT LOWER LEVEL AND VINYL SIDING AT UPPER LEVEL) TO BE REMOVED AND OPENED UP FOR NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, TYPICAL AT MULTIPLE LOCATIONS

7F EXISTING EXTERIOR BRICK VENEER SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, PATCH AND REPAIR AS REQUIRE, PROVIDE NEW HEADER TRIM AND FLASHING AS REQUIRED FOR NEW CONSTRUCTION INTERSECTION / PENETRATION FOR NEW H.V.A.C. DUCT WORK SYSTEMS, TYPICAL AT ALL LOCATIONS

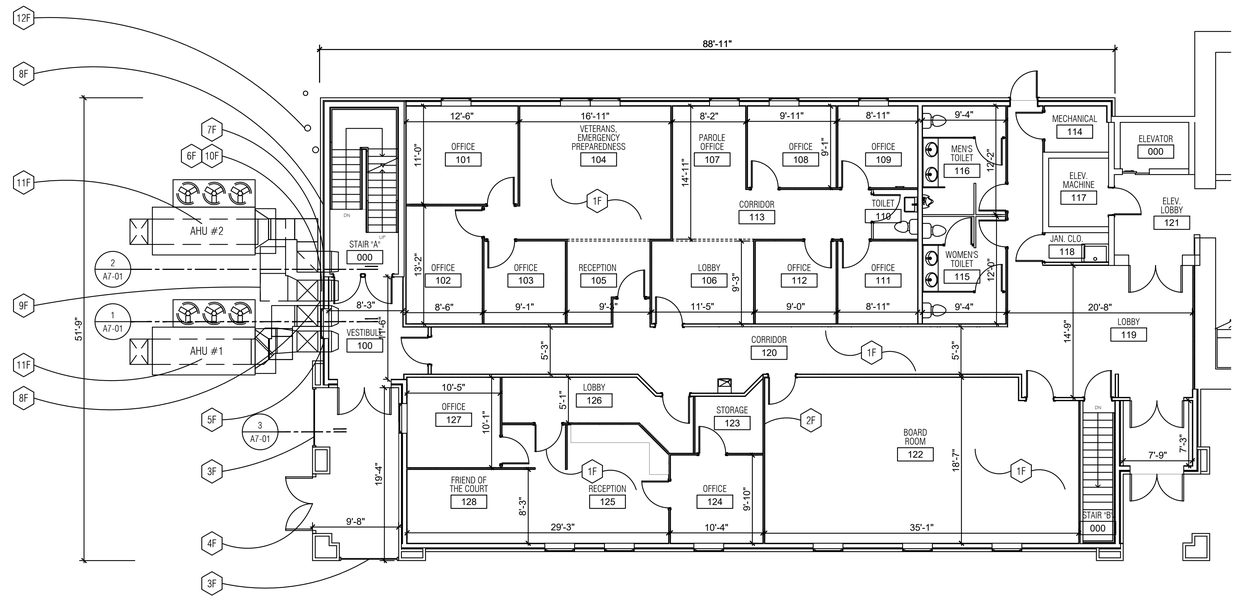
8F PROVIDE NEW WALL MOUNTED EXTERIOR ELECTRICAL POWER AND DISCONNECT EQUIPMENT, COORDINATE LOCATION IN FIELD WITH ARCHITECT, REFER TO ELECTRICAL AND MECHANICAL PLANS AND SPECIFICATIONS

9F NEW EXTERIOR INSULATED DUCT WORK SYSTEM SUPPORTED WITH NEW UNI-STRUT FRAMING AND SUPPORT SYSTEM, (MECHANICAL CONTRACTOR TO PROVIDE DEFERRED SUBMITTALS DESIGN AND INSTALLATION DRAWINGS AND DETAILS) REFER TO MECHANICAL PLANS AND SPECIFICATIONS FOR EXACT CONFIGURATION AND ROUTING OF NEW DUCT WORK THRU EXISTING EXTERIOR WALLS, TYPICAL AT ALL LOCATIONS

10F NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, CONTRACTOR TO VERIFY AND COORDINATE SIZE AND LOCATION IN FIELD WITH MECHANICAL PLANS AND SPECIFICATIONS, PROVIDE AIR AND WATER TIGHT SEAL AND FRAMING AROUND PERIMETER OF NEW SUPPLY AIR AND RETURN AIR DUCT PENETRATIONS, TYPICAL AT ALL LOCATIONS

11F NEW H.V.A.C MECHANICAL UNITS LOCATED ON STRUCTURAL FRAMING SYSTEM AT GRADE / GROUND LEVEL REFER TO MECHANICAL AND CIVIL PLANS AND SPECIFICATIONS, TYPICAL FOR TWO (2) NEW UNITS TO REPLACED EXISTING ROOT TOP EQUIPMENT TO BE REMOVED

12F EXISTING UNDERGROUND SANITARY LINES AND BUILDING CLEAN OUTS TO REMAIN, CONTRACTOR TO LOCATE AND AND COORDINATE NEW CONSTRUCTION WITH EXISTING, CONTRACTOR TO PROTECT EXISTING DURING CONSTRUCTION, CONTRACTOR TO REPAIR ANY DAMAGE TO MATCH EXISTING AS REQUIRED



N 3 A3-02

1st Floor - Composite Floor Plan

1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
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REFLECTED CEILING GENERAL NOTES :

A. REFER TO FLOOR PLANS FOR ROOM NAMES, NUMBERS AND ROOM DIMENSIONS.

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PRESQUE ISLE COUNTY ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

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CHECKED BY:	JFR

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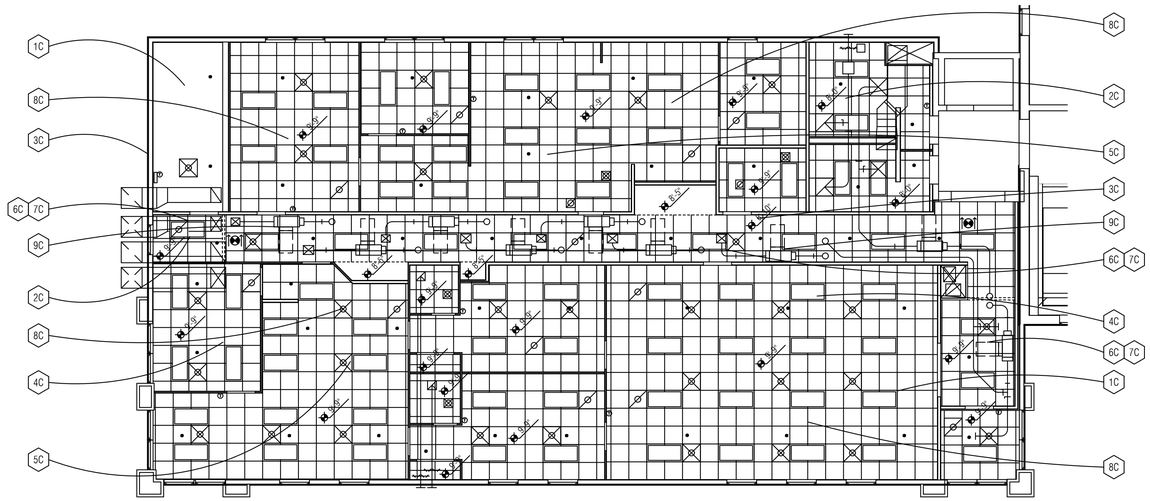
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PROJECT NO.: 24-028

DRAWING NAME: 1st FLOOR PLAN and RCP

SHEET NO.: A3-02



N 6 A3-03 2nd Floor - Reflected Ceiling Plan
1/8" = 1'-0"

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GENERAL FLOOR PLAN NOTES :

1. ALL PLAN DIMENSIONS ARE NOMINAL TO FACE OF WALL. WALL THICKNESS ARE SHOWN NOMINAL
2. COORDINATE SIZE AND LOCATION OF ALL DUCT AND SHAFT OPENINGS IN WALLS, CEILINGS AND FLOORS WITH MECHANICAL AND ELECTRICAL. PROVIDE ALL REQUIRED LINTELS FOR OPENINGS.
3. DO NOT SCALE DRAWINGS. USE DIMENSIONS PROVIDED. IF A CONFLICT IS ENCOUNTERED OR A REQUIRED DIMENSION IS NOT PROVIDED, REQUEST A CLARIFICATION FROM THE ARCHITECT.
4. ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.
5. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VISITING THE JOB SITE AND FAMILIARIZING THEMSELVES WITH EXISTING CONDITIONS PRIOR TO START OF WORK. ALL DIMENSIONS AND FIELD CONDITIONS SHALL BE VERIFIED, AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO THE RECEIPT OF BIDS. FAILURE OF THE CONTRACTOR TO VERIFY ALL CONDITIONS PRIOR TO THE AWARD OF BID WILL NOT BE CONSIDERED AS GROUNDS FOR AN EXTRA.
6. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THE CONTRACT. PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE SAFETY OF THE WORKERS AND GENERAL PUBLIC DURING CONSTRUCTION.
7. ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT AND ENGINEER AND AS APPROVED BY THE OWNER.
8. SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT AND ENGINEER AND OWNER FOR REVIEW PRIOR TO INSTALLATION / APPLICATION.
9. ALL DEBRIS SHALL BE LEGALLY DISPOSED OF OFF THE SITE BY THE CONTRACTOR.
10. ALL PRECAUTIONS SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING MATERIALS AND CONSTRUCTION TO REMAIN.
11. CONTRACTOR SHALL KEEP NOISE, DUST, ETC., TO A MINIMUM STANDARD AS SET FORTH BY THE OWNER.
12. CONTRACTOR SHALL COORDINATE INSTALLATION AND PHASING OF WORK WITH THE OWNER'S REPRESENTATIVE PRIOR TO THE START OF WORK.
13. NOTE ALL DIMENSIONS ARE + / - AND ARE TO BE FIELD VERIFIED
14. CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL NEW WORK AS REQUIRED FOR ELECTRICAL MECHANICAL AND STRUCTURAL WITH ARCHITECTURAL IF A CONFLICT IS ENCOUNTERED, REQUEST CLARIFICATIONS FROM THE ARCHITECT. REFER TO ELECTRICAL PLANS FOR LIGHT FIXTURE TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO MECHANICAL PLANS FOR DIFFUSER, REGISTERS AND RETURN GRILLES TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO STRUCTURAL FOR NEW SYSTEMS DETAILS AND SPECIFICATIONS.

FLOOR PLAN KEY NOTES :

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW MECHANICAL FANS, DUCT WORK, GRILLS, DIFFUSERS, EXHAUST FANS, FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

1F CONTRACTOR IS REQUIRED TO PROTECT EXISTING INTERIOR FINISHES AND EQUIPMENT AS REQUIRED FOR NEW ABOVE CEILING CONSTRUCTION WORK. CONTRACTOR WILL BE RESPONSIBLE TO REPLACE, REPAIR, REPAINT ALL INTERIOR FINISHES AND EQUIPMENT AS NECESSARY, TYPICAL AT ALL LOCATIONS

2F LOCATION OF NEW T- STAT's AND H.V.A.C. CONTROLS TO BE COORDINATE WITH COURT BUILDING FACILITY STAFF AND MECHANICAL DRAWINGS AND SPECIFICATIONS IN FIELD AS REQUIRED TO MEET OWNERS NEEDS, TYPICAL AT ALL LOCATIONS

3F NEW ALUMINUM STORE FRONT FRAMING SYSTEM ENTRY VESTIBULE (COLOR AND FRAME TO MATCH EXISTING), REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE THERMALLY BROKE FRAMING #SL-450TB / SL-245 FG) PROVIDE 1" LOW 'E' INSULATED TINTED (MATCH EXISTING) GLASS GLAZING IN LOCATIONS AS INDICATED AND 1/2" INSULATION DOUBLED SIDED FRP TEXTURED PANEL IN LOCATIONS AS INDICATED, PROVIDE BACKER ROOD AND SEALANT ALL AROUND / BOTH SIDES OF FRAMING SYSTEM IN EXISTING OPENING

4F NEW DOUBLE ENTRY DOOR SYSTEM WITH REMOVABLE CENTER POST MULLION (COLOR AND FRAME TO MATCH EXISTING) , REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE DOOR AND FRAME #SL-17 WITH RECESSED DOOR HARDWARE PULL SL-82 ON EXTERIOR SIDE AND PANIC EGRESS HARDWARE ON INTERIOR EXIT SIDE)

5F EXISTING EXTERIOR WINDOW SYSTEM TO BE REMOVED AS REQUIRED FOR NEW H.V.A.C. SYSTEMS AND NEW CONSTRUCTION WORK SCOPE, COORDINATE WITH MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

6F "SELECTIVE DEMOLITION" PORTION OF EXISTING EXTERIOR WALL SYSTEM (STUD CONSTRUCTION WITH BRICK VENEER AT LOWER LEVEL AND VINYL SIDING AT UPPER LEVEL) TO BE REMOVED AND OPENED UP FOR NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, TYPICAL AT MULTIPLE LOCATIONS

7F EXISTING EXTERIOR SIDING SYSTEM AND ASPHALT SHINGLES TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, PATCH AND REPAIR AS REQUIRE, PROVIDE NEW HEADER TRIM AND FLASHING AS REQUIRED FOR NEW CONSTRUCTION INTERSECTION / PENETRATION FOR NEW H.V.A.C. DUCT WORK SYSTEMS, TYPICAL AT ALL LOCATIONS

8F PROVIDE NEW WALL MOUNTED EXTERIOR ELECTRICAL POWER AND DISCONNECT EQUIPMENT, COORDINATE LOCATION IN FIELD WITH ARCHITECT, REFER TO ELECTRICAL AND MECHANICAL PLANS AND SPECIFICATIONS

9F NEW EXTERIOR INSULATED DUCT WORK SYSTEM SUPPORTED WITH NEW UNI-STRUT FRAMING AND SUPPORT SYSTEM. (MECHANICAL CONTRACTOR TO PROVIDE DEFERRED SUBMITTALS DESIGN AND INSTALLATION DRAWINGS AND DETAILS) REFER TO MECHANICAL PLANS AND SPECIFICATIONS FOR EXACT CONFIGURATION AND ROUTING OF NEW DUCT WORK THRU EXISTING EXTERIOR WALLS, TYPICAL AT ALL LOCATIONS

10F NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, CONTRACTOR TO VERIFY AND COORDINATE SIZE AND LOCATION IN FIELD WITH MECHANICAL PLANS AND SPECIFICATIONS, PROVIDE AIR AND WATER TIGHT SEAL AND FRAMING AROUND PERIMETER OF NEW SUPPLY AIR AND RETURN AIR DUCT PENETRATIONS, TYPICAL AT ALL LOCATIONS

11F NEW H.V.A.C MECHANICAL UNITS LOCATED ON STRUCTURAL FRAMING SYSTEM AT GRADE / GROUND LEVEL REFER TO MECHANICAL AND CIVIL PLANS AND SPECIFICATIONS, TYPICAL FOR TWO (2) NEW UNITS TO REPLACED EXISTING ROOT TOP EQUIPMENT TO BE REMOVED

12F EXISTING UNDERGROUND SANITARY LINES AND BUILDING CLEAN OUTS TO REMAIN, CONTRACTOR TO LOCATE AND AND COORDINATE NEW CONSTRUCTION WITH EXISTING, CONTRACTOR TO PROTECT EXISTING DURING CONSTRUCTION, CONTRACTOR TO REPAIR ANY DAMAGE TO MATCH EXISTING AS REQUIRED

REFLECTED CEILING GENERAL NOTES :

A. REFER TO FLOOR PLANS FOR ROOM NAMES, NUMBERS AND ROOM DIMENSIONS.

B. REFER TO ELECTRICAL FOR LIGHT FIXTURE TYPES AND SPECIFICATIONS.

C. REFER TO MECHANICAL FOR DIFFUSERS, REGISTERS, AND RETURNS.

D. ALL LIGHT FIXTURES ARE TO BE CENTERED WITHIN CEILING TILE AND GYP SOFFIT U.O.N.

E. CEILING GRID IS TO BE CENTERED IN ROOM U.O.N.

REFLECTED CEILING PLAN KEY NOTES :

NOTE:
COORDINATE WITH ELECTRICAL DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW ELECTRICAL POWER, LIGHTING FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW MECHANICAL FANS, DUCT WORK, GRILLS, DIFFUSERS, EXHAUST FANS, FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

NOTE:
ALL LIGHT FIXTURES AND ELECTRICAL AND MECHANICAL AND EQUIPMENT IN ALL ROOMS ARE TO BE CENTERED WITHIN CEILING / SPACE WITH EQUAL SPACING THROUGH OUT, TYPICAL

1C EXISTING LAY-IN CEILING, SUSPENDED, CEILING MOUNTED LIGHT FIXTURE SYSTEMS TO REMAIN (ALL TYPE OF LIGHTS, EBU's, EXIST SIGNS ETC.) , CONTRACTOR TO PROVIDE TEMPORARILY SUPPORT, REMOVE AND RELOCATE AS REQUIRED FOR NEW WORK SCOPE OF H.V.A.C. EQUIPMENT REMOVAL AND INSTALLATION, CONTRACTOR TO FIELD VERIFY, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AND MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

2C EXISTING FIRE PROTECTION SPRINKLER SYSTEM TO REMAIN, CONTRACTOR TO PROVIDE TEMPORARILY SUPPORT, REMOVE AND RELOCATE AS REQUIRED FOR NEW WORK SCOPE OF H.V.A.C. EQUIPMENT REMOVAL AND INSTALLATION, CONTRACTOR TO FIELD VERIFY, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AND MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

3C EXISTING FIRE ALARM HORN AND STROBE AND DETECTION AND P.A. ADDRESS SYSTEMS TO REMAIN, CONTRACTOR TO PROVIDE TEMPORARILY SUPPORT, REMOVE AND RELOCATE AS REQUIRED FOR NEW WORK SCOPE OF H.V.A.C. EQUIPMENT REMOVAL AND INSTALLATION, CONTRACTOR TO FIELD VERIFY, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AND MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

4C NEW METAL GRID SYSTEM AND ACOUSTICAL CEILING TILE PADS TO MATCH EXISTING (CONTRACTOR TO MATCH EXISTING AND RE-USES ANY SALVAGED SELECTED DEMOLITION PRODUCTS AS POSSIBLE FOR REPLACEMENT, REFER TO SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

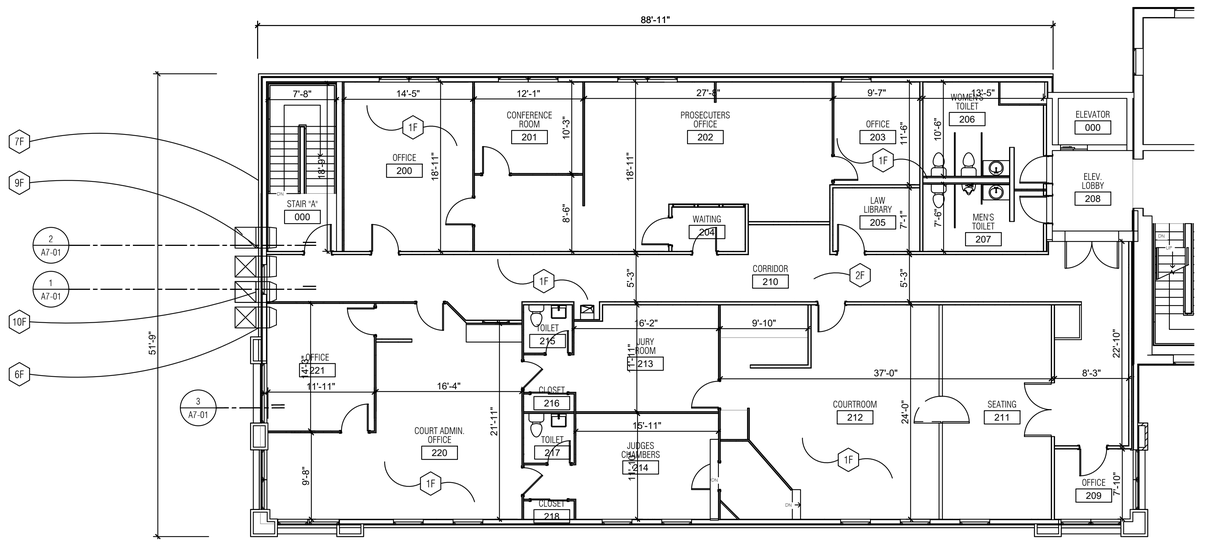
5C NEW MECHANICAL S.A. DIFFUSERS AND R.A. GRILLS / REGISTERS AND H.V.A.C. DUCT WORK SYSTEM ABOVE CEILING, REFER TO MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

6C NOTE: CONTRACTOR TO PROVIDE BEFORE CONSTRUCTION "SHOP DRAWINGS / SUBMITTALS" FOR ALL ABOVE CEILING EQUIPMENT AND CLEARANCE FOR ALL NEW H.V.A.C. DUCTS AND EQUIPMENT IN RELATIONSHIP TO PLUMBING, EXISTING STRUCTURE AND ELECTRICAL SYSTEMS, "SHOP DRAWINGS / SUBMITTALS" MUST BE REVIEWED AND APPROVED BY OWNER / ARCHITECT / ENGINEERS BEFORE CONSTRICTION, TYPICAL AT ALL LOCATIONS.

7C CONTRACTOR TO AVOID ABOVE CEILING SPACE CONFLICTS, COORDINATE NEW H.V.A.C. DUCT WORK AND MECHANICAL EQUIPMENT WITH LIGHT FIXTURES AND PLUMBING PIPING ABOVE CEILING, ADJUST IN FIELD LOCATIONS AS NECESSARY FOR PLACEMENT AND CLEARANCE SPACE, COORDINATE WITH NEW CEILING ELEVATION, TYPICAL AT ALL LOCATIONS

8C DUCT PENETRATION FROM ATTIC TO ABOVE CEILING SECOND FLOOR TO BE PROVIDE WITH CONTINUOUS "FLANGE ANGLE" AROUND FULL PERIMETER OF ALL DUCT PENETRATION SHAPES, PROVIDE "SIKA BOARD" #626 FIRE BOARD FIRE SEPARATION SEAL AT ALL GAPS AROUND DUCT PENETRATION LOCATION, PROVIDE FIRE SEALANT FOR TIGHT AND COMPLETE AIR AND FIRE SEAL, TYPICAL AT ALL MECHANICAL AND ELECTRICAL DUCT PENETRATIONS THROUGH EXISTING GYPSUM BOARD CEILING AT UNDERSIDE OF EXISTING ROOF TRUSSES

9C NOTE: NEW MECHANICAL VAV BOXES ARE +/- 10" DEEP , CONTRACTOR NEED TO PROVIDE MINIMUM 24" CLEAR SPACE FROM UNDERSIDE OF GYPSUM BOARD ON TRUSSES TO ACOUSTICAL CEILING SYSTEM HEIGHT FOR NEW MECHANICAL EQUIPMENT AND DUCT WORK AND MAINTENANCE ACCESS, TYPICAL AT ALL LOCATIONS



N 5 A3-03 2nd Floor - Composite Floor Plan
1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

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CONSULTANT:

PROJECT NAME:
HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: jr
CHECKED BY: JFR

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
OWNER REVIEW	10/29/24
COUNTY BOARD MEETING	11/27/24
V.E. REDESIGN	12/02/24
OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024
PROJECT NO.: 24-028
DRAWING NAME: 2nd FLOOR PLAN and RCP
SHEET NO.: A3-03

GENERAL FLOOR PLAN NOTES :

1. ALL PLAN DIMENSIONS ARE NOMINAL TO FACE OF WALL. WALL THICKNESS ARE SHOWN NOMINAL
2. COORDINATE SIZE AND LOCATION OF ALL DUCT AND SHAFT OPENINGS IN WALLS, CEILINGS AND FLOORS WITH MECHANICAL AND ELECTRICAL. PROVIDE ALL REQUIRED LINTELS FOR OPENINGS.
3. DO NOT SCALE DRAWINGS. USE DIMENSIONS PROVIDED. IF A CONFLICT IS ENCOUNTERED OR A REQUIRED DIMENSION IS NOT PROVIDED, REQUEST A CLARIFICATION FROM THE ARCHITECT.
4. ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.
5. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VISITING THE JOB SITE AND FAMILIARIZING THEMSELVES WITH EXISTING CONDITIONS PRIOR TO START OF WORK. ALL DIMENSIONS AND FIELD CONDITIONS SHALL BE VERIFIED, AND ARCHITECT NOTIFIED OF ANY DISCREPANCIES PRIOR TO THE RECEIPT OF BIDS. FAILURE OF THE CONTRACTOR TO VERIFY ALL CONDITIONS PRIOR TO THE AWARD OF BID WILL NOT BE CONSIDERED AS GROUNDS FOR AN EXTRA.
6. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE PERFORMANCE OF THE CONTRACT. PROVIDE ALL NECESSARY TEMPORARY PROTECTION TO ENSURE THE SAFETY OF THE WORKERS AND GENERAL PUBLIC DURING CONSTRUCTION.
7. ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT AND ENGINEER AND AS APPROVED BY THE OWNER.
8. SUBMIT SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT AND ENGINEER AND OWNER FOR REVIEW PRIOR TO INSTALLATION / APPLICATION.
9. ALL DEBRIS SHALL BE LEGALLY DISPOSED OF OFF THE SITE BY THE CONTRACTOR.
10. ALL PRECAUTIONS SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING MATERIALS AND CONSTRUCTION TO REMAIN.
11. CONTRACTOR SHALL KEEP NOISE, DUST, ETC., TO A MINIMUM STANDARD AS SET FORTH BY THE OWNER.
12. CONTRACTOR SHALL COORDINATE INSTALLATION AND PHASING OF WORK WITH THE OWNER'S REPRESENTATIVE PRIOR TO THE START OF WORK.
13. NOTE ALL DIMENSIONS ARE + / - AND ARE TO BE FIELD VERIFIED
14. CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL NEW WORK AS REQUIRED FOR ELECTRICAL MECHANICAL AND STRUCTURAL WITH ARCHITECTURAL IF A CONFLICT IS ENCOUNTERED, REQUEST CLARIFICATIONS FROM THE ARCHITECT. REFER TO ELECTRICAL PLANS FOR LIGHT FIXTURE TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO MECHANICAL PLANS FOR DIFFUSER, REGISTERS AND RETURN GRILLES TYPES, LOCATIONS AND SPECIFICATIONS. REFER TO STRUCTURAL FOR NEW SYSTEMS DETAILS AND SPECIFICATIONS.

ATTIC PLAN KEY NOTES :

NOTE:
COORDINATE WITH MECHANICAL / PLUMBING DRAWING PLANS AND SPECIFICATIONS FOR ALL NEW MECHANICAL FANS, DUCT WORK, GRILLS, DIFFUSERS, EXHAUST FANS, FIXTURES AND EQUIPMENT, LOCATIONS, DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS. COORDINATE WITH NEW ARCHITECTURAL WORK, ALL CONFLICTS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT, TYPICAL AT ALL ROOMS AND LOCATIONS

1a EXISTING FIRE PROTECTION PIPING AND SPRINKLER SYSTEM TO REMAIN, CONTRACTOR TO PROVIDE TEMPORARILY SUPPORT, REMOVE AND RELOCATE AS REQUIRED FOR NEW WORK SCOPE OF H.V.A.C. EQUIPMENT REMOVAL AND INSTALLATION, CONTRACTOR TO FIELD VERIFY, REFER TO ELECTRICAL PLANS AND SPECIFICATIONS AND MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

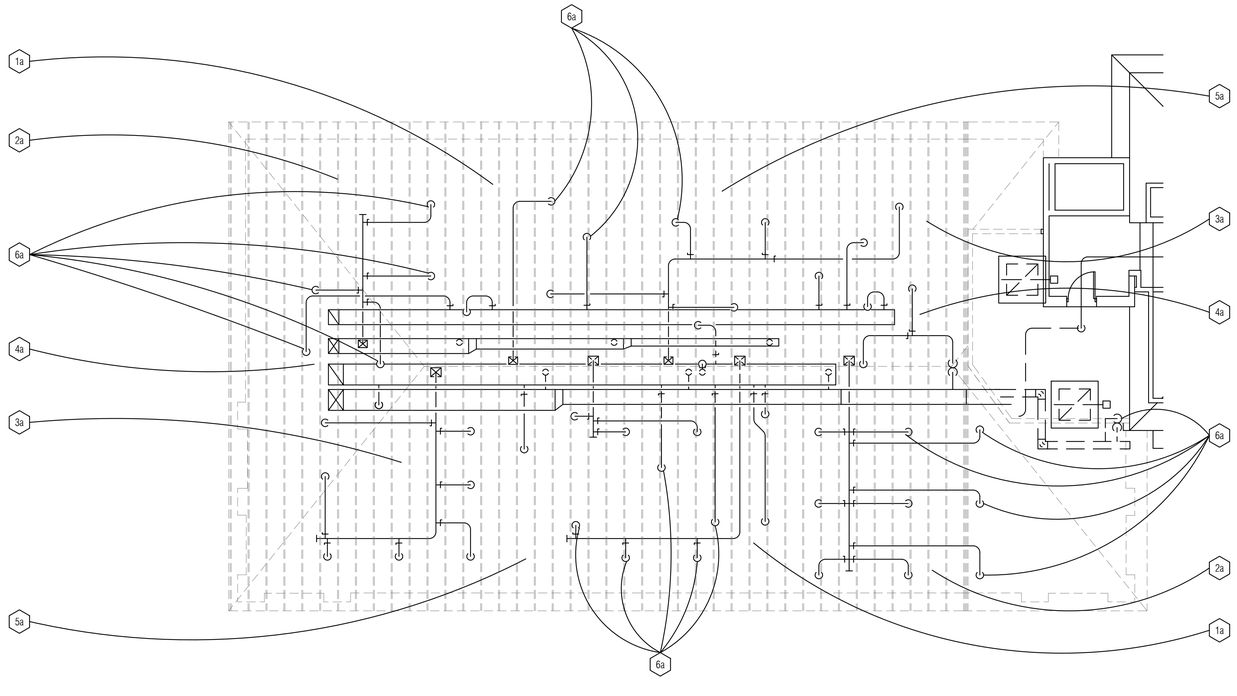
2a EXISTING STRUCTURAL PRE-ENGINEERED WOOD TRUSSES (TOP CHORD, BOTTOM CHORD WEB BRACING, HORIZONTAL BRACING) SYSTEM TO REMAIN, CONTRACTOR TO WORK THRU INTERIOR ATTIC SPACES AS REQUIRED FOR INSTALLATION OF NEW H.V.A.C. SYSTEM, REFER TO MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS.

3a EXISTING GYPSUM BOARD CEILING SYSTEM ON UNDERSIDE OF ROOF TRUSSES TO REMAIN, CONTRACTOR TO PROVIDE CAUTION WHEN WORKING IN ATTIC SPACE, CONTRACTOR TO PROVIDE TEMPORARY SUPPORTS IN ATTIC SPACE AS REQUIRED FOR CONSTRUCTION ACCESS , CONTRACTOR TO PATCH AND REPAIR ALL DAMAGED AREAS AS REQUIRED, TYPICAL AT ALL LOCATIONS

4a EXISTING BLOWN - IN ATTIC INSULATION TO REMAIN, CONTRACTOR TO CLEAR AND REMOVE AS REQUIRED TO ACCESS GYPSUM BOARD CEILING ON UNDERSIDE OF TRUSSES CHORDS AS REQUIRED FOR NEW H.V.A.C. SYSTEM, REFER TO MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS

5a CONTRACTOR TO PROVIDE NEW 8" MINIMUM OF LOOSE FILL FIBERGLASS INSULATION (R-3.7 PER INCH FOR MINIMUM OF R-24.8 TOTAL ADDED INCREASE INSULATION VALUE) ACROSS FULL ATTIC AREA AFTER INSTALLATION OF NEW H.V.A.C. SYSTEM

6a TYPICAL AT ALL LOCATIONS, NEW AND EXISTING DUCT PENETRATION FROM ATTIC TO ABOVE CEILING SECOND FLOOR TO BE PROVIDE WITH CONTINUOUS "FLANGE ANGLE" AROUND FULL PERIMETER OF ALL DUCT PENETRATION SHAPES, PROVIDE "SIKA BOARD" #626 FIRE BOARD FIRE SEPARATION SEAL AT ALL GAPS AROUND DUCT PENETRATION LOCATION, PROVIDE FIRE SEALANT FOR TIGHT AND COMPLETE AIR AND FIRE SEAL, TYPICAL AT ALL MECHANICAL AND ELECTRICAL DUCT PENETRATIONS THROUGH EXISTING GYPSUM BOARD CEILING AT UNDERSIDE OF EXISTING ROOF TRUSSES



N 7 / A3-04 2nd Floor - Gypsum RCP and Attic Floor Plan
1/8" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

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CONSULTANT:

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: jr
CHECKED BY: JFR

REVISIONS:

SCHEMATIC DESIGN	05/09/24
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BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: 2nd FLOOR GYPSUM RCP and ATTIC PLAN

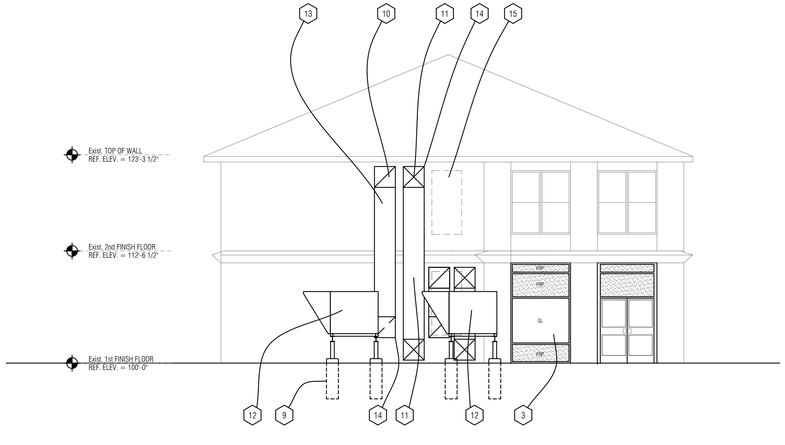
SHEET NO.: A3-04

EXTERIOR ELEVATIONS KEY NOTES:

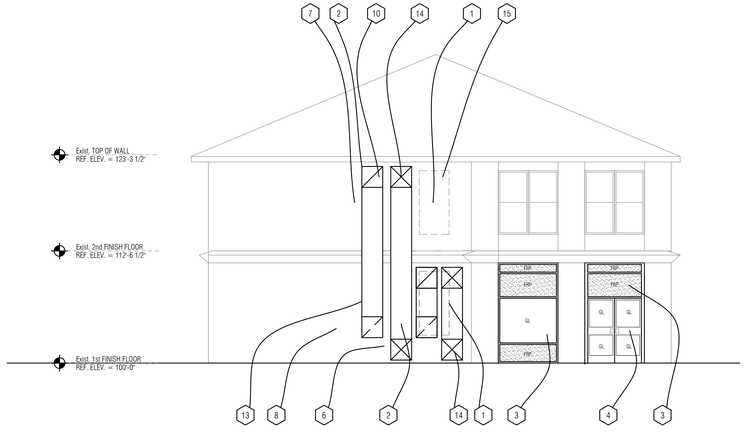
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2. "SELECTIVE DEMOLITION" PORTION OF EXISTING EXTERIOR WALL SYSTEM (STUD CONSTRUCTION WITH BRICK VENEER AT LOWER LEVEL AND VINYL SIDING AT UPPER LEVEL) TO BE REMOVED AND OPENED UP FOR NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, COORDINATE WITH MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS
3. NEW ALUMINUM STORE FRONT FRAMING SYSTEM ENTRY VESTIBULE (COLOR AND FRAME TO MATCH EXISTING), REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE THERMALLY BROKE FRAMING #SL-450TB / SL-245 FG) PROVIDE 1" LOW 'E' INSULATED TINTED (MATCH EXISTING) GLASS GLAZING IN LOCATIONS AS INDICATED AND 1/2" INSULATION DOUBLED SIDED FRP TEXTURED PANEL IN LOCATIONS AS INDICATED, PROVIDE BACKER ROOD AND SEALANT ALL AROUND / BOTH SIDES OF FRAMING SYSTEM IN EXISTING OPENING
4. NEW DOUBLE ENTRY DOOR SYSTEM WITH REMOVABLE CENTER POST MULLION (COLOR AND FRAME TO MATCH EXISTING) , REFER TO ARCHITECTURAL FLOOR PLANS AND SPECIFICATIONS. (PROVIDE SPECIAL-LITE DOOR AND FRAME #SL-17 WITH RECESSED DOOR HARDWARE PULL SL-82 ON EXTERIOR SIDE AND PANIC EGRESS HARDWARE ON INTERIOR EXIT SIDE)
5. CONTRACTOR ATTIC ACCESS THRU EXISTING SOUTH GABLE VERTICAL ROOF OPENING OF +/- 42" x 42" REMOVABLE PANEL FORM EXISTING FLAT ROOF AREA, CONTRACTOR TO FIELD VERIFY AS REQUIRED FOR NEW CONSTRUCTION AND H.V.A.C. ACCESS POINT
6. EXISTING EXTERIOR BRICK VENEER SYSTEM TO REMAIN, CONTRACTOR TO PROTECT DURING CONSTRUCTION, PATCH AND REPAIR AS REQUIRE, PROVIDE NEW HEADER TRIM AND FLASHING AS REQUIRED FOR NEW CONSTRUCTION INTERSECTION / PENETRATION FOR NEW H.V.A.C. DUCT WORK SYSTEMS, TYPICAL AT ALL LOCATIONS
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8. PROVIDE NEW WALL MOUNTED EXTERIOR ELECTRICAL POWER AND DISCONNECT EQUIPMENT, COORDINATE LOCATION IN FIELD WITH ARCHITECT, REFER TO ELECTRICAL AND MECHANICAL PLANS AND SPECIFICATIONS
9. LINE OF SONO-TUBE AND NEW REINFORCED CONCRETE FOUNDATION SYSTEM BELOW GRADE AT NEW MECHANICAL EQUIPMENT SUPPORT FRAMING SYSTEM, REFER TO STRUCTURAL AND CIVIL PLANS AND SPECIFICATIONS
10. NEW EXTERIOR INSULATED DUCT WORK SYSTEM SUPPORTED WITH NEW UNI-STRUT FRAMING AND SUPPORT SYSTEM, (MECHANICAL CONTRACTOR TO PROVIDE DEFERRED SUBMITTALS DESIGN AND INSTALLATION DRAWINGS AND DETAILS) REFER TO MECHANICAL PLANS AND SPECIFICATIONS FOR EXACT CONFIGURATION AND ROUTING OF NEW DUCT WORK THRU EXISTING EXTERIOR WALLS, TYPICAL AT ALL LOCATIONS
11. NEW H.V.A.C. MECHANICAL DUCT PENETRATION FROM EXTERIOR TO INTERIOR OF BUILDING, CONTRACTOR TO VERIFY AND COORDINATE SIZE AND LOCATION IN FIELD WITH MECHANICAL PLANS AND SPECIFICATIONS, PROVIDE AIR AND WATER TIGHT SEAL AND FRAMING AROUND PERIMETER OF NEW SUPPLY AIR AND RETURN AIR DUCT PENETRATIONS, TYPICAL AT ALL LOCATIONS
12. NEW H.V.A.C MECHANICAL UNITS LOCATED ON STRUCTURAL FRAMING SYSTEM AT GRADE / GROUND LEVEL REFER TO MECHANICAL AND CIVIL PLANS AND SPECIFICATIONS, TYPICAL FOR TWO (2) NEW UNITS TO REPLACED EXISTING ROOT TOP EQUIPMENT TO BE REMOVED
13. NEW 28" x 28" WITH FULL WRAP INSULATION SYSTEM FOR NEW SUPPLY AIR AND RETURN AIR DUCT WORK TO BE COORDINATED AND LOCATED IN FIELD WITH REQUIRED SELECTED DEMOLITION AND REMOVAL OF EXISTING EXTERIOR WINDOWS SYSTEM AND NEW CONSTRUCTION WITH H.V.A.C. CONTRACTOR AND APPROVED BY ARCHITECT / OWNER / ENGINEERS BEFORE CONSTRUCTION, TYPICAL AT 2 LOCATIONS FOR 2ND FLOOR AND 2 LOCATIONS FOR 1ST FLOOR
14. NOTE: CONTRACTOR TO PROVIDE BEFORE CONSTRUCTION "SHOP DRAWINGS / SUBMITTALS" FOR ALL ABOVE CEILING EQUIPMENT AND CLEARANCE FOR ALL NEW H.V.A.C. DUCTS AND EQUIPMENT IN RELATIONSHIP TO PLUMBING, EXISTING STRUCTURE AND ELECTRICAL SYSTEMS, "SHOP DRAWINGS / SUBMITTALS" MUST BE REVIEWED AND APPROVED BY OWNER / ARCHITECT / ENGINEERS BEFORE CONSTRICTION, TYPICAL AT ALL LOCATIONS
15. COORDINATE EXTENT OF REMOVAL REQUIRED OF EXISTING WINDOW SYSTEM WITH SIZES OF NEW H.V.A.C. DUCT WORK AND PENETRATION LOCATION IN FIELD, REVIEW WITH ARCHITECT / OWNER / ENGINEERS IF EXISTING WINDOW SYSTEM CAN REMAIN, TYPICAL AT ALL LOCATIONS



3 A4-01 West Elevation
1/8" = 1'-0"



2 A4-01 North Elevation with New Mechanical Units in View
1/8" = 1'-0"



1 A4-01 North Elevation
1/8" = 1'-0"

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CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	jr
CHECKED BY:	JFR

REVISIONS:

SCHEMATIC DESIGN	05/09/24
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DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: EXTERIOR ELEVATIONS

SHEET NO.: A4-01

TYPICAL ROOF PLAN NOTES:

A. REFER TO SPECIFICATION FOR ADDITIONAL INFORMATION FOR ROOF RELATED ITEMS.

B. TAPERED INSULATION SHALL SLOPE 1/4" PER 1'-0" TOWARDS ROOF SUMP UNLESS OTHERWISE NOTED. SLOPE VALUES ARE APPROXIMATE. IF SLOPE CANNOT BE ACHIEVED, CONTACT ARCHITECT BEFORE PROCEEDING FURTHER. ARROWS SHOWN REPRESENT DOWN SLOPE OF ROOF.

C. PROVIDE (2) ROWS OF 24" x 24" ROOF WALKWAY PADS AT ROOF DOOR ENTRANCE

D. ALL WORK SHALL COMPLY WITH NATIONAL, STATE AND LOCAL CODES, ORDINANCES AND REGULATIONS.

E. ALL MATERIALS SHALL BE INSTALLED / APPLIED IN STRICT ACCORDANCE WITH MANUFACTURER'S REGULATIONS, AS REQUIRED TO PROVIDE FULL MANUFACTURERS WARRANTY.

F. ALL DETAILS SHALL BE IN ACCORDANCE WITH CURRENT STANDARDS FROM NRCA REQUIREMENTS AND MANUFACTURES REQUIREMENTS FOR WARRANTY COVERAGE

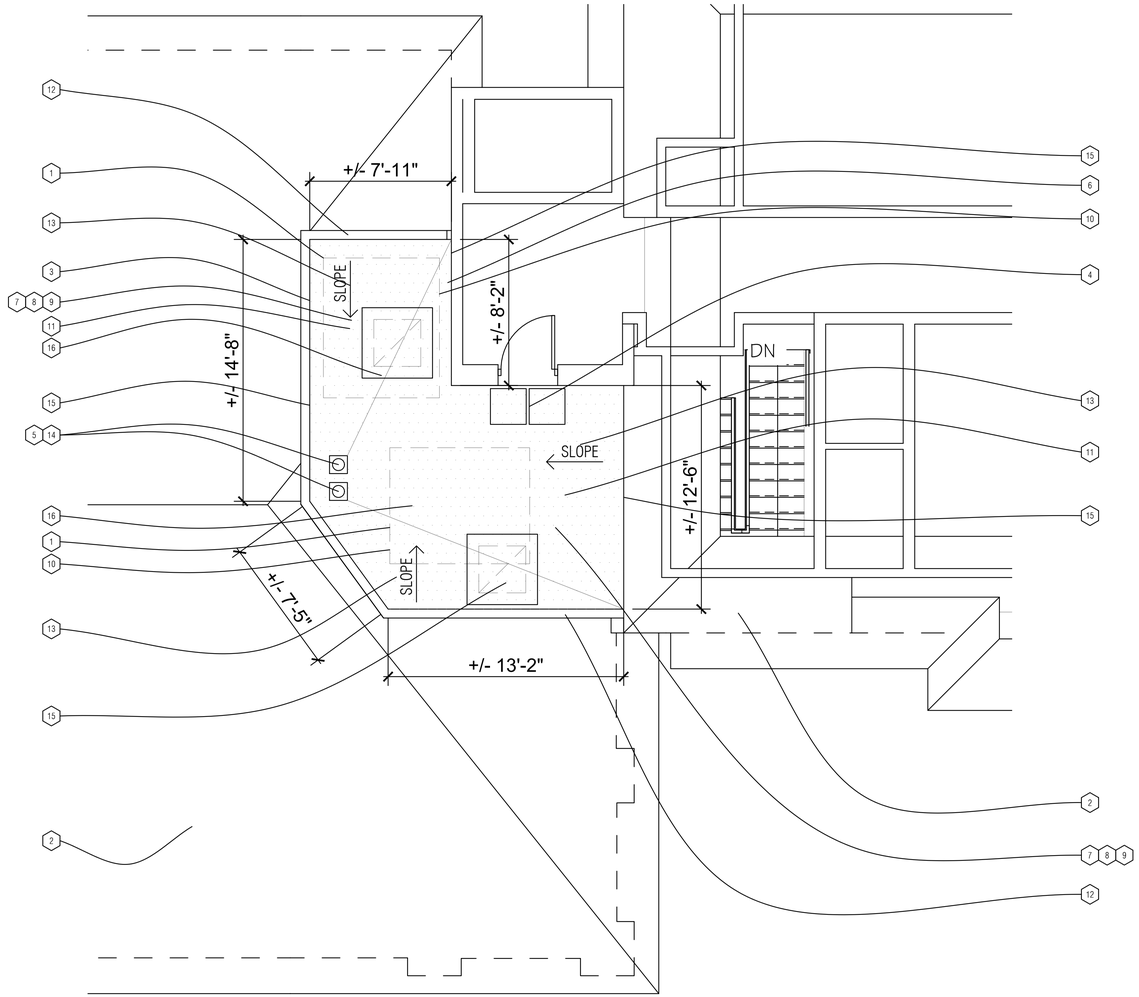
G. ALL ITEMS SHALL BE AS SPECIFIED BY ARCHITECT.

H. SUBMIT SHOP DRAWINGS, TAPER ROOF INSULATION PLANS, PRODUCT DATA, AND SAMPLES TO THE ARCHITECT FOR REVIEW PRIOR TO INSTALLATION / APPLICATION.

I. ALL PRECAUTIONS SHALL BE TAKEN TO AVOID DAMAGE TO EXISTING MATERIALS AND CONSTRUCTION TO REMAIN.

ROOF PLAN KEY NOTES:

1. EXISTING ROOF TOP H.V.A.C. MECHANICAL UNITS AND CURBS TO BE COMPLETELY REMOVED AND DISCONNECTED, REFER TO MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS ON EXISTING FLAT ROOF AREA
2. EXISTING SLOPED ASPHALT SHINGLE ROOF SYSTEM, GUTTER AND DOWN SPOUT SYSTEMS TO REMAIN, CONTRACTOR TO TO PROTECT DURING CONSTRUCTION, TYPICAL IN ALL AREAS
3. EXISTING VERTICAL SIDING SYSTEM ON SLOPED ROOF END GABLE TO REMAIN, CONTRACTOR TO TO PROTECT DURING CONSTRUCTION, TYPICAL IN ALL AREAS
4. EXISTING BUILDING ACCESS DOOR AND FRAMED SYSTEM TO REMAIN, PROVIDE NEW WALK-WAY 24" X 24" SURFACE PROTECTION PAD AT ENTRANCE ACCESS DOOR LOCATIONS, REFER TO DETAILS AND SPECIFICATIONS
5. EXISTING ROOF SUMP AND EMERGENCY OVER FLOW DRAIN SYSTEM LOCATIONS TO REMAIN, CONTRACTOR TO REMOVE "CAGE" AND CLEAN DRAINS AND RESEAL WITH NEW ROOFING SYSTEM, PROVIDE NEW ROOF SUMP RING AND "CAGE" AS REQUIRED FOR NEW WORK , REFER TO DETAILS AND SPECIFICATIONS, TYPICAL AT ALL AREAS.
6. EXISTING ELECTRICAL SERVICE AND DISCONNECT CONDUITS, BOXES, AND SYSTEMS TO BE REMOVED AND DISCONNECTED COMPLETELY, CONTRACTOR TO REMOVED AND CAP IN PLACE, REFER TO MECHANICAL AND ELECTRICAL PLANS AND SPECIFICATIONS, TYPICAL AT BOTH H.V.A.C. ROOF TOP UNITS TO BE REMOVED
7. EXISTING MEMBRANE ROOFING SYSTEM TO BE COMPLETELY REMOVED (FULL TEAR-OFF) , CONTRACTOR TO REMOVE ALL FLASHING, COUNTER FLASHING, REGULATE, PARAPET COPINGS AND ASSOCIATED ACCESSORIES AS REQUIRED TO PREP AREA FOR NEW ROOFING SYSTEM CONSTRUCTION, TYPICAL AT ALL LOCATIONS
8. EXISTING RIGID INSULATION SYSTEM TO BE REMOVED COMPLETELY TO WOOD ROOF DECK SYSTEM, CONTRACTOR TO PREP AREA FOR NEW ROOFING SYSTEM CONSTRUCTION, TYPICAL AT ALL LOCATIONS.
9. CONTRACTOR AND ROOFING CONTRACTOR WILL BE REQUIRED TO INSPECT EXISTING WOOD ROOF DECKING SYSTEM FOR DAMAGE AND WATER LEAKS, IF EXISTING WOOD ROOF DECK SYSTEM IS DETERMINED TO BE DAMAGED CONTRACTOR MUST REPORT TO OWNER AND ARCHITECT IMMEDIATELY FOR REQUIRED REPAIRS AND REPLACEMENT, TYPICAL AT ALL LOCATIONS
10. EXISTING GAS LINE SERVICE TO REMOVED ROOF TOP UNITS TO BE REMOVED AND DISCONNECTED COMPLETELY, CONTRACTOR TO REMOVED AND CAP IN PLACE, REFER TO MECHANICAL PLANS AND SPECIFICATIONS, TYPICAL AT BOTH H.V.A.C. ROOF TOP UNITS TO BE REMOVED
11. NEW 90 MIL EPDM ROOFING MEMBRANE (30 YEAR WARRANTY) , FULLY ADHERED , SLOPED MIN. 1/4" PER FOOT WITH NEW 1/2" DENS DECK PRIME COVER BOARD, FULLY ADHERED, ON 2 LAYERS OF 2.6" MECHANICAL FASTEN (5" MIN TOTAL R-30) WITH STAGGERED JOINTS. PROVIDE CRICKETS, VALLEY AND SADDLES AS REQUIRED TO PROVIDE NECESSARY ROOF DRAINAGE SLOPE, RIGID INSULATION TO HAVE A MIN. 60 P.S.I., REFER TO SPECIFICATIONS
12. PROVIDE NEW PRE-FINISHED METAL COPING SYSTEM, TO MATCH EXISTING SIZE, PROFILE AND COLOR, REFER TO DETAIL AND SPECIFICATIONS, FINAL COLOR SELECTION BY ARCHITECT / OWNER, REFER TO SPECIFICATIONS
13. PROVIDE NEW TAPERED INSULATION AS REQUIRED FOR POSITIVE DRAINAGE TO ROOF DRAINS, TYPICAL AT ALL LOCATIONS AND AROUND ROOF TOP MECHANICAL CURBS
14. PROVIDE NEW NEW ROOF SUMP AND EMERGENCY OVERFLOW SYSTEM, (CAGE, RINGS, SEALANTS AND CONNECTION TO EXISTING DRAIN PIPES) REFER TO DETAILS, COORDINATE WITH MECHANICAL AND STRUCTURAL AS REQUIRED
15. PROVIDE NEW COUNTER FLASHING AND REGULATE SYSTEM "KNEE WALL" / PARAPET WALL / VERTICAL SIDING WALL AROUND FULL PERIMETER OF FLAT ROOF AREA BELOW EXISTING LOUVER SYSTEM, REFER TO DETAILS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS
16. PROVIDE NEW MECHANICAL VENTILATOR HOOD ON NEW ROOF CURB SYSTEM ADAPTED INTO EXISTING ROOF OPENINGS AND EXISTING ROOF CURB ADAPTOR, CONTRACTOR TO CONFIGURE AND COORDINATE IN FIELD WITH EXISTING OPENINGS AND NEW H.V.A.C. EQUIPMENT, REFER TO MECHANICAL DRAWINGS AND SPECIFICATIONS, TYPICAL AT ALL LOCATIONS



N 1 / A5-01 Existing / New Partial Roof Plan
1/4" = 1'-0"

NOTE: ALL DIMENSIONS ARE APPROXIMATE +/- DIMENSIONS.
CONTRACTORS WILL BE RESPONSIBLE TO FIELD VERIFY ALL DIMENSIONS AND LOCATIONS.

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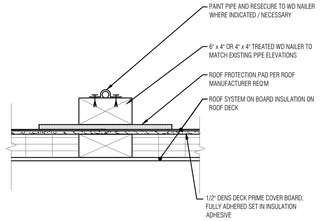
PROJECT NO.: 24-028

DRAWING NAME:

ROOF PLAN
and DETAILS

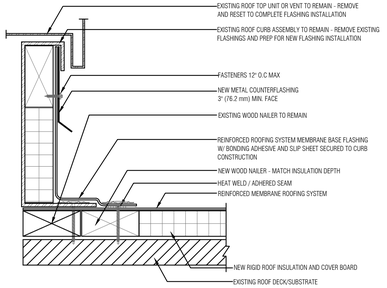
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A5-01



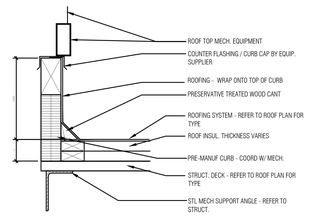
20 A5-02 **Typical Pipe Support Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



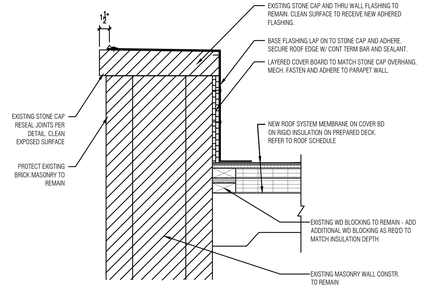
19 A5-02 **Termination at Roof Top Equipment**
N.T.S

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



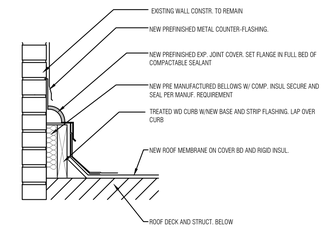
18 A5-02 **Typical Roof Curb Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



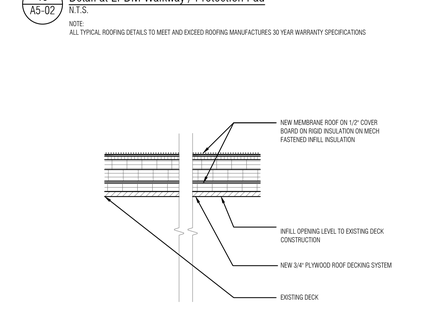
17 A5-02 **Typical Parapet Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



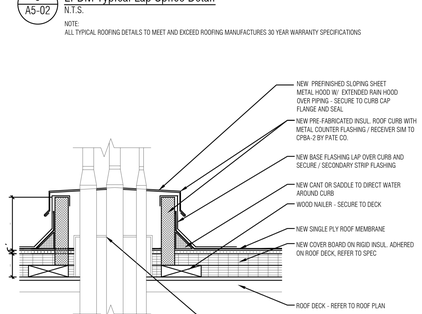
16 A5-02 **Typical Expansion Joint Cover at Existing Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



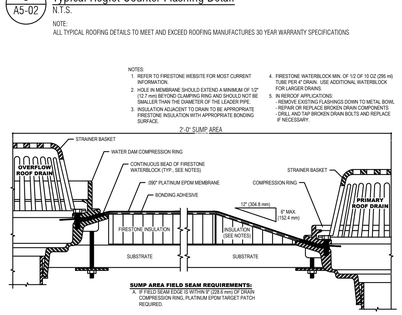
15 A5-02 **Typical Parapet Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



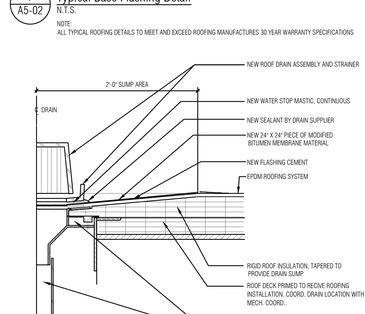
14 A5-02 **Typical Parapet Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



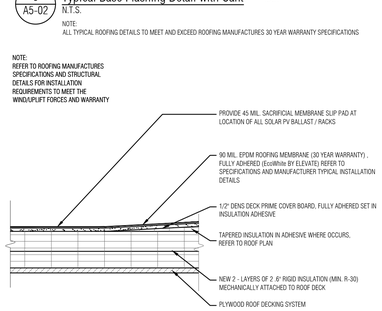
13 A5-02 **Typical Plumbing Vent Flashing Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



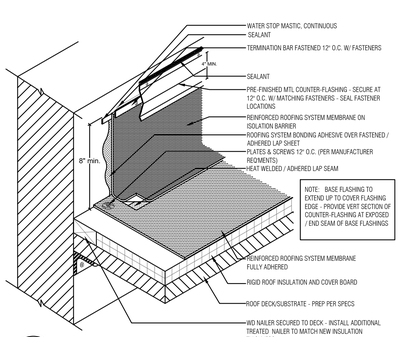
12 A5-02 **Typical Plumbing Vent Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



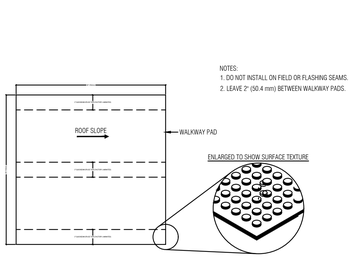
11 A5-02 **Typical Roof Pipe Penetration Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



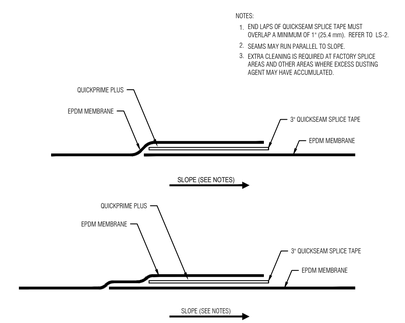
10 A5-02 **Detail at EPDM Walkway / Protection Pad**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



9 A5-02 **EPDM Typical Lap Splice Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS



8 A5-02 **Typical Reglet Counter Flashing Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

7 A5-02 **Typical Base Flashing Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

6 A5-02 **Typical Base Flashing Detail with Cant**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

5 A5-02 **Infill @ Capped Opening**
N.T.S.

4 A5-02 **Typical Detail at Pipe Curb**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

3 A5-02 **Typical Roof Drain with Overflow Drain Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

2 A5-02 **Typical Roof Drain Detail**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

1 A5-02 **Typical Roofing Section at Existing Building**
N.T.S.

NOTE:
ALL TYPICAL ROOFING DETAILS TO MEET AND EXCEED ROOFING MANUFACTURES 30 YEAR WARRANTY SPECIFICATIONS

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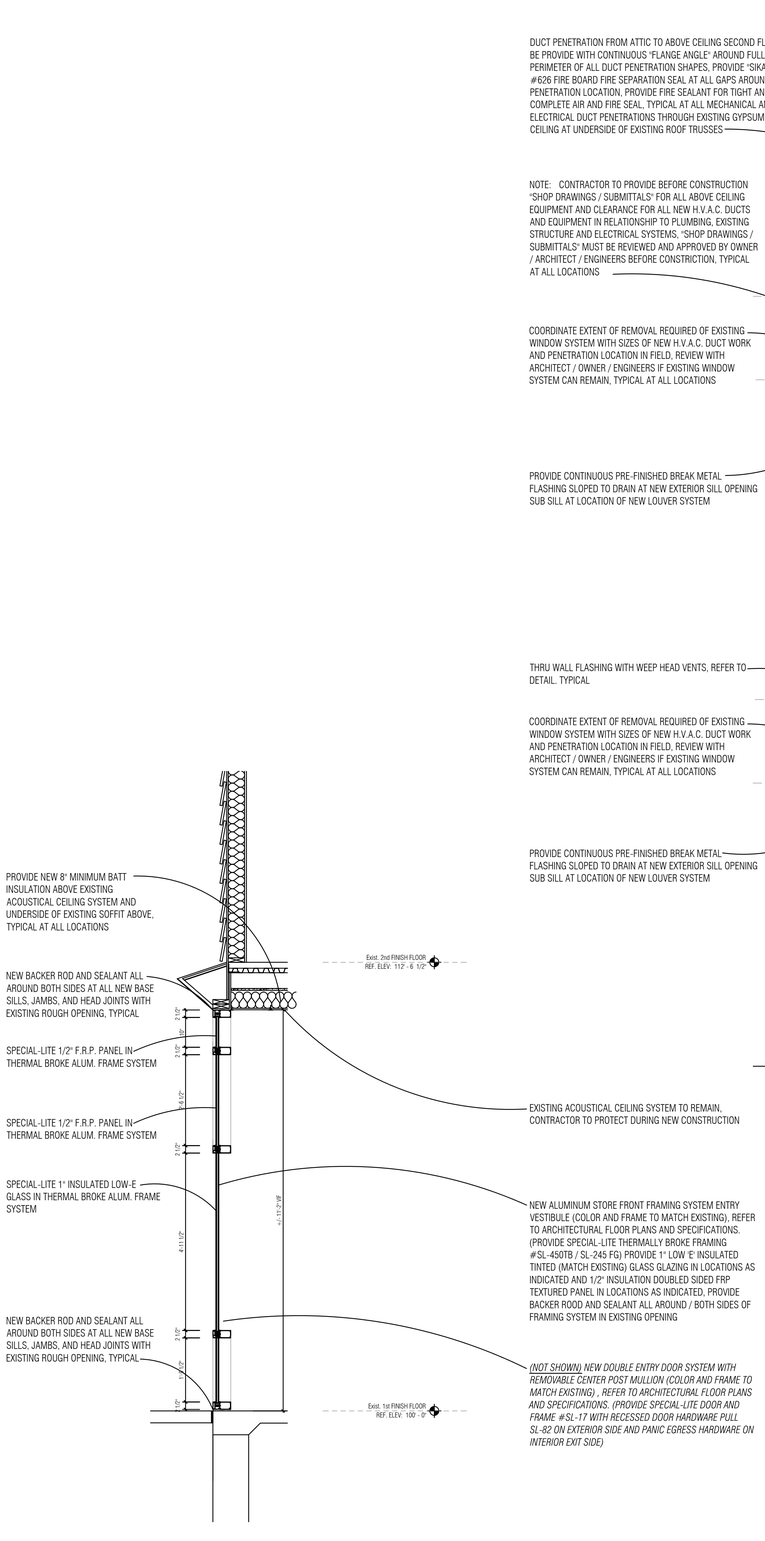
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CONSTRUCTION	○

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CHECKED BY: JFR

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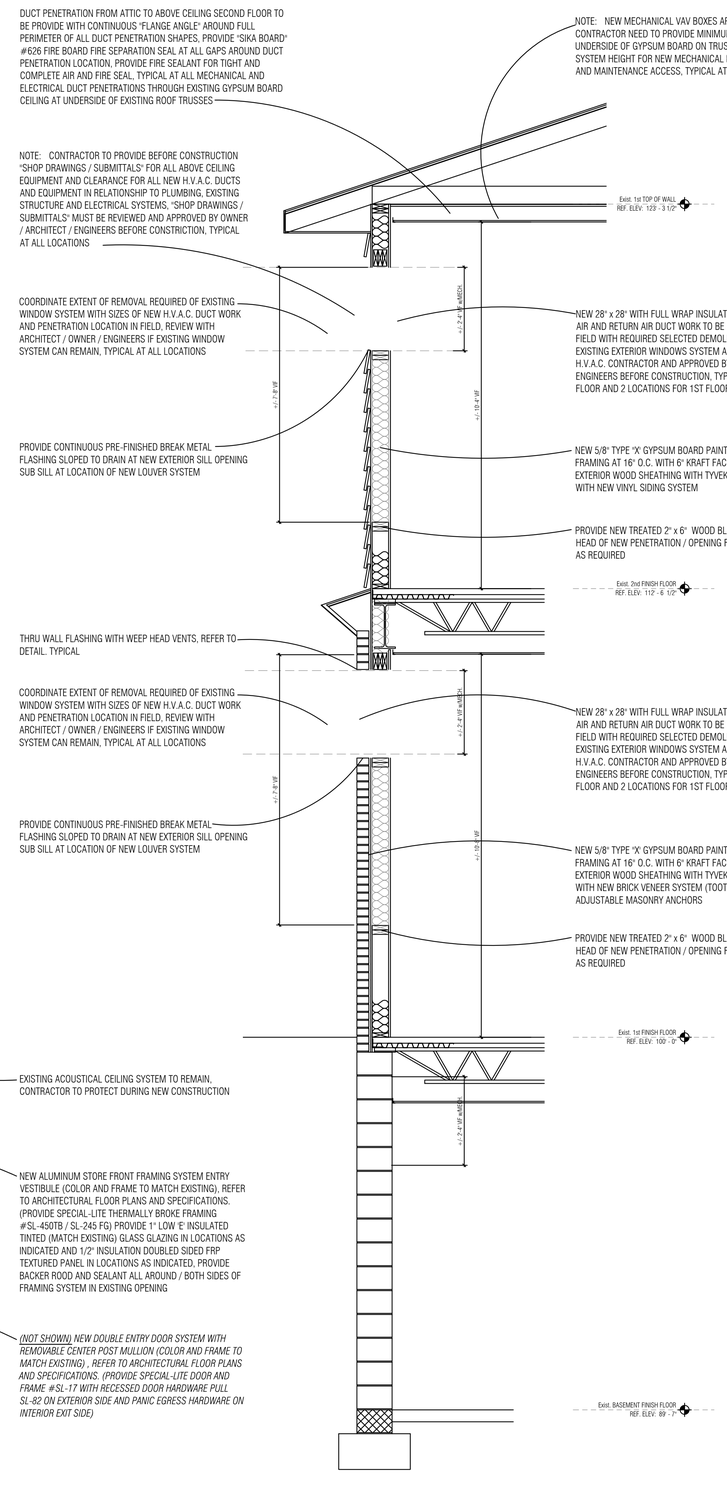
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DATE: 8 APRIL 2024
PROJECT NO.: 24-028
DRAWING NAME: TYPICAL ROOF DETAILS
SHEET NO.: A5-02



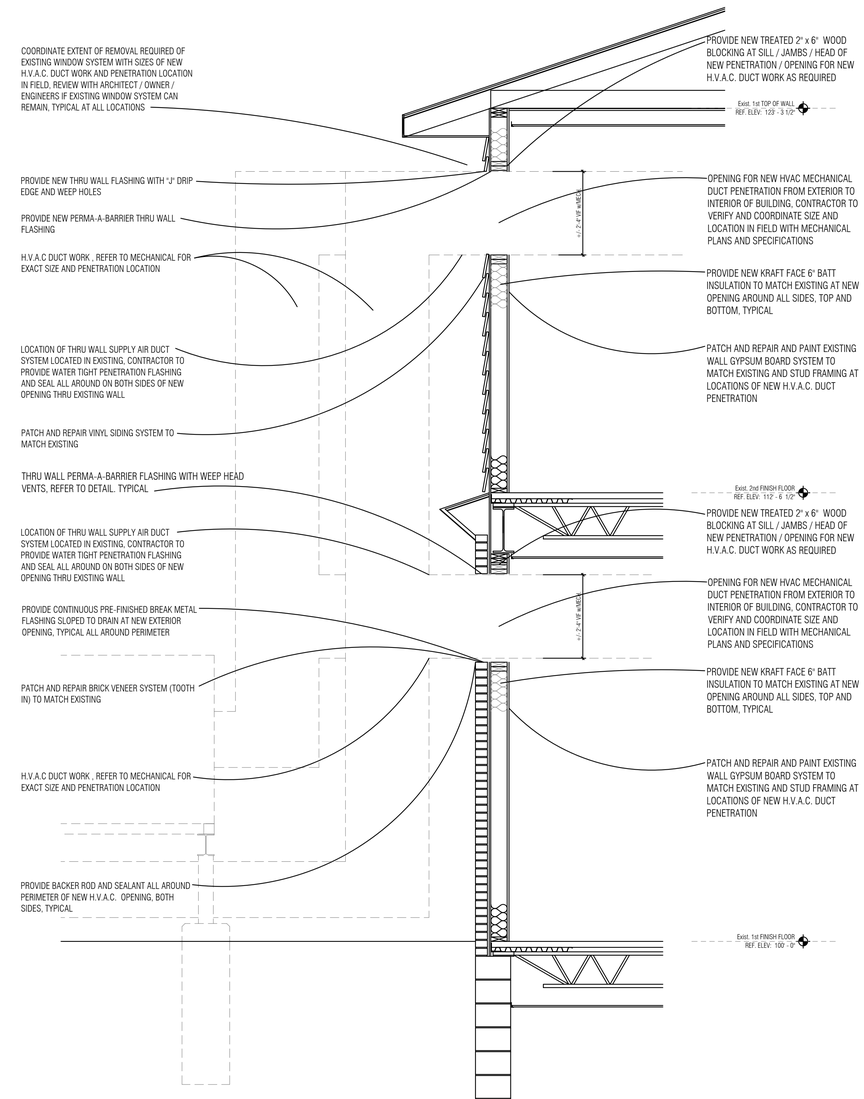
3 / A7-01 Typical Wall Section @ Storefront
1/2" = 1'-0"

NOTE: REFER TO ALL SECTIONS / DETAILS FOR SIMILAR NOTES AND DIMENSIONS



2 / A7-01 Typical Wall Section @ Window Infill
1/2" = 1'-0"

NOTE: REFER TO ALL SECTIONS / DETAILS FOR SIMILAR NOTES AND DIMENSIONS



1 / A7-01 Typical Wall Section @ Duct Penetration
1/2" = 1'-0"

NOTE: REFER TO ALL SECTIONS / DETAILS FOR SIMILAR NOTES AND DIMENSIONS

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OWNER REVIEW	01/24/25
OWNER REVIEW	03/31/25
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME:

WALL SECTIONS and DETAILS

SHEET NO.: A7-01

GENERAL NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS AND ELEVATIONS IN THE FIELD. IT IS THE CONTRACTORS RESPONSIBILITY TO REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.
2. IT IS THE CONTRACTOR IS RESPONSIBILITY FOR VERIFYING THE NATURE AND STATUS OF ALL UTILITY RELOCATION WORK PRIOR TO CONSTRUCTION. IT IS ALSO THE CONTRACTORS RESPONSIBILITY TO COORDINATE ALL CONSTRUCTION AND UTILITY RELOCATION WORK WITHIN THE PROPER SEQUENCING OF CONSTRUCTION WORK FOR THE PROJECT.

EARTHWORK & SOIL NOTES:

1. ALL FOUNDATIONS SOILS SHALL BE BACKFILLED WITH MDOT CLASS I AGGREGATE AND COMPACTED TO 95% MAXIMUM DENSITY.
2. SLAB AND SIDEWALK BASE MATERIAL SHALL BE MDOT CLASS II FILL COMPACTED TO 95% MAX DENSITY WITH A MINIMUM OF 6 INCH LAYER THICKNESS UNLESS OTHERWISE SPECIFIED ON THE CONSTRUCTION PLANS.
3. ALL FOOTINGS AND FOUNDATIONS SHALL BE PLACED ON UNDISTURBED, NATURAL SOIL. IF SITE SOIL CONDITIONS ARE POOR, FOOTING AND FOUNDATION BASE MATERIAL SHALL BE BACKFILLED WITH MDOT CLASS II GRANULAR FILL, AND COMPACT TO 98% MAX DENSITY.
4. SUB-GRADE AND BASE PREPARATION:

A. ALL GRANULAR BACKFILLS SHALL BE COMPACTED IN 8" LIFTS TO FINAL ELEVATION.
B. SOFT SPOTS SHALL BE FILLED WITH A WELL-GRADED COURSE AGGREGATE LESS THAN 15% PASSING THE NO. 200 SIEVE, STRUCTURAL FILL.
C. PRIOR TO THE INSTALLATION OF ANY FOOTINGS, SLABS, SIDEWALKS, OR OTHER FOUNDATIONS THE DENSITY OF THE SOIL SHALL BE VERIFIED TO HAVE THE MINIMUM BEARING CAPACITIES AS INDICATED IN THE FOUNDATION, FOOTING & SLAB NOTES.

5. IT IS THE CONTRACTORS RESPONSIBILITY TO ENSURE THAT ALL LIFTS AND FILLS HAVE REACHED OR EXCEEDED THE REQUIRED MAX DENSITY AS NOTED.
6. ALL SITE SOIL USED FOR PREPARING BUILDING FOOTPRINT SHOULD BE INSPECTED FOR QUALITY ANY MATERIAL CONTAINING ORGANICS, CLAY, AND/OR SILT SHALL BE REMOVED. FOR FILL REFER TO NOTE 3.
7. ANY SUBSURFACE SOIL CONDITIONS THAT ARE NOT REFLECTED ON THE CONSTRUCTION PLANS OR SPECIFICATIONS DURING CONSTRUCTION SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ENGINEER FOR FURTHER ACTION ON THE FOUNDATION DESIGN.
8. THE CONTRACTOR IS RESPONSIBLE FOR PREPARING THE SITE PRIOR TO CONSTRUCTION.

FOUNDATION, FOOTING & SLAB NOTES:

1. ALL FOOTINGS HAVE BEEN DESIGNED FOR AN ALLOWABLE SOIL BEARING PRESSURE OF 2,000 POUNDS PER SQUARE FOOT (PSF). THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND PREPARING SOIL TO ACHIEVE THE DESIGNED BEARING PRESSURE AT THE PROJECT SITE FOR ALL FOOTINGS, SLABS, AND FOUNDATIONS WITH LESS THAN ¾" SETTLEMENT.
2. MINIMUM 28-DAY CONCRETE NORMAL WT. COMPRESSIVE STRENGTHS FOR STRUCTURAL ELEMENTS:

A. PAD FOOTINGS: 4000 PSI
B. STRUCTURAL WALLS, COLUMNS: 4000 PSI
C. EXTERIOR SLABS ON GRADE: 4000 PSI, WITH 6% ± 1.5% AIR ENTRAINMENT
D. INTERIOR SLABS ON GRADE: 3500 PSI

3. ALL CONCRETE MATERIAL AND WORK SHALL BE DONE IN ACCORDANCE WITH THE FOLLOWING:

A. LATEST EDITION OF THE ACI 4301 SPECIFICATIONS FOR STRUCTURAL CONCRETE IN BUILDINGS.
B. LATEST EDITION OF THE ACI 318 BUILDING CODE AND COMMENTARY

INCASE OF DESIGN CONFLICT, THE GREATER STRENGTH REQUIREMENT SHALL BE USED.

4. ALL INTERIOR SLABS SHALL HAVE AT MINIMUM A 6-MIL VAPOR BARRIER DIRECTLY BELOW SLAB.
5. CONCRETE PLACEMENT AND PROTECTION CONFORMING TO ACI 117, 301, 305R, 306.1 AND 308.1, LATEST EDITIONS REQUIRED.
6. ALL SHALLOW FOUNDATIONS ARE DESIGNED IN ACCORDANCE WITH THE 2015 MICHIGAN BUILDING CODE SECTION 1809.5 AND ASCE 32-01 DESIGN AND CONSTRUCTION OF FROST-PROTECTED SHALLOW FOUNDATIONS.

REINFORCING STEEL:

1. ALL BARE AND EPOXY COATED REINFORCEMENT SHALL CONFORM TO ASTM A615 GRADE 60 STEEL.
2. ALL WELDED WIRE FABRIC (WWF) SHALL BE IN ACCORDANCE WITH ASTM A185.
3. ALL REINFORCING STEEL SHALL HAVE A CONCRETE COVER AS FOLLOWS, UNLESS NOTED OTHERWISE:

A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 3 INCHES
B. CONCRETE NOT PERMANENTLY CASE OR EXPOSED TO EARTH: 2 INCHES
D. SLAB ON GRADE: 2 INCHES

4. ALL REINFORCING STEEL SHALL HAVE LAP SPLICES AS FOLLOWS UNLESS NOTED OTHERWISE:

A. #4 BAR - 18"
B. #5 BAR - 24"
C. #6 BAR - 36"
D. #8 BAR - 48"

5. CONTRACTOR SHALL PROVIDE CORNER BARS OF EQUAL OR GREATER SIZE FOR HORIZONTAL WALL REINFORCEMENT AT ALL CORNERS AND INTERSECTIONS OF REINFORCED CONCRETE.
6. CONFORM TO ASTM A706/A706M, GRADE 60 FOR ALL WELDED REINFORCING STEEL. WELDED REINFORCEMENT SHALL BE PLACED IN ACCORDANCE OF THE CRSI MANUAL OF STANDARD PRACTICE. WELDING SHALL BE DONE IN ACCORDANCE WITH THE STRUCTURAL WELDING CODE (AWS D1.4)
7. ALL WELDS SHALL USE A E70XX ELECTRODES.

GENERAL SHOP DRAWING NOTES:

1. SUBMIT SHOP DRAWINGS FOR REVIEW AS INDICATED IN MATERIAL SECTION OF GENERAL STRUCTURAL NOTES AND SPECIFICATIONS.
2. ALLOW IN THE SCHEDULE - DETAILING, FABRICATION AND ERECTION - A MINIMUM OF 14 WORKING DAYS FOR REVIEW OF EACH SHOP DRAWING SUBMITTAL BY THE STRUCTURAL ENGINEER. SUBMIT SHOP DRAWINGS IN REASONABLE QUANTITIES AT REASONABLE INTERVALS (NOT MORE THAN 3 DRAWINGS PER SUBMITTAL PER WEEK). THE 14 WORKING DAYS STATED HEREIN, WILL BE IN ADDITION TO THE REVIEW TIME REQUIRED BY OTHER PROJECT TEAM MEMBERS, SUBMIT A SHOP DRAWING SUBMITTAL SCHEDULE PRIOR TO THE FIRST SUBMITTAL.
3. REVIEW OF SHOP DRAWINGS AND OTHER SUBMITTALS BY THE STRUCTURAL ENGINEER DOES NOT RELIEVE THE CONTRACTOR OF THE RESPONSIBILITY TO CHECK THE SHOP DRAWINGS PRIOR TO SUBMITTAL. ERRORS AND OMISSIONS ASSOCIATED WITH THE PREPARATION OF SHOP DRAWINGS NOT CONFORMING TO THE CONSTRUCTION DOCUMENTS ARE THE RESPONSIBILITY OF THE SHOP DRAWING PREPARER.
4. SHOP DRAWINGS ARE AN AID FOR FIELD PLACEMENT AND ARE SUPERCEDED BY THE CONTRACT DOCUMENTS. CONTRACTOR SHALL ENSURE THAT CONSTRUCTION IS IN ACCORDANCE WITH THE LATEST CONTRACTOR DOCUMENTS. SHOP DRAWINGS REVIEW IS ONLY FOR GENERAL COMPLIANCE WITH THE CONTRACTOR DOCUMENTS. REVIEW OF THE SHOP DRAWINGS BY THE STRUCTURAL ENGINEER DOES NOT GUARANTEE THAT THE SHOP DRAWINGS ARE CORRECT NOR INFER THAT THE SHOP DRAWINGS SUPERCEDE THE CONTRACT DOCUMENTS.
5. CONTRACTOR SHALL PROVIDE TWO HARD COPIES OF SHOP DRAWING SETS FOR REVIEW - ONE FOR RECORD AND ONE TO BE RETURNED WITH REVIEW COMMENTS. CONTRACTOR SHALL PROVIDE A SET OF APPROVED SHOP DRAWINGS BEARING THE REVIEW STAMP OF THE STRUCTURAL ENGINEER, TO THE LOCAL BUILDING DEPARTMENT AND THE PROJECT SITE.
6. NOTES ON SUBMITTED SHOP DRAWINGS FOR WORK "BY OTHERS" CANNOT BE RESPONSIBLY APPROVED BY STRUCTURAL ENGINEER. CONTRACTOR SHALL COORDINATE RESPONSIBILITY FOR MATERIALS, CONNECTIONS, ETC. PRIOR TO SHOP DRAWING SUBMITTAL TO THE STRUCTURAL ENGINEER.
7. CONTRACTOR SHALL VERIFY ALL RELEVANT DIMENSIONS AND ELEVATIONS FOR EQUIPMENT INSTALLATIONS AGAINST PURCHASED MANUFACTURER'S CERTIFIED EQUIPMENT DRAWINGS. CONTRACTOR SHALL COORDINATE DIMENSIONS THAT DEPEND UPON SPECIFIC EQUIPMENT, SUCH AS ELEVATOR OPENINGS, MECHANICAL EQUIPMENT SUPPORTS, ETC. PRIOR TO SUBMITTAL. SUCH DIMENSIONS SHALL BE PROVIDED ON THE SHOP DRAWINGS PRIOR TO SUBMITTAL TO THE STRUCTURAL ENGINEER. CONTRACTOR'S FAILURE TO PROVIDE SUCH DIMENSIONS ON SUBMITTED SHOP DRAWINGS WILL RESULT IN SHOP DRAWING RETURN WITHOUT REVIEW.
8. SHOP DRAWINGS SUBMITTED FOR REVIEW SHALL BE REVIEWED BY THE CONTRACTOR AND SHALL BE COMPLETE AND ACCURATE. FOR NON-CONFORMING SHOP DRAWINGS WHICH DO NOT MEET INDUSTRY STANDARDS FOR COMPLETION AND ACCURACY, AND WHICH REQUIRE EXCESSIVE CHANGES, CORRECTIONS, REVISIONS, OR COMPLETION BY THE STRUCTURAL ENGINEER WILL NOT BE REVIEWED.

STRUCTURAL STEEL:

ALL STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING UNLESS NOTED OTHERWISE:

W-SHAPES	ASTM A992, Fy=50KSI
ANGLES, CHANNELS, PLATES UNLESS NOTED OTHERWISE	ASTM A36, Fy=36KSI
SQUARE OR RECTANGULAR HSS	ASTM A500, GRADE C Fy=50 KSI
STEEL PIPE DIAMETER LESS THAN OR EQUAL TO 12"	ASTM A36, Fy=36KSI ASTM A572, Fy=50KSI ASTM A588, Fy=50KSI
ALL OTHER STEEL UNLESS OTHERWISE NOTED:	ASTM A441, Fy=50KSI

1. GENERAL NOTES FOR STEEL CONNECTIONS SHALL APPLY FOR ALL CONNECTIONS UNLESS NOTED OTHERWISE.
2. ALL STRUCTURAL STEEL WORK SHALL BE DONE IN ACCORDANCE WITH AISC SPECIFICATIONS.
3. SHOP DRAWINGS SHALL BE SUBMITTED AND REVIEWED BY THE ARCHITECT/ENGINEERING PRIOR TO FABRICATION.
4. ALL STEEL BEAMS ARE TO BE EQUALLY SPACED BETWEEN DIMENSION POINTS, UNLESS NOTED OTHERWISE.
5. MINIMUM CONNECTIONS SHALL BE A (2)-BOLT, ¾" DIA. A325 STRUCTURAL BOLT IN SINGLE SHEAR, ALL BOLTS TO BE TIGHTENED AND INSPECTED IN ACCORDANCCE WITH AISC SPECIFICATIONS.
6. ALL BEAMS BEARING DIRECTLY OVER THE TOP OF COLUMNS OR OTHER POINT LOADS SHALL HAVE A WEB STIFFENER EQUAL TO OR GREATER THAN THE THICKNESS OF THE WEB.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ERECTION AIDES, THAT INCLUDE BUT ARE NOT LIMITED TO: ERECTION ANGLES, LIFT HOLES, AND OTHER AIDES.
8. ALL STRUCTURAL STEEL SHAPES & COMPONENTS SHALL BE HOT-DIPPED GALVANIZED PER ASTM123.
9. ALL FASTENERS, WASHERS, NUTS, BOLTS SHALL BE HOT-DIPPED GALVANIZED PER ASTM153.

STRUCTURAL STEEL WELDING:

1. ALL WELD WORK SHALL BE EXECUTED BY AWS CERTIFIED WELDERS AND IN ACCORDANCE WITH AWS D1.1 (STEEL) & D1.3 (SHEET STEEL) WELDS SHOWN ON ENGINEERED DRAWINGS ARE MINIMUM SIZE WELDS. INCREASE WELD SIZE TO AWS MINIMUM WELD SIZES BASED ON PLATE THICKNESS. MINIMUM WELD SIZE SHALL BE $\frac{1}{8}$".
2. ALL WELDS SHALL BE MADE WITH E70XX ELECTRODE. ELECTRODES THAT HAVE BEEN WET SHALL NOT BE USED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE JOINT PREPARATIONS, AND WELDING PROCEDURES THAT INCLUDE, BUT ARE NOT LIMITED TO: REQUIRED ROOT OPENINGS, ROOT FACE DIMENSIONS, COPES, GROOVE ANGLES, BACKING BARS, SURFACE ROUGHNESS VALUES, AND TAPERS AND TRANSITIONS OF UNEQUAL PARTS.

STRUCTURAL DESIGN DATA:

ASD (ALLOWABLE STRESS DESIGN) METHODOLOGY

ROOF DEFLECTION LIMITED TO L/240

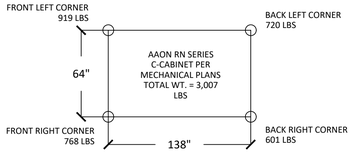
LOAD COMBINATIONS

ASD LOAD COMBINATIONS ARE IN ACCORDANCE WITH SECTION 1605 OF THE 2015 MICHIGAN BUILDING CODE.

DEAD LOADS

DEAD LOADS SHALL BE IN ACCORDANCE WITH THE 2015 MICHIGAN BUILDING CODE (SECTION 1607).

SEE AIR HANDLING UNIT (AHU) LOAD DIAGRAM BELOW. VERIFY WITH MANUFACTURER FILL WEIGHT.



AHU #1 & #2 LOAD DIAGRAM

SNOW LOADS

SNOW LOADING AND SNOW DRIFT LOADING SHALL BE IN ACCORDANCE WITH ASCE 7-16 "MINIMUM DESIGN LOADS FOR BUILDINGS & OTHER STRUCTURES"

GROUND SNOW LOAD:	Pg = 76 PSF (ASCE 7 HAZARD TOOL)
IMPORTANCE FACTOR:	Is = 1.1
SNOW EXPOSURE FACTOR:	Ce = 1.1
THERMAL FACTOR:	Ct = 1.2
FLAT-ROOF SNOW LOAD:	Pf = 71 PSF
DRIFT LOAD:	USE FLAT ROOF SNOW LOAD

WIND LOADS

WIND PRESSURE LOADING SHALL BE IN ACCORDANCE WITH THE 2015 MICHIGAN BUILDING CODE (SECTION 1609).

BASIC WIND SPEED:	V-ULT = 115 MPH (3-SECOND GUST) V-ASD = 90 MPH (3-SECOND GUST)
RISK CATEGORY:	II
EXPOSURE:	C
ENCLOSURE CLASSIFICATION:	FULLY ENCLOSED
LATERAL WIND PRESSURE (LP):	29.3 PSF (NO ASD REDUCTION FACTORS APPLIED)
PARAPET WIND PRESSURE (PP):	66 PSF (2.25xLP, NO ASD REDUCTION FACTORS APPLIED)
WIND UPLIFT:	31.8 PSF
NET WIND UPLIFT (0.6D+0.6W):	10 PSF (MIN.)

WIND PRESSURE LOADING SHALL BE APPLIED ACCORDANCE WITH ASCE 7-10 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.

SEISMIC LOADS

SEISMIC LOADING SHALL BE IN ACCORDANCE WITH THE 2015 MICHIGAN BUILDING CODE (SECTION 1613).

SITE CLASS:	D
DESIGN CATEGORY:	A
IMPORTANCE FACTOR:	Ie = 1.0

SHEET NO.	STRUCTURAL DRAWING INDEX	REV
S100	STRUCTURAL NOTES	
S101	AHU FOUNDATION & STEEL FRAMING PLAN	

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151 E. HURON AVE., ROGERS CITY, MI 49779

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CHECKED BY: JFR

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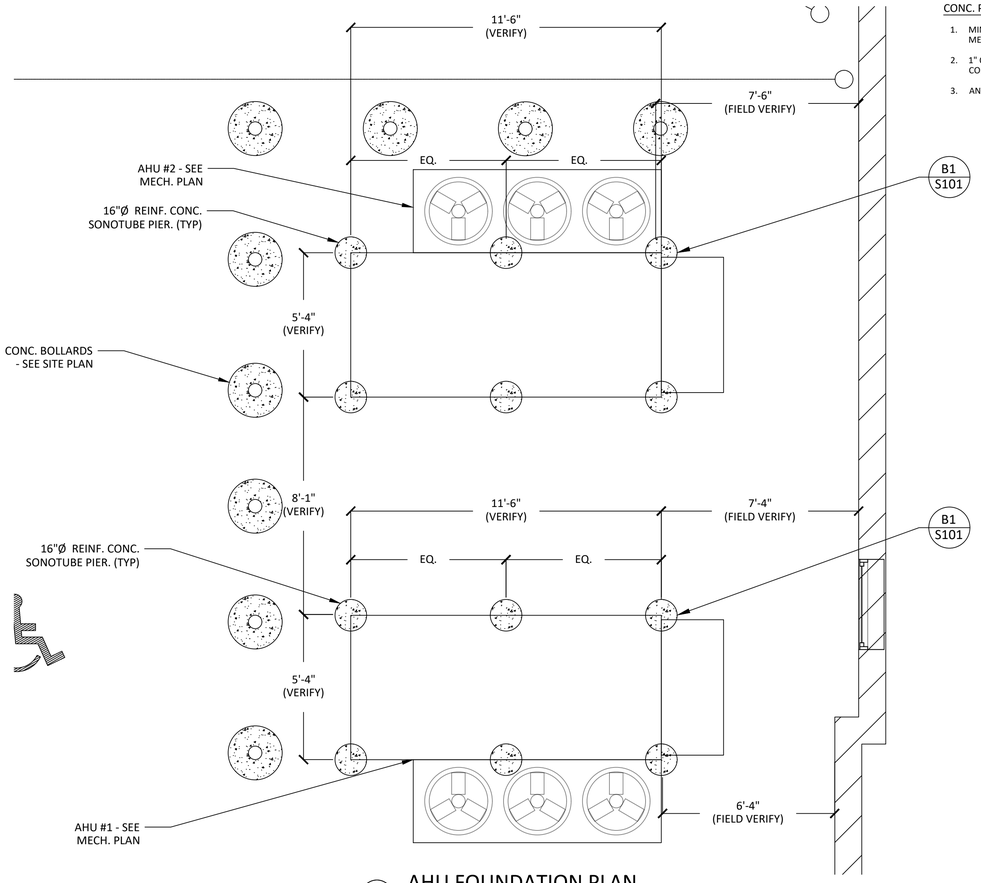
PROJECT NO.: 24-028

DRAWING NAME:

STRUCTURAL NOTES

SHEET NO.:

S100

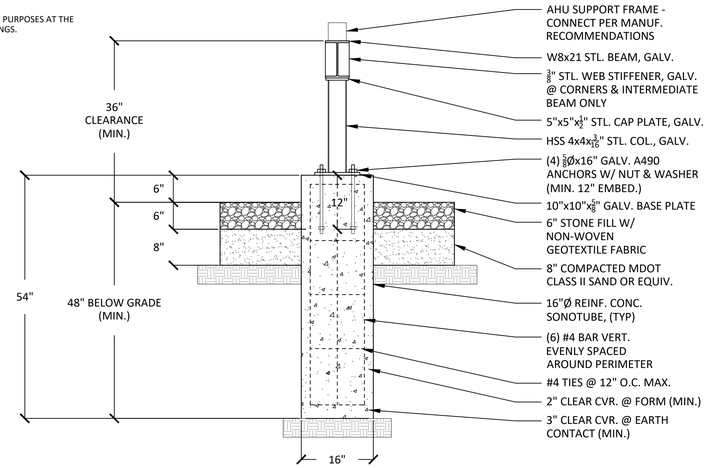


A1 AHU FOUNDATION PLAN

SCALE: 3/8" = 1'-0"

CONC. PIER NOTES:

1. MINIMUM CLEARANCE FROM GRADE TO BOTTOM OF AHU SHALL BE 36". VERIFY WITH APPROVED MECHANICAL SHOP DRAWINGS AND PLANS.
2. 1" OF NON-SHRINK GROUT MAY BE USED WITH LEVELING NUTS FOR ERECTION PURPOSES AT THE CONTRACTORS OPTION. RECONCILE ELEVATION DIFFERENCES IN SHOP DRAWINGS.
3. ANCHOR RODS SHALL HAVE AT MINIMUM 1" PROJECTION.

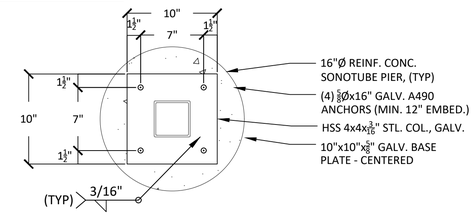


B1 CONC. PIER DETAIL, (TYP)

SCALE: 3/4" = 1'-0"

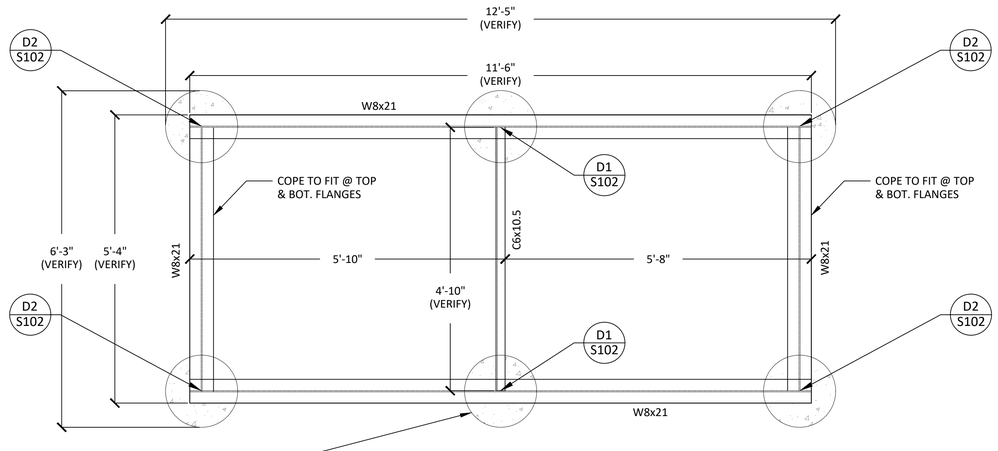
FOUNDATION NOTES:

1. ALL DIMENSIONS & ELEVATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL COORDINATE FOUNDATION LAYOUT WITH APPROVED MECHANICAL SHOP DRAWINGS OF AIR HANDLING UNITS (AHU). VERIFY FRAME SUPPORT DIMENSIONS PRIOR TO CONSTRUCTION.
3. CONTRACTOR SHALL VERIFY UNDERSIDE CLEARANCE REQUIREMENTS PER THE APPROVED MECHANICAL SHOP DRAWINGS OF AIR HANDLING UNITS (AHU).
4. FOUNDATION DESIGN IS DIMENSIONED TO REDUCE BEAM OVERHANG AND PONDING. OUT-OUT OF STEEL FRAMING SHALL BE VERIFIED TO FIT OVERALL DIMENSION OF AHU.
5. ALL CONCRETE PIERS SHALL BE CENTERED UNDER STEEL FRAMING SUPPORT POINTS.
6. CONTRACTOR SHALL PROVIDE LEVEL AND COMPACTED BASE AND SUBBASE FOR AHU UNIT AS SHOWN ON DETAIL B1 (THIS SHEET).
7. IT IS RECOMMENDED TO BEGIN FOUNDATION WORK AFTER STEEL FRAMING SHOP DRAWINGS HAVE BEEN APPROVED.



B2 STL. BASE PLATE DETAIL, (TYP)

SCALE: 1-1/2" = 1'-0"

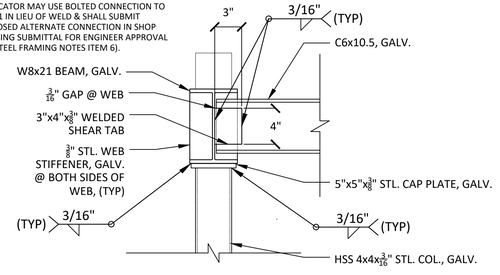


C1 AHU STEEL FRAME SUPPORT PLAN

SCALE: 3/16" = 1'-0"

DETAIL D1 NOTE:

1. FABRICATOR MAY USE BOLTED CONNECTION TO W8x21 IN LIEU OF WELD & SHALL SUBMIT PROPOSED ALTERNATE CONNECTION IN SHOP DRAWING SUBMITTAL FOR ENGINEER APPROVAL (SEE STEEL FRAMING NOTES ITEM 6).

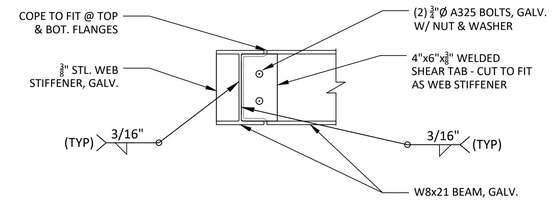


D1 STL. CONN. @ CENTER BEAM, (TYP)

SCALE: 1-1/2" = 1'-0"

STEEL FRAMING NOTES:

1. ALL DIMENSIONS & ELEVATIONS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. FABRICATOR SHALL COORDINATE THE MECHANICAL UNIT PLACEMENT AND ANCHORAGE TO THE STEEL FRAME WITH THE MECHANICAL CONTRACTOR AND MANUFACTURERS SHOP DRAWING IN THE FIELD.
3. FABRICATOR SHALL COORDINATE STEEL LAYOUT WITH APPROVED MECHANICAL SHOP DRAWINGS OF AIR HANDLING UNITS (AHU) AND MANUFACTURER RECOMMENDED CONNECTIONS TO THE FRAME. VERIFY FRAME SUPPORT DIMENSIONS PRIOR TO FABRICATION.
4. ALL AHU LOAD POINTS ON W8x21 BEAMS SHALL HAVE 3/8" WEB STIFFENERS AT BOTH SIDES OF WEB AT MINIMUM.
5. AT THE CONTRACTORS OPTION, FABRICATOR MAY PROPOSE ALTERNATE CONNECTION METHODS TO VALUE ENGINEER AHU STEEL SUPPORT FRAME OR IMPROVE CONSTRUCTABILITY. FABRICATOR ASSUMES LIABILITY AND RESPONSIBILITY FOR ALL ALTERNATE CONNECTIONS USED. ALL PROPOSED ALTERNATE CONNECTIONS SHALL BE PRESENTED IN SHOP DRAWING SUBMITTAL STAMPED BY A MICHIGAN PROFESSIONAL LICENSED ENGINEER FOR APPROVAL.
6. CONTRACTOR IS RESPONSIBLE FOR SUBMITTING STEEL SHOP DRAWINGS FOR ENGINEERS APPROVAL PRIOR TO FABRICATION.
7. ALL STRUCTURAL STEEL SHAPES & COMPONENTS SHALL BE HOT-DIPPED GALVANIZED PER ASTM123.
8. ALL FASTENERS, WASHERS, NUTS, BOLTS SHALL BE HOT-DIPPED GALVANIZED PER ASTM153.

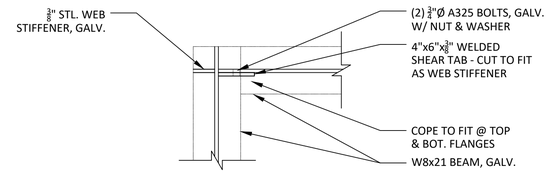


D2 STL. CONN. @ CORNER DETAIL, (TYP)

SCALE: 1-1/2" = 1'-0"

DETAIL D2 & D3 NOTE:

1. BOLTS MAY BE ELIMINATED IN LIEU OF A WELDED SHEAR TAB SIMILAR TO DETAIL D1. INDICATE ON SHOP DRAWINGS INTENDED CONNECTION METHOD.



D3 STL. CONN. @ CORNER TOP VIEW, (TYP)

SCALE: 1-1/2" = 1'-0"

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DRAWING NAME:

AHU FOUNDATION & STEEL FRAMING PLAN

SHEET NO.:

S101

MECHANICAL ABBREVIATION LIST

ABBREVIATION	DESCRIPTION
A	COMPRESSED AIR
A(___*)	COMPRESSED AIR (SPECIFIC PSIG)
AV	AUTOMATIC AIR VENT
ACC	AIR COOLED CONDENSER
ACCU	AIR COOLED CONDENSING UNIT
AD	ACCESS DOOR
AD	AREA DRAIN
AE	AIR EXTRACTOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ALT	ALTERNATE
AMP	AMPERE
APD	AIR PRESSURE DROP
AR	ARGON
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR-CONDITIONING ENGINEERS
ASR	AUTOMATIC SPRINKLER RISER
AUX	AUXILIARY
AV	ACID VENT
AVTR	ACID VENT THROUGH ROOF
AW	ACID WASTE
BAS	BUILDING AUTOMATION SYSTEM
BCU	BLOWER COIL UNIT
BFP	BACKFLOW PREVENTER
BHP	BRAKE HORSEPOWER
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT PER HOUR
BWV	BACKWATER VALVE
C	COMMON
CAP	CAPACITY
CAV	CONSTANT AIR VOLUME
CB	CATCH BASIN
CC	COOLING COIL
CD	COLD DECK
CD	CONDENSATE DRAIN
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CHW	CHILLED WATER
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	COOLING
CNDS	CONDENSATE
CNDS (___*)	CONDENSATE (SPECIFIC PSIG)
CO	CLEAN OUT
CO2	CARBON DIOXIDE
CONT	CONTINUATION OR CONTINUED
CONTR	CONTRACTOR
CONV	CONVECTOR
COS	CENTRAL OPERATOR STATION
CP	CIRCULATING PUMP
CRU	CONDENSATE RETURN UNIT
CSS	CLINICAL SERVICE SINK
CT	COOLING TOWER
CUH	CABINET UNIT HEATER
CW	DOMESTIC COLD WATER
CWR	CONDENSER WATER RETURN
CWS	CONDENSER WATER SUPPLY
D&T	DRIP AND TRAP
DA	DISCHARGE AIR
DAT	DISCHARGE AIR TEMPERATURE
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DEG	DEGREE
DFU	DRAINAGE FIXTURE UNITS
DIA	DIAMETER
DMPR	DAMPER
DN	DAYLNIGHT
DN	DOWN
DNZ	DOWNSPOUT NOZZLE
DT	DRAIN TILE
DTC	DRAIN TILE CONNECTION
DWH	DOMESTIC WATER HEATER
DWG	DRAWING
(E)	EXISTING
E	EXHAUST GRILLE OR REGISTER
EA	EACH
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EC	EXPANSION COMPENSATOR
ECUH	ELECTRIC CABINET UNIT HEATER
EDB	ENTERING DRY BULB
EEW	EMERGENCY EYE WASH
EF	EXHAUST FAN
EFF	EFFICIENCY
EHC	ELECTRIC HEATING COIL
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
EMS	ENERGY MANAGEMENT SYSTEM
ERL	ENERGY RECOVERY LOOP
ERLR	ENERGY RECOVERY LOOP RETURN
ERLS	ENERGY RECOVERY LOOP SUPPLY
ERU	ENERGY RECOVERY UNIT
ER	EXHAUST REGISTER
ESP	EXTERNAL STATIC PRESSURE
EUH	ELECTRIC UNIT HEATER
EWB	ENTERING WET BULB
EWC	ELECTRIC WATER COOLER
EWT	ENTERING WATER TEMPERATURE
EXH	EXHAUST
F	FIRE PROTECTION
°F	DEGREES FAHRENHEIT
F&B	FACE AND BYPASS
F&T	FLOAT AND THERMOSTATIC
FA	FACE AREA
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
FH	FIRE HYDRANT
FHC	FIRE HOSE CABINET
FHR	FIRE HOSE RACK
FHV	FIRE HOSE VALVE
FLA	FULL LOAD AMPS
FLR	FLOOR
FM	FLOW MEASURING DEVICE
FMS	FLOW MEASURING STATION
FPM	FEET PER MINUTE
FP	FIRE PUMP
FPTU	FAN POWERED (AIR) TERMINAL UNIT
FS	FLOOR SINK
FT	FEET
FTR	FINNED TUBE RADIATION
FV	FACE VELOCITY
G	NATURAL GAS
GA	GAUGE
GAL	GALLON
GRH	GRAVITY RELIEF HOOD
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
H	HYDROGEN
HB	HOSE BIBB
HC	HEATING COIL
HD	HOT DECK
HEPA	HIGH EFFICIENCY PARTICULATE ARRESTANCE
HL	HIGH LIMIT
HOA	HAND/OFF/AUTO
HP	HEAT PUMP
HP	HORSEPOWER
HPCW	HIGH PRESSURE DOMESTIC COLD WATER
HPHW	HIGH PRESSURE DOMESTIC HOT WATER
HPHWR	HIGH PRESSURE DOMESTIC HOT WATER RETURN
HPL	HEAT PUMP LOOP
HPLR	HEAT PUMP LOOP RETURN
HPLS	HEAT PUMP LOOP SUPPLY
HR	HOUR
HTG	HEATING
HV	HEATING VENTILATING
HVAC	HEATING, VENTILATING, AIR CONDITIONING
HWH	HOT WATER HEATING
HWHR	HOT WATER HEATING RETURN
HWHS	HOT WATER HEATING SUPPLY
HW	DOMESTIC HOT WATER
HW(___)	DOMESTIC HOT WATER (SPECIFIC TEMP °F)
HWR	DOMESTIC HOT WATER RETURN
HX	HEAT EXCHANGER
HZ	HERTZ
IAQ	INDOOR AIR QUALITY
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IH	INTAKE HOOD
IN	INCHES
IR	INFRARED HEATER
IW	INDIRECT WASTE
JC	JANITOR'S CLOSET
JP	JOCKEY PUMP
KW	KILOWATT
KWH	KILOWATT-HOUR
LAT	LEAVING AIR TEMPERATURE
LAB	LABORATORY
LAV	LAVATORY
LBS	POUNDS
LDB	LEAVING DRY BULB
LL	LOW LIMIT
LPC	LOW PRESSURE CONDENSATE
LPS	LOW PRESSURE STEAM
LRA	LOCKED ROTOR AMPS
LTU	LAB (AIR) TERMINAL UNIT
LWB	LEAVING WET BULB
LWT	LEAVING WATER TEMPERATURE
MA	MIXED AIR
MAT	MIXED AIR TEMPERATURE
MAU	MAKE-UP AIR UNIT
MV	MANUAL AIR VENT
MAX	MAXIMUM
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MCA	MEDICAL COMPRESSED AIR
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MMBH	MILLION BRITISH THERMAL UNITS PER HOUR
MS	MOTOR STARTER
MTD	MOUNTED
MTR	MOTOR
MVAC	MEDICAL VACUUM
N	NEW
N2O	NITROUS OXIDE
NC	NOISE CRITERIA
NC	NORMALLY CLOSED
NCTC	NORMALLY CLOSED TIMED CLOSED
NCTO	NORMALLY CLOSED TIMED OPEN
NFPA	NATIONAL FIRE PROTECTION AGENCY
NOTC	NORMALLY OPEN TIMED CLOSED
NOTO	NORMALLY OPEN TIMED OPEN
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NOM	NOMINAL
NPCW	NON POTABLE COLD WATER
O	OXYGEN
OA	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER/CENTER TO CENTER
OD	OUTSIDE DIAMETER
OL	OVERLOAD
ORC	OVERFLOW ROOF CONDUCTOR
ORD	OVERFLOW ROOF DRAIN
OS&Y	OUTSIDE SCREW AND YOLK
OV	OUTLET VELOCITY
PACU	PACKAGED AIR CONDITIONING UNIT
PBD	PARALLEL BLADE DAMPER
PC	PUMPED CONDENSATE
PCW	PROCESS COOLING WATER
PCWR	PROCESS COOLING WATER RETURN
PCWS	PROCESS COOLING WATER SUPPLY
PD	PRESSURE DROP (FEET OF WATER)
PH	PERIMETER HEAT
PHR	PERIMETER HEAT RETURN
PHS	PERIMETER HEAT SUPPLY
PNL	PANEL
PPM	PARTS PER MILLION
PRESS	PRESSURE
PRV	PRESSURE REDUCING VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH - ABSOLUTE
PSIG	POUNDS PER SQUARE INCH - GAUGE
PW	PURIFIED WATER
PWR	PURIFIED WATER RETURN
PWS	PURIFIED WATER SUPPLY
PRESS	PRESSURE
(R)	RELOCATED
RR	RETURN GRILLE OR REGISTER
RA	RETURN AIR
RAT	RETURN AIR TEMPERATURE
RC	RAIN CONDUCTOR
RCP	RADIANT CEILING PANEL
RD	ROOF DRAIN
REQD	REQUIRED
RF	RETURN FAN
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID
RLFA	RELIEF AIR
RPM	REVOLUTIONS PER MINUTE
RS	REFRIGERANT SUCTION
RTU	ROOFTOP UNIT
SD	SUPPLY AIR DIFFUSER OR GRILLE
SA	SOUND ATTENUATOR
SA	SUPPLY AIR
SAN	SANITARY WASTE
SAT	SUPPLY AIR TEMPERATURE
SECT	SECTION
SF	SUPPLY FAN
SH	SHOWER
SK	SINK
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SPKLR	SPRINKLER
SQFT	SQUARE FOOT/SQUARE FEET
S/S	START/STOP
SS	SERVICE SINK
ST	STORM
STD	STANDARD
STK	STACK
STM	STEAM
STM(___*)	STEAM (SPECIFIC PSIG)
S/W	SUMMER/WINTER
SW	SWITCH
T	TRANSFER GRILLE
TC	TEMPERATURE CONTROL
TC	TEMPERING COIL
TCP	TEMPERATURE CONTROL PANEL
TD	TRENCH DRAIN
TEMP	TEMPERATURE
TEMP	TEMPORARY
TH	TERMINAL HEATING
THR	TERMINAL HEATING RETURN
THS	TERMINAL HEATING SUPPLY
TSP	TOTAL STATIC PRESSURE
TU	(AIR) TERMINAL UNIT
TV	TURNING VANES
TYP	TYPICAL
UH	UNIT HEATER
UL	UNDERWRITER'S LABORATORY
UON	UNLESS OTHERWISE NOTED
UR	URINAL
UV	UNIT VENTILATOR
V	VALVE
V	VENT
VAC	VACUUM
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER (MANUALLY ADJUSTABLE)
VOL	VOLUME
VSD	VARIABLE SPEED DRIVE
VTR	VENT THROUGH ROOF
VUV	VERTICAL UNIT VENTILATOR
W	WASTE
W&V	WASTE AND VENT
WB	WET BULB
WC	WATER CLOSET
WC	WATER COLUMN
WG	WATER GAUGE
WH	WALL HYDRANT
WPD	WATER PRESSURE DROP
WT	WEIGHT
XFMR	TRANSFORMER

MECHANICAL SYMBOL LIST

PIPING SYMBOLS

SYMBOL	DESCRIPTION
AV	AIR VENT - AUTOMATIC
MV	AIR VENT - MANUAL
BFP	BACKFLOW PREVENTER
	CATCH BASIN
	CIRCULATING PUMP
CO	CLEAN OUT - IN FLOOR
CO	CLEAN OUT - FLANGE
	DIRECTION OF FLOW
	DIRECTION OF PITCH - DOWN
	FINNED TUBE RADIATION
	FIRE PROTECTION - SIAMESE CONNECTION - FREE STANDING
	FIRE PROTECTION - SIAMESE CONNECTION - WALL MOUNTED
	FIRE PROTECTION - SPRINKLER HEAD, CONCEALED
	FIRE PROTECTION - SPRINKLER HEAD, PENDANT
	FIRE PROTECTION - SPRINKLER HEAD, UPRIGHT
	FIRE PROTECTION - SPRINKLER HEAD, SIDEWALL
	FLOOR DRAIN
	FLOOR DRAIN - ELEVATION
	FLOOR DRAIN - FUNNEL
	FLOOR DRAIN - FUNNEL, ELEVATION
	FLOW MEASURING DEVICE
FS	FLOW SWITCH
HB	HOSE BIBB
MH	MANHOLE
	OPEN SITE DRAIN
	PIPE - ANCHOR
	PIPE - CAP OR PLUG
	PIPE - ELBOW DOWN
	PIPE - ELBOW UP
	PIPE - EXPANSION JOINT OR COMPENSATOR
	PIPE - FLANGE
	PIPE - FLEXIBLE CONNECTION
	PIPE - GUIDE
	PIPE - TEE DOWN
	PIPE - TEE UP
	PIPE - UNION
P/T	PRESSURE AND TEMPERATURE TEST PLUG
	PRESSURE GAUGE AND COCK
	REDUCER - CONCENTRIC
	REDUCER - ECCENTRIC
RD	ROOF DRAIN
	STEAM TRAP - FLOAT AND THERMOSTATIC
	STRAINER
	STRAINER WITH BLOW-OFF
	THERMOMETER
	TRAP
	VALVE - ANGLE
	VALVE - BALL
	VALVE - BALANCE
	VALVE - BUTTERFLY
	VALVE - COMBINATION BALANCE & FLOW MEASURING
	VALVE - CHECK
	VALVE - SPRING CHECK
	VALVE - GAS (MANUAL)
	VALVE - GLOBE
	VALVE - ISOLATION
	VALVE - NEEDLE
	VALVE - OS&Y
	VALVE - PLUG
	VALVE - PRESSURE REGULATING
	VALVE - PRESSURE REDUCING
	VALVE - PRESSURE RELIEF
	VALVE - PRESSURE & TEMPERATURE RELIEF
VTR	VENT THROUGH ROOF
WH	WALL HYDRANT

DUCTWORK SYMBOLS

SYMBOL	DESCRIPTION
1	AIR TERMINAL UNIT
2	AIR TERMINAL UNIT WITH HEATING COIL
	AIR TERMINAL UNIT - LABORATORY
	DAMPER - HORIZONTAL FIRE (EXISTING, NEW)
	DAMPER - HORIZONTAL FIRE / SMOKE (EXISTING, NEW)
	DAMPER - SMOKE (EXISTING, NEW)
	DAMPER - VERTICAL FIRE (EXISTING, NEW)
	DAMPER - VERTICAL FIRE / SMOKE (EXISTING, NEW)
M	DAMPER - MOTORIZED
	DAMPER - VOLUME (MANUALLY ADJUSTABLE)
	DIFFUSER - BLANK OFF
	DIFFUSER - LINEAR SLOT
	DIFFUSER - SQUARE OR RECTANGULAR
	DUCT CROSS SECTION - SUPPLY
	DUCT CROSS SECTION - RETURN OR EXHAUST
	DUCT - FLEXIBLE CONNECTION
	DUCT - FLEXIBLE DUCT
	DUCT TAKE-OFF - ROUND CONICAL
	DUCT TAKE-OFF - RECTANGULAR WITH SHOE TAP
	ELBOW - RECTANGULAR WITH TURNING VANES
	ELBOW - RECTANGULAR/ ROUND SMOOTH RADIUS
	ELBOW DOWN - RECTANGULAR
	ELBOW DOWN - ROUND
	ELBOW UP - RECTANGULAR
	ELBOW UP - ROUND
	FAN - AXIAL
	FAN - CENTRIFUGAL (ELEVATION)
	HEATING COIL
D	INCLINED DROP IN DIRECTION OF AIRFLOW
R	INCLINED RISE IN DIRECTION OF AIRFLOW
	INTAKE OR RELIEF HOOD
	REGISTER - RETURN OR EXHAUST
	REGISTER - RETURN WITH BOOT
	REGISTER - TRANSFER GRILLE
	ROOF EXHAUST FAN
	TRANSITION - CONCENTRIC
	TRANSITION - ECCENTRIC
	UNIT HEATER - HORIZONTAL THROW
	UNIT HEATER - VERTICAL THROW

MECHANICAL DRAWING INDEX

SHEET NO.	SHEET TITLE
MG0.1	MECHANICAL SHEET INDEX, SYMBOLS LIST AND ABBREVIATIONS
M0.0	MECHANICAL BASEMENT DEMO PLAN
M0.1	MECHANICAL FIRST FLOOR DEMO PLAN
M0.2	MECHANICAL SECOND FLOOR DEMO PLAN
M0.3	MECHANICAL ATTIC / ROOF DEMO PLAN
M1.0	MECHANICAL BASEMENT PLAN
M1.1	MECHANICAL FIRST FLOOR PLAN
M1.2	MECHANICAL SECOND FLOOR PLAN
M1.3	MECHANICAL ATTIC / ROOF PLAN
M5.1	MECHANICAL DETAILS
M5.2	MECHANICAL DETAILS
M6.1	MECHANICAL SCHEDULES
M7.1	TEMPERATURE CONTROL DIAGRAMS
M7.2	TEMPERATURE CONTROL DIAGRAMS

STANDARD METHODS OF NOTATION

S-1 — SUPPLY DIFFUSER WITH SCHEDULE TAG "1",
10ø — 10" DIAMETER NECK SIZE
350-4 — 350 CFM TYPICAL FOR 4

R-1 — RETURN REGISTER WITH SCHEDULE TAG "1",
22x22 — 22"x 22" NECK SIZE
640-2 — 640 CFM TYPICAL FOR 2
EXHAUST REGISTER E DESIGNATION SIMILAR.

700/200
330 OA
1 — AIR TERMINAL UNIT WITH HEATING COIL, SIZE 1
700 CFM MAX / 200 CFM MIN
330 CFM MIN REQUIRED OUTSIDE AIR FOR OCCUPIED MODE

1 — CONSTRUCTION NOTE NUMBER

1 — DEMOLITION NOTE NUMBER

EF-1 — EQUIPMENT DESIGNATION,
(i.e. EXHAUST FAN NUMBER 1)

HW-1 — PIPING RISER DESIGNATION
(i.e. HOT WATER RISER NUMBER 1)

NEW SYSTEM COMPONENT
EXISTING SYSTEM COMPONENT TO REMAIN
POINT OF NEW CONNECTION SYMBOL

1 / M5.1 — SECTION OR PLAN NUMBER
SHEET WHERE SECTION IS DRAWN

AREA OF ENLARGEMENT
PLAN NUMBER
1 / M5.1 — SHEET WHERE ENLARGED PLAN IS DRAWN

1 / M5.1 — SECTION OR PLAN NUMBER
SECTION OR ENLARGED PLAN
SCALE: 1/8" = 1' - 0"
0 1 4 8
SHEET WHERE SECTION IS CUT OR ENLARGED PLAN IS REFERENCED

SHEET M1.0 / SHEET M1.1 — MATCH LINE

HEAVY LINE WEIGHT INDICATES NEW WORK

LIGHT LINE WEIGHT INDICATES EXISTING EQUIPMENT OR REFERENCED INFORMATION

DASHED LINES INDICATE PIPING ROUTED BELOW SLAB OR GRADE

HATCH MARKS INDICATE EQUIPMENT OR MATERIALS TO BE DISCONNECTED AND REMOVED.

NOTE: ALL SYMBOLS & ABBREVIATIONS SHOWN MAY NOT APPLY TO THIS PROJECT.

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LE No. 24-0104

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	RO
CHECKED BY:	ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL SHEET INDEX, SYMBOLS LIST AND ABBREVIATIONS

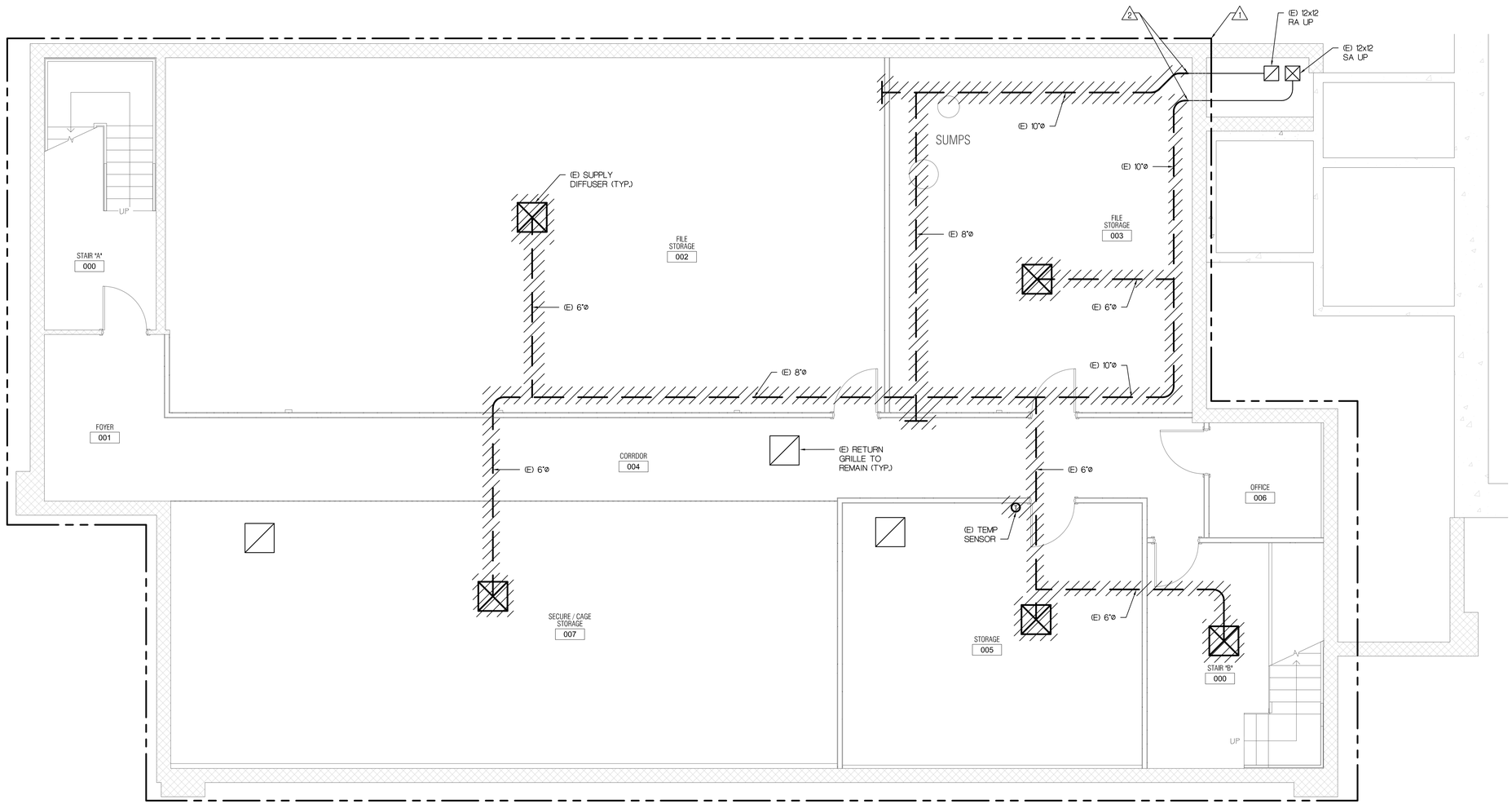
SHEET NO.: MG0.1

⚠1 MECHANICAL DEMOLITION KEY NOTES:

1. REMOVE ALL EXISTING MECHANICAL HVAC AND EXHAUST SYSTEMS COMPLETE IN ENTIRE BUILDING UNLESS NOTED OTHERWISE INCLUDING BASEMENT, FIRST FLOOR, SECOND FLOOR, ATTIC AND ROOF INCLUDING BUT NOT LIMITED TO MECHANICAL EQUIPMENT, DUCTWORK, CONTROLS, HANGERS AND SUPPORTS, ALL ASSOCIATED ACCESSORIES, ETC. NO MECHANICAL SYSTEMS SHALL REMAIN IN ENTIRE BUILDING, OUTDOORS OR ON ROOF UPON COMPLETION OF DEMOLITION WORK UNLESS NOTED OTHERWISE. PATCH ALL WALL PENETRATIONS, ROOF PENETRATIONS, ETC. TO MATCH EXISTING. COORDINATE EXTENT OF DEMOLITION WORK WITH ALL TRADES PRIOR TO START OF CONSTRUCTION.
2. REMOVE EXISTING SUPPLY AND RETURN DUCTWORK BACK TO WALL. PREPARE EXISTING SUPPLY AND RETURN DUCTWORK AT WALL FOR CONNECTION TO NEW SUPPLY AND RETURN DUCTWORK. REFER TO NEW WORK PLANS FOR NEW WORK.
3. REMOVE EXISTING GAS PIPING BACK TO THIS POINT. PREPARE EXISTING GAS PIPING FOR CONNECTION TO NEW GAS PIPING. REFER TO NEW WORK PLANS FOR NEW WORK.

MECHANICAL GENERAL DEMOLITION NOTES:

1. ANY INTERRUPTIONS OF EXISTING SERVICES OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE BUILDING OPERATION.
2. THESE DRAWINGS INDICATE THE GENERAL EXTENT OF WORK. THE EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK AND REMOVAL OF MATERIALS/COMPONENTS NOT REQUIRED FOR THE NEW AND RENOVATED SYSTEMS.
3. ALL MECHANICAL SYSTEMS TO BE REMOVED SHALL BE REMOVED COMPLETE WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, CONTROLS, ETC. PATCH AND SEAL ALL OPENINGS AS A RESULT OF DEMOLITION IN RATED WALLS TO MAINTAIN EXISTING WALL'S FIRE OR SMOKE RATING AND TO MATCH EXISTING ADJACENT SURFACES.
4. ALL ITEMS AND EQUIPMENT REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS POSSESSION RIGHTS ARE WAIVED. CONTRACTOR SHALL MEET WITH THE OWNER PRIOR TO START OF DEMOLITION TO DETERMINE WHICH ITEMS ARE TO BE SALVAGED. CONTRACTOR SHALL REMOVE REMAINING ITEMS FROM SITE.
5. FIELD VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES PRIOR TO START OF DEMOLITION.
6. PATCH WALL TO MATCH EXISTING WHERE EXISTING CONTROLLERS, TEMPERATURE SENSORS ARE NOT BEING REPLACED WITH NEW OR PROVIDE WALL PLATES WHERE INDICATED ON DRAWINGS.
7. ALL ITEMS ON THE DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED.



NORTH

MECHANICAL BASEMENT DEMO PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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CONSTRUCTION	○

DRAWN BY: RO
CHECKED BY: ML

REVISIONS:

BIDS AND PERMITS	04/15/25

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DRAWING NAME: MECHANICAL BASEMENT DEMO PLAN

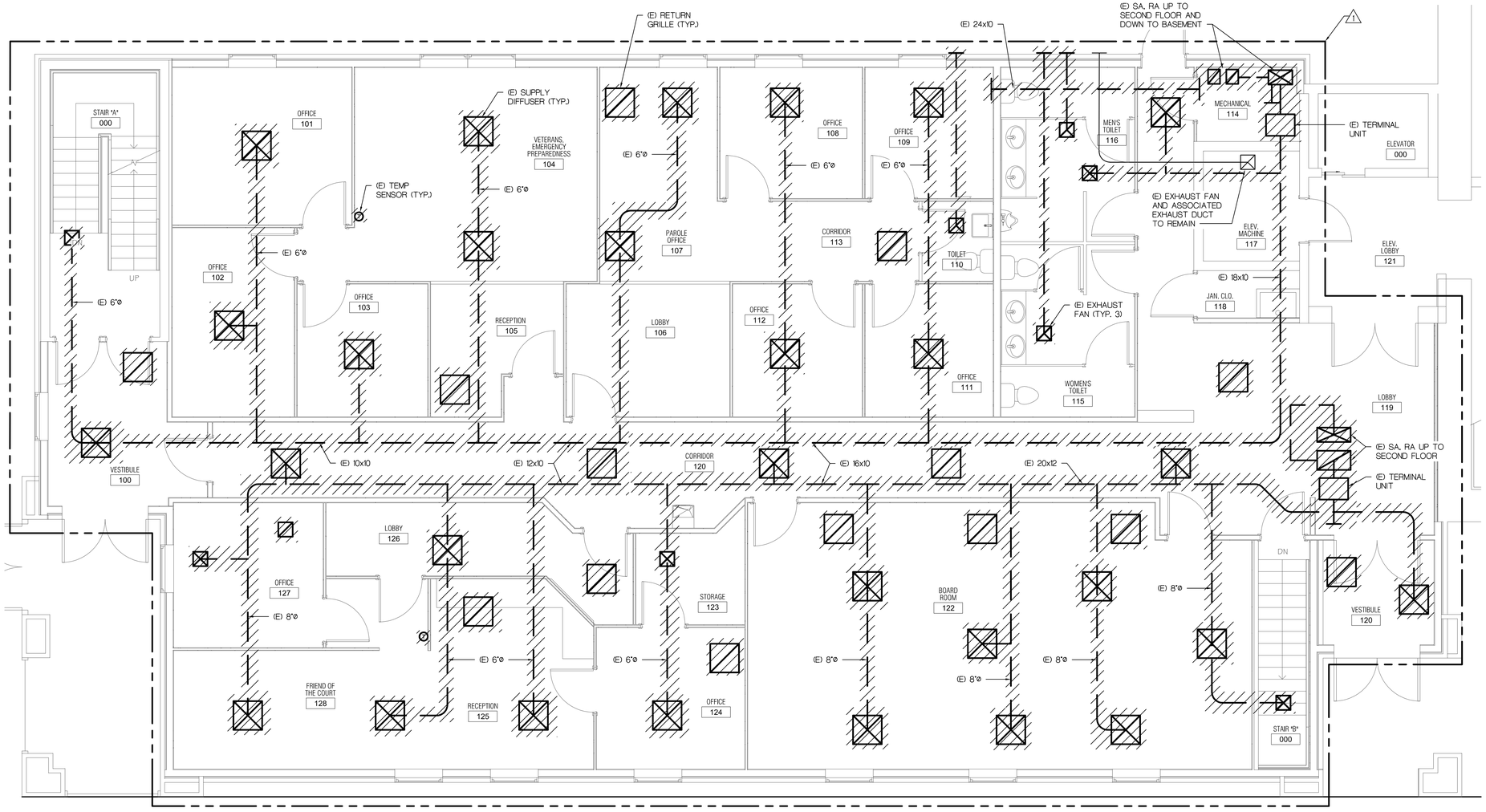
SHEET NO.: M0.0

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3. ALL MECHANICAL SYSTEMS TO BE REMOVED SHALL BE REMOVED COMPLETE WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, CONTROLS, ETC. PATCH AND SEAL ALL OPENINGS AS A RESULT OF DEMOLITION IN RATED WALLS TO MAINTAIN EXISTING WALL'S FIRE OR SMOKE RATING AND TO MATCH EXISTING ADJACENT SURFACES.
4. ALL ITEMS AND EQUIPMENT REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS POSSESSION RIGHTS ARE WAIVED. CONTRACTOR SHALL MEET WITH THE OWNER PRIOR TO START OF DEMOLITION TO DETERMINE WHICH ITEMS ARE TO BE SALVAGED. CONTRACTOR SHALL REMOVE REMAINING ITEMS FROM SITE.
5. FIELD VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES PRIOR TO START OF DEMOLITION.
6. PATCH WALL TO MATCH EXISTING WHERE EXISTING CONTROLLERS, TEMPERATURE SENSORS ARE NOT BEING REPLACED WITH NEW OR PROVIDE WALL PLATES WHERE INDICATED ON DRAWINGS.
7. ALL ITEMS ON THE DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED.



NORTH

MECHANICAL FIRST FLOOR DEMO PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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Bloomfield Hills Michigan 48304
(586) 601- 4219
LE No. 24-0104

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS

PRESQUE ISLE COUNTY ANNEX COURT BLDG.

151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: RO
CHECKED BY: ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL FIRST FLOOR DEMO PLAN

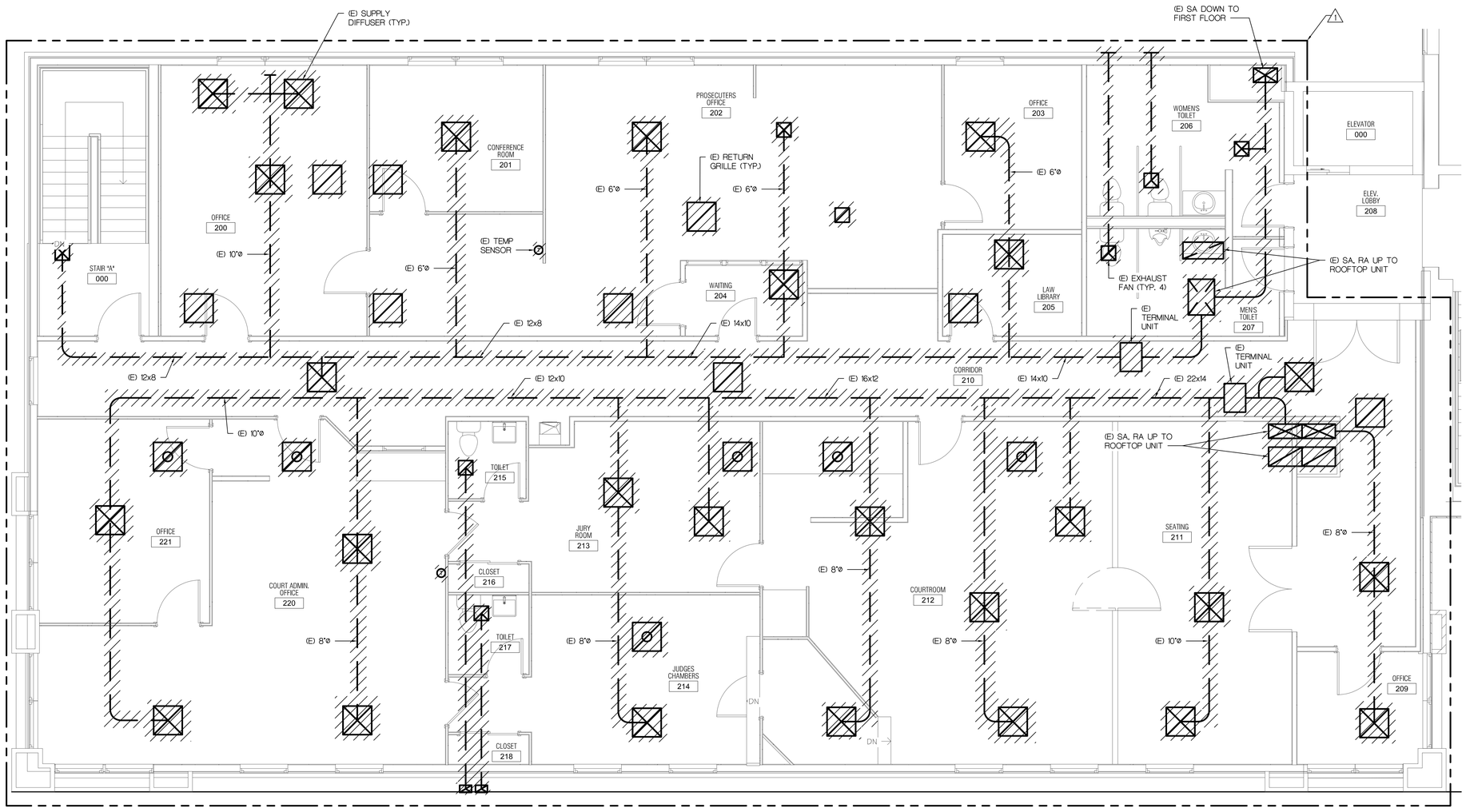
SHEET NO.: M0.1

⚠1 MECHANICAL DEMOLITION KEY NOTES:

1. REMOVE ALL EXISTING MECHANICAL HVAC AND EXHAUST SYSTEMS COMPLETE IN ENTIRE BUILDING UNLESS NOTED OTHERWISE INCLUDING BASEMENT, FIRST FLOOR, SECOND FLOOR, ATTIC AND ROOF INCLUDING BUT NOT LIMITED TO MECHANICAL EQUIPMENT, DUCTWORK, CONTROLS, HANGERS AND SUPPORTS, ALL ASSOCIATED ACCESSORIES, ETC. NO MECHANICAL SYSTEMS SHALL REMAIN IN ENTIRE BUILDING, OUTDOORS OR ON ROOF UPON COMPLETION OF DEMOLITION WORK UNLESS NOTED OTHERWISE. PATCH ALL WALL PENETRATIONS, ROOF PENETRATIONS, ETC. TO MATCH EXISTING. COORDINATE EXTENT OF DEMOLITION WORK WITH ALL TRADES PRIOR TO START OF CONSTRUCTION.
2. REMOVE EXISTING SUPPLY AND RETURN DUCTWORK BACK TO WALL. PREPARE EXISTING SUPPLY AND RETURN DUCTWORK AT WALL FOR CONNECTION TO NEW SUPPLY AND RETURN DUCTWORK. REFER TO NEW WORK PLANS FOR NEW WORK.
3. REMOVE EXISTING GAS PIPING BACK TO THIS POINT. PREPARE EXISTING GAS PIPING FOR CONNECTION TO NEW GAS PIPING. REFER TO NEW WORK PLANS FOR NEW WORK.

MECHANICAL GENERAL DEMOLITION NOTES:

1. ANY INTERRUPTIONS OF EXISTING SERVICES OR EQUIPMENT SHALL BE PERFORMED AT A TIME APPROVED IN ADVANCE BY THE OWNER'S REPRESENTATIVE SO AS NOT TO INTERFERE WITH THE BUILDING OPERATION.
2. THESE DRAWINGS INDICATE THE GENERAL EXTENT OF WORK. THE EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK AND REMOVAL OF MATERIALS/COMPONENTS NOT REQUIRED FOR THE NEW AND RENOVATED SYSTEMS.
3. ALL MECHANICAL SYSTEMS TO BE REMOVED SHALL BE REMOVED COMPLETE WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, CONTROLS, ETC. PATCH AND SEAL ALL OPENINGS AS A RESULT OF DEMOLITION IN RATED WALLS TO MAINTAIN EXISTING WALL'S FIRE OR SMOKE RATING AND TO MATCH EXISTING ADJACENT SURFACES.
4. ALL ITEMS AND EQUIPMENT REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS POSSESSION RIGHTS ARE WAIVED. CONTRACTOR SHALL MEET WITH THE OWNER PRIOR TO START OF DEMOLITION TO DETERMINE WHICH ITEMS ARE TO BE SALVAGED. CONTRACTOR SHALL REMOVE REMAINING ITEMS FROM SITE.
5. FIELD VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES PRIOR TO START OF DEMOLITION.
6. PATCH WALL TO MATCH EXISTING WHERE EXISTING CONTROLLERS, TEMPERATURE SENSORS ARE NOT BEING REPLACED WITH NEW OR PROVIDE WALL PLATES WHERE INDICATED ON DRAWINGS.
7. ALL ITEMS ON THE DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED.



NORTH

MECHANICAL SECOND FLOOR DEMO PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: RO
CHECKED BY: ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL SECOND FLOOR DEMO PLAN

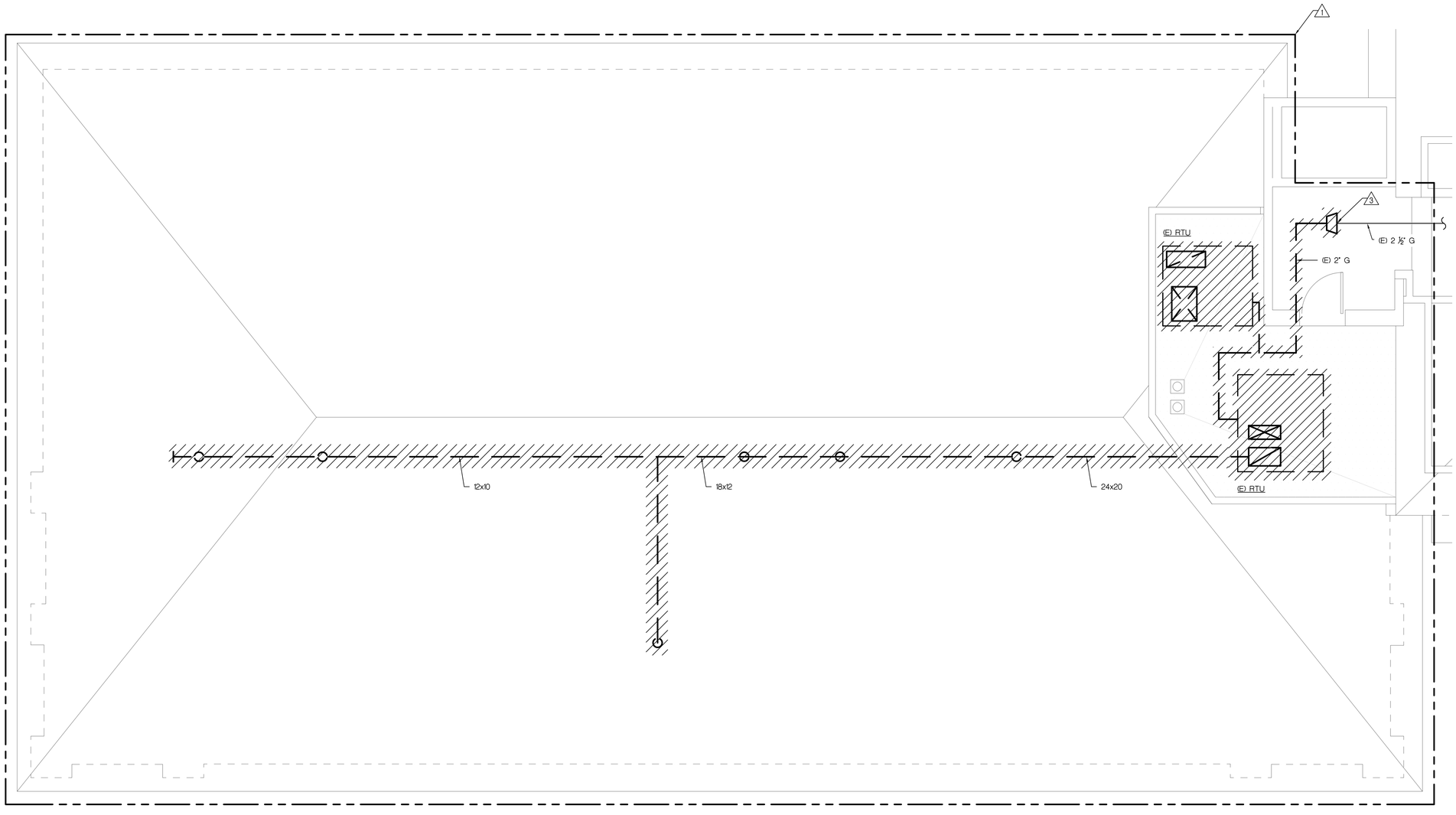
SHEET NO.: M0.2

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1. REMOVE ALL EXISTING MECHANICAL HVAC AND EXHAUST SYSTEMS COMPLETE IN ENTIRE BUILDING UNLESS NOTED OTHERWISE INCLUDING BASEMENT, FIRST FLOOR, SECOND FLOOR, ATTIC AND ROOF INCLUDING BUT NOT LIMITED TO MECHANICAL EQUIPMENT, DUCTWORK, CONTROLS, HANGERS AND SUPPORTS. ALL ASSOCIATED ACCESSORIES, ETC. NO MECHANICAL SYSTEMS SHALL REMAIN IN ENTIRE BUILDING, OUTDOORS OR ON ROOF UPON COMPLETION OF DEMOLITION WORK UNLESS NOTED OTHERWISE. PATCH ALL WALL PENETRATIONS, ROOF PENETRATIONS, ETC. TO MATCH EXISTING. COORDINATE EXTENT OF DEMOLITION WORK WITH ALL TRADES PRIOR TO START OF CONSTRUCTION.
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2. THESE DRAWINGS INDICATE THE GENERAL EXTENT OF WORK. THE EXTENT OF DEMOLITION SHALL BE AS REQUIRED BY THE NEW WORK AND REMOVAL OF MATERIALS/COMPONENTS NOT REQUIRED FOR THE NEW AND RENOVATED SYSTEMS.
3. ALL MECHANICAL SYSTEMS TO BE REMOVED SHALL BE REMOVED COMPLETE WITH ALL RELATED ITEMS INCLUDING HANGERS, SUPPORTS, CONTROLS, ETC. PATCH AND SEAL ALL OPENINGS AS A RESULT OF DEMOLITION IN RATED WALLS TO MAINTAIN EXISTING WALL'S FIRE OR SMOKE RATING AND TO MATCH EXISTING ADJACENT SURFACES.
4. ALL ITEMS AND EQUIPMENT REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER UNLESS POSSESSION RIGHTS ARE WAIVED. CONTRACTOR SHALL MEET WITH THE OWNER PRIOR TO START OF DEMOLITION TO DETERMINE WHICH ITEMS ARE TO BE SALVAGED. CONTRACTOR SHALL REMOVE REMAINING ITEMS FROM SITE.
5. FIELD VERIFY EXACT SIZE AND LOCATION OF ALL EXISTING SERVICES PRIOR TO START OF DEMOLITION.
6. PATCH WALL TO MATCH EXISTING WHERE EXISTING CONTROLLERS, TEMPERATURE SENSORS ARE NOT BEING REPLACED WITH NEW OR PROVIDE WALL PLATES WHERE INDICATED ON DRAWINGS.
7. ALL ITEMS ON THE DEMOLITION PLANS SHALL BE CONSIDERED EXISTING UNLESS OTHERWISE NOTED.



NORTH

MECHANICAL ATTIC / ROOF DEMO PLAN
1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20
WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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DESIGN DEVELOPMENT	●
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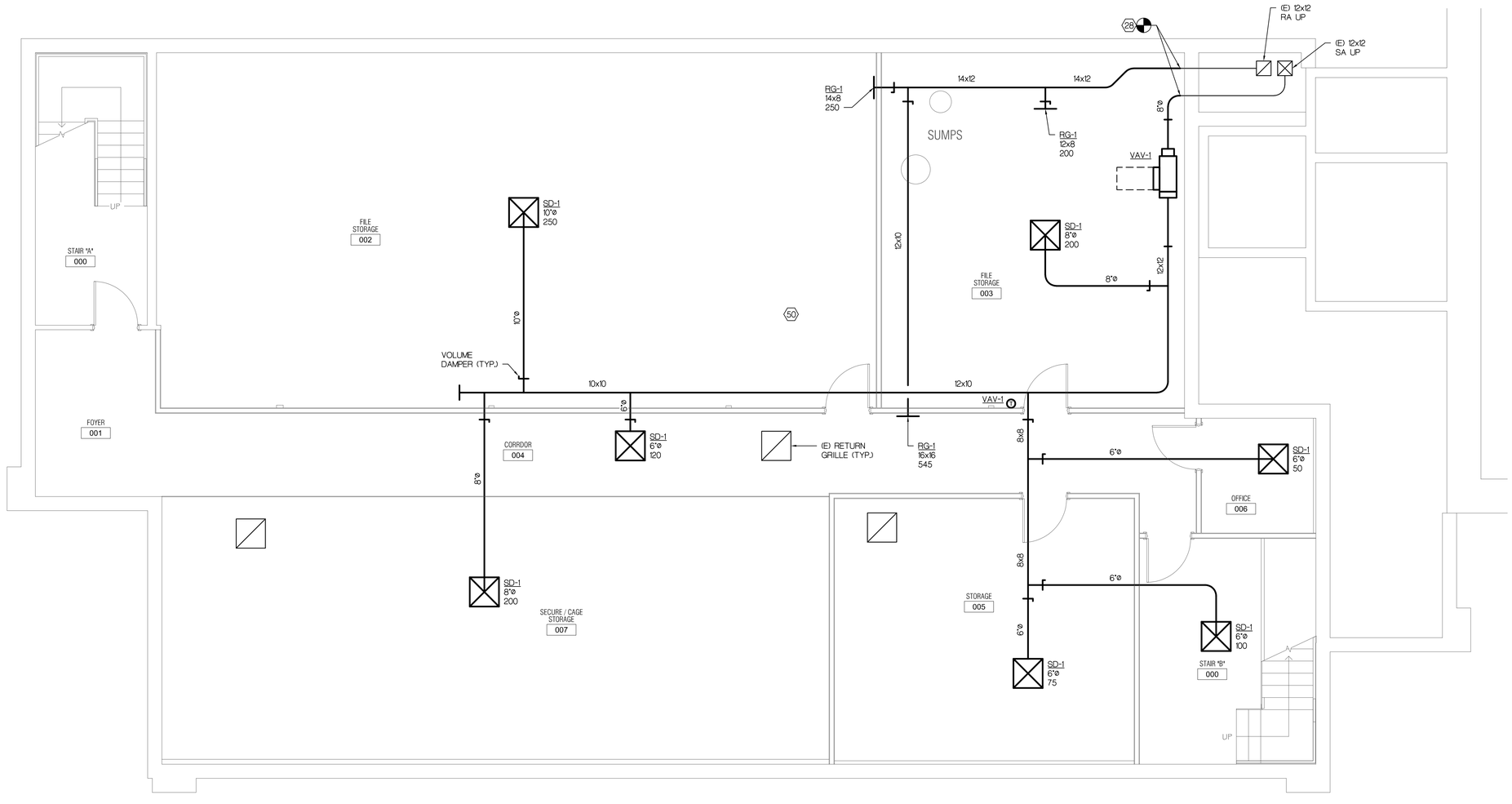
REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024
PROJECT NO.: 24-028
DRAWING NAME: MECHANICAL ATTIC / ROOF DEMO PLAN
SHEET NO.: M0.3

(X) MECHANICAL KEY NOTES:

1. MOUNT AIR HANDLING UNIT ON STEEL FRAMING SYSTEM. FRAMING SYSTEM TO BE PROVIDED BY OTHERS. COORDINATE EXACT SIZE OF STEEL FRAMING SYSTEM REQUIRED WITH STRUCTURAL CONTRACTOR UTILIZING APPROVED AIR HANDLING UNIT SUBMITTAL.
2. ROUTE SUPPLY AIR DUCTWORK DIRECTLY AT UNDERSIDE OF STEEL FRAMING SYSTEM. ATTACH SUPPLY AIR DUCTWORK TO STEEL FRAMING SYSTEM.
3. 34" X 24" SUPPLY AIR DUCTWORK DOWN TO UNDERSIDE OF STEEL FRAMING SYSTEM.
4. 28" X 28" SUPPLY AIR DUCTWORK UP ALONG EXTERIOR WALL. SECURE SUPPLY AIR DUCTWORK FIRMLY TO EXTERIOR WALL.
5. 28" X 28" RETURN AIR DUCTWORK UP ALONG EXTERIOR WALL. SECURE RETURN AIR DUCTWORK FIRMLY TO EXTERIOR WALL.
6. SUPPLY AIR DUCTWORK BRANCHES THRU WEBBING OF EXISTING JOISTS.
7. SUPPLY AIR DUCTWORK AT UNDERSIDE OF SECOND FLOOR BETWEEN EXISTING JOISTS.
8. 28" X 28" SUPPLY AIR DUCTWORK DOWN ALONG EXTERIOR WALL. SECURE SUPPLY AIR DUCTWORK FIRMLY TO EXTERIOR WALL.
9. 28" X 28" RETURN AIR DUCTWORK DOWN ALONG EXTERIOR WALL. SECURE RETURN AIR DUCTWORK FIRMLY TO EXTERIOR WALL.
10. 20" X 10" SUPPLY AIR DUCTWORK UP TO ATTIC.
11. 20" X 10" RETURN AIR DUCTWORK UP TO ATTIC.
12. 4" DIAMETER SUPPLY AIR DUCTWORK UP TO ATTIC.
13. 6" DIAMETER SUPPLY AIR DUCTWORK UP TO ATTIC.
14. 8" DIAMETER SUPPLY AIR DUCTWORK UP TO ATTIC.
15. PROVIDE LOW VOLTAGE MOTORIZED DAMPER AT WALL. INTERLOCK DAMPER WITH ASSOCIATED EXHAUST FAN.
16. PROVIDE BACKDRAFT DAMPER AT WALL.
17. 8" DIAMETER SUPPLY AIR DUCTWORK DOWN TO SECOND FLOOR.
18. 4" DIAMETER SUPPLY AIR DUCTWORK DOWN TO SECOND FLOOR.
19. 6" DIAMETER SUPPLY AIR DUCTWORK DOWN TO SECOND FLOOR.
20. 20" X 10" SUPPLY AIR DUCTWORK DOWN TO SECOND FLOOR.
21. 20" X 10" RETURN AIR DUCTWORK DOWN TO SECOND FLOOR.
22. 28" X 20" SUPPLY AIR DUCTWORK DOWN TO SECOND FLOOR.
23. 28" X 20" RETURN AIR DUCTWORK DOWN TO SECOND FLOOR.
24. 28" X 20" SUPPLY AIR DUCTWORK UP TO ATTIC.
25. 28" X 20" RETURN AIR DUCTWORK UP TO ATTIC.
26. 14" X 10" SUPPLY AIR DUCTWORK UP TO ATTIC.
27. 12" X 8" SUPPLY AIR DUCTWORK UP TO ATTIC.
28. CONNECT NEW SUPPLY AIR AND RETURN AIR DUCTWORK TO EXISTING. TRANSITION NEW DUCTWORK AS REQUIRED TO CONNECT TO EXISTING.
29. 14" X 10" SUPPLY AIR DUCTWORK UP FROM SECOND FLOOR.
30. 12" X 8" SUPPLY AIR DUCTWORK UP FROM SECOND FLOOR.
31. 16" X 10" SUPPLY AIR DUCTWORK UP FROM SECOND FLOOR.
32. 12" X 10" SUPPLY AIR DUCTWORK UP FROM SECOND FLOOR.
33. ROUTE 2-1/2" GAS PIPING ALONG EXTERIOR WALL UP TO ATTIC. SECURE GAS PIPING TO EXTERIOR WALL.
34. ROUTE GAS PIPING ALONG EXTERIOR WALL. SECURE GAS PIPING TO EXTERIOR WALL.
35. PROVIDE AND INSTALL GAS REGULATOR. SET PRESSURE TO EQUIPMENT MANUFACTURERS RECOMMENDATION.
36. CONNECT GAS PIPING TO AIR HANDLING UNIT.
37. PROVIDE GAS PIPING SUPPORT EVERY 5'-0" ON CENTER FOR ANY GAS PIPING SUPPORTED FROM GRADE.
38. PROVIDE LOW VOLTAGE MOTORIZED DAMPER AT UNDERSIDE OF ROOF DECK. INTERLOCK DAMPER WITH AIR HANDLING UNITS AHU-1, 2.
39. 2-1/2" GAS PIPING DOWN TO SECOND FLOOR CEILING.
40. CONNECT NEW 2-1/2" GAS PIPING TO EXISTING 2-1/2" GAS PIPING.
41. ROUTE NEW 2-1/2" GAS PIPING IN ATTIC.
42. 2-1/2" GAS PIPING UP TO ATTIC.
43. 2-1/2" GAS PIPING DOWN ALONG EXTERIOR WALL. SECURE GAS PIPING TO EXTERIOR WALL.
44. 40" X 24" RELIEF AIR DUCT UP TO SECOND FLOOR. UTILIZE EXISTING SECOND FLOOR OPENING FOR NEW RELIEF AIR DUCT.
45. TRANSITION RELIEF AIR DUCT FROM 40" X 24" TO 40" X 32" DIRECTLY ABOVE SECOND FLOOR LINE. ROUTE 36" X 36" RELIEF AIR DUCT UP TO ROOF MOUNTED GRAVITY RELIEF AIR HOOD GRH-1. UTILIZE EXISTING ROOF OPENING FOR NEW RELIEF AIR DUCT.
46. CONTRACTOR SHALL INVESTIGATE EXISTING FLOOR AND ROOF OPENING SIZES FOR COORDINATION WITH PROPOSED RELIEF AIR DUCT SIZES AND GRAVITY RELIEF AIR HOOD SIZES AND REPORT FINDINGS TO ENGINEER PRIOR TO DUCT FABRICATION.
47. 36" X 36" RELIEF AIR DUCT UP TO ROOF MOUNTED GRAVITY RELIEF AIR HOOD GRH-2. UTILIZE EXISTING ROOF OPENING FOR NEW RELIEF AIR DUCT.
48. PROVIDE TWO 20" X 10" TRANSFER GRILLES TG-1 IN CORRIDOR WALL. INSTALL TRANSFER GRILLE BACK TO BACK ON BOTH SIDES OF CORRIDOR WALL. LOCATE TRANSFER GRILLE DIRECTLY BELOW SECOND FLOOR DECK TO ALLOW FOR UNIMPEDED TRANSFER OF AIR FROM OFFICE CEILING PLENUM INTO CORRIDOR CEILING PLENUM.
49. ALL DUCTWORK IN ATTIC SHALL BE HARD DUCT. NO FLEXIBLE DUCTWORK ALLOWED.
50. RELOCATE EXISTING FIRE PROTECTION PIPING IN ENTIRE BUILDING AS REQUIRED TO ACCOMMODATE NEW MECHANICAL SYSTEMS.



NORTH

MECHANICAL BASEMENT PLAN

1/4" = 1'-0"

ALL DISCIPLINE COORDINATION NOTES:

1. MECHANICAL CONTRACTOR SHALL ASSUME THE LEAD RESPONSIBILITY FOR COMPLETE COORDINATION OF ALL BUILDING COMPONENTS TO ENSURE A COMPLETE INSTALLATION OF THE NEW MECHANICAL SYSTEMS. UPON AWARD OF PROJECT, MECHANICAL CONTRACTOR SHALL IMMEDIATELY PERFORM A COMPLETE AND THOROUGH FIELD INVESTIGATION OF THE ENTIRE BUILDING TO DOCUMENT ALL EXISTING BUILDING CONDITIONS FOR PREPARATION OF DETAILED SHOP/LAYOUT DRAWINGS.
2. MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND TRUSS COORDINATION OF DUCT WORK, PIPING, CONDUITS, LIGHTS, ETC IN ORDER TO ACCOMMODATE THE CEILING SPACE AND TRUSS SPACE CONDITIONS.
3. REFER TO ARCHITECTURAL DRAWINGS FOR ALL BUILDING PLANS.
4. LAYOUTS INDICATED ON PLANS ARE PROVIDED TO CONVEY THE DESIGN INTENT AND SHALL NOT BE USED AS INSTALLATION DRAWINGS. PROVIDE ALL NECESSARY TRANSITIONS, OFFSETS, ANGLES, FITTINGS, ETC, AS REQUIRED FOR THE INSTALLATION OF DUCT WORK, PIPING, CONDUIT AND OTHER UTILITIES AND EQUIPMENT AS REQUIRED TO ACCOMMODATE BUILDING CONDITIONS AND PROVIDE COMPLETE AND OPERATING SYSTEMS.
5. ALL DUCT WORK, TERMINAL UNITS, PIPING, CONDUITS, BOXES, ETC SHALL BE INSTALLED AS HIGH AS POSSIBLE WITHIN THE CEILING SPACE OR TRUSS SPACE.
6. ALL EQUIPMENT SHALL BE INSTALLED TO PROVIDE SUFFICIENT CLEARANCE AND ACCESS AS REQUIRED FOR MAINTENANCE AND IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS INCLUDING EQUIPMENT ABOVE CEILING AND IN TRUSS SPACE.
7. SUBMIT FOR APPROVAL CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS INDICATING THE INSTALLED LOCATION AND ACTUAL SIZE OF DUCT WORK (MAINS AND BRANCHES), TERMINAL BOXES, GAS PIPING, FIRE PROTECTION PIPING, LIGHTS, CONDUITS, ETC., AS REQUIRED FOR A COORDINATED INSTALLATION. INCLUDE ON COORDINATION SHOP/LAYOUT DRAWINGS STRUCTURAL STEEL, JOISTS, TRUSSES, CROSS BRACING, CEILINGS, ETC. AS REQUIRED FOR INSTALLATION. INCLUDE ON SHOP/LAYOUT DRAWINGS ALL ROOF OPENINGS AND PENETRATIONS. ROOF OPENINGS SHALL BE BASED ON ACTUAL EQUIPMENT SHOP DRAWINGS.
8. CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO THE INSTALLATION OR FABRICATION OF EQUIPMENT OR MATERIALS TO BE INSTALLED.
9. ALL COSTS ASSOCIATED WITH CEILING SPACE AND TRUSS SPACE COORDINATION AS WELL AS PREPARATION OF CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE INCLUDED IN THE BID.
10. LIMITED SPACE EXISTS FOR INSTALLATION OF NEW MECHANICAL SYSTEMS. SHOP/LAYOUT DRAWINGS PREPARED BY MECHANICAL CONTRACTOR SHALL BE UTILIZED AS FABRICATION AND INSTALLATION DRAWINGS. COMPLETE ACCURACY IS REQUIRED FOR PREPARATION OF SHOP/LAYOUT DRAWINGS AND SEAMLESS INSTALLATION.

MECHANICAL GENERAL NOTES:

1. COORDINATE NEW DUCTWORK WITH SITE CONDITIONS. EQUIPMENT MANUFACTURER AND ALL OTHER TRADES TO AVOID INTERFERENCES.
2. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURERS REQUIREMENTS OR CODES REFERENCED BY THE AUTHORITY HAVING JURISDICTION, WHICHEVER IS MORE STRINGENT.
3. ALL CORING AND CUTTING THROUGH FLOORS, WALLS, AND ROOFS SHALL BE BY MECHANICAL CONTRACTOR.
4. COORDINATE DUCTWORK ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES.
5. BALANCE ALL AIR SYSTEMS TO INDICATED AIR FLOW RATES.
6. DUCT SIZES TO DIFFUSERS SHALL MATCH NECK SIZE OF EACH. REFER TO GRILLE, REGISTER & DIFFUSER SCHEDULE.
7. ALL DUCTWORK SHALL BE CONCEALED IN WALLS AND/OR CEILING SPACE, UNLESS OTHERWISE NOTED. REFER TO ARCHITECTURAL PLANS.
8. ALL DUCTWORK SHALL BE ROUTED AS HIGH AS POSSIBLE, UNLESS OTHERWISE NOTED. COORDINATE ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES
9. SEAL ALL PENETRATIONS THROUGH WALLS PER DETAILS AND SPECIFICATIONS.
10. COORDINATE EXACT LOCATIONS OF ALL DIFFUSERS AND RETURN GRILLES WITH ARCHITECTURAL AND ELECTRICAL REFLECTED CEILING PLANS.
11. COORDINATE ALL TEMPERATURE SENSOR LOCATIONS WITH FURNITURE AND ARCHITECT.
12. REFER TO ARCHITECTURAL DRAWINGS FOR WALL AND CEILING CONSTRUCTION AND MATERIALS. ARRANGE ALL WORK ACCORDINGLY. PROVIDED FIRE RATED PENETRATIONS AND SLEEVES THROUGH WALL AND FLOOR CONSTRUCTION.
13. THE USE OF FLEXIBLE DUCTWORK IS NOT ACCEPTABLE.

1/4" 0 1 2 3 4 8 12 16 20

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DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL BASEMENT PLAN

SHEET NO.: M1.0

ALL DISCIPLINE COORDINATION NOTES:

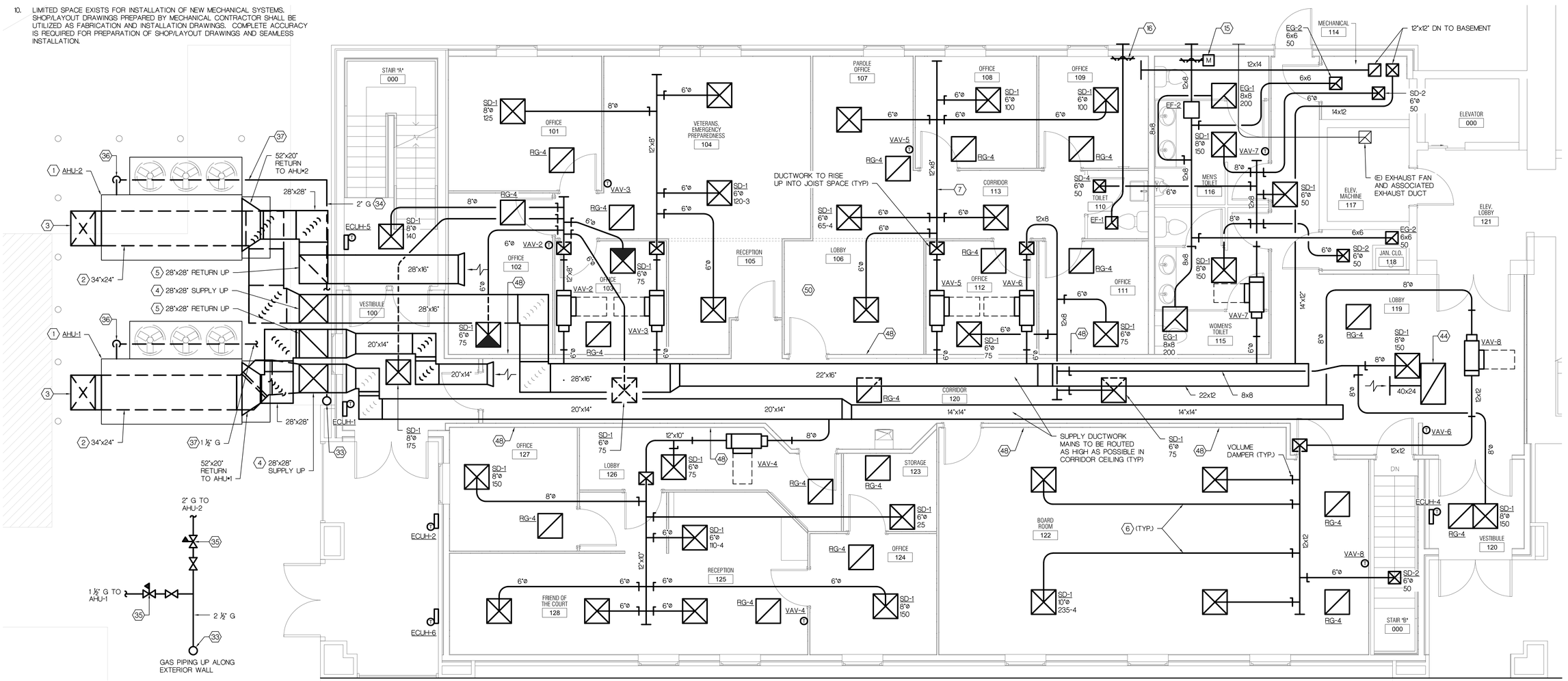
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2. MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND TRUSS COORDINATION OF DUCT WORK, PIPING, CONDUITS, LIGHTS, ETC IN ORDER TO ACCOMMODATE THE CEILING SPACE AND TRUSS SPACE CONDITIONS.
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1. MOUNT AIR HANDLING UNIT ON STEEL FRAMING SYSTEM. FRAMING SYSTEM TO BE PROVIDED BY OTHERS. COORDINATE EXACT SIZE OF STEEL FRAMING SYSTEM REQUIRED WITH STRUCTURAL CONTRACTOR UTILIZING APPROVED AIR HANDLING UNIT SUBMITTAL.
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NATURAL GAS PARTIAL PIPING PLAN

NOT TO SCALE

NORTH

MECHANICAL FIRST FLOOR PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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(586) 601- 4219
LE No. 24-0104

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	RO
CHECKED BY:	ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL FIRST FLOOR PLAN

SHEET NO.: M1.1

(X) MECHANICAL KEY NOTES:

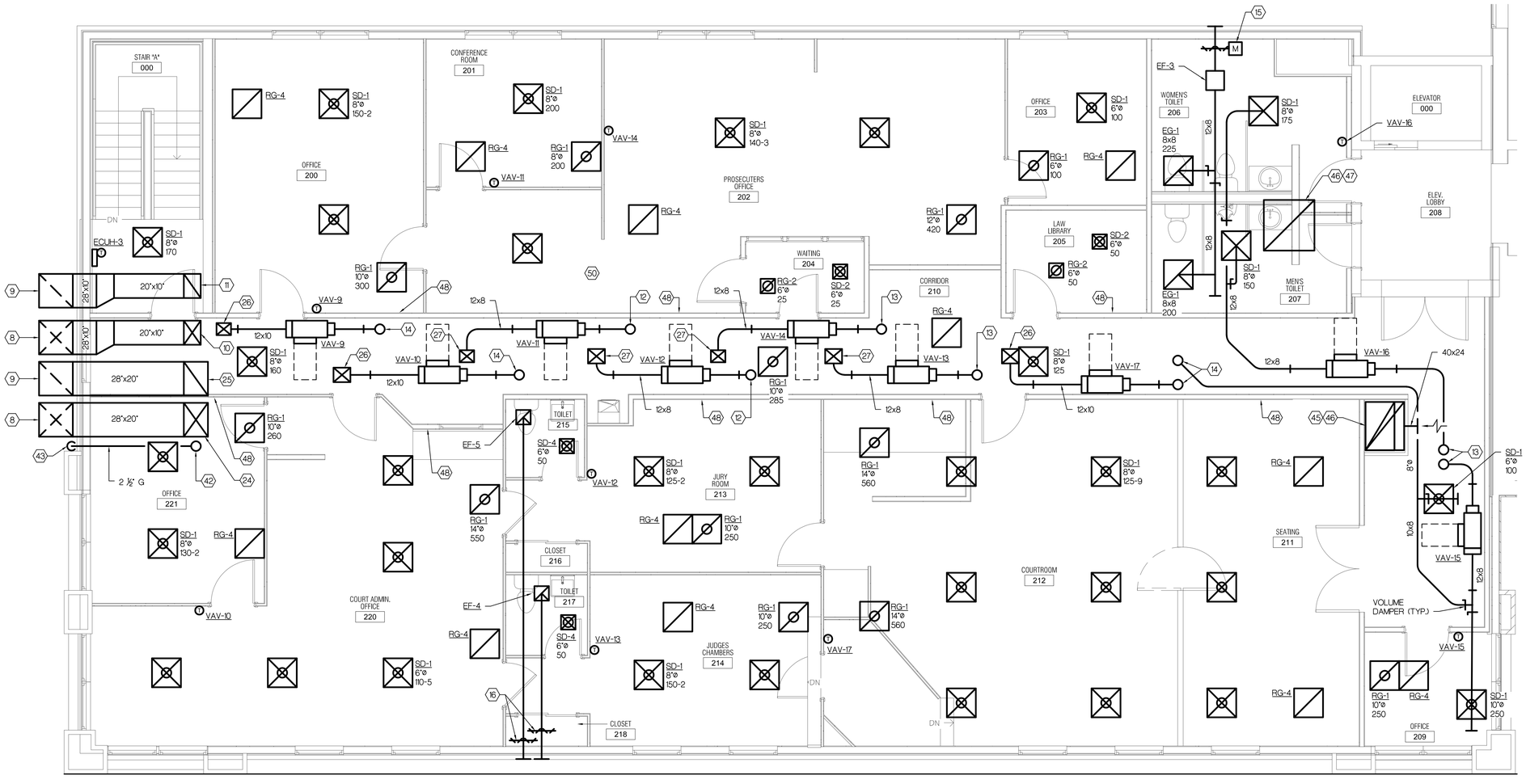
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ALL DISCIPLINE COORDINATION NOTES:

1. MECHANICAL CONTRACTOR SHALL ASSUME THE LEAD RESPONSIBILITY FOR COMPLETE COORDINATION OF ALL BUILDING COMPONENTS TO ENSURE A COMPLETE INSTALLATION OF THE NEW MECHANICAL SYSTEMS. UPON AWARD OF PROJECT, MECHANICAL CONTRACTOR SHALL IMMEDIATELY PERFORM A COMPLETE AND THOROUGH FIELD INVESTIGATION OF THE ENTIRE BUILDING TO DOCUMENT ALL EXISTING BUILDING CONDITIONS FOR PREPARATION OF DETAILED SHOP/LAYOUT DRAWINGS.
2. MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND TRUSS COORDINATION OF DUCT WORK, PIPING, CONDUITS, LIGHTS, ETC IN ORDER TO ACCOMMODATE THE CEILING SPACE AND TRUSS SPACE CONDITIONS.
3. REFER TO ARCHITECTURAL DRAWINGS FOR ALL BUILDING PLANS.
4. LAYOUTS INDICATED ON PLANS ARE PROVIDED TO CONVEY THE DESIGN INTENT AND SHALL NOT BE USED AS INSTALLATION DRAWINGS. PROVIDE ALL NECESSARY TRANSITIONS, OFFSETS, ANGLES, FITTINGS, ETC, AS REQUIRED FOR THE INSTALLATION OF DUCT WORK, PIPING, CONDUIT AND OTHER UTILITIES AND EQUIPMENT AS REQUIRED TO ACCOMMODATE BUILDING CONDITIONS AND PROVIDE COMPLETE AND OPERATING SYSTEMS.
5. ALL DUCT WORK, TERMINAL UNITS, PIPING, CONDUITS, BOXES, ETC SHALL BE INSTALLED AS HIGH AS POSSIBLE WITHIN THE CEILING SPACE OR TRUSS SPACE.
6. ALL EQUIPMENT SHALL BE INSTALLED TO PROVIDE SUFFICIENT CLEARANCE AND ACCESS AS REQUIRED FOR MAINTENANCE AND IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS INCLUDING EQUIPMENT ABOVE CEILING AND IN TRUSS SPACE.
7. SUBMIT FOR APPROVAL CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS INDICATING THE INSTALLED LOCATION AND ACTUAL SIZE OF DUCT WORK (MAINS AND BRANCHES), TERMINAL BOXES, GAS PIPING, FIRE PROTECTION PIPING, LIGHTS, CONDUITS, ETC., AS REQUIRED FOR A COORDINATED INSTALLATION. INCLUDE ON COORDINATION SHOP/LAYOUT DRAWINGS STRUCTURAL STEEL, JOISTS, TRUSSES, CROSS BRACING, CEILINGS, ETC. AS REQUIRED FOR INSTALLATION. INCLUDE ON SHOP/LAYOUT DRAWINGS ALL ROOF OPENINGS AND PENETRATIONS. ROOF OPENINGS SHALL BE BASED ON ACTUAL EQUIPMENT SHOP DRAWINGS.
8. CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO THE INSTALLATION OR FABRICATION OF EQUIPMENT OR MATERIALS TO BE INSTALLED.
9. ALL COSTS ASSOCIATED WITH CEILING SPACE AND TRUSS SPACE COORDINATION AS WELL AS PREPARATION OF CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE INCLUDED IN THE BID.
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NORTH

MECHANICAL SECOND FLOOR PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

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(586) 601- 4219
LE No. 24-0104

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HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS

PRESQUE ISLE COUNTY ANNEX COURT BLDG.

151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY: RO
CHECKED BY: ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL SECOND FLOOR PLAN

SHEET NO.: M1.2

⟨X⟩ MECHANICAL KEY NOTES:

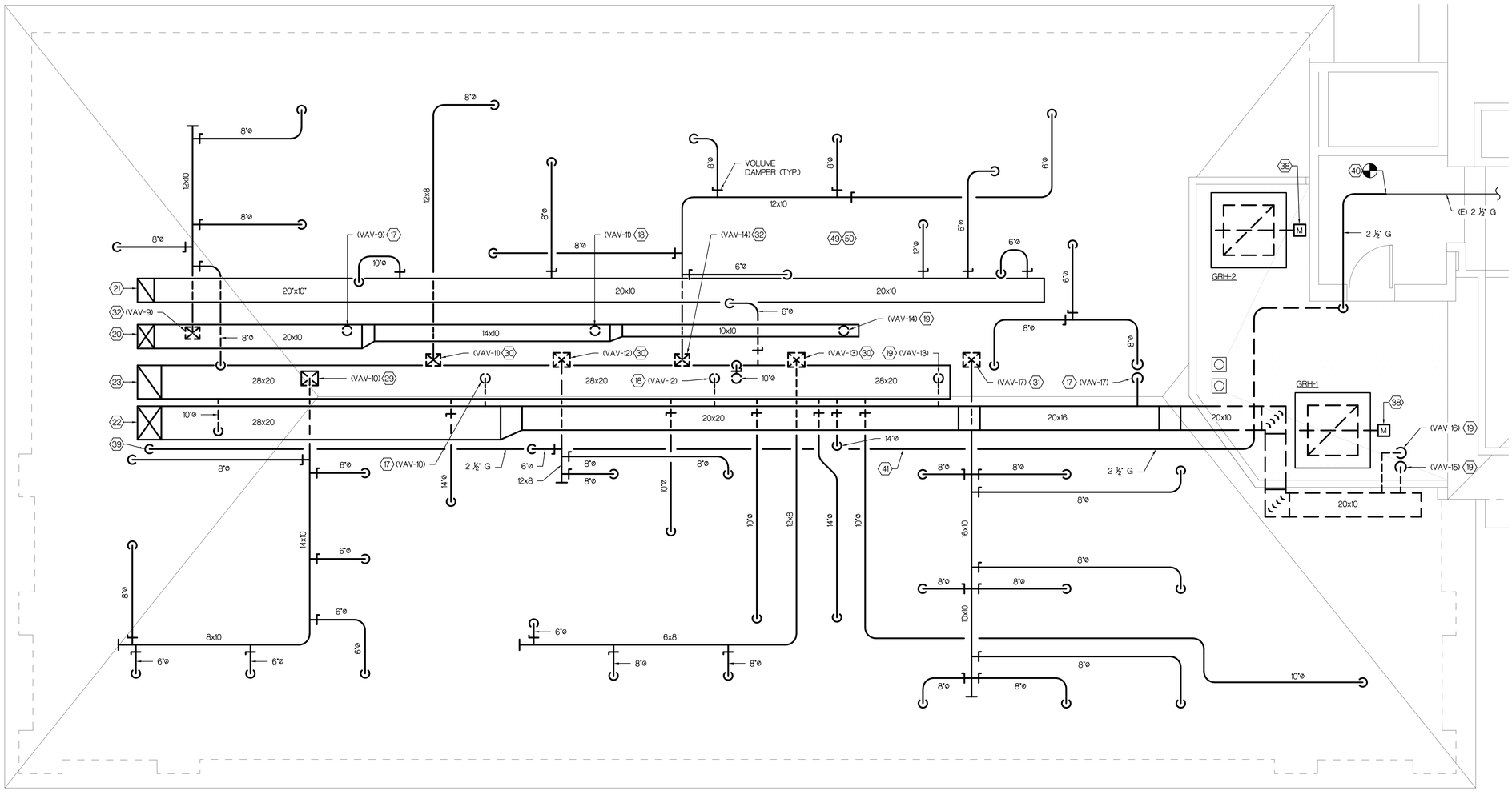
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41. ROUTE NEW 2-1/2" GAS PIPING IN ATTIC.
42. 2-1/2" GAS PIPING UP TO ATTIC.
43. 2-1/2" GAS PIPING DOWN ALONG EXTERIOR WALL. SECURE GAS PIPING TO EXTERIOR WALL.
44. 40" X 24" RELIEF AIR DUCT UP TO SECOND FLOOR. UTILIZE EXISTING SECOND FLOOR OPENING FOR NEW RELIEF AIR DUCT.
45. TRANSITION RELIEF AIR DUCT FROM 40" X 24" TO 40" X 32" DIRECTLY ABOVE SECOND FLOOR LINE. ROUTE 36" X 36" RELIEF AIR DUCT UP TO ROOF MOUNTED GRAVITY RELIEF AIR HOOD GRH-1. UTILIZE EXISTING ROOF OPENING FOR NEW RELIEF AIR DUCT.
46. CONTRACTOR SHALL INVESTIGATE EXISTING FLOOR AND ROOF OPENING SIZES FOR COORDINATION WITH PROPOSED RELIEF AIR DUCT SIZES AND GRAVITY RELIEF AIR HOOD SIZES AND REPORT FINDINGS TO ENGINEER PRIOR TO DUCT FABRICATION.
47. 36" X 36" RELIEF AIR DUCT UP TO ROOF MOUNTED GRAVITY RELIEF AIR HOOD GRH-2. UTILIZE EXISTING ROOF OPENING FOR NEW RELIEF AIR DUCT.
48. PROVIDE TWO 20" X 10" TRANSFER GRILLES TG-1 IN CORRIDOR WALL. INSTALL TRANSFER GRILLE BACK TO BACK ON BOTH SIDES OF CORRIDOR WALL. LOCATE TRANSFER GRILLE DIRECTLY BELOW SECOND FLOOR DECK TO ALLOW FOR UNIMPEDED TRANSFER OF AIR FROM OFFICE CEILING PLENUM INTO CORRIDOR CEILING PLENUM.
49. ALL DUCTWORK IN ATTIC SHALL BE HARD DUCT. NO FLEXIBLE DUCTWORK ALLOWED.
50. RELOCATE EXISTING FIRE PROTECTION PIPING IN ENTIRE BUILDING AS REQUIRED TO ACCOMMODATE NEW MECHANICAL SYSTEMS.

ALL DISCIPLINE COORDINATION NOTES:

1. MECHANICAL CONTRACTOR SHALL ASSUME THE LEAD RESPONSIBILITY FOR COMPLETE COORDINATION OF ALL BUILDING COMPONENTS TO ENSURE A COMPLETE INSTALLATION OF THE NEW MECHANICAL SYSTEMS. UPON AWARD OF PROJECT, MECHANICAL CONTRACTOR SHALL IMMEDIATELY PERFORM A COMPLETE AND THOROUGH FIELD INVESTIGATION OF THE ENTIRE BUILDING TO DOCUMENT ALL EXISTING BUILDING CONDITIONS FOR PREPARATION OF DETAILED SHOP/LAYOUT DRAWINGS.
2. MECHANICAL CONTRACTOR SHALL PROVIDE UTILITY AND EQUIPMENT CEILING SPACE AND TRUSS COORDINATION OF DUCT WORK, PIPING, CONDUITS, LIGHTS, ETC IN ORDER TO ACCOMMODATE THE CEILING SPACE AND TRUSS SPACE CONDITIONS.
3. REFER TO ARCHITECTURAL DRAWINGS FOR ALL BUILDING PLANS.
4. LAYOUTS INDICATED ON PLANS ARE PROVIDED TO CONVEY THE DESIGN INTENT AND SHALL NOT BE USED AS INSTALLATION DRAWINGS. PROVIDE ALL NECESSARY TRANSITIONS, OFFSETS, ANGLES, FITTINGS, ETC. AS REQUIRED FOR THE INSTALLATION OF DUCT WORK, PIPING, CONDUIT AND OTHER UTILITIES AND EQUIPMENT AS REQUIRED TO ACCOMMODATE BUILDING CONDITIONS AND PROVIDE COMPLETE AND OPERATING SYSTEMS.
5. ALL DUCT WORK, TERMINAL UNITS, PIPING, CONDUITS, BOXES, ETC SHALL BE INSTALLED AS HIGH AS POSSIBLE WITHIN THE CEILING SPACE OR TRUSS SPACE.
6. ALL EQUIPMENT SHALL BE INSTALLED TO PROVIDE SUFFICIENT CLEARANCE AND ACCESS AS REQUIRED FOR MAINTENANCE AND IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS INCLUDING EQUIPMENT ABOVE CEILING AND IN TRUSS SPACE.
7. SUBMIT FOR APPROVAL CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS INDICATING THE INSTALLED LOCATION AND ACTUAL SIZE OF DUCT WORK (MAINS AND BRANCHES), TERMINAL BOXES, GAS PIPING, FIRE PROTECTION PIPING, LIGHTS, CONDUITS, ETC., AS REQUIRED FOR A COORDINATED INSTALLATION. INCLUDE ON COORDINATION SHOP/LAYOUT DRAWINGS STRUCTURAL STEEL JOISTS, TRUSSES, CROSS BRACING, CEILINGS, ETC. AS REQUIRED FOR INSTALLATION. INCLUDE ON SHOP/LAYOUT DRAWINGS ALL ROOF OPENINGS AND PENETRATIONS. ROOF OPENINGS SHALL BE BASED ON ACTUAL EQUIPMENT SHOP DRAWINGS.
8. CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO THE INSTALLATION OR FABRICATION OF EQUIPMENT OR MATERIALS TO BE INSTALLED.
9. ALL COSTS ASSOCIATED WITH CEILING SPACE AND TRUSS SPACE COORDINATION AS WELL AS PREPARATION OF CEILING SPACE/TRUSS SPACE COORDINATION SHOP/LAYOUT DRAWINGS SHALL BE INCLUDED IN THE BID.
10. LIMITED SPACE EXISTS FOR INSTALLATION OF NEW MECHANICAL SYSTEMS. SHOP/LAYOUT DRAWINGS PREPARED BY MECHANICAL CONTRACTOR SHALL BE UTILIZED AS FABRICATION AND INSTALLATION DRAWINGS. COMPLETE ACCURACY IS REQUIRED FOR PREPARATION OF SHOP/LAYOUT DRAWINGS AND SEAMLESS INSTALLATION.

MECHANICAL GENERAL NOTES:

1. COORDINATE NEW DUCTWORK WITH SITE CONDITIONS. EQUIPMENT MANUFACTURER AND ALL OTHER TRADES TO AVOID INTERFERENCES.
2. PROVIDE ACCESS AROUND ALL NEW EQUIPMENT PER MANUFACTURERS REQUIREMENTS OR CODES REFERENCED BY THE AUTHORITY HAVING JURISDICTION, WHICHEVER IS MORE STRINGENT.
3. ALL CORING AND CUTTING THROUGH FLOORS, WALLS, AND ROOFS SHALL BE BY MECHANICAL CONTRACTOR.
4. COORDINATE DUCTWORK ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES.
5. BALANCE ALL AIR SYSTEMS TO INDICATED AIR FLOW RATES.
6. DUCT SIZES TO DIFFUSERS SHALL MATCH NECK SIZE OF EACH. REFER TO GRILLE, REGISTER & DIFFUSER SCHEDULE.
7. ALL DUCTWORK SHALL BE CONCEALED IN WALLS AND/OR CEILING SPACE, UNLESS OTHERWISE NOTED. REFER TO ARCHITECTURAL PLANS.
8. ALL DUCTWORK SHALL BE ROUTED AS HIGH AS POSSIBLE, UNLESS OTHERWISE NOTED. COORDINATE ROUTING WITH OTHER TRADES TO AVOID INTERFERENCES
9. SEAL ALL PENETRATIONS THROUGH WALLS PER DETAILS AND SPECIFICATIONS.
10. COORDINATE EXACT LOCATIONS OF ALL DIFFUSERS AND RETURN GRILLES WITH ARCHITECTURAL AND ELECTRICAL REFLECTED CEILING PLANS.
11. COORDINATE ALL TEMPERATURE SENSOR LOCATIONS WITH FURNITURE AND ARCHITECT.
12. REFER TO ARCHITECTURAL DRAWINGS FOR WALL AND CEILING CONSTRUCTION AND MATERIALS. ARRANGE ALL WORK ACCORDINGLY, PROVIDED FIRE RATED PENETRATIONS AND SLEEVES THROUGH WALL AND FLOOR CONSTRUCTION.
13. THE USE OF FLEXIBLE DUCTWORK IS NOT ACCEPTABLE.



MECHANICAL ATTIC / ROOF PLAN

1/4" = 1'-0"

1/4" 0 1 2 3 4 8 12 16 20

WHEN USING THIS DRAWING - PLOT OR PRINT FULL SIZE TO ENSURE CORRECT SCALE. NOTE REDUCED SIZE DRAWINGS ARE NOT TO SCALE

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LE No. 24-0104

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DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
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CONSTRUCTION	○

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CHECKED BY: ML

REVISIONS:

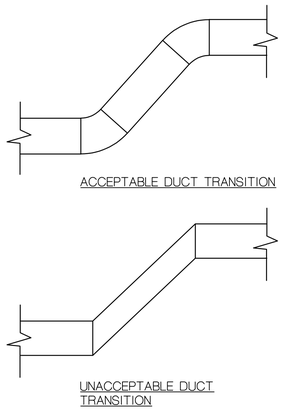
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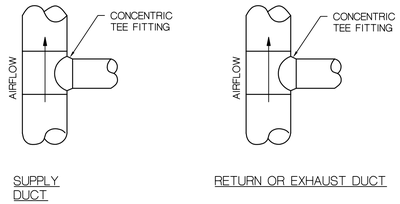
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DRAWING NAME: MECHANICAL ATTIC / ROOF PLAN

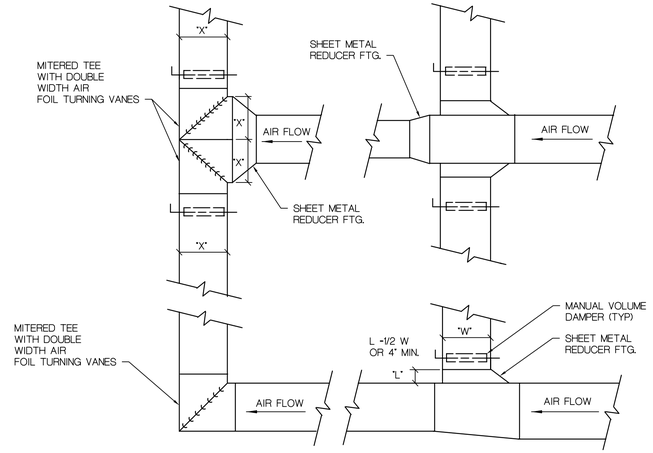
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DUCT TRANSITION DETAIL
NOT TO SCALE.

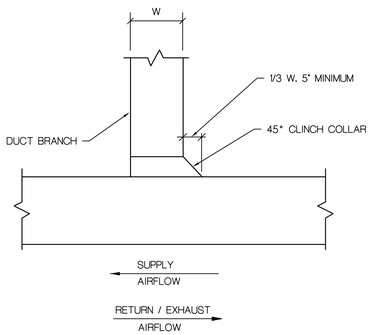


ROUND OR FLAT OVAL DUCT BRANCH TAKE-OFF DETAIL
NOT TO SCALE.



NOTE:
BRANCH TAKE-OFFS TO BE LOCATED IN CENTER OF REDUCER FITTINGS.

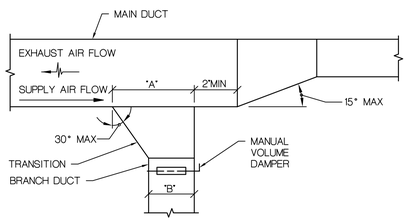
SUPPLY AIR DUCT CONNECTION DETAIL
NOT TO SCALE.



NOTE:

1. FURNISHED THIS TYPE CONNECTION FOR BRANCHES WITH LESS THAT 25% OF TOTAL AIR FLOW.

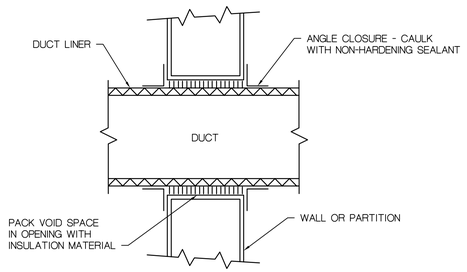
RECTANGULAR DUCT BRANCH CONNECTION DETAIL
NOT TO SCALE.



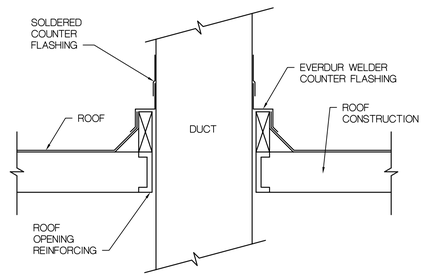
NOTES:

1. THIS TRANSITION SHALL BE USED FOR ALL MAIN DUCTS (SUPPLY AND EXHAUST).
2. AREA OF "A" THE CONNECTION IS EQUAL TO 1.5 TIMES AREA OF "B" THE BRANCH.

RECTANGULAR DUCT CONNECTION DETAIL
NOT TO SCALE.



NON-FIRE RATED ASSEMBLY HORIZONTAL DUCT PENETRATION DETAIL
NOT TO SCALE.



DUCT THRU ROOF DETAIL
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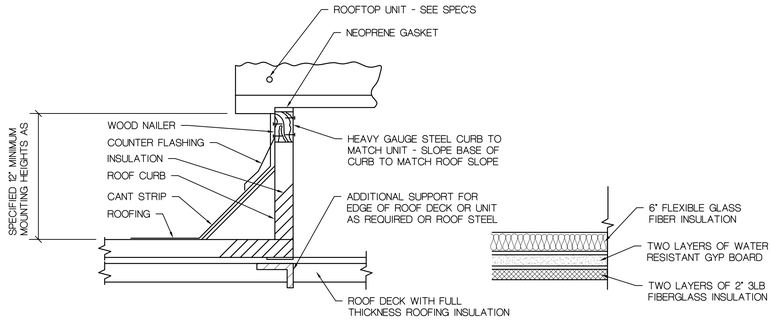
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DRAWING NAME: MECHANICAL DETAILS

SHEET NO.: M5.1

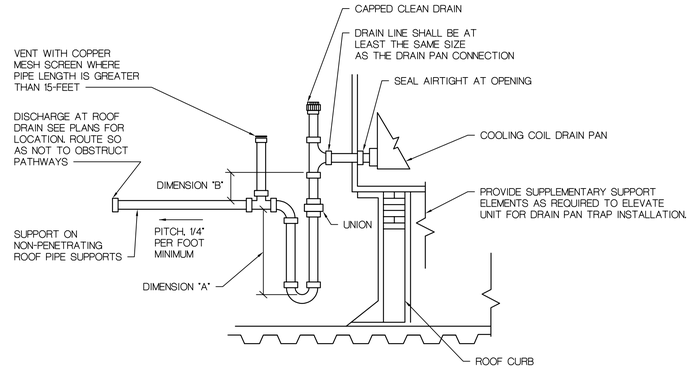


NOTE:

ALL DUCT, PIPING AND ELECTRICAL CONNECTIONS TO UNITS BELOW CURB SHALL HAVE FLEXIBLE CONNECTIONS. CUT INSULATION, GYP BOARD, ROOFING INSULATION, AND ROOF DECKING PENETRATIONS TIGHT TO ITEMS PENETRATING THROUGH THE ASSEMBLY. PACK ALL PENETRATION OPENINGS WITH FLEXIBLE INSULATION. PROVIDE SEALS AND GASKETS AT AL ROOFTOP PENETRATIONS.

ROOFTOP EQUIPMENT CURB DETAIL

NOT TO SCALE.

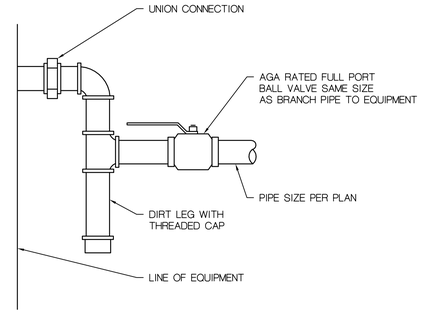


NOTES:

1. FOR DRAW THROUGH UNITS - DIMENSION "A" - 1/2 OF DIMENSION "B". DIMENSION "B" - FAN SUCTION STATIC PRESSURE PLUS 2 INCHES.
2. FOR BLOW THROUGH UNITS - DIMENSION "A" - FAN DISCHARGE STATIC PRESSURE PLUS 2 INCHES. DIMENSION "B" - 2 INCHES.
3. REFER TO AIR HANDLING UNIT SCHEDULE FOR SUCTION OR DISCHARGE STATIC PRESSURE.

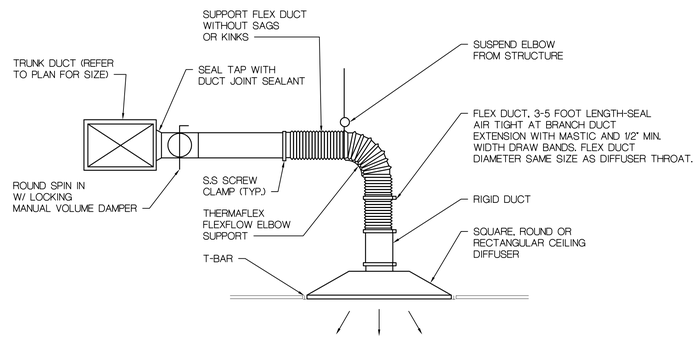
COOLING COIL SECTION CONDENSATE DRAIN TRAP PIPING DETAIL

NOT TO SCALE.



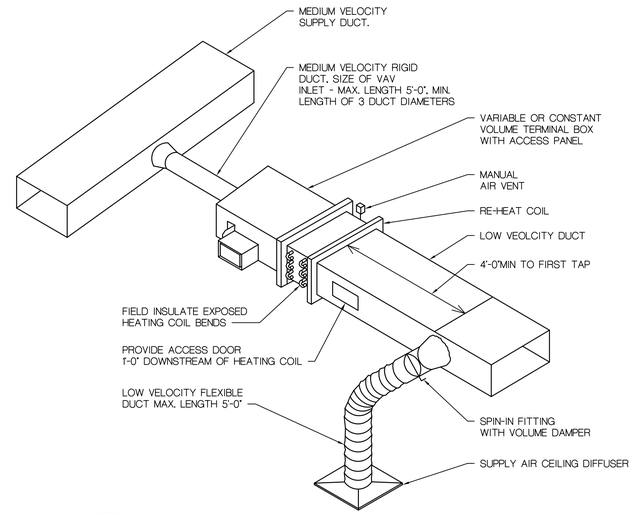
GAS PIPE EQUIPMENT CONNECTION DETAIL

NOT TO SCALE.



SPIN-IN AND CEILING DIFFUSER DETAIL

NOT TO SCALE.



NOTES:

1. FOR RUNOUT PIPE SIZES AND DUCT CONNECTIONS TO BOXES SEE SCHEDULES.
2. THE FIRST TAKE-OFF FROM BOX SHALL BE MIN. OF 3'-0" DOWN STREAM OF BOX OUTLET.

TYPICAL AIR TERMINAL DEVICE DETAIL AND RELATED SUPPLY AIR DUCKWORK

NOT TO SCALE.

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DRAWN BY:	RO
CHECKED BY:	ML

REVISIONS:

BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: MECHANICAL DETAILS

SHEET NO.: M5.2

AIR HANDLING UNIT SCHEDULE

MARK	LOCATION	AREA SERVED	SUPPLY FAN							GAS HEATING					DX COOLING						ELECTRICAL					AIR FILTER		MAX UNIT DIMENSIONS (L x W x H - INCHES)	MAX UNIT WEIGHT (LBS)	MANUFACTURER	MODEL NUMBER	NOTES
			FAN CFM @ 70°F	O.A. CFM	EXT SP (IN WC)	DRIVE	MOTOR (QTY) HP	MOTOR VOLT	MOTOR PHASE	INPUT (MBH)	OUTPUT (MBH)	EAT DB (°F)	LAT DB (°F)	MAX APD (IN-WG)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	SENSIBLE CAPACITY (MBH)	TOTAL CAPACITY (MBH)	VOLT	PHASE	FLA	MCA	MOP	TYPE	MERV RATING					
AHU-1	ON GRADE	COURTHOUSE NORTH SIDE	4725	1665	1.5	DIRECT	(1) 5	208	3	270	218.7	41.8	84.5	0.12	80.3	66.2	52.5	52.1	140.3	191.9	208	3	75	82	100	THROWAWAY	13	138 x 60 x 60	3006	AAON	RNA-016-C-A-8-GAAOC-DB1LO	1,2,3
AHU-2	ON GRADE	COURTHOUSE SOUTH SIDE	5210	1560	1.5	DIRECT	(1) 5	208	3	405	328.1	46.8	103	0.15	79.3	65.5	53.5	53.0	149.1	194.1	208	3	75	82	100	THROWAWAY	13	138 x 60 x 60	3018	AAON	RNA-016-C-A-8-GAAOC-DB2LO	1,2,3

1. MOTOR CONTROLLERS AND DISCONNECT SWITCH FURNISHED BY UNIT MANUFACTURER.
2. 120 V RECEPTACLE BY ELECTRICAL CONTRACTOR.
3. AIC RATING SHALL BE A MINIMUM OF 42K

FAN SCHEDULE

MARK	LOCATION	AREA / SYSTEM SERVED	TYPE	CFM @ 70 °F	TOTAL SP (IN WC)	FAN RPM	BHP	DRIVE	ARRAINGMENT	MOTOR					FAN OPERATING WEIGHT (LBS)	MANUFACTURER	MODEL NUMBER	NOTES
										WATTS/ HP	RPM	VOLT	PHASE	MOTOR ENCL.				
EF-1	TOILET 110	TOILET 110	CEILING	75	0.50	773	-	DIRECT	CENTRIFUGAL	16	-	115	1	TEAO	8	GREENHECK	SP-LP0511	2, 3
EF-2	MENS TOILET 116	WOMEN'S TOILET 115, MEN'S TOILET 116, JC 118, MECHANICAL 114	IN-LINE	500	0.50	1,598	0.11	DIRECT	CENTRIFUGAL	1/6	1,725	115	1	TENV	37	GREENHECK	SQ-95-VG	1, 4
EF-3	WOMEN'S TOILET 206	WOMEN'S TOILET 206, MEN'S TOILET 207	IN-LINE	425	0.50	1,669	0.08	DIRECT	CENTRIFUGAL	1/10	1,725	115	1	TENV	36	GREENHECK	SQ-90-VG	1, 4
EF-4	TOILET 217	TOILET 217	CEILING	75	0.50	773	-	DIRECT	CENTRIFUGAL	16	-	115	1	TEAO	8	GREENHECK	SP-LP0511	2, 3
EF-5	TOILET 215	TOILET 215	CEILING	75	0.50	773	-	DIRECT	CENTRIFUGAL	16	-	115	1	TEAO	8	GREENHECK	SP-LP0511	2, 3

1. DISCONNECT SWITCH FURNISHED AND INSTALLED BY UNIT MANUFACTURER.
2. PROVIDE WITH GRAVITY BACKDRAFT DAMPER.
3. DISCONNECT SWITH BY ELECTRICAL TRADES.
4. MOTOR CONTROLOR BY UNIT MANUFACTURER.

VARIABLE AIR VOLUME BOX SCHEDULE

MARK	AREA SERVED	BOX CHARACTERISTICS			AIR FLOW			HEATING COIL		ELECTRICAL DATA				MANUFACTURER	MODEL NUMBER	NOTES
		BOX INLET (IN)	BOX OUTLET (IN)	TOTAL BOX APD (IN W.G.)	MAX COOLING CFM	HEATING CFM	MINIMUM CFM	EDB (F)	LDB (F)	KW	VOLTS/ PHASE	MCA	MOP			
VAV-1	BASEMENT LEVEL	8	12 x 10	0.3	995	500	500	55	90	5.5	208/3	20.8	25	PRICE	SDV	2, 3
VAV-2	VESTIBULE 100, OFFICE 102, OFFICE 103, STAIR "A"	6	12 x 8	0.3	515	400	260	55	90	4.4	208/3	16.6	20	PRICE	SDV	2, 3
VAV-3	OFFICE 101, VETERNS & EMERGENCY PREPAREDNESS 104	6	12 x 8	0.3	475	240	240	55	90	2.7	208/3	10.2	15	PRICE	SDV	2, 3
VAV-4	STORAGE 123, OFFICE 124, RECEPTION 125, LOBBY 126, OFFICE 127, FRIEND OF COURT 128	8	12 x 10	0.3	850	425	425	55	90	4.7	208/3	17.8	20	PRICE	SDV	2, 3
VAV-5	LOBBY 106, PAROLE OFFICE 107, OFFICE 108, OFFICE 109	6	12 x 8	0.3	450	225	225			2.5		9.5	15			2, 3
VAV-6	OFFICE 111, OFFICE 112, LOBBY 119, CORRIDOR 120, STAIR "B" VESTIBULE	6	12 x 8	0.3	520	350	260	55	90	3.9	208/3	14.8	15	PRICE	SDV	2, 3
VAV-7	MECHANICAL 114, WOMEN'S TOILET 115, MEN'S TOILET 116, JC 118, CORRIDOR	6	12 x 8	0.3	500	500	500	55	90	5.5	208/3	20.8	25	PRICE	SDV	2, 3
VAV-8	BOARD ROOM 122	8	12 x 10	0.3	950	475	475	55	90	5.3	208/3	20.0	25	PRICE	SDV	1, 2, 3
VAV-9	OFFICE 200, CORRIDOR 210, STAIR "A"	8	12 x 10	0.3	580	580	290	55	90	6.4	208/3	24.2	25	PRICE	SDV	2, 3
VAV-10	COURT ADMIN. OFFICE 220, OFFICE 221	8	12 x 10	0.3	810	650	405	55	90	7.2	208/3	27.2	30	PRICE	SDV	2, 3
VAV-11	CONFERENCE ROOM 201	4	12 x 8	0.3	200	200	100	55	90	2.2	208/3	8.3	15	PRICE	SDV	1, 2, 3
VAV-12	JURY ROOM 213, TOILET 215	4	12 x 8	0.3	300	150	150			1.7		6.4	15			2, 3
VAV-13	JUDGES CHAMBERS 214, TOILET 217	6	12 x 8	0.3	350	250	150	55	90	2.8	208/3	10.6	15	PRICE	SDV	2, 3
VAV-14	PROSECUTORS OFFICE 202, OFFICE 203, WAITING 204	6	12 x 8	0.3	525	400	175	55	90	4.4	208/3	16.6	20	PRICE	SDV	2, 3
VAV-15	LAW LIBRARY 205, OFFICE 209, CORRIDOR 210	6	12 x 8	0.3	525	325	265	55	90	3.6	208/3	13.6	15	PRICE	SDV	2, 3
VAV-16	WOMEN'S TOILET 206, MEN'S TOILET 207	6	12 x 8	0.3	325	325	325	55	90	3.6	208/3	13.6	15	PRICE	SDV	1, 2, 3
VAV-17	COURTROOM 212	8	12 x 10	0.3	1100	550	550	55	90	6.1	208/3	23.1	25	PRICE	SDV	2, 3

1. CONSTANT VOLUME
2. DISCONNECT SWITCH FURNISHED BY UNIT MANUFACTURER.
3. PROVIDE SCR CONTROL FOR HEATING COIL.

ELECTRIC CABINET UNIT HEATER SCHEDULE

MARK	AREA SERVED	AIR FLOW (CFM) @ 70 DEG F	BTUH	ELECTRICAL DATA				HEATER			MANUFACTURER	MODEL NUMBER	NOTES
				KW	AMPS	VOLT	PHASE	WIDTH (IN)	HEIGHT (IN)	DEPTH (IN)			
ECUH-1	VESTIBULE 100	175	3413	1.0	8.3	120	1	16	21	4	MARKEL	E3322TD-RP	1, 2, 3, 4
ECUH-2	EXTERIOR VESTIBULE	175	7763	2.25	10.8	208	1	16	21	4	MARKEL	HF3325TD-RP	1, 2, 3, 4
ECUH-3	STAIR "A" 000 SECOND FLOOR	175	3413	1.0	8.3	120	1	16	21	4	MARKEL	E3322TD-RP	1, 2, 3, 4
ECUH-4	VESTIBULE 120	175	7763	2.25	10.8	208	1	16	21	4	MARKEL	HF3325TD-RP	1, 2, 3, 4
ECUH-5	STAIR "A" 000 FIRST FLOOR	175	3413	1.0	8.3	120	1	16	21	4	MARKEL	E3322TD-RP	1, 2, 3, 4
ECUH-6	EXTERIOR VESTIBULE	175	7763	2.25	10.8	208	1	16	21	4	MARKEL	HF3325TD-RP	1, 2, 3, 4

1. DISCONNECT SWITCH FURNISHED BY MANUFACTURER.
2. HEAVY DUTY CONSTRUCTION WITH INTEGRAL THERMOSTAT.
3. WALL MOUNTED.
4. COLOR TO BE SELECTED BY ARCHITECT.

GRAVITY RELIEF HOOD SCHEDULE

MARK	AREA / SYSTEM SERVED	LOCATION	CFM	SP DROP IN WG	ROOF CURB HEIGHT (IN)	THROAT			HOOD				MANUFACTURER	MODEL NUMBER	NOTES
						WIDTH (IN)	LENGTH (IN)	VELOCITY (FPM)	HOOD MATERIAL	HEIGHT (IN)	WIDTH (IN)	LENGTH (IN)			
GRH-1	BUILDING	ROOF	5000	0.024	18	42	42	420	ALUMINUM	23	63	63	GREENHECK	FGR	1
GRH-2	BUILDING	ROOF	5000	0.024	18	42	42	420	ALUMINUM	23	63	63	GREENHECK	FGR	1

NOTES:
1. PROVIDE MOTORIZED DAMPER

DIFFUSER-REGISTER-GRILLE SCHEDULE

MARK	FLOW RANGE (CFM)	DIFFUSER FACE SIZE (IN)	DIFFUSER NECK SIZE (IN)	FLOW PATTERN	MOUNTING TYPE	COLOR	MATERIAL	MANUFACTURER	MODEL NUMBER	NOTES
RG-1	SEE PLANS	24"x24"	SEE PLANS	PERFORATED	LAY-IN	WHITE	STEEL	PRICE	PDDR	1, 2
RG-2	SEE PLANS	12"x12"	SEE PLANS	PERFORATED	LAY-IN	WHITE	STEEL	PRICE	PDDR	1, 2
RG-3	SEE PLANS	D + 1 3/4"	D - 3/4"	45 DEG DEFLECTION	SURFACE	WHITE	STEEL	PRICE	530	1
RG-4	N/A	24"x24"	N/A	EGG CRATE	LAY-IN	WHITE	STEEL	PRICE	80	1
EG-1	SEE PLANS	24"x24"	SEE PLANS	PERFORATED	LAY-IN	WHITE	STEEL	PRICE	PDDR	1, 2
EG-2	SEE PLANS	12"x12"	SEE PLANS	PERFORATED	LAY-IN	WHITE	STEEL	PRICE	PDDR	1, 2
SD-1	SEE PLANS	24"x24"	SEE PLANS	360 DEG RADIAL HORIZONTAL	LAY-IN	WHITE	STEEL	PRICE	SCD	1, 2
SD-2	SEE PLANS	12"x12"	SEE PLANS	360 DEG RADIAL HORIZONTAL	LAY-IN	WHITE	STEEL	PRICE	SCD	1, 2
SD-3	SEE PLANS	D + 1 3/4"	D - 3/4"	DOUBLE DEFLECTION	SURFACE	WHITE	STEEL	PRICE	520	1
SD-4	SEE PLANS	12"x12"	SEE PLANS	360 DEG RADIAL HORIZONTAL	SURFACE	WHITE	STEEL	PRICE	SCD	1, 2
TG-1	N/A	20"x10"	N/A	0 DEG DEFLECTION	SURFACE	WHITE	STEEL	PRICE	510Z	-

1. REFER TO REFLECTED CEILING PLANS EXACT LOCATION. PROVIDE ALL FRAMES AND ACCCESSORIES AS REQUIRED FOR PROPER INSTALLATION.
2. FLEXIBLE DUCTWORK SHALL BE THE SAME SIZE AS THE DIFFUSER NECK OR AN EQUIVALENT ROUND DUCT. FLEXIBLE DUCTWORK SHALL BE SUPPORTED TO PREVENT KINKS OR BENDS.

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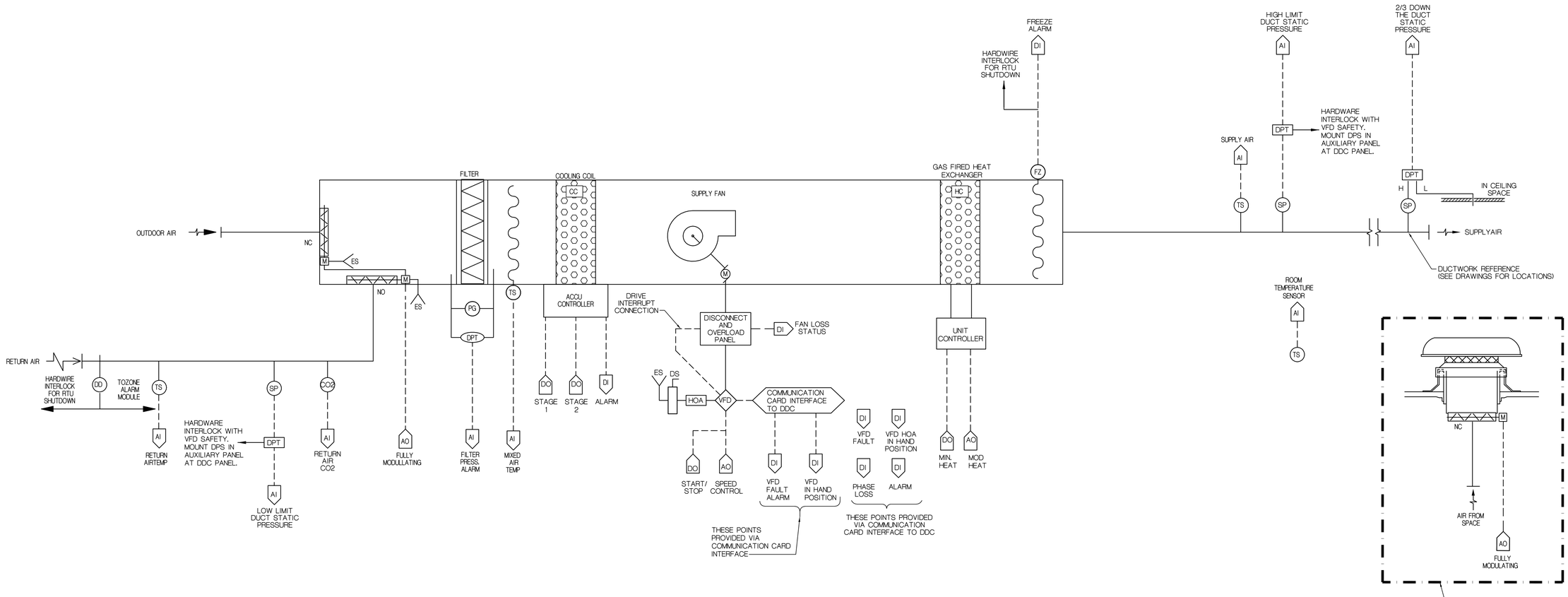
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DRAWING NAME: MECHANICAL SCHEDULES

SHEET NO.: M6.1



AIR HANDLING UNIT AHU-1, 2 CONTROL DIAGRAM

NO SCALE

OUTDOOR VAV ROOFTOP UNIT SEQUENCE OF OPERATION

1. THE TERM DDC SHALL REFER TO THE OUTDOOR RTU DDC CONTROLLER.
2. ALL HAND-OFF-AUTO (H-O-A) SWITCHES NORMALLY REMAIN IN THE "AUTO" POSITION AND THE "HAND" AND "OFF" POSITIONS ARE USED FOR MAINTENANCE SITUATIONS.
3. ALL VARIABLE FREQUENCY DRIVE (VFD) HAND-OFF-AUTO (H-O-A) SWITCHES NORMALLY REMAIN IN THE "AUTO" POSITION AND THE "HAND" AND "OFF" POSITIONS ARE USED FOR MAINTENANCE SITUATIONS.
4. DDC MONITORS ALL VARIABLE FREQUENCY DRIVE (VFD) IN FORMATION THROUGH A COMMUNICATIONS INTERFACE DIRECT FROM THE DDC CONTROLLER TO THE DRIVE. COORDINATE REQUIREMENT SWITH VFD MANUFACTURER.
5. OCCUPIED AND UNOCCUPIED MODE IS DETERMINED FROM THE DDC CONTROLLER TIME OF DAY SCHEDULE.
6. WITH SUPPLY FAN VFD H-O-A SWITCH N THE "AUTO" POSITION, THE SUPPLY FAN IS AUTOMATICALLY STARTED AND STOPPED BASED ON THE OCCUPIED MODE. UPON INITIAL START, DISABLE ALL SENSOR ALARMS FOR A PERIOD OF 300 SECONDS (ADJUSTABLE). SAFETY RELATED DEVICES WILL STILL REPORT ALARMS. SUPPLY FAN SHALL RUN CONTINUOUSLY WHEN IN OCCUPIED MODE. SAFETY DEVICES ARE HARD-WIRED INTO SUPPLY FAN VFD SAFETY CIRCUIT. SUPPLY FAN VFD "RUN PERMISSIVE" SIGNALS RETURN FAN VFD TO START.
7. UPON START, VFD'S START AT A MINIMUM LOADING OF 20 TO 25% AND THEN RAMP SLOWLY AND LINEARLY OVER A 120 SECOND PERIOD (ADJUSTABLE) TO REACH SETPOINT IN AN ORDERLY AND CONTROLLED MANNER. FROM THIS POINT, THE FAN VFD'S ARE ALLOWED TO MODULATE AS REQUIRED TO MAINTAIN THEIR RESPECTIVE SETPOINTS. VFD'S REQUIRE MAXIMUM HERTZ SPEED SETTINGS, STEP-OVER FREQUENCIES, BI-DIRECTIONAL AUTO SPEED SEARCH TO ALLOW STARTING IN TO ROTATING LOADS SPINNING IN EITHER DIRECTION, AND THREE AUTOMATIC RESTARTS BEFORE SHUTTING DOWN FOR MANUAL RESET OR FAULT CORRECTION.
8. WHEN THE CONTROL CIRCUIT OF THE SUPPLY FAN IS ENERGIZED, THE OUT DOOR AIR DAMPER MODULATES TO MINIMUM OUTDOOR AIR VENTILATION SETPOINT (ADJUSTABLE) POSITION AFTER A 180 SECOND DELAY (ADJUSTABLE). RETURN AIR DAMPER SHALL MODULATE IN INVERSE PROPORTION TO OUTDOOR AIR DAMPER. RELIEF AIR DAMPER TRACKS THE SAME AS OUTDOOR AIR DAMPER.
9. THE SUPPLY DUCT STATIC PRESSURE SENSOR, THROUGH THE DDC SYSTEM, MODULATES THE SUPPLY FAN VFD SPEED TO MAINTAIN SUPPLY AIR DUCT STATIC PRESSURE SETPOINT (ADJUSTABLE). THE SUPPLY DUCT STATIC PRESSURE SETPOINT SHALL BE ESTABLISHED DURING SYSTEM BALANCING. THE SETPOINT IS INITIALLY SET AT 1.5" W.G. AND IS RESET BASED ON FEEDBACK FROM ALL THE VAV AIR TERMINAL UNIT DDC CONTROLLERS TO MAINTAIN THE CRITICAL ZONE VAV DAMPER POSITIONAL MOST WIDE OPEN.
10. DDC MODULATES COOLING COIL OR GAS BURNER AS NEEDED BASED ON SUPPLY AIR TEMPERATURE SETPOINT 55°F (ADJUSTABLE). DDC SHALL PROVIDE A SUPPLY AIR TEMPERATURE RESET BETWEEN 55°F AND 60°F (ADJUSTABLE) BASED ON HALF OF THE CONNECTED AIR TERMINAL DAMPERS ARE AT MINIMUM CFM AND IN HEATING MODE. HEATING AND COOLING CONTROL DO NOT OVERLAP.
11. DDC MONITORS THE SUPPLY FAN MOTORS WITH A CURRENT SWITCH. WHEN DDC COMMANDS THE FAN TO RUN, AND WITHIN 120 SECONDS (ADJUSTABLE) IF FAN CURRENT IS NOT SENSED PROPERLY ,DDC CONTROLLER SHALL INDICATE A FAN FAILURE ALARM. WHEN DDC COMMANDS THE FAN OFF, AND WITHIN 120 SECONDS (ADJUSTABLE) FAN CURRENT IS NOT ZERO, DDC CONTROLLER SHALL INDICATE A FAN FAILURE ALARM.
12. MIXED AIR TEMPERATURE SENSOR SHALL OVERRIDE THE ECONOMIZER, ACTING AS A LOW LIMIT CONTROLLER MAINTAINING 40°F (ADJUSTABLE).

OUTDOOR VAV ROOFTOP UNIT SEQUENCE OF OPERATION (CONTINUED)

13. DDC MONITORS FAN LOSS STATUS POINT AND PROVIDES AN ALARM TO THE BAS.
14. DDC MONITORS THE PRESSURE DROP ACROSS AIR FILTER AND INDICATES AN ALARM UPON HIGH DIFFERENTIAL PRESSURE. SET ALARM LIMIT BASED ON FILTER MANUFACTURER'S LOADED FILTER DATA. LOCAL ALARM LIGHTIS LOCATED ON CONTROLLER AND IDENTIFIED.
15. THE FOLLOWING ALARMS SHALL BE SENT TO THE BAS-
    A. SUPPLY FAN VFD FAULT / FAILURE
    B. SUPPLY FAN MOTOR FAILURE
    C. SUPPLY VFD IN HAND POSITION
    D. SUPPLY/RETURN SMOKE DETECTOR
    E. LOW OUTDOOR AIR FLOW RATE
    F. HIGH AIR FILTER PRESSURE DROP
    G. CONTROLLING SENSOR DIAGNOSTIC FAILURE
16. ALL SETPOINTS, DEADBANDS, AND TIME DELAY INTERVALS DESCRIBED IN SEQUENCE SHALL BE ADJUSTABLE BY SYSTEM OPERATORS. APPROPRIATE DEADBANDS AND TIME DELAYS SHALL BE USED TO PREVENT SHORT CYCLING SITUATION.

ECONOMIZER MODE-

1. WHEN THE OUTDOOR AIR TEMPERATURE IS LESS THAN 60°F(ADJUSTABLE),THE MIXED AIR DAMPER CONTROL SHALL MODULATE THE DAMPERS TO MAINTAIN SPACE TEMPERATURE SETPOINT (ADJUSTABLE). DAMPERS MAY OPEN FULLY. COOLING COIL MAYBE USED ONLY WHEN THE DAMPER IS 100% OPEN AND SUPPLY AIR TEMPERATURE SETPOINT CAN NOT BE MAINTAINED.
2. ABOVE AN OUTDOOR AIR TEMPERATURE OF 63°F (ADJUSTABLE), THE DAMPERS SHALL MODULATE TO THE MINIMUM OUTDOOR AIR FLOW RATE PROVIDED IN THE SCHEDULES AND FIELD VERIFIED BY THE AIR SYSTEM BALANCER.

OUTDOOR VAV ROOFTOP UNIT SEQUENCE OF OPERATION (CONTINUED)

UNOCCUPIED MODE CONTROL SEQUENCE-

1. DURING THE UNOCCUPIED MODE, THE ROOFTOP UNIT IS CYCLED ON AND OFF BY POLLING THE VAV BOX TEMPERATURE SENSORS TO MAINTAIN THE AVERAGE SPACE HEATING OR COOLING UNOCCUPIED TEMPERATURE SETPOINT.
2. IF THE AVERAGE SPACE TEMPERATURE IS 1°F (ADJUSTABLE) ABOVE UNOCCUPIED COOLING SETPOINT OR BELOW UNOCCUPIED HEATING SETPOINT, THE RTU IS STARTED. THE OUTDOOR AND RELIEF AIR DAMPERS REMAIN FULLY CLOSED AND THE RETURN AIR DAMPER IS OPENED FULLY. ALL OTHER CONTROL ALGORITHMS REMAIN ACTIVE.
3. IF AVERAGE SPACE TEMPERATURE IS 1°F (ADJUSTABLE) BELOW UNOCCUPIED HEATING SETPOINT, DDC LOCKS OUT THE HEATING AND COOLING CONTROL. DDC SHALL OVERRIDE VAV BOX DAMPERS TO 50% OPEN. DDC DOES NOT ALLOW SUPPLY FAN CFM TO EXCEED MAXIMUM DUCT STATIC PRESSURE RATING AS DETERMINED BY SYSTEM AIR BALANCER. HEATING FOR SPACES BELOW UNOCCUPIED HEATING SETPOINT WILL BE PROVIDED BY THEIR RESPECTIVE VAV BOX TEMPERING COILS.
4. IF AVERAGE SPACE TEMPERATURE IS ABOVE UNOCCUPIED COOLING SETPOINT, DDC MODULATES COOLING CONTROL FROM THE SUPPLY AIR TEMPERATURE SENSOR FOR 50°F (ADJUSTABLE). DDC LOCKS OUT HEATING CONTROL FROM OPERATING. SUPPLY FAN CFM IS CONTROLLED FROM THE DUCT STATIC PRESSURE CONTROL.
5. WHEN THE AVERAGE SPACE TEMPERATURE IS 2°F (ADJUSTABLE) INSIDE THE UNOCCUPIED HEATING AND COOLING SETPOINTS, THE UNIT SHALL SHUTDOWN. SEE SHUTDOWN MODE CONTROL SEQUENCE.

SAFETY CONTROL-

1. IF SMOKE IS DETECTED IN THE AIRSTREAM BY A DUCT SMOKE DETECTOR OR THE FIRE ALARM ZONE MODULE INDICATES A ZONE ALARM, THE SUPPLY AND EXHAUST FANS SHALL BE DE-ENERGIZED. SEE SHUTDOWN MODE OF CONTROL.
2. UNIT SHALL SHUTDOWN WHEN EVER A CONTROLLING SENSOR IS DETERMINED TO BE FAILED THAT WOULD CAUSE DAMAGE TO THE EQUIPMENT OR INAPPROPRIATE CONDITIONS IN THE SPACE.
3. THE SUPPLY FAN DISCHARGE HIGH-LIMIT OR RETURN SUCTION HIGH -LIMIT STATIC PRESSURE SWITCHES AT THE ROOFTOP UNIT STOP THE SUPPLY FAN TO PREVENT THE SUPPLY FAN DISCHARGE STATIC PRESSURE FROM EXCEEDING ITS HIGH-LIMIT SETPOINT (ADJUSTABLE) OR RETURN SUCTION LOW-LIMIT (ADJUSTABLE). THESE STATIC PRESSURE ALARM SETPOINTS ARE SET 0.5 INCHES W.G. (ADJUSTABLE) ABOVE OR BELOW THEIR FAN STATIC PRESSURE SHUT-DOWN SETPOINTS. ALL STATIC PRESSURE SWITCH ALARM TRIPS REMAIN IN EFFECT UNTIL MANUALLY RESET. SEE SHUTDOWN MODE CONTROL.
4. IF FREEZE STAT SETPOINT 35° F (ADJUSTABLE) IS REACHED, THE SUPPLY FAN SHALL BE DE-ENERGIZED. NUMBER OF FREEZE STATS ARE DEPENDED ON COIL AREA COVERAGE REQUIRED. FREEZE STATS SHALL BE MANUAL RESET-TYPE ONLY. SEE SHUTDOWN MODE OF CONTROL.

SHUTDOWN MODE CONTROL SEQUENCE-

1. WHEN THE SYSTEM IS DE-ENERGIZED FOR ANY REASON, SUPPLY FAN IS COMMANDED OFF, OUTDOOR AIR AND RELIEF AIR DAMPERS CLOSEFULLY, RETURN AIR DAMPER OPENS FULLY, COOLING CONTROL CLOSES FULLY, AND HEATING CONTROL CLOSES FULLY. ALARMS FOR THE UNIT SHALL BE DISABLED FROM REPORTING TO DDC AND BAS.

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DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
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CONSTRUCTION	○

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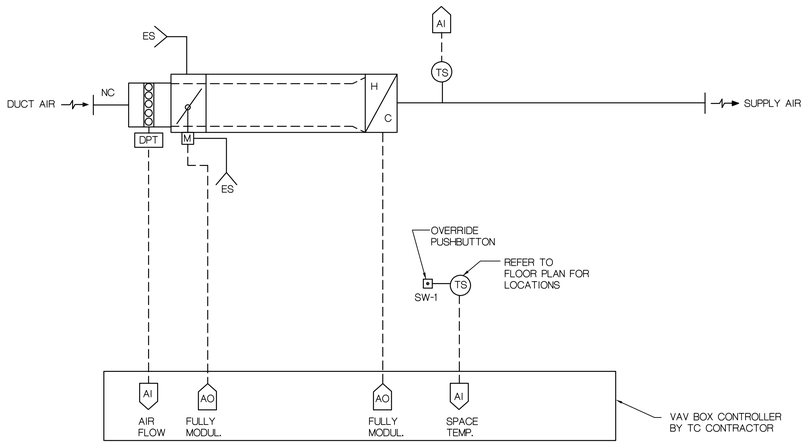
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DRAWING NAME: TEMPERATURE CONTROL DIAGRAM

SHEET NO.: M7.1



TYPICAL VARIABLE AIR VOLUME (VAV) BOX WITH ELECTRIC REHEAT COIL CONTROL DIAGRAM

NOTE: TC CONTRACTOR SHALL PROVIDE 24 VAC POWER SUPPLY TO TERMINAL UNIT CONTROLLER.

NOTES:

1. VAV BOX LAYOUT IS DIAGRAMMATIC IN NATURE. SEE VAV BOX LAYOUT DRAWINGS FOR DEVICE PHYSICAL ORIENTATION.
2. ALL SETPOINTS, DEADBANDS, AND TIME DELAYS DESCRIBED IN SEQUENCE SHALL BE ADJUSTABLE BY SYSTEM OPERATORS (CREATE REQUIRED VIRTUAL POINTS).
3. APPROPRIATE DEADBANDS SHALL BE USED TO PREVENT SHORT CYCLING SITUATIONS.

SEQUENCE OF OPERATIONS

1. VAV BOX MINIMUM AND MAXIMUM DESIGN VOLUME AIRFLOW SETTINGS SHALL BE AS INDICATED ON THE VAV BOX SCHEDULE (ADJUSTABLE BY BAS OPERATOR ONLY). VAV BOXES SHALL OPERATE AS CONSTANT VOLUME WHEN THE SCHEDULED MINIMUM AND MAXIMUM DESIGN AIRFLOW SETTINGS ARE EQUAL.
2. ACTUAL VAV BOX AIRFLOW SHALL BE TOTALED IN REAL - TIME FOR BAS DISPLAY. PROVIDE TOTAL AIRFLOWS FOR EACH RTU.

VARIABLE AIR VOLUME TERMINAL CONTROL (VAV):

A. UNOCCUPIED MODE (BUILDING OCCUPANCY SCHEDULE OFF):

1. IN THIS MODE THE BUILDING TIME-OF-DAY SCHEDULER DETERMINES THE FACILITY IS IN UNOCCUPIED MODE. THE CONTROLLER SHALL USE THE UNOCCUPIED COOLING/HEATING SETPOINTS FOR SPACE TEMPERATURE CONTROL.
2. WHEN BETWEEN UNOCCUPIED HEATING AND COOLING SETPOINTS (ADJUSTABLE), THE VAV DAMPER WILL BE CLOSED, SUPPLEMENTAL ELECTRIC HEATING COIL OFF. VAV AIR FLOW SETPOINT SHALL BE ZERO CFM.
3. IF THE SPACE TEMPERATURE INCREASES TO THE UNOCCUPIED COOLING SETPOINT (ADJUSTABLE), THE VAV CONTROLLER SHALL CALL FOR AIRFLOW AND MODULATE THE VAV DAMPER UP TO MAXIMUM DESIGN CFM AIRFLOW SETPOINT (ADJUSTABLE), IN ORDER TO MAINTAIN SPACE TEMPERATURE AT SETPOINT. ELECTRIC HEATING COIL SHALL REMAIN OFF. WHEN SPACE TEMPERATURE FALLS SUFFICIENTLY BELOW THE UNOCCUPIED COOLING SETPOINT, THE VAV CONTROLLER SHALL CALL FOR ZERO CFM AIRFLOW.
4. IF THE SPACE TEMPERATURE DECREASES TO THE UNOCCUPIED HEATING SETPOINT (ADJUSTABLE),THE VAV CONTROLLER SHALL MODULATE THE VAV DAMPER TO MAINTAIN THE REHEAT MINIMUM DESIGN CFM SETPOINT (ADJUSTABLE) AND THEN MODULATE THE ELECTRIC REHEAT COIL ON. THEN ON A CONTINUED DEMAND FOR HEAT THE VAV CONTROLLER SHALL MODULATE THE ELECTRIC HEAT. WHEN SPACE TEMPERATURE INCREASES SUFFICIENTLY ABOVE THE UNOCCUPIED HEATING SETPOINT, THE VAV CONTROLLER SHALL CALL FOR ZERO CFM AIRFLOW AND TURN OFF THE REHEAT COIL.

SEQUENCE CONTINUED:

B. OCCUPIED MODE (BUILDING OCCUPANCY SCHEDULE ON):

1. IN THIS MODE THE BUILDING TIME-OF-DAY SCHEDULER HAS DETERMINED THE FACILITY IS IN OCCUPIED MODE IN THE SPACE. THE CONTROLLER SHALL USE THE OCCUPIED COOLING/HEATING SETPOINTS FOR SPACE TEMPERATURE CONTROL.
2. WHEN BETWEEN OCCUPIED HEATING AND COOLING SETPOINTS (ADJUSTABLE), THE VAV DAMPER WILL BE AT MINIMUM DESIGN CFM SETPOINT, ELECTRIC REHEAT COIL CONTROLS FOR OCCUPIED TEMPERATURE SETPOINTS.
3. IF THE SPACE TEMPERATURE INCREASES TO THE OCCUPIED COOLING SETPOINT (ADJUSTABLE), THE VAV CONTROLLER SHALL CALL FOR AIRFLOW AND MODULATE THE VAV DAMPER UP TO MAXIMUM DESIGN CFM AIRFLOW SETPOINT (ADJUSTABLE), IN ORDER TO MAINTAIN SPACE TEMPERATURE AT SETPOINT. ELECTRIC REHEAT COIL SHALL MODULATE CLOSED. WHEN SPACE TEMPERATURE FALLS SUFFICIENTLY BELOW THE OCCUPIED COOLING SETPOINT, THE VAV CONTROLLER SHALL CALL FOR MINIMUM DESIGN CFM SETPOINT.
4. IF THE SPACE TEMPERATURE DECREASES TO THE OCCUPIED HEATING SETPOINT (ADJUSTABLE), THE VAV CONTROLLER SHALL MODULATE THE VAV DAMPER TO MAINTAIN THE REHEAT MINIMUM DESIGN CFM SETPOINT (ADJUSTABLE) AND THEN MODULATE THE ELECTRIC REHEAT COIL ON. THEN ON A CONTINUED DEMAND FOR HEAT THE VAV CONTROLLER SHALL MODULATE THE ELECTRIC HEAT. WHEN SPACE TEMPERATURE INCREASES SUFFICIENTLY ABOVE THE OCCUPIED HEATING SETPOINT, THE VAV CONTROLLER SHALL CALL FOR MINIMUM DESIGN CFM SETPOINT AND MODULATE ELECTRIC REHEAT COIL CONTROLLER TO MAINTAIN STANDBY HEATING SETPOINT.
5. VAV CONTROLLER SHALL REMAIN IN OCCUPIED MODE UNTIL THE TIME-OF-DAY SCHEDULER INDICATES UNOCCUPIED MODE (SEE HEREIN), AFTER A TIMED RELAY, NO PEOPLE ARE PRESENT AND THE CONTROLLER SHALL SWITCH TO STANDBY CONTROL MODE (SEE HEREIN).

ALL VAVS:

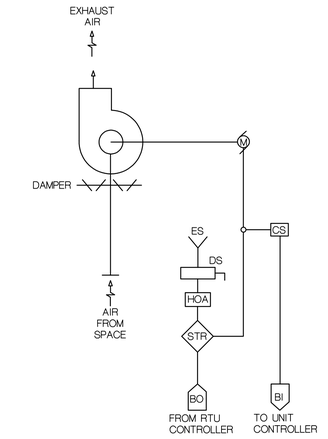
A. ZONE SPACE TEMPERATURE SETPOINTS SHALL BE AS FOLLOWS:

UNOCCUPIED HEATING SPACE TEMPERATURE SETPOINT:	62°F (ADJUSTABLE)
STANDBY HEATING SPACE TEMPERATURE SETPOINT:	68°F(ADJUSTABLE)
OCCUPIED HEATING SPACE TEMPERATURE SETPOINT:	70°F (ADJUSTABLE)
OCCUPIED COOLING SPACE TEMPERATURE SETPOINT:	75°F (ADJUSTABLE)
STANDBY COOLING SPACE TEMPERATURE SETPOINT:	78°F (ADJUSTABLE)
UNOCCUPIED COOLING SPACE TEMPERATURE SETPOINT:	80°F (ADJUSTABLE)

B. THE DDC VAV CONTROLLER SHALL PERIODICALLY CALIBRATE ITS AIRFLOW SENSOR.

C. VAV'S SHALL BE PROGRAMMED SUCH THAT ALL VAV BOXES SUPPLIED BY A PARTICULAR RTU CAN BE DRIVEN TO MAXIMUM AIRFLOW WITH A SINGLE COMMAND FROM THE BAS.

D. VAV'S SHALL BE PROGRAMMED SUCH THAT THE DISCHARGE AIR TEMPERATURE, AS SENSED BY THE SUPPLY AIR TEMPERATURE SENSOR, NOT EXCEED 18°F TEMPERATURE DIFFERENTIAL TO SPACE TEMPERATURE AS SENSED BY THE SPACE TEMPERATURE SENSOR.

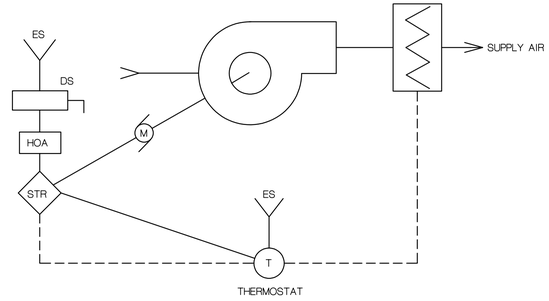


TYPICAL EXHAUST FAN CONTROL DIAGRAM

ALL CONTROLS BY TEMPERATURE CONTROLS CONTRACTOR

SEQUENCE OF OPERATION:

1. DRAWING IS DIAGRAMMATIC. REFER TO THE OTHER MECHANICAL DRAWINGS AND MANUFACTURER'S EQUIPMENT DIAGRAMS FOR DETAILS.
2. ALL SETPOINT AND TIME INTERVALS DESCRIBED IN SEQUENCE SHALL BE ADJUSTABLE.
3. THE FAN MOTOR STARTER HAND / OFF / AUTO SWITCH SHALL NORMALLY BE IN THE "AUTO" POSITION.
4. EACH EXHAUST FAN SHALL BE CONTROLLED BY THE RESPECTIVE ROOFTOP UNIT / AIR HANDLING UNIT SERVING THE SAME AREA BEING EXHAUSTED.
5. WHEN THE ROOFTOP UNIT / AIR HANDLING UNIT CONTROLLER COMMANDS THE FAN TO START, DURING OCCUPIED MODE THE EXHAUST FAN STARTER IS ENERGIZED WHICH STARTS THE FAN.
6. WHEN THE ROOFTOP UNIT / AIR HANDLING UNIT CONTROLLER COMMANDS THE FAN TO STOP, THE EXHAUST FAN STARTER IS DE-ENERGIZED WHICH STOPS THE FAN.



TYPICAL ELECTRIC CABINET UNIT HEATER CONTROL DIAGRAM

ALL CONTROLS BY TEMPERATURE CONTROLS CONTRACTOR

NOTES:

1. DRAWING IS DIAGRAMMATIC. REFER TO THE OTHER MECHANICAL DRAWINGS AND MANUFACTURER'S EQUIPMENT DIAGRAM FOR DETAILS.
2. ALL SETPOINTS AND TIME INTERVALS DESCRIBED IN SEQUENCE SHALL BE ADJUSTABLE.

SEQUENCE OF OPERATION:

1. A THERMOSTAT SHALL CONTROL THE CABINET UNIT HEATER BASED ON TEMPERATURE SETPOINT (ADJUSTABLE). INITIAL SETPOINT SHALL BE 65 DEGREES F. PROVIDE GUARD IN PUBLIC AREAS. COORDINATE WITH OWNER.
2. UPON SENSING THE SPACE TEMPERATURE DROP BELOW SPACE SETPOINT (ADJUSTABLE), THE THERMOSTAT SHALL START THE FAN AND THEN ENERGIZE THE ELECTRIC HEATING COIL TO MAINTAIN SPACE TEMPERATURE (ADJUSTABLE).
3. UPON SENSING THE SPACE TEMPERATURE RISE ABOVE SPACE SETPOINT, THE THERMOSTAT SHALL DE-ENERGIZED THE ELECTRIC HEATING COIL AND THEN TURN OFF THE FAN TO MAINTAIN SPACE TEMPERATURE (ADJUSTABLE).
4. THE THERMOSTAT SHALL MAINTAIN A SPACE SETPOINT OF 65° F (ADJUSTABLE) AND A 2° F (MINIMUM) DEADBAND. THERMOSTAT SHALL INTERFACE WITH AN OUTDOOR AIR TEMPERATURE SENSOR. THERMOSTAT SHALL ENABLE/DISABLE CABINET UNIT HEATER BASED ON OUTDOOR AIR TEMPERATURE ABOVE 45°F.

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PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY:	RO
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REVISIONS:

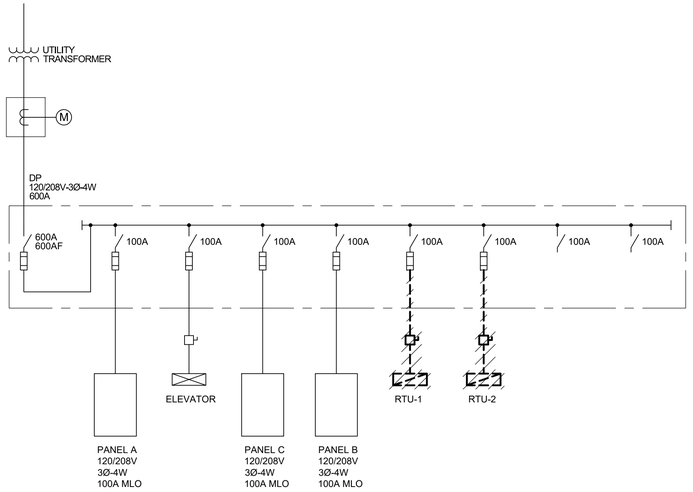
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

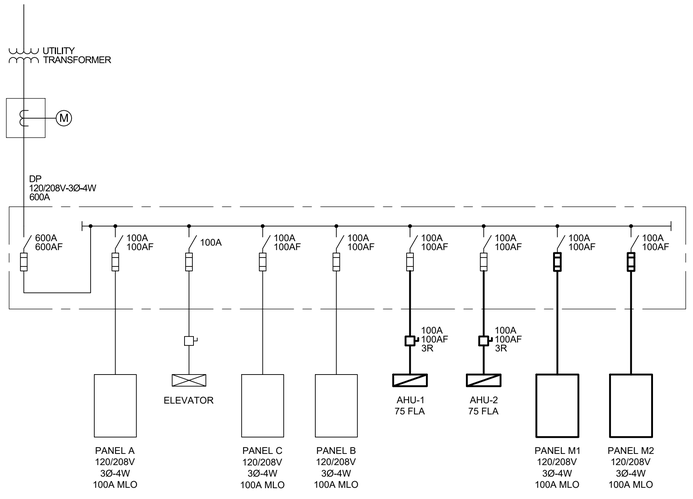
DRAWING NAME: TEMPERATURE CONTROL DIAGRAMS

SHEET NO.: M7.2



ONE LINE DIAGRAM - DEMOLITION

NOT TO SCALE



ONE LINE DIAGRAM - NEW WORK

NOT TO SCALE

Panelboard:	DP (Existing Panel)				Location:	Basement Electrical Room		
Voltage:	120/208Y				Source:	Service CT Cabinet		
Bus Amperage:	600A				AIC:	65kA		
Main Switch:	600A				Available SCC	13.77kA		
Circuit	Switch (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	100A-3P	Panel M1	10838	S	2	100A-3P	Panel M2	8820	S
		7.59kA Available Fault	8359	S			7.59kA Available Fault	9131	S
			9584	S				9134	S
3	100A-3P	AHU-1	9000	H	4	100A-3P	AHU-2	9000	H
		3.37kA Available Fault	9000	H			3.37kA Available Fault	9000	H
			9000	H				9000	H
5	100A-3P	Panel C	6194	S	6	100A-3P	Panel B	5514	S
		4.82kA Available Fault	5483	S			5.92kA Available Fault	6359	S
			5479	S				6586	S
7	100A-3P	Panel A	4535	S	8	100A-3P	Elevator	7440	M
		7.59kA Available Fault	11935	S			7.7kA Available Fault	7440	M
			11045	S				7440	M

	Conn. (VA)	Demand (VA)	
Lighting	0	0	125%
Receptacle (First 10kVA)	0	0	100%
Receptacle	0	0	50%
HVAC	54000	43200	80%
Miscellaneous	22320	3348	15%
Sub Panel	118995	118995	100%
Total	195315	165543	459.84 FLA

Lighting Fixture Schedule

TYPE	DESCRIPTION	MOUNTING	WATTS
LA	LED 2'x4' ARCHITECTURAL VOLUMETRIC TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (3000/4000/5000), COLOR SELECTABLE (30K/35K/40K). ELITE #24 EDGE LED 3000L/4000L/5000L DIM10 MVOLT 30K/40K/50K 85	RECESSED	52 (MAX)
LA/EM	LED 2'x4' ARCHITECTURAL VOLUMETRIC TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (3000/4000/5000), COLOR SELECTABLE (30K/35K/40K),10W EMERGENCY BATTERY. ELITE #24 EDGE LED 3000L/4000L/5000L DIM10 MVOLT 30K/40K/50K 85 0-EMG-LED-10W	RECESSED	52 (MAX)
LB	LED 2'x2' ARCHITECTURAL VOLUMETRIC TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (2000/3000/4000), COLOR SELECTABLE (30K/35K/40K). ELITE #22 EDGE LED 2000L/3000L/4000L DIM10 MVOLT 30K/40K/50K 85	RECESSED	40 (MAX)
LC	LED 2'x4' ARCHITECTURAL SHALLOW PLENUM TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, ACRYLCI DIFFUSER, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (3000/4000/5000), COLOR SELECTABLE (35K/40K/50K). ELITE #24 OEVHP LED 3000L/4000L/5000L DIM10 MVOLT 35K/40K/50K 85	RECESSED	39 (MAX)
LC/EM	LED 2'x4' ARCHITECTURAL SHALLOW PLENUM TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, ACRYLCI DIFFUSER, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (3000/4000/5000), COLOR SELECTABLE (35K/40K/50K), 10W EMERGENCY BATTERY. ELITE #24 OEVHP LED 3000L/4000L/5000L DIM10 MVOLT 35K/40K/50K 85 0-EMG-LED-10W	RECESSED	39 (MAX)
LD	LED 2'x2' ARCHITECTURAL SHALLOW PLENUM TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, ACRYLCI DIFFUSER, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (2000/3000/4000), COLOR SELECTABLE (35K/40K/50K). ELITE #22 OEVHP LED 2000L/3000L/4000L DIM10 MVOLT 35K/40K/50K 85	RECESSED	32 (MAX)
LD/EM	LED 2'x2' ARCHITECTURAL SHALLOW PLENUM TROFFER WITH HEAVY-DUTY 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, ACRYLCI DIFFUSER, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 85+CRI, LUMEN SELECTABLE (2000/3000/4000), COLOR SELECTABLE (35K/40K/50K), 10W EMERGENCY BATTERY. ELITE #22 OEVHP LED 2000L/3000L/4000L DIM10 MVOLT 35K/40K/50K 85 0-EMG-LED-10W	RECESSED	32 (MAX)
LE	LED 1X4 ARCHITECTURAL LED FLAT BACKLIT PANEL WITH 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, LUMEN SELECTABLE 2000L/3000L/4000L/5000L, 120-277V INPUT, 0-10V 10% DIMMING DRIVER, 85+CRI, COLOR SELECTABLE (35K/40K/50K). ELITE #14 FPL-BL LED 2000L/3000L/4000L/5000L DIM10 MVOLT 35K/40K/50K 85	RECESSED	32 (MAX)
LE/EM	LED 1X4 ARCHITECTURAL LED FLAT BACKLIT PANEL WITH 20-GAUGE COLD ROLLED STEEL BODY, POST PAINTED, LUMEN SELECTABLE 2000L/3000L/4000L/5000L, 120-277V INPUT, 0-10V 10% DIMMING DRIVER, 85+CRI, COLOR SELECTABLE (35K/40K/50K), 10W EMERGENCY BATTERY. ELITE #14 FPL-BL LED 2000L/3000L/4000L/5000L DIM10 MVOLT 35K/40K/50K 85 0-EMG-LED-10W	RECESSED	32 (MAX)
LF	LED 4" ROUND ARCHITECTURAL FLANGED DOWNLIGHT WITH 2000 LUMENS, 120-277V INPUT, 0-10V 1% DIMMING DRIVER, 35K, MEDIUM WIDE DISTRIBUTION, 90+CRI, LOW IRIDESCENT SATIN HAZE. ELITE #HH4-LED 2000L DIM10 MVOLT MWD 35 90 HH4-4501 SHZ-SHZ	RECESSED	24
LX	LED EMERGENCY EXIT WITH WHITE HIGH IMPACT UL FLAME RATED THERMOPLASTIC HOUSING, RED OR GREEN FIELD SELECTABLE PANEL, 120/277V INPUT, NI-CAD BATTERY. COMPASS #CERG	UNIVERSAL	3.5
EA	LED RECESSED ARCHITECTURAL BATTERY UNIT WITH THERMOPLASTIC RECTANGULAR CONSTRUCTION, WHITE, 120-277V INPUT, SQUARE DISTRIBUTION. LIGHTALARMS #RP W SQ	RECESSED	3

Electrical Symbol List

SYMBOL	DESCRIPTION
S	SINGLE POLE SWITCH
S2	TWO WAY SWITCH
S3	THREE WAY SWITCH
SOS	WALL MOUNTED OCCUPANCY SENSOR WITH ON/OFF RAISE LOWER CONTROL. TOILET ROOMS OPERATE THE ROOM LIGHTING AND EXHAUST
	CEILING MOUNTED OCCUPANCY SENSOR
SL	LIGHTING CONTROL STATION WITH ON/OF, RAISE LOWER CONTROL (DIMMING)
	SURFACE MOUNTED LIGHTING FIXTURE
	4' LINEAR PENDANT MOUNTED LIGHTING FIXTURE
	RECESSED LIGHT FIXTURE 2'X4'
	RECESSED LIGHT FIXTURE 2'X2'
	DOWNLIGHT FIXTURE
	WALL MOUNTED FIXTURE
	SINGLE FACE EXIT LIGHT
	DOUBLE FACE EXIT LIGHT
	DOUBLE FACE EXIT LIGHT
	COMBINATION EXIT LIGHT AND EMERGENCY BATTERY UNIT
	OCCUPANCY SENSOR - CEILING / WALL MOUNTED (TYPE AS NOTED)
	EMERGENCY BATTERY UNIT
	DUAL HEAD REMOTE
	RECESSED EMERGENCY BATTERY UNIT
	FLOODLIGHT
	TELE / DATA OUTLET
	DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE
	ABOVE COUNTER DUPLEX RECEPTACLE
	SPECIAL PURPOSE RECEPTACLE
	ELECTRICAL PANEL
	SINGLE PHASE MOTOR
	THREE PHASE MOTOR
	DISCONNECT SWITCH
	JUNCTION BOX
SD	FIRE ALARM SMOKE DETECTOR
GFI	GROUND FAULT INTERRUPTER
WP GFI	WEATHERPROOF / GROUND FAULT
NL	NIGHT LIGHT

SHEET INDEX

E0-01 SHEET INDEX, SYMBOL LIST, RISER DIAGRAM, LIGHTING FIXTURE SCHEDULE
E1-01 SPECIFICATIONS
E1-02 SPECIFICATIONS
E2-01 DEMOLITION PLANS
E3-01 NEW WORK PLANS - BASEMENT & FIRST FLOOR
E3-02 NEW WORK PLAN - SECOND FLOOR
E6-01 PANEL SCHEDULES

LIGHTING CONTROL NOTES:

1. THE LIGHTING CONTROLS SHALL COMPLY WITH THE 2021 MICHIGAN ENERGY CODE.
2. DEVICES SHOWN ARE FOR CONCEPT ONLY. REFER TO DEVICE INSTALLATION INSTRUCTIONS FOR EXACT DEVICE PLACEMENT.
3. TO PREVENT FALSE ACTIVATION ULTRASONIC CEILING MOUNTED SENSORS SHOULD BE MOUNTED AWAY FROM THE PATH OF STRONG AIR TURBULENCE. IN NORMAL AIRFLOW CONDITIONS, SENSORS SHOULD BE MOUNTED FOUR TO SIX FEET AWAY FROM THE SOURCE. FOR TYPICAL PLACEMENT REFER TO MANUFACTURERS LOCATION DIAGRAMS. IN LOCATIONS WITH STRONG AIR TURBULENCE A PIR CEILING SENSOR SHOULD BE CONSIDERED.
4. ALL STAND ALONE CEILING MOUNTED VACANCY AND OCCUPANCY SENSORS SHALL BE PROVIDED WITH A HEAVY DUTY SWITCH PACK.
5. MULTIPLE SENSORS IN A ROOM AND/OR CORRIDOR SHALL BE DAISY-CHAINED.
6. AUTOMATIC OFF SHALL BE SET TO AUTOMATICALLY TIME OUT WITHIN 20 MINUTES OF ALL OCCUPANTS LEAVING THE SPACE.
7. FINAL LOCATION OF LIGHTING CONTROL DEVICES SHALL BE BASED ON MANUFACTURER'S RECOMMENDATION AND COVERAGE PATTERN.
8. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR PROPER TIME DELAY AND SENSITIVITY ADJUSTMENTS WHEN APPLICABLE.
9. ASHRAE 90.1 2013, 9.4.3 FUNCTIONAL TESTING: LIGHTING CONTROL DEVICES AND CONTROL SYSTEMS SHALL BE TESTED TO ENSURE THAT CONTROL HARDWARE AND SOFTWARE ARE CALIBRATED, ADJUSTED, PROGRAMMED, AND IN PROPER WORKING CONDITION IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS AND MANUFACTURER'S INSTALLATION INSTRUCTIONS. THE THE INDIVIDUAL(S) RESPONSIBLE FOR THE FUNCTIONAL TESTING SHALL NOT BE DIRECTLY INVOLVED IN EITHER THE DESIGN OR CONSTRUCTION OF THE PROJECT AND SHALL PROVIDE DOCUMENTATION CERTIFYING THAT THE INSTALLED LIGHTING CONTROLS MEET OR EXCEED ALL DOCUMENTED PERFORMANCE CRITERIA.
10. THE ELECTRICAL CONTRACTOR TO INCLUDE TIME FOR SITE VISIT FOR FINAL CALIBRATION OF ALL OCCUPANCY SENSORS AND START UP.

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PROJECT NAME:

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PRESQUE ISLE COUNTY
ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	BLD
CHECKED BY:	JWF

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/08/24
CD's PROGRESS	09/30/24
BIDS AN PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: **SHEET INDEX, SYMBOL LIST, RISER DIAG., LTG. FIX. SCH.**

SHEET NO.: **E0-01**

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
C. Metal-clad cable is permitted only as follows:
  1. Where not otherwise restricted, may be used:
    a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      1) Maximum Length: 6 feet (1.8 m).

CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
D. Comply with NEMA WC 70.
E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
G. Conductor Material:
  1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
  3. Tinned Copper Conductors: Comply with ASTM B33.
H. Minimum Conductor Size:
  1. Branch Circuits: 12 AWG.
    a. Exceptions:
      1) 20 A, 120 V circuits longer than 100 feet (23 m): 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
  2. Control Circuits: 14 AWG.
I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
J. Conductor Color Coding:
  1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  2. Color Coding Method: Integrally colored insulation.
  3. Color Code:
    a. Equipment Ground, All Systems: Green.
    b. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
    c. For control circuits, comply with manufacturer's recommended color code.

SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
  1. Copper Building Wire:
    a. Cerro Wire LLC: www.cerrowire.com.
    b. Encore Wire Corporation: www.encorewire.com.
    c. General Cable Technologies Corporation;
    d. Southwire Company: www.southwire.com.
B. Description: Single conductor insulated wire.
C. Conductor Stranding:
  1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation:
  1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

METAL-CLAD CABLE

A. Manufacturers:
  1. AFC Cable Systems Inc:
  2. Encore Wire Corporation:
  3. Southwire Company:
B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
C. Conductor Stranding:
  1. Size 10 AWG and Smaller: Solid.
  2. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
F. Grounding: Full-size integral equipment grounding conductor.
G. Armor: Steel, interlocked tape.

WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

WIRING ACCESSORIES

A. Electrical Tape:
  1. Manufacturers:
    a. 3M: www.3m.com.
    b. Plymouth Rubber Europa: www.plymouthrubber.com.
  2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
  5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
D. Cable Ties: Material and tensile strength rating suitable for application.

INSTALLATION

A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. Arrange circuiting to minimize splices.
  3. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
  4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
    a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    b. Increase size of conductors as required to account for ampacity derating.
    c. Size raceways, boxes, etc. to accommodate conductors.
  6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Install metal-clad cable (Type MC) in accordance with NECA 120.
E. Installation in Raceway:
  1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
G. Terminate cables using suitable fittings.
  1. Metal-Clad Cable (Type MC):
    a. Use listed fittings.
    b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
H. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
I. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
J. Insulate ends of spare conductors using vinyl insulating electrical tape.
K. Install firestopping to preserve fire resistance rating of partitions and other elements.
L. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
D. Bonding and Equipment Grounding:
  1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal air ducts.
E. Communications Systems Grounding and Bonding:
  1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

GROUNDING AND BONDING COMPONENTS

A. General Requirements:
  1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  2. Provide products listed and labeled as complying with UL 467 where applicable.
B. Conductors for Grounding and Bonding:
  1. Use insulated copper conductors unless otherwise indicated.
C. Connectors for Grounding and Bonding:
  1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
D. Ground Bars:
  1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  2. Size: As indicated.
  3. Holes for Connections: As indicated or as required for connections to be made.

EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as indicated.
C. Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
D. Identify grounding and bonding system components.

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
  1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2X. Include consideration for vibration, equipment operation, and shock loads where applicable.
  4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
  5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
A. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  2. Conduit Clamps: Bolted type unless otherwise indicated.
B. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
C. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  1. Comply with MFMA-4.
  2. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
  1. Minimum Size, Unless Otherwise Indicated or Required:
    a. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
    b. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
    c. Outlet Boxes: 1/4 inch (6 mm) diameter.
    d. Luminaires: 1/4 inch (6 mm) diameter.
F. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  3. Hollow Masonry: Use toggle bolts.
  4. Hollow Stud Walls: Use toggle bolts.
  5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  6. Sheet Metal: Use sheet metal screws.

EXAMINATION

A. Verify that mounting surfaces are ready to receive support and attachment components.
B. Verify that conditions are satisfactory for installation prior to starting work.

INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support ystem or ceiling grid.
E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
G. Equipment Support and Attachment:
  1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
H. Secure fasteners according to manufacturer's recommended torque settings.
I. Remove temporary supports.

CONDUIT FOR ELECTRICAL SYSTEMS

CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
C. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
I. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC).
J. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
  1. Maximum Length: 6 feet (1.8 m).
K. Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit.
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    a. Transformers.
    b. Motors.
L. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.
D. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4 inch (21 mm) trade size.
  2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  3. Control Circuits: 1/2 inch (16 mm) trade size.
  4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
B. Fittings:
  1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.

LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.

ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
B. Fittings:
  1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use compression (gland) or set-screw type.
    a. Do not use indenter type connectors and couplings.

ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
B. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
C. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
E. Install intermediate metal conduit (IMC) in accordance with NECA 101.
F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
G. Conduit Support:
  1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
H. Connections and Terminations:
  1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
I. Penetrations:
  1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  8. Install firestopping to preserve fire resistance rating of partitions and other elements
J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
L. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

BOXES FOR ELECTRICAL SYSTEMS

BOXES

A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
  1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  12. Minimum Box Size, Unless Otherwise Indicated:
    a. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.

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CONSULTANT:

IRON CORE ENGINEERING

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS
PRESQUE ISLE COUNTY ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○
DRAWN BY:	BLD
CHECKED BY:	JWF

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: **SPECIFICATIONS**

SHEET NO.: **E1-01**

A. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
   a. Indoor Clean, Dry Locations: Type 1, painted steel.
   b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
F. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
G. Install boxes plumb and level.
H. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.epair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
I. Install boxes as required to preserve insulation integrity.
J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
K. Install firestopping to preserve fire resistance rating of partitions and other elements.
L. Close unused box openings.
M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
N. Provide grounding and bonding in accordance with Grounding and Bonding.

IDENTIFICATION FOR ELECTRICAL SYSTEMS

IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   a. Panelboards:
      1) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
   b. Enclosed switches, circuit breakers, and motor controllers:
      1) Identify voltage and phase.
      2) Identify power source and circuit number. Include location when not within sight of equipment.
      3) Identify load(s) served. Include location when not within sight of equipment.
2. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
3. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less:
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
   a. Within boxes when more than one circuit is present.

C. Identification for Boxes:
1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.

D. Identification for Devices:
1. Use identification label to identify fire alarm system devices.
   a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
   a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. Equipment Designation: 1/2 inch (13 mm).
5. Color:
   a. Normal Power System: White text on black background.

D. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

E. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
C. Legend: Power source and circuit number or other designation indicated.
D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
E. Minimum Text Height: 1/8 inch (3 mm).
F. Color: Black text on white background unless otherwise indicated.

INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Interior Components: Legible from the point of access.
6. Boxes: Outside face of cover.
7. Conductors and Cables: Legible from the point of access.
8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
F. Mark all handwritten text, where permitted, to be neat and legible.

LIGHTING CONTROL DEVICES

SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
2. Manufacturer's plan layout or devices.
B. Field Quality Control Reports.
B. Project Record Documents: Record actual installed locations and settings for lighting control devices.

LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

OCCUPANCY SENSORS

A. All Occupancy Sensors:
1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
   b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
   c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
   d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Wall Dimmer Occupancy Sensors:
1. General Requirements:
   a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
   b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

C. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
   b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
   c. Provide field selectable setting for disabling LED motion detector visual indicator.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 square meters) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet (46.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

D. Power Packs for Low Voltage Occupancy Sensors:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.

DAYLIGHTING CONTROLS

A. Manufacturers:
B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
1. Sensor Type: Filtered silicon photo diode.
2. Sensor Range:
   a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
3. Finish: White unless otherwise indicated.
D. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
3. Control Capability:
   a. Single Zone Switching Modules: Capable of controlling one programmable channel.
E. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
F. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
2. Input Supply Voltage: Dual rated for 120/277 V ac.

CONTROL ACCESSORIES

A. Auxiliary Contacts:
1. Comply with NEMA ICS 5.
2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
C. Install lighting control devices in accordance with manufacturer's instructions.
D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
E. Install lighting control devices plumb and level, and held securely in place.
F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
G. Provide required supports.
H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
I. Occupancy Sensor Locations:
1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
J. Daylighting Control Photo Sensor Locations:
1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.

FIELD QUALITY CONTROL

A. Inspect each lighting control device for damage and defects.
B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
C. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

ADJUSTING

A. Adjust devices and wall plates to be flush and level.
B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.

PANELBOARDS

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation;
B. Schneider Electric; Square D Products;
C. Siemens Industry, Inc;
D. ABB

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:
   a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
C. Short Circuit Current Rating:
1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
G. Conductor Terminations: Suitable for use with the conductors to be installed.
H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
2. Boxes: Galvanized steel unless otherwise indicated
   a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
   a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
   b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
B. Conductor Terminations:
1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
2. Main and Neutral Lug Type: Mechanical.
C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.
D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
E. Enclosures:
1. Provide surface-mounted or flush-mounted enclosures as indicated.
2. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required support and attachment.
F. Install panelboards plumb.
G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
J. Provide grounding and bonding.
K. Install all field-installed branch devices, components, and accessories.
L. Provide filler plates to cover unused spaces in panelboards.

3.02 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
B. Adjust alignment of panelboard fronts.

WIRING DEVICES

SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.
B. Wiring Devices, Unless Otherwise Indicated: White with stainless steel wall plate. Confirm colors with existing.

WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
B. Control: Slide control type with separate on/off switch.
C. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.
3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.
B. Convenience Receptacles:
1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
3. Tamper Resistant Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
C. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
D. USB Charging Devices:
1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
   a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type A) USB charging device and receptacle, commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

WALL PLATES

A. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard
3. Screws: Metal with slotted heads finished to match wall plate finish.
B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
C. Install wiring devices in accordance with manufacturer's instructions.
D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on

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IRON CORE ENGINEERING

PROJECT NAME:

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PRESQUE ISLE COUNTY ANNEX COURT BLDG.
151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
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BIDS & PERMITS	●
CONSTRUCTION	○
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CHECKED BY:	JWF

REVISIONS:

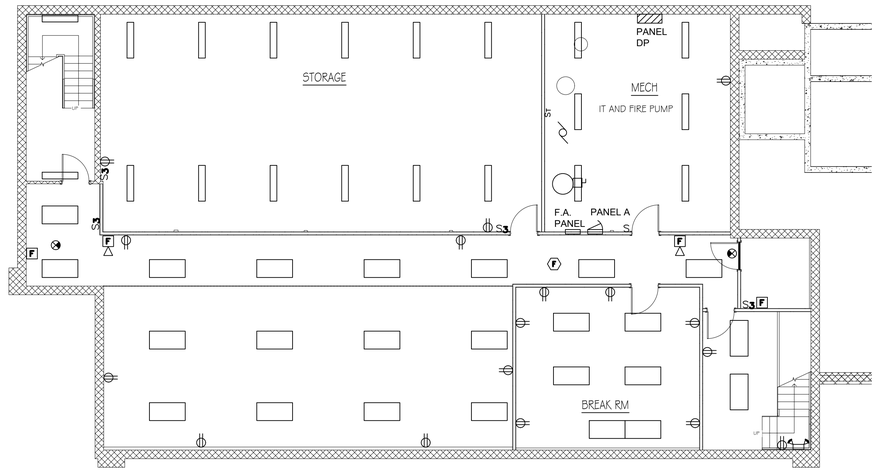
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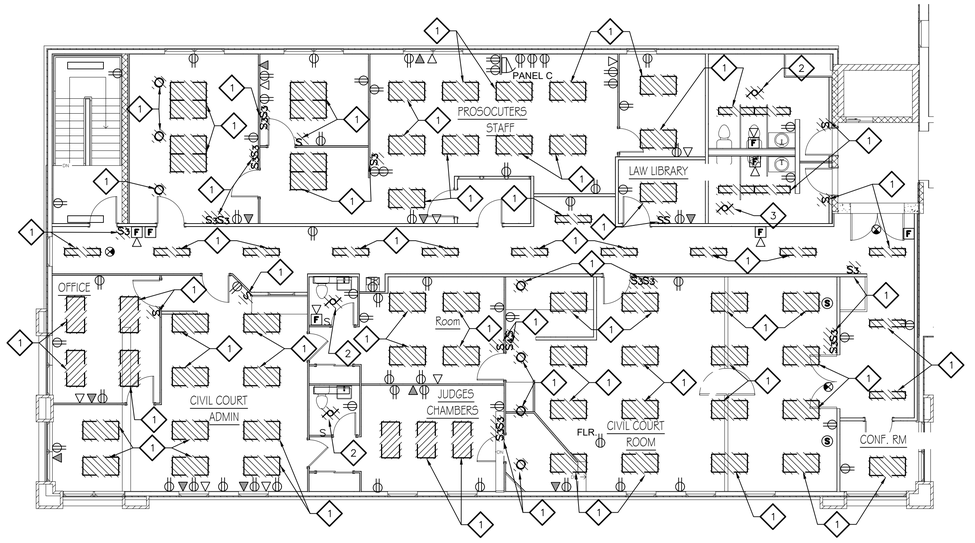
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SHEET NO.: **E1-02**



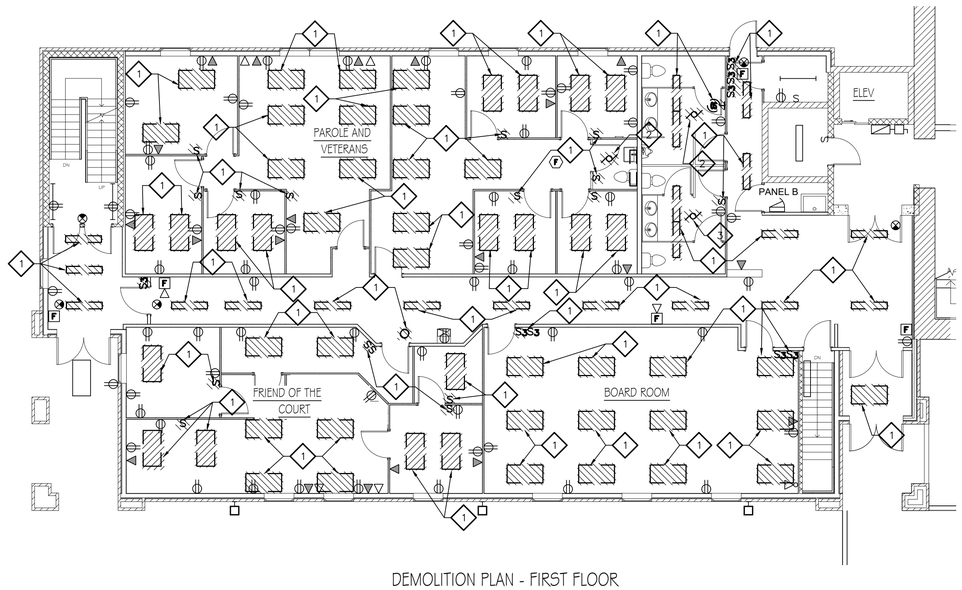
DEMOLITION PLAN - BASEMENT

1/8" = 1'-0"



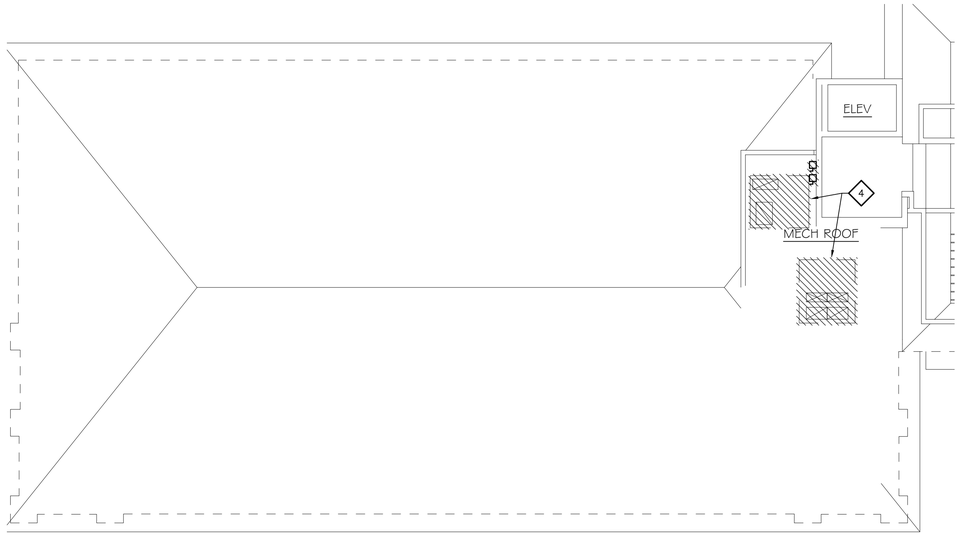
DEMOLITION PLAN - SECOND FLOOR

1/8" = 1'-0"



DEMOLITION PLAN - FIRST FLOOR

1/8" = 1'-0"



DEMOLITION PLAN - ATTIC / ROOF

1/8" = 1'-0"

Demolition Keyed Notes:

(SEE PLAN FOR APPLICABLE NOTES)

1. DISCONNECT, AND REMOVE LIGHTING COMPLETE INCLUDING LIGHTING FIXTURE, LIGHTING CONTROLS, FIXTURE WHIPS AND BRANCH CIRCUITS BACK TO NEAREST JUNCTION BOX TO REMAIN. MAINTAIN BRANCH CIRCUITS TO SERVE NEW LED LIGHTING.
2. EXHAUST FAN TO BE REMOVED AND REPLACED. REWORK BRANCH CIRCUIT WIRING TO ACCOMMODATE INTERLOCKS PER THE MECHANICAL CONTROL REQUIREMENTS. REFER TO MECHANICAL DRAWINGS.
3. EXHAUST FAN TO BE REMOVED. REMOVE BRANCH CIRCUIT WIRING COMPLETE BACK TO SOURCE, EXCEPT WHERE CIRCUIT IS SHARED WITH EQUIPMENT TO REMAIN IN SERVICE.
4. REMOVE BRANCH CIRCUIT TO RTU COMPLETE BACK TO SOURCE. REFER TO ONE LINE DIAGRAM ON SHEET E0-01 FOR DEMOLITION, NEW WORK ON CIRCUIT.

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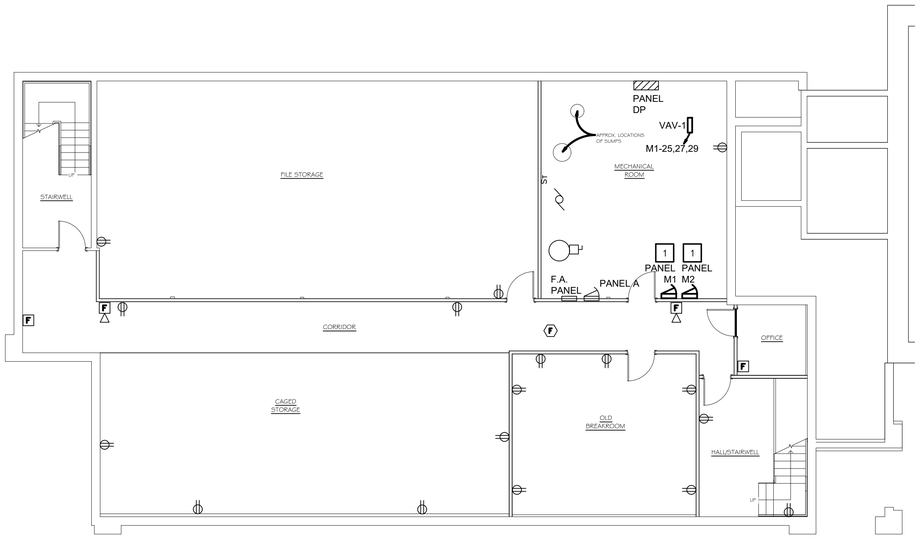
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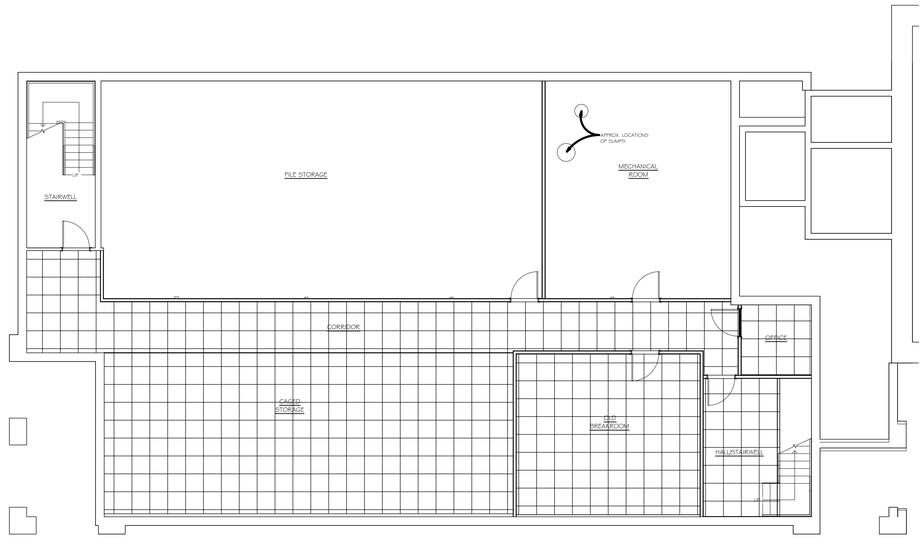
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SHEET NO.: **E2-01**



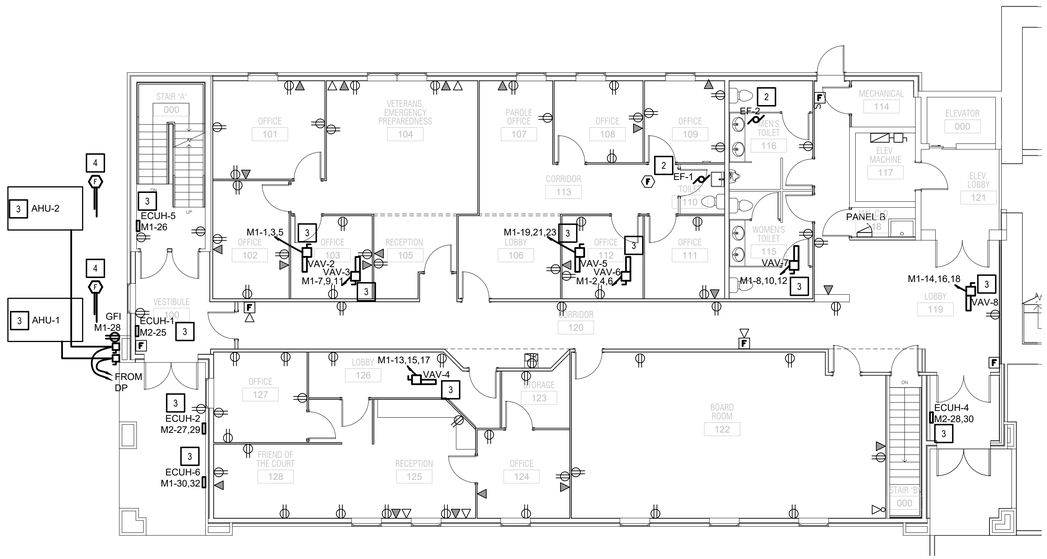
NEW WORK PLAN - BASEMENT - POWER & SIGNAL

1/8" = 1'-0"



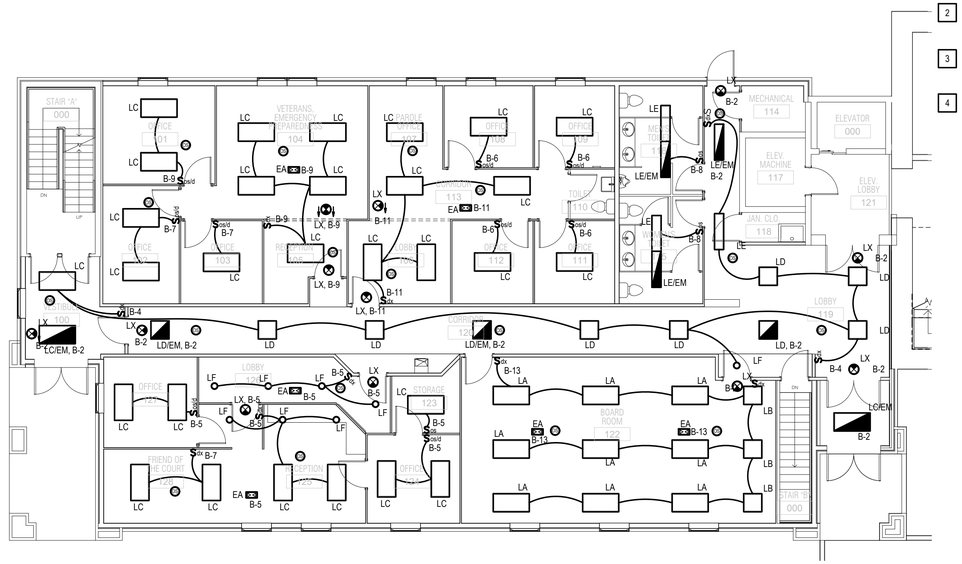
NEW WORK PLAN - BASEMENT - LIGHTING

1/8" = 1'-0"



NEW WORK PLAN - FIRST FLOOR - POWER & SIGNAL

1/8" = 1'-0"



NEW WORK PLAN - FIRST FLOOR - LIGHTING

1/8" = 1'-0"

SHEET NOTES:

1. COORDINATE ALL ELECTRICAL WORK REQUIRED WITH ARCHITECTURAL, MECHANICAL DRAWINGS, DETAILS, ELEVATIONS, AND DIAGRAMS.
2. THE ELECTRICAL CONTRACTOR SHALL VISIT THE JOB SITE BEFORE SUBMITTING BIDS TO BECOME FAMILIARIZED WITH ACTUAL JOB CONDITIONS AND AREA OF WORK.
3. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT LOCATION OF LIGHTING FIXTURES (NORMAL, EXIT, AND EMERGENCY EGRESS).
4. ALL ELECTRICAL ITEMS SHOWN ARE NEW UNLESS OTHERWISE NOTED.
5. ALL ELECTRICAL MATERIALS SHALL BE NEW AND BEAR THE "UL" LABEL OR LISTING.
6. ALL ELECTRICAL ITEMS SHOWN SHALL BE PROVIDED, AND INSTALLED. (AS INDICATED) BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.
7. BRANCH CIRCUIT WIRING SHALL BE "THHN/THWN", UNLESS NOTED ON PLANS.
8. ALL BRANCH CIRCUITS SHALL BE COPPER, 20A-1P AND WIRED WITH 2#12+1#12GRD IN A MINIMUM 3/4"C, UNLESS OTHERWISE NOTED. PROVIDE #10WIRE FOR ALL CIRCUITS OVER 100'-0" FROM THE RESPECTIVE PANEL.
9. INSTALL ALL CONDUITS WITHIN FINISHED AREAS OF THE BUILDING "CONCEALED", UNLESS SPECIFIC APPROVAL IS RECEIVED FROM THE OWNER OR ARCHITECT TO INSTALL CONDUITS EXPOSED. ALL CUTTING, CORING, PAINTING AND PATCHING OF BUILDING CONSTRUCTION (TO ACCOMMODATE INSTALLATION OF NEW ELECTRICAL ITEMS) SHALL BE DONE BY THE CONTRACTOR, PATCHING SHALL MATCH BUILDING CONSTRUCTION.
10. SEAL ALL CEILING, WALL, AND FLOOR PENETRATIONS WITH APPROVED MATERIAL TO MAINTAIN ALL REQUIRED RATINGS.
11. COORDINATE ALL FLOOR CORE LOCATIONS WITH STRUCTURAL MEMBERS.
12. ALL LIGHTING CONTROLS SHALL COMPLY WITH THE 2021 MICHIGAN ENERGY CODE.
13. UPDATE ALL PANEL DIRECTORIES UPON COMPLETION OF WORK.

New Work Keyed Notes:

(SEE PLAN FOR APPLICABLE NOTES)

1. PROVIDE PANELBOARD AND FEEDER PER ONE LINE DIAGRAM ON SHEET E0-01, AND PANELBOARD SCHEDULE ON SHEET E6-01.
2. REWORK EXISTING EXHAUST FAN BRANCH CIRCUIT TO ACCOMMODATE CONTROL INTERLOCK REQUIREMENTS TO NEW EXHAUST FAN. REFER TO MECHANICAL DRAWINGS.
3. PROVIDE NEW BRANCH CIRCUIT TO MECHANICAL EQUIPMENT. REFER TO PANEL SCHEDULES ON SHEET E6-01 AND ONE LINE DIAGRAM ON SHEET E0-01.
4. PROVIDE RETURN DUCT SMOKE DETECTOR, RATED FOR ENVIRONMENT WHERE IT IS INSTALLED. EXTEND FIRE ALARM INITIATION CIRCUIT AND PROVIDE FIRE ALARM SYSTEM PROGRAMMING AND SYSTEM TESTING.

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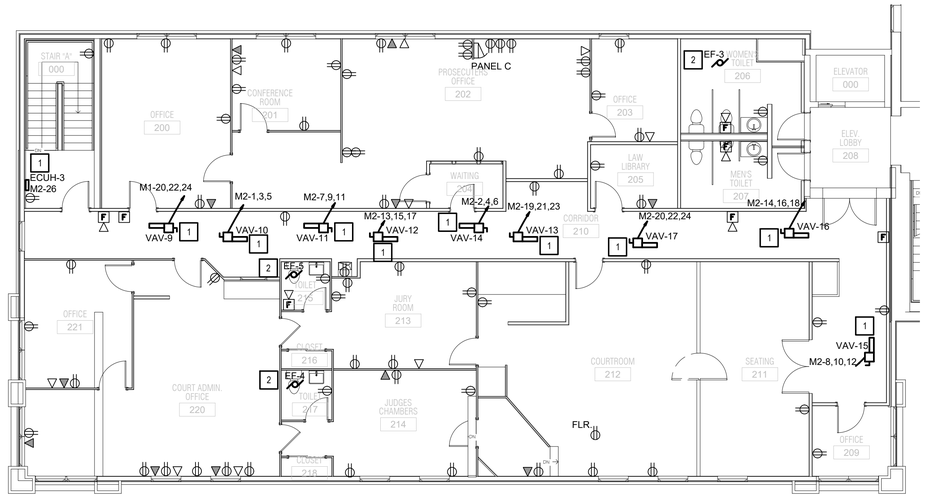
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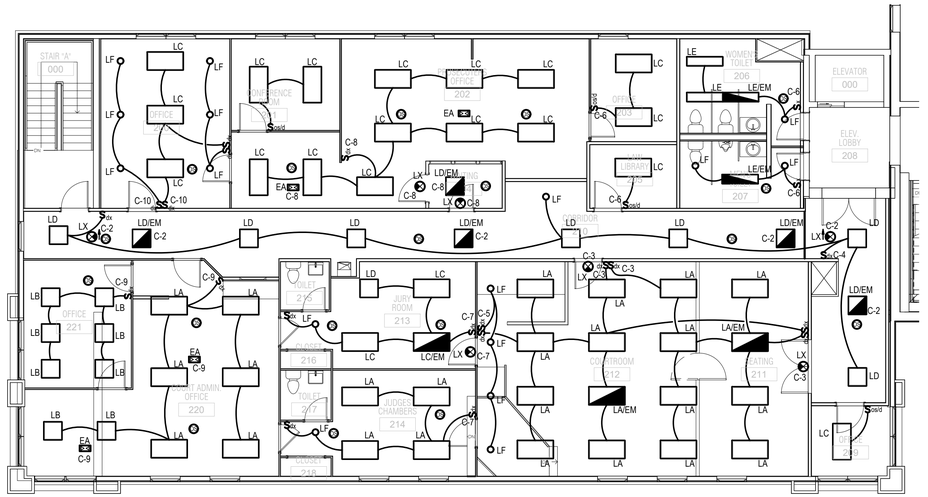
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SHEET NO.: **E3-01**



NEW WORK PLAN - SECOND FLOOR - POWER & SIGNAL

1/8" = 1'-0"



NEW WORK PLAN - SECOND FLOOR - LIGHTING

1/8" = 1'-0"

SHEET NOTES:

1. COORDINATE ALL ELECTRICAL WORK REQUIRED WITH ARCHITECTURAL, MECHANICAL DRAWINGS, DETAILS, ELEVATIONS, AND DIAGRAMS.
2. THE ELECTRICAL CONTRACTOR SHALL VISIT THE JOB SITE BEFORE SUBMITTING BIDS TO BECOME FAMILIARIZED WITH ACTUAL JOB CONDITIONS AND AREA OF WORK.
3. REFER TO ARCHITECTURAL REFLECTED CEILING PLAN FOR EXACT LOCATION OF LIGHTING FIXTURES (NORMAL, EXIT, AND EMERGENCY EGRESS).
4. ALL ELECTRICAL ITEMS SHOWN ARE NEW UNLESS OTHERWISE NOTED.
5. ALL ELECTRICAL MATERIALS SHALL BE NEW AND BEAR THE "UL" LABEL OR LISTING.
6. ALL ELECTRICAL ITEMS SHOWN SHALL BE PROVIDED, AND INSTALLED. (AS INDICATED) BY THE ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.
7. BRANCH CIRCUIT WIRING SHALL BE "THHN/THWN", UNLESS NOTED ON PLANS.
8. ALL BRANCH CIRCUITS SHALL BE COPPER, 20A-1P AND WIRED WITH 2#12+1#12GRD IN A MINIMUM $\frac{3}{4}$"C, UNLESS OTHERWISE NOTED. PROVIDE #10WIRE FOR ALL CIRCUITS OVER 100'-0" FROM THE RESPECTIVE PANEL.
9. INSTALL ALL CONDUITS WITHIN FINISHED AREAS OF THE BUILDING "CONCEALED", UNLESS SPECIFIC APPROVAL IS RECEIVED FROM THE OWNER OR ARCHITECT TO INSTALL CONDUITS EXPOSED. ALL CUTTING, CORING, PAINTING AND PATCHING OF BUILDING CONSTRUCTION (TO ACCOMMODATE INSTALLATION OF NEW ELECTRICAL ITEMS) SHALL BE DONE BY THE CONTRACTOR, PATCHING SHALL MATCH BUILDING CONSTRUCTION.
10. SEAL ALL CEILING, WALL, AND FLOOR PENETRATIONS WITH APPROVED MATERIAL TO MAINTAIN ALL REQUIRED RATINGS.
11. COORDINATE ALL FLOOR CORE LOCATIONS WITH STRUCTURAL MEMBERS.
12. ALL LIGHTING CONTROLS SHALL COMPLY WITH THE 2021 MICHIGAN ENERGY CODE.
13. UPDATE ALL PANEL DIRECTORIES UPON COMPLETION OF WORK.

New Work Keyed Notes:

(SEE PLAN FOR APPLICABLE NOTES)

1. PROVIDE NEW BRANCH CIRCUIT TO MECHANICAL EQUIPMENT. REFER TO PANEL SCHEDULES ON SHEET E6-01 AND ONE LINE DIAGRAM ON SHEET E0-01.
2. REWORK EXISTING EXHAUST FAN BRANCH CIRCUIT TO ACCOMMODATE CONTROL INTERLOCK REQUIREMENTS TO NEW EXHAUST FAN. REFER TO MECHANICAL DRAWINGS.

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CONSULTANT:

IRON CORE ENGINEERING

PROJECT NAME:

HVAC, ROOF and BLDG. RENOVATION and MODIFICATIONS

PRESQUE ISLE COUNTY
ANNEX COURT BLDG.

151 E. HURON AVE., ROGERS CITY, MI 49779

DESIGN DEVELOPMENT	●
CONSTRUCTION DOC.'S	●
BIDS & PERMITS	●
CONSTRUCTION	○

DRAWN BY:	BLD
CHECKED BY:	JWF

REVISIONS:

SCHEMATIC DESIGN	05/09/24
DESIGN DEVELOPMENT	08/06/24
CD's PROGRESS	09/30/24
BIDS AND PERMITS	04/15/25

DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: **NEW WORK PLAN - SECOND FLOOR**

SHEET NO.: **E3-02**

Panelboard:	Panel A (Existing Panel)			Location:	Basement Electrical Room		
Voltage:	120/208Y			Source:	DP		
Bus Amperage:	100A			AIC:	10kA		
Main Breaker:				Available SCC	7.59kA		

Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	20A-1P	Lighting - Janitor	820	L	2	20A-1P	Nite Lights, Exit Stair B	400	L
3	20A-1P	Lighting - New Storage	1088	L	4	20A-1P	Lighting - Stair A	320	L
5	20A-1P	Recept. - Storage, Corridor	900	R	6	20A-1P	Lighting - Corridor	320	L
7	20A-1P	Recept. - Janitor	360	R	8	20A-1P	Lighting - Mechanical Room	384	L
9	20A-1P	Recept. - Janitor	360	R	10	20A-1P	Lighting - Storage	1152	L
11	20A-1P	Recept. - Janitor	360	R	12	20A-1P	Telephone Equipment	800	M
13	20A-1P	Sump Pump	1200	M	14	20A-1P	Receptacle - Micro Film Rm	360	R
15	20A-1P	Microwave	1200	R	16	20A-1P	Sewege Ejector	1200	M
17	20A-1P	Coffee Pot	800	R	18	20A-1P	Sump Pump	1200	M
19	20A-1P	Spare			20	20A-1P	HW Circ Pump	700	H
21	60A-2P	Water Heater	4500	E	22	20A-1P	Fire Alarm	200	M
23			4500	E	24	20A-1P	Air Compressor	800	M
25	20A-1P	Sprinkler Timer	180	R	26	20A-1P	Lounge Receptacle	180	R
27	20A-1P	Lounge Receptacle	360	R	28	20A-1P	Exhaust Fan	100	H
29	20A-1P	Receptacle - South	360	R	30	20A-1P	Recept. - South Wall	360	R

	Conn. (VA)	Demand (VA)	
Lighting	4484	5605	125%
Receptacle (First 10kVA)	5780	5780	100%
Receptacle	0	0	50%
HVAC	800	560	70%
Miscellaneous	5400	4320	80%
EWH / Electric Heater	9000	11250	125%
Total	25464	27515	76.43 FLA

* GFCI Breaker

Panelboard:	Panel B (Existing Panel)			Location:	Janitor Closet 118 (1st Floor)		
Voltage:	120/208Y			Source:	DP		
Bus Amperage:	100A			AIC:	10kA		
Main Breaker:				Available SCC	5.92kA		

Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	20A-1P	Lighting - Room 122	588	L	2	20A-1P	Nite Lights & Exits	271	L
3	20A-1P	Spare (Was Rm 122 Ltg)			4	20A-1P	Lighting - Corridor	319	L
5	20A-1P	Ltg - Rms 123, 124, 125	345	L	6	20A-1P	Ltg - Rms 108, 109, 111, 112	156	L
7	20A-1P	Ltg - Rms 102, 103, 126, 127	291	L	8	20A-1P	Lighting - Toilets	228	L
9	20A-1P	Ltg - Rms 101, 104, 107	351	L	10	20A-1P	Rcpt - Rms 111, Lobby, Toilet	1260	R
11	20A-1P	Ltg - Rms 105, 106	117	L	12	20A-1P	Rcpt - Rms 108, 109	1260	R
13	20A-1P	Recept. - Room 122	1260	R	14	20A-1P	Rcpt - Rms 106, 107, 112	1440	R
15	20A-1P	Rcpt - Rms 123, 124, 125	1440	R	16	20A-1P	Rcpt - Rms 103, 104	1260	R
17	20A-1P	Rcpt - Rms 126, 127	1440	R	18	20A-1P	Rcpt - Rms 101, 102	1260	R
19	20A-1P	Unknown Load	1000	R	20	20A-1P	Exterior Lighting	364	L
21	20A-1P	Unknown Load	1000	R	22	20A-1P	Unknown Load	1000	R
23	20A-1P	Unknown Load	1000	R	24	20A-1P	Unknown Load	1000	R
25	20A-1P	Unknown Load	1000	R	26	20A-1P	Unknown Load	1000	R
27	20A-1P	Unknown Load	1000	R	28	20A-1P	Unknown Load	1000	R
29	20A-1P	Unknown Load	1000	R	30	20A-1P	Unknown Load	1000	R

	Conn. (VA)	Demand (VA)	
Lighting	2271	2838.75	125%
Receptacle (First 10kVA)	10000	10000	100%
Receptacle	5620	2810	50%
HVAC	0	0	80%
Miscellaneous	0	0	50%
EWH	0	0	125%
Total	17891	15648.8	43.47 FLA

* GFCI Breaker

Panelboard:	Panel C (Existing Panel)			Location:	Prosecuters Office 202 (2nd Floor)		
Voltage:	120/208Y			Source:	DP		
Bus Amperage:	100A			AIC:	10kA		
Main Breaker:				Available SCC	4.82kA		

Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	20A-1P	Lighting - Room 211	832	L	2	20A-1P	Nite Lights & Exits	158	L
3	20A-1P	Spare (Was Rm 212 Ltg)			4	20A-1P	Corridor Lighting	287	L
5	20A-1P	Lighting - Room 212	96	L	6	20A-1P	Lighting - Toilet, Library	239	L
7	20A-1P	Lighting - Rooms 213, 214	605	L	8	20A-1P	Lighting - Rms 202, 203	461	L
9	20A-1P	Lighting - Rooms 220, 221	632	L	10	20A-1P	Lighting - Rms 200, 201	339	L
11	20A-1P	Lighting - Rooms 222, Toilets	300	L	12	20A-1P	Rcpt - Rms 200, 201	1440	R
13	20A-1P	Rcpt - Rooms 213, 214	1440	R	14	20A-1P	Rcpt - Rms 202, 203	1440	R
15	20A-1P	Rcpt - Rooms 213, 214, 220	1260	R	16	20A-1P	Rcpt - Rms 211, 212, Toilet	1440	R
17	20A-1P	Rcpt - Rooms 219, 221, 222	1440	R	18	20A-1P	Rcpt - Roof	180	R
19	20A-1P	Unknown Load	1000	R	20	20A-1P	Court Room Alarm	500	M
21	20A-1P	Unknown Load	1000	R	22	20A-1P	Unknown Load	1000	R
23	20A-1P	Unknown Load	1000	R	24	20A-1P	Unknown Load	1000	R
25	20A-1P	Unknown Load	1000	R	26	20A-1P	Unknown Load	1000	R
27	20A-1P	Unknown Load	1000	R	28	20A-1P	Unknown Load	1000	R
29	20A-1P	Unknown Load	1000	R	30	20A-1P	Unknown Load	1000	R

	Conn. (VA)	Demand (VA)	
Lighting	2412	3015	125%
Receptacle (First 10kVA)	10000	10000	100%
Receptacle	3640	1820	50%
HVAC	0	0	125%
Miscellaneous	500	500	100%
EWH	0	0	125%
Total	16552	15335	42.60 FLA

* GFCI Breaker

Panelboard:	Panel M1 (New Panel)			Location:	Basement Electrical Room		
Voltage:	120/208Y			Source:	DP		
Bus Amperage:	125A			AIC:	10kA		
Main Breaker:				Available SCC	7.59kA		

Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	20A-3P	VAV-2	1467	H	2	15A-3P	VAV-6	1300	H
3			1466	H	4			1300	H
5			1466	H	6			1300	H
7	15A-3P	VAV-3	900	H	8	25A-3P	VAV-7	1834	H
9			900	H	10			1833	H
11			900	H	12			1833	H
13	20A-1P	VAV-4	1567	H	14	25A-3P	VAV-8	1767	H
15			1566	H	16			1767	H
17			1566	H	18			1766	H
19	15A-3P	VAV-5	834	H	20	25A-3P	VAV-9	2134	H
21			833	H	22			2133	H
23			833	H	24			2133	H
25	25A-3P	VAV-1	1834	H	26	20A-1P	ECUH-5	1000	E
27			1833	H	28	20A-1P*	AHU Receptacle	180	R
29			1833	H	30	20A-2P	ECUH-6	1125	E
		Integral Surge Protective Device			32			1125	E
					34		Space		
					36		Space		
					38		Space		
					40		Space		
					42		Space		

	Conn. (VA)	Demand (VA)	
Lighting	0	0	125%
Receptacle (First 10kVA)	180	180	100%
Receptacle	0	0	50%
HVAC	40898	24538.8	60%
Miscellaneous	0	0	50%
EWH	3250	4062.5	125%
Total	44328	28781.3	79.95 FLA

* GFCI Breaker

Panelboard:	Panel M2 (New Panel)			Location:	Basement Electrical Room		
Voltage:	120/208Y			Source:	DP		
Bus Amperage:	125A			AIC:	10kA		
Main Breaker:				Available SCC	7.59kA		

Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type	Circuit	Breaker (Amps)	Load	Connected Load (VA)	Load Type
1	30A-3P	VAV-10	2400	H	2	20A-3P	VAV-14	1467	H
3			2400	H	4			1466	H
5			2400	H	6			1467	H
7	15A-1P	VAV-11	734	H	8	15A-3P	VAV-15	1200	H
9			733	H	10			1200	H
11			733	H	12			1200	H
13	15A-3P	VAV-12	567	H	14	15A-3P	VAV-16	1200	H
15			566	H	16			1200	H
17			567	H	18			1200	H
19	15A-3P	VAV-13	933	H	20	25A-3P	VAV-17	2033	H
21			933	H	22			2033	H
23			934	H	24			2034	H
25	20A-1P	ECUH-1	1000	E	26	20A-1P	ECUH-3	1000	E
27	20A-2P	ECUH-2	1125	E	28	20A-2P	ECUH-4	1125	E
29			1125	E	30			1125	E
		Integral Surge Protective Device			32	20A-2P	Spare		
					34				
					36	20A-1P	Spare		
					38		Space		
					40		Space		
					42		Space		

	Conn. (VA)	Demand (VA)	
Lighting	0	0	125%
Receptacle (First 10kVA)	0	0	100%
Receptacle	0	0	50%
HVAC	31600	18960	60%
Miscellaneous	0	0	50%
EWH / Space Heater	6500	8125	125%
Total	38100	27085	75.24 FLA

* GFCI Breaker

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DATE: 8 APRIL 2024

PROJECT NO.: 24-028

DRAWING NAME: **PANEL SCHEDULES**

SHEET NO.: **E6-01**