STATE OF ALASKA

DEPARTMENT OF PUBLIC SAFETY

CONTRACT DOCUMENTS AND SPECIFICATIONS

As Advertised: April 2, 2023

Project 23ABI0402A ABI HVAC

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STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

INVITATION TO BID

for Construction Contract

April 2, 2023

23ABI0402A ABI HVAC

Project Name and Number

The Department invites bidders to submit bids for furnishing all labor, equipment, and materials and performing all work for the project described below. The Department will only consider bids received **before 2:00 PM local time (per the Department's time source) on the 26th day of April 2023.** On that date, the Department will assemble, open, and then publicly announce the timely-received bids at 4805 Dr. MLK Junior Avenue, at 2:30 PM, or as soon thereafter as practicable.

Location of Project: 5500 East Tudor Road, Anchorage, Alaska 99507

Contracting Officer: Johann Mueller

Issuing Office: DPS Division of Administrative Services Supply Section

State Funded ☒ Federal Aid ☐

Description of Work:
This project involves the removal and replacement of the HVAC and chiller system. The complete scope of work is outlined in Exhibit A and Exhibit B.

All work shall be substantially completed by **July 31, 2023**.
Any changes to the completion date must be agreed upon and approved by the Department of Public Safety (DPS).
The Department will identify interim completion dates, if any, in the Special Provisions.

The apparent successful bidder must furnish a payment bond in the amount of 100% of the contract and a performance bond in the amount of 100% of the contract as security conditioned for the full, complete and faithful performance of the contract. The apparent successful bidder must execute the said contract and bonds within fifteen calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of their bid.

Submission of Bidding Documents

Bidders may submit bidding documents electronically via the DPS.DAS.Solicitations@alaska.gov group email, through the mail or hand delivered. For mailed or hand delivered bids and for electronically submitted bids with a paper bid guaranty, documents shall be submitted in a sealed envelope marked as follows:

Bidding Documents for Project: 23ABI0402A ABI HVAC	ATTN: State of Alaska Department of Public Safety Johann Mueller, Building Management Specialist

It is incumbent upon the bidder to ensure its bid, any amendments, and/or withdrawal arrive, in its entirety, at the location and before the deadline stated above. A bidder sending a bid amendment or withdrawal via email must transmit its documentation to the Department at this email address: DPS.DAS.Solicitations@alaska.gov.

To be responsive, a bid must include a bid guaranty equal to 5% of the amount bid. (*When calculating the bid amount for purposes of determining the 5% value of the bid guaranty, a bidder shall include its base bid amount, plus the amount bid for alternate and supplemental bid items, if any.)*

The Department hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this Invitation, Disadvantaged Business Enterprises will be afforded full opportunity to submit bids and will not be discriminated against on the grounds of race, color, national origin, or sex in consideration for an award.

NOTICE TO BIDDERS

The following data may assist a bidder in preparing its bid:

If you received this solicitation from the State of Alaska's "Online Public Notice" web site, you must register with the procurement officer listed below in order to receive notification of subsequent amendments to the solicitation. Failure to register with the procurement officer may result in the rejection of your offer.

Register with Johann Mueller: johann.mueller@alaska.gov Phone: 907.269.0599

The point of contract for inquiries for this project is Johann Mueller.
If a bidder has a question relating to design features, constructability, quantities, or other technical aspects of the project, it may direct its inquiry to Johann Mueller at the contact information below:
Email: johann.mueller@alaska.gov Phone: (907) 269-0599.

A bidder may direct questions concerning bidding procedures and requirements to:
Johann Mueller
Email: johann.mueller@alaska.gov Phone: 907.269.0599.

Other Information:
Email bids are accepted. If submitting a bid via email, the bid may be emailed to DPS.DAS.Solicitations@alaska.gov and must contain the ITB number in the subject line of the email. The maximum size of a single email (including all text and attachments) that can be received by the state is 20mb (megabytes). If the email containing the bid exceeds this size, the bid must be sent in multiple emails that are each less than 20 megabytes and each email must comply with the requirements described above.
Please note that email transmission is not instantaneous. Similar to sending a hard copy bid, if you are emailing your bid, the state recommends sending it enough ahead of time to ensure the email is delivered by the deadline for receipt of bid.
It is the bidder's responsibility to contact the issuing agency at 907.269.0599 to confirm that the bid has been received. The state is not responsible for unreadable, corrupt, or missing attachments.

SPECIAL NOTICE TO BIDDERS

Questions from bidders on this project as associated Department responses will be published as Informational Notice to Bidders.

- **All questions must be submitted in writing in sufficient time to receive a reply prior to submitting a bid** (Reference Standard Specification 102-1.04). Questions submitted within two business days of bid opening may or may not be considered at the Department's discretion. If a significant question is asked just prior to bid opening, the Department will determine whether the issue raised is significant enough to delay the bid opening and issue an addendum or to proceed with the scheduled bid opening.

- Bidders submitting questions will not receive individual responses

- All questions must be submitted to the Construction Manager(s) identified on the Invitation to bid. Questions submitted to the DPS DAS Solicitation email, or a location other than the identified Construction Manager, will not be answered.

- At increments of time determined by the Department, all questions and answers on the project received will be published on the Bid Express website, and as such are not contractual.

- The Department will publish only questions and answers. The Department will not publish contractor's name or contact information.

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

INFORMATION TO BIDDERS

This Information to Bidders outlines requirements that a bidder must follow when submitting a bid. The Department will reject a noncompliant bid.

100.01 BIDDERS QUALIFICATIONS

A bidder shall:

Submit evidence of a valid Department of Commerce, Community, and Economic Development certificate of Contractor Registration (Contractor Registration), under AS 08.18, and submit evidence of a valid Alaska Business License prior to award; and

When requested, submit a completed Contractor's Questionnaire (Form 25D-8) stating previous experience in performing comparable work, business and technical organization, financial resources, and equipment available to be used in performing the work.

Before a bid is considered for award, the bidder may be requested by the Department to submit a statement of facts, in detail, as to his previous experience in performing comparable work, his business and technical organization, financial resources, and plant available to be used in performing the contemplated work.

100.02 CONTENTS OF BID PACKAGE

Upon request, the Department will furnish prospective bidders with a bid package, at the price stated in the Invitation To Bid.

The bid package includes the following:

1) Location and description of the project;

2) Time in which the work must be completed;

3) Amount of the bid guaranty;

4) Date, time, and place when bids are due;

5 Plans and specifications; and

6) Bid forms.

Unless otherwise stated in the bid package, the Plans, Contract Provisions and Specifications, Standard Modifications, Special Provisions, permits, forms and any other documents designated in the bid package are considered a part of the bid whether attached or not.

100.03 EXAMINATION OF CONTRACT REQUIREMENTS

Bidders are responsible for carefully examining the plans, specifications and all other documents incorporated in the contract to determine the requirements thereof before preparing bids.

Any explanation desired by bidders regarding the meaning or interpretation of drawings and specifications must be requested in writing and with sufficient time allowed for a reply to reach them before the submission of their bids. Oral explanations or instructions given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the specifications or drawings and will be furnished to all bidders and its receipt by the bidder shall be acknowledged.

100.04 CONDITIONS AT SITE OF WORK

Bidders are responsible for visiting the site to ascertain pertinent local conditions such as the location, accessibility and character of the site, labor conditions, the character and extent of the existing work within or adjacent thereto, and any other work being performed thereon. The bidder's failure to visit the work site will in no way relieve the bidder of the responsibility of performing the work in strict compliance with the true intent and meaning of the terms, conditions and specifications of this ITB.

A bidder requesting an in person visit to review the project site must make arrangements at lease 48 hours in advance.

The site may be inspecting by contacting Johann Mueller at 907.269.0599 or email at johann.mueller@alaska.gov.

This contact person is only empowered to allow potential bidders to view the work site. The contact person cannot and will not answer potential bidder questions regarding the work to be performed un this ITB or the terms, conditions and specifications of this ITB. Any questions potential bidders have must be directed in writing to the procurement officer.

100.05 PREPARATION OF BIDS

A. A bidder shall prepare its bid using the Department provided bid forms or legible copies of the Department’s forms.

   The bid must be signed in ink by the person or persons authorized to sign the Contract for the bidder. If a bidder is a corporation, the bid must be signed by a corporate officer or agent with authority to bind the corporation. If a bidder is a partnership, a partner must sign. If the bidder is a joint venture, each principal member must sign. If a bidder is a sole proprietorship, the owner must sign. Each person signing the bid must initial any changes made to entries on the bid forms.

B. The bid schedule contains empty space(s) that call for the bidder to enter its proposed price for each corresponding item which may include unit price or lump sum items and alternative, optional or supplemental price schedules or a combination thereof which will result in a total bid amount for the proposed construction.

C. The bidder shall specify the price or prices bid in figures. On unit price contracts the bidder shall also show the products of the respective unit prices and quantities written in figures in the column provided for the purpose and the total amount of the proposal obtained by adding the amounts of the several items. All the figures shall be in ink or typed.

D. Neither conditional nor alternative bids will be considered unless called for.

100.06 BID SECURITY

All bids shall be accompanied by a bid security in the amount specified on the Invitation to Bid. The bid security shall be unconditionally payable to the State of Alaska and shall be in the form of an acceptable Bid Bond (Form 25D-14) , or a certified check, a cashier's check or a money order made payable to the State of Alaska.

The surety of a Bid Bond may be any corporation or partnership authorized to do business in Alaska as an insurer under AS 21.09. A legible power of attorney shall be included with each Bid Bond (Form 25D-14).

A Bid Bond must be accompanied by a legible Power of Attorney.

An individual surety will not be accepted as a bid security.

100.07 ADDENDA REQUIREMENTS

The Department will issue addenda if it determines, in its discretion, that clarifications or changes to the Contract documents or bid due date are needed. The Department may send addenda by any reasonable method such as, email, or may post the addenda on its website or online bidding service. Unless picked up in person or included with the bid documents, addenda or notice that an addendum has been issued will be addressed to the individual or company to whom bidding documents were issued and sent to the email address on the plan holders' list. Notwithstanding the Department's efforts to distribute addenda, bidders are responsible for ensuring that they have received all addenda affecting the Invitation To Bid. Bidders must acknowledge all addenda on the Bid Forms, or by email before the deadline stated in the Invitation to Bid.

100.08 DELIVERY OF BIDS

Bids shall be submitted in a sealed envelope. When bids are submitted in a sealed envelope, the envelope shall clearly indicate its contents and the address of the Department's designated contracts office, as specified on the Invitation to Bid. Bids for other work may not be included in the envelope. Faxed bids will not be considered.

Emailed bids are accepted. If submitting a bid via email, the bid must be emailed to DPS.DAS.Solicitations@alaska.gov and must contain the ITB number in the subject line of the email. The maximum size of a single email (including all text and attachments) that can be received by the state is 20mb (megabytes). If the email containing the bid exceeds this size, the bid must be sent in multiple emails that are each less than 20 megabytes and each email must comply with the requirements described above.

Please note that email transmission is not instantaneous. Similar to sending a hard copy bid, if you are emailing your bid, the state recommends sending it enough ahead of time to ensure the email is delivered by the deadline for receipt of bid.

It is the bidder's responsibility to contact the issuing agency at 907.269.0599 to confirm that the bid has been received. The state is not responsible for unreadable, corrupt, or missing attachments

100.09 WITHDRAWAL OR REVISION OF BIDS

Bids may be withdrawn or revised in writing delivered by mail, or email, provided that the Department's designated office receives the withdrawal or revision before the deadline stated in the Invitation To Bid. Withdrawal requests must be signed and submitted by the bidder's duly appointed representative who is legally authorized to bind the bidder. Revisions shall include both the modification of the unit bid price and the total modification of each item modified but shall not reveal the amount of the total original or revised bids.

100.010 PROTEST OF INVITATION TO BID

An interested party, as defined in AS 36.30.699, may protest an Invitation to Bid before the bid opening in accordance with AS 36.30.560 and AS 36.30.565. The interested party must submit a protest to the Contracting Officer.

100.011 RECEIPT AND OPENING OF BIDS

The Department will only consider bids, revisions, and withdrawals received before the deadline stated in the Invitation to Bid.

The Department will assemble, open, and publicly announce bids at the time and place indicated in the Invitation to Bid, or as soon thereafter as practicable. The Department is not responsible for prematurely opening or for failing to open bids that are improperly addressed or identified.

100.012 NONRESPONSIVE BIDS

1. A bid shall be rejected as nonresponsive if it:
    a. Is not properly signed by an authorized representative of the bidder and in a legally binding manner;
    b. Contains unauthorized additions, conditional or alternative bids, or other irregularities that make the bid incomplete, indefinite, or ambiguous;
    c. Includes a reservation of the right to accept or reject any award, or to enter into a contract pursuant to an award,
    d. Fails to include an acceptable bid guaranty with the bid;
    e. Is materially unbalanced; or
    f. Fails to meet any other material requirement of the Invitation To Bid.
2. A bid may be rejected as nonresponsive, in the Department's discretion, if it:

a. Is not typed or completed in ink;

b. Fails to include an acknowledgement of receipt of each addendum by assigned number and date of issue; or

c. Is missing a bid price for any pay item, except when alternate pay items are authorized.

100.013 BIDDERS INTERESTED IN MORE THAN ONE BID

A party who has quoted prices to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a bid directly for the work.

100.014 ELECTRONIC MAIL

Within its submitted bid, a bidder must include a current electronic mail (email) address of bidder's representative who possesses authority to receive, process, and respond to Department emails regarding the advertised project.

The Department may send notices and information to a bidder by using the furnished email address of the bidder's authorized representative.

A bidder shall notify the Department if the bidder requests the Department to send email notices or information to an address different from the email address initially provided in its bid forms. The bidder shall notify the Department of such change by sending a request in writing to the Contract's point of contact identified on the Invitation to Bid that is signed by a representative who is authorized and empowered to legally bind the bidder.

Delivery of an email sent by the Department is complete upon receipt in the addressee's email account. An email sent after 4:30 pm shall be deemed to have occurred at the opening of business on the next working day.

If needed, the Department may demonstrate proof of email delivery by affidavit or certification that includes the following:

1. The date and time that the Department sent the email message;
2. The email address from which the Department sent the message;
3. The name and email address to which the Department sent the message;
4. A statement that the Department sent the email message and that the person signing the affidavit or certification believes the transmission to have been complete and without error; and
5. An attached copy of the subject email.

100.015 CONSIDERATION OF BIDS

Until the Award, the Department may reject any or all bids, waive minor informalities or advertise for new bids without liability to any bidder if the Department, in its discretion, determines that to do so is in the best interests of the State.

A bidder may request withdrawal of a bid after opening and before the Award only in accordance with AS 36.30.160(b) and State procurement regulations. The bidder must submit the request to the Contracting Officer.

An interested party, as defined in AS 36.30.699, may protest a proposed Award of contract as per AS 36.30.560 and AS 36.30.565. The bidder must submit the protest to the Contracting Officer.

WHOLLY STATE-FUNDED PROJECTS. On wholly state-funded projects, determination of the low bidder will include bidder preferences as required under AS 36.30.321, according to subsections 1-3 below. Alaska Bidder Preference, Alaska Veteran Preference, and Alaska Product Preference are not applicable on projects with federal funding.

1. Alaska Bidder Preference: A bidder claiming this preference shall provide with their bid an Alaska Bidder Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Bidder Preference according to AS 36.30.

   If the bidder qualifies as an Alaska bidder, a five percent (5%) preference will be applied to the price of the bid. "Alaska bidder" means a person who:

   a. holds a current Alaska business license;

   b. submits a bid for goods, services, or construction under the name as appearing on the person's current Alaska business license;

   c. has maintained a place of business within the state staffed by the bidder or an employee of the bidder for a period of six months immediately preceding the date of the bid;

   d. is incorporated or qualified to do business under the laws of the state, is a sole proprietorship and the proprietor is a resident of the state, is a limited liability company organized under AS 10.50 and all members are residents of the state, or is a partnership under former AS 32.05, AS 32.06, or AS 32.11 and all partners are residents of the state; and

   e. If a joint venture, is composed entirely of ventures that qualify under (a) through (d), above.

2. Alaska Veteran Preference: A bidder claiming this preference shall provide an Alaska Veteran Preference Certification, certifying they qualify as an Alaska bidder eligible for Alaska Veteran preference according to AS 36.30.

   If a bidder qualifies as an Alaska bidder and is a qualifying entity, an Alaska Veteran Preference of 5 percent shall be applied to the bid price. The preference may not exceed $5,000 (AS 36.30.321). A “qualifying entity” means a:

   a. sole proprietorship owned by an Alaska veteran;

   b. partnership under AS 32.06 or AS 32.11 if a majority of the partners are Alaska veterans;

c. limited liability company organized under AS 10.50 if a majority of the members are Alaska veterans; or

d. corporation that is wholly owned by individuals, and a majority of the individuals are Alaska veterans.

A preference under this section is in addition to any other preference for which the bidder qualifies.

To qualify for this preference, the bidder must add value by the bidder itself actually performing, controlling, managing and supervising a significant part of the services provided or the bidder must have sold supplies of the general nature solicited to other state agencies, governments, or the general public.

An Alaska veteran is a resident of Alaska who:

1) served in the Armed forces of the United States, including a reserve unit of the United States armed forces; or the Alaska Territorial Guard, the Alaska Army National Guard, the Alaska Air National Guard, or the Alaska Naval Militia; and

2) was separated from service under a condition that was not dishonorable.

3. Alaska Product Preference: A bidder claiming this preference shall complete and sign the Alaska Product Preference Worksheet, according to the worksheet instructions, and submit the completed worksheet with their bid.

Except for timber, lumber and manufactured lumber products used in the construction project under AS 36.30.322(b), an Alaska products preference will be given as required under AS 36.30.326 - 36.30.332 when the bidder designates the use of Alaska products.

If the successful bidder/contractor proposes to use an Alaska product and does not do so, a penalty will be assessed against the successful bidder/contractor according to AS 36.30.330(a).

Each Alaska product declared on the Alaska Product Preference Worksheet must have an "Approval" date on the Alaska Product Preference Program List, that is on or before the bid opening date for this contract, and that does not expire before the bid opening date for this contract.

100.016 RESPONSIBILITY OF BIDDERS

The Department may find a bidder is nonresponsible for any one of the following reasons, but is not limited in its responsibility analysis to the following factors:

1. Evidence of bid rigging or collusion;

2. Fraud or dishonesty in the performance of previous contracts;

3. More than one bid for the same work from an individual, firm, or corporation under the same or different name;

4. Unsatisfactory performance on previous or current contracts;

5. Failure to pay, or satisfactorily settle, all bills due for labor and material on previous contracts;
6. Uncompleted work that, in the judgment of the Department, might hinder or prevent the bidder's prompt completion of additional work, if awarded;
7. Failure to reimburse the State for monies owed on any previous contracts;
8. Default under previous contracts;
9. Failure to submit evidence of registration and licensing;
10. Failure to comply with any qualification requirements of the Department;
11. Engaging in any activity that constitutes a cause for debarment or suspension under the State Procurement Code (AS 36.30) or submitting a bid during a period of debarment;
12. Failure to satisfy the responsibility standards set out in state regulations;
13. Lack of skill, ability, financial resources, or equipment required to perform the contract; or
14. Lack of legal capacity to contract.

Nothing contained in this section deprives the Department of its discretion in determining the lowest responsible bidder.

100.017 SUBCONTRACTOR LIST

The apparent low bidder shall submit a completed Subcontractor List, Form 25D-5, within five working days following receipt of written notification by the Department that it is the low bidder.

An apparent low bidder who fails to submit a completed Subcontractor List form within the time allowed will be declared nonresponsible and may be required to forfeit the bid security. The Department will then consider the next lowest bidder for award of the Contract.

If a bidder fails to list a subcontractor, or lists more than one subcontractor for the same portion of work, and the value of that work is in excess of one-half of one percent of the total bid amount, the bidder agrees to perform that portion of work without a subcontractor and represents that it is qualified to perform that work.

A bidder who lists as a subcontractor another contractor who, in turn, sublets the majority of the work required under the Contract, violates this subsection.

A bidder or Contractor may, without penalty, replace a listed subcontractor who:

1) Fails to comply with licensing and registration requirements of AS 08.18;
2) Fails to obtain a valid Alaska business license;
3) Files for bankruptcy or becomes insolvent;

4) Fails to execute a subcontract for performance of the work for which the subcontractor was listed, and the bidder acted in good faith;

5) Fails to obtain bonding acceptable to the Department;

6) Fails to obtain insurance acceptable to the Department;

7) Fails to perform the subcontract work for which the subcontractor was listed;

8) Must be replaced to meet the bidder's required state or federal affirmative action requirements;

9) Refuses to agree or abide with the bidder's labor agreement; or

10) Is determined by the Department to be not responsible.

In addition to the circumstances described above, a Contractor may in writing request permission from the Department to add a new subcontractor or replace a listed subcontractor. The Department will approve the request if it determines in writing that allowing the addition or replacement is in the best interest of the State.

A bidder or Contractor shall submit a written request to add a new subcontractor or replace a listed subcontractor to the Contracting Officer a minimum of five working days before the date the new subcontractor is scheduled to begin work on the construction site. The request must state the basis for the request and include supporting documentation acceptable to the Contracting Officer.

If a bidder violates this subsection, the Contracting Officer may:

1) Cancel the Contract after Award without any damages accruing to the Department; or

2) After notice and a hearing, assess a penalty on the bidder in an amount not exceeding 10 percent of the value of the subcontract at issue.

100.018 AWARD OF CONTRACT

The Department will award the Contract to the lowest responsible and responsive bidder unless it rejects all bids. The Department will notify all bidders in writing via email, or U.S. Mail of its intent to award.

In order to establish a clear and definitive basis of award for contracts with additive alternates, the State has established a budgeted amount from which the order of bidders will be determined. The amount will be disclosed when timely received bids are announced. The low bid will be determined by considering the basic bid and additive alternate(s) in the order listed on the Bid Schedule up to a total not to exceed the budgeted amount. The State reserves the right to reject all bids. The State also reserves the right to award the contract above or below the budgeted amount to the low bidder based on any combination of alternate(s) or no alternate(s), providing that the low bidder remains unchanged.

The Department will notify the successful bidder in writing of its intent to award the Contract and request that certain required documents, including the Contract Form, bonds, and insurance be

submitted within the time specified. The successful bidder's refusal to sign the Contract and provide the requested documents within the time specified may result in cancellation of the notice of intent to award and forfeiture of the bid security.

If an award is made, it will be made as soon as practicable and usually within 40 days after bid opening. Award may be delayed due to bid irregularities or a bid protest, or if the award date is extended by mutual consent. Bids shall be valid for 120 days after bid opening, and may be extended by mutual consent.

100.019 RETURN OF BID SECURITY

The Department will return bid securities, other than bid bonds:

1. To all except the two lowest responsive and responsible bidders, as soon as practicable after the opening of bids; and
2. To the two lowest responsive and responsible bidders immediately after Contract award.

100.020 PERFORMANCE AND PAYMENT BONDS

The successful bidder shall furnish all required Performance and Payment Bonds on forms provided by the Department for the sums specified in the Contract. If no sum is specified, the successful bidder shall comply with AS 36.25.010. The Surety on each bond may be any corporation or partnership authorized to do business in the state as an insurer under AS 21.09 or two individual sureties approved by the Contracting Officer.

If individual sureties are used, two individual sureties must each provide the Department with security assets located in Alaska equal to the penal amount of either the performance bond or the payment bond. Any costs incurred by the Contractor and the individual Surety are subsidiary and shall be borne by the Contractor or the individual Surety. In no event will the Department be liable for these costs.

Individual sureties shall provide security by one, or a combination, of the following methods:

1. Escrow Account, with a federally insured financial institution, in the name of the Department. Acceptable securities include, but are not limited to, cash, treasury notes, bearer instruments having a specific value, or money market certificates.
2. Irrevocable letters of credit, from a financial institution approved by the Contracting Officer, with the Department named as beneficiary.
3. Cashier’s or certified check made payable to the State of Alaska issued by financial institutions approved by the Contracting Officer.

These bonds and security assets, as applicable, shall remain in effect for 12 months after the date of final payment or, if longer, until all obligations and liens under this Contract are satisfied, including, but not limited to, obligations under General Conditions, Subsection 12.7.

The Department may, in its discretion, notify the bonding company or Surety of any potential default or liability.

The Contractor shall substitute, within five working days, another bond or surety acceptable to the Department if an individual Surety or the Surety on any bond furnished in connection with the Contract:

1. Becomes insolvent or is declared bankrupt;
2. Loses its right to do business in any state affecting the work;
3. Ceases to meet Contract requirements;
4. Fails to furnish reports of financial condition upon request; or
5. Otherwise becomes unacceptable to the Department.

When approved by the Contracting Officer, the Contractor may replace:

1. An individual surety with a corporate surety; or
2. Posted collateral with substitute collateral.

Failure to maintain the specified bonds or to provide substitute bonds when required under this section may be grounds for withholding contract payments until substitute bonding is obtained, and may, in the Department's discretion, be grounds for declaring the Contractor in default.

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REQUIRED DOCUMENTS

State Funded Contracts

REQUIRED FOR BID. Bids will not be considered if the following documents are not completely filled out and submitted at the time of bidding:

1. **Bid Forms**
    a. **Bid Cover Sheet**
    b. **Bid Schedule**
    c. **Bid Attachments (as applicable)**
    d. **Addenda Acknowledgment**
    e. **Bidder's Acknowledgment and Certification**
2. Bid Security

REQUIRED FOR BID MODIFICATIONS. Any bid revisions must be submitted by the bidder prior to bid opening on the following form:

3. **Bid Modification (Form 25D-16)**

REQUIRED FOR CLAIMED PROCUREMENT PREFERENCE. The Department will not consider a claimed procurement preference unless a bidder submits the appropriate, signed certification(s) for the claimed preference at the time of bidding:

4. **Alaska Bidder Preference Certification (Form 25D-19)**
5. **Alaska Veteran Preference Certification (Form 25D-17)**
6. **Alaska Products Preference Certification (Form 25D-20)**

REQUIRED AFTER NOTICE OF APPARENT LOW BIDDER. The apparent low bidder is required to complete and submit the following document within 5 working days after receipt of written notification:

1. **Subcontractor List (Form 25D-5)**

REQUIRED FOR AWARD. In order to be awarded the contract, the successful bidder must completely fill out and submit the following documents within the time specified in the intent to award letter:

1. **Construction Contract (Form 25D-10A) or (Form 25D-10H), as applicable.**
2. **Payment Bond (Form 25D-12)**
3. **Performance Bond (Form 25D-13)**
4. **Contractor's Questionnaire (Form 25D-8)**
5. **Certificate of Insurance (from carrier)**

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DEPARTMENT OF PUBLIC SAFETY

SUBCONTRACTOR LIST

Project Name and Number

The apparent low bidder shall complete this form and submit it so as to be received by the Contracting Officer prior to the close of business on the fifth working day after receipt of written notice from the Department.

An apparent low bidder who fails to submit a completed Subcontractor List form within the time allowed will be declared nonresponsible and may be required to forfeit the bid security.

Scope of work must be clearly defined. If an item of work is to be performed by more than one firm, indicate the portion or percent of work to be done by each.

Check as applicable: [☐] All Work on the above-referenced project will be accomplished without subcontracts

Or

[☐] List all first tier Subcontractors as follows:

FIRM NAME, ADDRESS, PHONE NO.	AK BUSINESS LICENSE NO., CONTRACTOR'S REGISTRATION NO.	SCOPE OF WORK TO BE PERFORMED

CONTINUE SUBCONTRACTOR INFORMATION ON REVERSE

For projects with federal-aid funding, I hereby certify Alaska Business Licenses and Contractor Registrations will be valid for all subcontractors prior to award of the subcontract. For projects without federal-aid funding (State funding only), I hereby certify the listed Alaska Business Licenses and Contractor Registrations were valid at the time bids were opened for this project.

Signature of Authorized Company Representative | **Title**

Company Name | **Company Address (Street or PO Box, City, State, Zip)**

Date | **Phone Number**

FIRM NAME, ADDRESS, PHONE NO.	AK BUSINESS LICENSE NO., CONTRACTOR'S REGISTRATION NO.	SCOPE OF WORK TO BE PERFORMED

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

CONTRACTOR'S QUESTIONNAIRE

_____

Project Name and Number

A. FINANCIAL

1. Have you ever failed to complete a contract due to insufficient resources?
   ☐ No ☐ Yes If YES, explain:

_____
_____
_____
_____
_____

2. Describe any arrangements you have made to finance this work: _____

_____

_____

B. EQUIPMENT

1. Describe below the equipment you have available and intend to use for this project.

ITEM	QUAN.	MAKE	MODEL	SIZE/ CAPACITY	PRESENT MARKET VALUE

2. What percent of the total value of this contract do you intend to subcontract? _____ %

3. Do you propose to purchase any equipment for use on this project?
◯ No ◯ Yes If YES, describe type, quantity, and approximate cost:

_____

_____

_____

4. Do you propose to rent any equipment for this work?
◯ No ◯ Yes If YES, describe type and quantity:

_____

_____

_____

5. Is your bid based on firm offers for all materials necessary for this project?
◯ Yes ◯ No If NO, please explain:

_____

_____

_____

C. EXPERIENCE

1. Have you had previous construction contracts or subcontracts with the State of Alaska?
◯ Yes ◯ No

Describe the most recent or current contract, its completion date, and scope of work:

_____

_____

_____

_____

2. List, as an attachment to this questionnaire, other construction projects you have completed, the dates of completion, scope of work, and total contract amount for each project completed in the past 12 months.

I hereby certify that the above statements are true and complete.

Name of Contractor	**Name and Title of Person Signing**
Signature	**Date**

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

PROPOSAL

for

Project 23ABI0402A ABI HVAC

by

Company Name

Company Address (Street or PO Box, City, State, Zip)

TO THE CONTRACTING OFFICER,

DEPARTMENT OF [department name]:

In compliance with your Invitation to Bid dated_____, the Undersigned proposes to furnish and deliver all the materials and do all the work and labor required in the construction of the above-referenced Project, located at or near_____, Alaska, according to the plans and specifications and for the amount and prices named herein as indicated on the Bid Schedule consisting of _____ sheets, which is made a part of this Bid.

The Undersigned declares that he has carefully examined the contract requirements and that he has made a personal examination of the site of the work; that he understands that the quantities, where such are specified in the Bid Schedule or on the plans for this project, are approximate only and subject to increase or decrease, and that he is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the Contract Documents.

The Undersigned hereby agrees to execute the said contract and bonds within fifteen calendar days, or such further time as may be allowed in writing by the Contracting Officer, after receiving notification of the acceptance of this bid, and it is hereby mutually understood and agreed that in case the Undersigned does not, the accompanying bid guarantee shall be forfeited to the State of Alaska, Department of Transportation and Public Facilities as liquidated damages, and the said Contracting officer may proceed to award the contract to others.

The Undersigned agrees to commence the work within 10 calendar days, and to complete the work within _____ calendar days, after the effective date of the Notice to Proceed, or by_____, unless extended in writing by the Contracting Officer.

The Undersigned proposes to furnish Payment Bond in the amount of **100%** (of the contract) and Performance Bond in the amount of **100%** (of the contract), as surety conditioned for the full, complete and faithful performance of this contract.

The Undersigned acknowledges receipt of the following addenda to the drawings and/or specifications (give number and date of each).

Addenda Number	Date Issued	Addenda Number	Date Issued	Addenda Number	Date Issued

NON-COLLUSION DECLARATION

The Undersigned declares, under penalty of perjury under the laws of the United States, that neither he nor the firm, association, or corporation of which he is a member, has, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

The Undersigned has read the foregoing and hereby agrees to the conditions stated therein by affixing his signature below:

Signature of Authorized Company Representative

Typed Name and Title

( )
Phone Number

( )
Fax Number

Email

Bid Forms – As-Advertised

Bid Cover Sheet

_____

Company Name

_____

Company Address

_____

Phone Number

_____

Email

Bid Schedule – As-Advertised

Line #	Item Descrition	Quantity	Unit	Unit Bid Price	Amount Bid
1	ABI HVAC	All Required	Lump Sum	Lump Sum	**$**_____

Total Bid $_____

_____
Company Name

_____
Company Address

_____
Typed Name of Authorized Representative

_____
Date

Bid Schedule Information – As-Advertised

Bidders Please Note: Before preparing this Bid Schedule read carefully the Invitation to Bid.

The Bidder shall insert a lump sump price in figures for each pay item in the bid schedule. The estimated quantity of work for payment on a lump sum basis will be "all required" and as further specified in the contract documents.

Wherever a contingent amount is shown for any item in this bid schedule this bid schedule such amount shall govern and be included in the bid total.

The bidder shall insert a price for each pay item listed. Type or print legibly.

Additional information, including the basis of award, can be found in the ITB, Information to Bidders, General Provisions, and General Conditions, as applicable.

Conditioned or qualified bids will be considered nonresponsive.

Bid Attachments – As-Advertised

It is the bidder's responsibility to ensure all documents required for this Invitation to Bid per the Required Documents form have been attached. If submitting manually, all attachments must be printed and submitted with the bid.

Addenda Acknowledgement – As-Advertised

An addendum is a clarification, correction, or change to the plans, specifications, or other documents in the bid package issued graphically or in writing by the Department after the advertisement but prior to bid opening.

The bidder can view, download, and print addenda from the Online Public Notices State of Alaska page. The bidder is solely responsible for obtaining, reviewing, applying, and acknowledging all addenda. Bidder's failure to acknowledge all addenda that the Department has issued for this ITB may cause the Department to reject the bid as non-responsive.

The Undersigned acknowledges receipt of the following addenda (give number and date of each).

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Addendum Number: _____ Date Issued: _____

Bidder's Acknowledgement & Certification – As-Advertised

The undersigned bidder acknowledges that:

1. It has carefully examined the bid package; the Department has afforded the bidder sufficient opportunity to examine the site of the work; it is familiar with regulatory and construction-related code requirements that may affect cost, progress, and performance of the work; and it possesses sufficient information to formulate its bid for performance of the project according to the terms and conditions of the bid package;

2. The quantities, where specified in the bid schedule or on the plans for this project, are approximate only and subject to increase or decrease and the undersigned bidder is willing to perform increased or decreased quantities of work at unit prices bid under the conditions set forth in the bid package;

3. If the Department accepts its bid, the bidder will execute the advertised contract and provide required bonds within the time and in the amount specified in the Invitation to Bid; if the bidder fails to do so, it further agrees that it will forfeit it's bid bond to the Department as liquidated damages and that the Department may award the contract to another bidder;

4. If the Department awards the bidder the advertised contract, the bidder will furnish and deliver all materials and do all work and labor required for the timely completion of the project according to the plans and specifications, and for the amount and prices stated in it's bid schedule, which is made a part of this bid; and

5. In a matter relating to a procurement or contract claim, it is unlawful fore a person to make a misrepresentation to the State through a trick, scheme, or device. AS 36.30.687.

By applying my signature below, I certify under penalty of perjury that:

1. The undersigned bidder has not made a misrepresentation to the Department in connection with this procurement;

2. Consistent with 2 AAC 12.800, the undersigned bidder has neither directly nor indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding. This bidder, its employees, and its agents have not divulged the contents of this proposal to any person who is not an employee or agent of the bidder or the surety furnishing bond(s) for bidder on this project; nor will they divulge such contents before the Department's public opening of the bidder's proposal; and

3. I am the duly appointed representative of the undersigned bidder, who has authorized and empowered me to legally bind it concerning this bid proposal.

_____
Company Name

_____
Company Address

_____
Phone Number

_____
Email

_____
Signature

_____
Printed Name and Title

_____
/ / (MM/DD/YYYY)
Date

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

CONSTRUCTION CONTRACT

Project Name and Number

This CONTRACT, between the STATE OF ALASKA, DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES, herein called the Department, acting by and through its Contracting Officer, and

Company Name

Company Address (Street or PO Box, City, State, Zip)

a/an ☐ Individual ☐ Partnership ☐ Joint Venture ☐ Sole Proprietorship ☐ Corporation incorporated under the laws of the State of _____, its successors and assigns, herein called the Contractor, is effective the date of the signature of the Contracting Officer on this document.

WITNESSETH: That the Contractor, for and in consideration of the payment or payments herein specified and agreed to by the Department, hereby covenants and agrees to furnish and deliver all the materials and to do and perform all the work and labor required in the construction of the above-referenced project at the prices bid by the Contractor for the respective estimated quantities aggregating approximately the sum of

_____ Dollars

($ _____), and such other items as are mentioned in the original Bid, which Bid and prices named, together with the Contract Documents are made a part of this Contract and accepted as such.

It is distinctly understood and agreed that no claim for additional work or materials, done or furnished by the Contractor and not specifically herein provided for, will be allowed by the Department, nor shall the Contractor do any work or furnish any material not covered by this Contract, unless such work is ordered in writing by the Department. In no event shall the Department be liable for any materials furnished or used, or for any work or labor done, unless the materials, work, or labor are required by the Contract or on written order furnished by the Department. Any such work or materials which may be done or furnished by the Contractor without written order first being given shall be at the Contractor's own risk, cost, and expense and the Contractor hereby covenants and agrees to make no claim for compensation for work or materials done or furnished without such written order.

The Contractor further covenants and agrees that all materials shall be furnished and delivered and all labor shall be done and performed, in every respect, to the satisfaction of the Department, on or before: _____ or within _____ calendar days. It is expressly understood and agreed that in case of the failure on the part of the Contractor, for any reason, except with the written consent of the Department, to complete the furnishing and delivery of materials and the doing and performance of the work before the aforesaid date, the Department shall have the right to deduct from any money due or which may become due the Contractor, or if no money shall be due, the Department shall have the right to recover _____ dollars ($_____) per day for each calendar day elapsing between the time stipulated for the completion and the actual date of completion in accordance with the terms hereof; such deduction to be made, or sum to be recovered, not as a penalty but as liquidated damages.

The bonds given by the Contractor in the sum of $_____ Payment Bond, and $_____ Performance Bond, to secure the proper compliance with the terms and provisions of this Contract, are submitted herewith and made a part hereof.

IN WITNESS WHEREOF, the parties hereto have executed this Contract and hereby agree to its terms and conditions.

CONTRACTOR

Company Name

Signature of Authorized Company Representative

Typed Name and Title

Date

(Corporate Seal)

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

Signature of Contracting Officer

Typed Name

Date

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

PERFORMANCE BOND

Bond No. _____

For

_____

Project Name and Number

KNOW ALL WHO SHALL SEE THESE PRESENTS:

That _____

of _____ as Principal,

and _____

of _____ as Surety,

firmly bound and held unto the State of Alaska in the penal sum of

_____ Dollars

($_____) good and lawful money of the United States of America for the payment whereof,

well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the _____ of _____ A.D., 20_____, for construction of the above-named project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall well and truly perform and complete all obligations and work under said contract and if the Principal shall reimburse upon demand of the Department of Transportation and Public Facilities any sums paid him which exceed the final payment determined to be due upon completion of the project, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at _____, _____ this _____ day of _____ A.D., 20_____.

Principal: _____

Address: _____

By: _____

Contact Name: _____

Phone: ( ) _____

Surety: _____

Address: _____

By: _____

Contact Name: _____

Phone: ( ) _____

The offered bond has been checked for adequacy under the applicable statutes and regulations:

_____ _____

Alaska Department of Transportation & Public Facilities Authorized Representative **Date**

See Instructions on Reverse

INSTRUCTIONS

1. This form shall be used whenever a performance bond is required. There shall be no deviation from this form without approval from the Contracting Officer.

2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.

3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.

4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.

5. The bond shall be signed by authorized persons. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

PAYMENT BOND

Bond No. _____

For

_____

Project Name and Number

KNOW ALL WHO SHALL SEE THESE PRESENTS:

That _____

of _____ as Principal,

and _____

of _____ as Surety,

firmly bound and held unto the State of Alaska in the penal sum of

_____ Dollars

($_____) good and lawful money of the United States of America for the payment whereof,

well and truly to be paid to the State of Alaska, we bind ourselves, our heirs, successors, executors, administrators, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the said Principal has entered into a written contract with said State of Alaska, on the _____ of _____ A.D., 20_____, for construction of the above-referenced project, said work to be done according to the terms of said contract.

Now, THEREFORE, the conditions of the foregoing obligation are such that if the said Principal shall comply with all requirements of law and pay, as they become due, all just claims for labor performed and materials and supplies furnished upon or for the work under said contract, whether said labor be performed and said materials and supplies be furnished under the original contract, any subcontract, or any and all duly authorized modifications thereto, then these presents shall become null and void; otherwise they shall remain in full force and effect.

IN WITNESS WHEREOF, we have hereunto set our hands and seals at _____, _____ this _____ day of _____ A.D., 20_____.

Principal: _____

Address: _____

By: _____

Contact Name: _____

Phone: ( ) _____

Surety: _____

Address: _____

By: _____

Contact Name: _____

Phone: ( ) _____

The offered bond has been checked for adequacy under the applicable statutes and regulations:

_____ _____

Alaska Department of Transportation & Public Facilities Authorized Representative **Date**

See Instructions on Reverse

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, shall be used whenever a payment bond is required. There shall be no deviation from this form without approval from the Contracting Officer.

2. The full legal name, business address, phone number, and point of contact of the Principal and Surety shall be typed on the face of the form. Where more than a single surety is involved, a separate form shall be executed for each surety.

3. The penal amount of the bond, or in the case of more than one surety the amount of obligation, shall be typed in words and in figures.

4. Where individual sureties are involved, a completed Affidavit of Individual Surety shall accompany the bond. Such forms are available upon request from the Contracting Officer.

5. The bond shall be signed by authorized persons. Where such persons are signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of authority must be furnished.

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

BID MODIFICATION

Project Name and Number

Modification Number: _____

Note: Use this form to modify Manual (paper) bids only.

- Group items and provide subtotals by bid schedule section.
- All revisions shall be made to the unadjusted bid amount(s).
- Changes to the adjusted bid amounts will be computed by the Department.

LINE NO.	ITEM NO.	PAY ITEM DESCRIPTION	REVISION TO UNIT BID PRICE +/-	REVISION TO BID AMOUNT +/-

TOTAL REVISION: $_____

Name of Bidding Firm

Responsible Party Signature **Date**

This form may be duplicated if additional pages are needed.

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

ALASKA BIDDER PREFERENCE CERTIFICATION

In response to the advertised procurement for:

Project Name and Number: _____

Bidder/Proposer (company name): _____

Operation of Alaska Bidder Preference

Procurement preferences under the Alaska Procurement Code are benefits that the State grants only to qualified bidders. Under AS 36.30.990(2), if a bidder is an eligible "Alaska Bidder", the Department will apply a five percent preference to the price of the bidder's proposal.

Instructions regarding Alaska Bidder Preference

A bidder that claims the Alaska Bidder Preference must review and then certify that each statement appearing under the heading "Alaska Bidder Certification" is true. The individual that signs the certification shall include his/her printed name and position within bidder's organization, *e.g.*, sole proprietor, partner, etc. If a bidder fails to submit a signed certification, the Department will not apply the claimed preference.

Alaska Bidder Certification

The bidding entity for which I am the duly authorized representative:

(A) Holds a current Alaska business license;

(B) Is submitting a bid or proposal for goods, services, or construction under the name appearing on the bidder's current Alaska business license;

(C) Has maintained a place of business in the State staffed by the bidder or an employee of the bidder for a period of six months immediately preceding the date of the proposal;

(D) Is incorporated or qualified to do business under the laws of the State, is a sole proprietorship and the proprietor is a resident of the State, is a limited liability company organized under AS 10.50 and all members are residents of the State, or is a partnership under former AS 32.05, AS 32.06, or AS 32.11 and all partners are residents of the State; and

(E) If a joint venture, is composed entirely of ventures that qualify under the four preceding paragraphs of this Alaska Bidder Certification.

By applying my signature below, I certify under penalty of perjury that I am the duly appointed representative of this bidder, which has authorized and empowered me to legally bind it concerning its proposal, and that the foregoing statements are true and correct.

_____ _____
By (signature) Date

_____ _____
Printed name Alaska Business License Number

_____
Title:

ALASKA PRODUCT PREFERENCE WORKSHEET

(See Reverse Side for Instructions)

Project Name and Number: _____

Bid Phase: _____ Bidder: _____

By applying my signature below, I certify under penalty of perjury that:

1. This worksheet accurately reports the type and quantity of product(s) that: (a) qualify for application of the Alaska Product Preference under AS 36.30.321 *et seq*. and (b) this bidder will use in performing the advertised project, if awarded the contract; and
2. All listed product(s) are specified for use on the project and will be permanently incorporated; and
3. I am the duly appointed representative of this bidder, which has authorized and empowered me to legally bind it concerning its proposal.

_____ _____

By (signature) Date

PRODUCT	MANUFACTURER	CLASS & PREFERENCE PERCENTAGE	TOTAL DECLARED VALUE	REDUCTION AMOUNT
			TOTAL	

INSTRUCTIONS FOR ALASKA PRODUCTS PREFERENCE WORKSHEET

Special Notice: All procurements, except those funded from Federal sources, shall contain Contract provisions for the preference of Alaska products. To be considered for the Alaska Product Preference, each product listed by the Bidder on this worksheet must have current certification from the Alaska Products Preference Program at the time of Bid Opening or the proposal due date. A product with expired certification at the bid opening or proposal due date will not be considered eligible. Products that are not specified for use on the project will not be considered eligible.

The Alaska Product Preference Program List of certified products is available online at:
https://www.commerce.alaska.gov/web/dcra/AlaskaProductPreferenceProgram.aspx or may be obtained by contacting Dept. of Commerce & Economic Development Alaska Division of Community and Regional Affairs, Alaska Products Preference Program, 550 W. 7th Ave., Suite 1650, Anchorage AK 99501-3510; Phone: (907) 269- 4501 Fax: (907) 269-4563, E-mail: madeinalaska@alaska.gov

BIDDERS INSTRUCTIONS:

A. General. The contracting Agency may request documentation to support entries made on this form. False presentations may be subject to AS 36.30.687. All Bidder's entries must conform to the requirements covering bid preparations in general. Discrepancies in price extensions shall be resolved by multiplying the declared total value times the preference percentage and adjusting any resulting computation(s) accordingly.

B. Form Completion – BASIC BIDS.

(1) Enter project number and name, the words "Basic Bid" and the CONTRACTOR'S name in the heading of each page as provided.

(2) The Bidder shall compare those candidate products appearing on the preference listing (see Special Notice comments above) against the requirements of the technical specifications appearing in the contract documents. If the Bidder determines that a candidate product can suitably meet the contract requirements, then that product may be included in the worksheet as follows.

(3) For each suitable product submitted under the "Basic Bid" enter:

- The product name, generic description and its corresponding technical specification section number under the heading "PRODUCT",
- The company name of the Alaska producer under the heading "Manufacturer", and
- The product class (I, II, or III) and preference percentage (3, 5, or 7% respectively) under the "CLASS/% heading.

(4) For each product appearing on the list and to be utilized by the CONTRACTOR enter:

- Under the heading "TOTAL DECLARED VALUE" the manufacturer's quoted price of the product, (caution: this value is to be the manufacturer's quoted price at the place of origin and shall not include costs for freight, handling or miscellaneous charges of incorporating the product into the Work,) and
- The resulting preference – i.e. the preference percentage times the total declared value amount – under the heading "REDUCTION AMOUNT".

(5) Continue for all "suitable" basic bid products. If the listing exceeds one page enter the words "Page # __ SUB" in front of the word "TOTAL" and on the first line of the following pages enter "SUBTOTAL OF REDUCTION AMOUNT FROM PREVIOUS PAGE".

(6) On the final page of the listing enter "BASIC BID PREFERENCE GRAND" immediately before the word "TOTAL".

(7) Total the entries in the "REDUCTION AMOUNT" column for each page by commencing at the first entry for that page. If a continuation page exists, ensure that the subtotal from the previous page is computed into the running total. Number pages as appropriate.

(8) Compute a Grand Total for the Basic Bid Preference. Enter the amount on the final page of the worksheet. (Note: When solicitations require written bids this amount should also be entered on line "C" of the Basic Bid Schedule.) Submit worksheet(s) with the Bid Schedule.

C. Form Completion – ALTERNATE BIDS.

(1) Enter project number and name, the words "ALTERNATE BID #__", and CONTRACTOR'S name in the heading of each page as provided.

(2) On the first entry line enter "ADDITIONAL ALASKA PRODUCTS FOR ALTERNATE BID #__", and repeat procedures 2 through 5 under part B these Bidder's instructions except that references to "Basic Bid" shall be replaced with the words "Alternate Bid #__."

(3) Following the listing of all additional Alaska products enter the words "ADDITIONAL PRODUCTS PREFERENCE FOR ALTERNATE BID #__ - SUBTOTAL" and enter a subtotal amount for all additional products as listed. Subtotal amount to be determined by adding all additional product entries in the "REDUCTION AMOUNT" column.

(4) Skip three lines and enter "LESS THE FOLLOWING NON-APPLICABLE ALASKA PRODUCTS:

(5) Beginning on the next line, enter the product name and manufacturer of each Alaska Product appearing on the "Basic Bid" listing which would be deleted or reduced from the Project should the "Alternate Bid" be selected. Details of entry need only be sufficient to clearly reference the subject product. (i.e. "Pre-hung doors by Alaska Door Co., Anchorage.") Products being reduced shall specify the amount of the reduction. Should no products require deletion enter "None". When a product is listed as a "NON-APPLICABLE ALASKA PRODUCT" for this alternate bid and if under the basic bid the Bidder received a preference on his basic bid as a result of that product, then the applicable entries under the headings "TOTAL DECLARED VALUE" and "REDUCTION AMOUNT" (for each product and from the basic bid listing) shall also be entered into the corresponding headings of this form. Where only a portion of the products has been deleted, the entry (which will differ from those on the basic bid listing) may be "pro-rated" or as otherwise substantiated.

(6) Following the listing of all non-applicable Alaska products enter the words "NON-APPLICABLE PRODUCTS PREFERENCE FROM BASIC BID ___ SUBTOTAL" and enter a subtotal amount for all non-applicable products listed. Subtotal amount to be determined by adding all non-applicable entries in the "REDUCTION AMOUNT" column.

(7) At the bottom of the final page enter the words "ALTERNATE BID #___ PREFERENCE GRAND" immediately before the word "TOTAL".

(8) Compute a Grand Total for the Alternate Bid Preference (for Alternate #___) by subtracting the non-applicable product preference subtotal from the additional product preference subtotal. Enter on the final page. (Note: When solicitations require written bids this amount should also be entered on line "C" of the Alternate Bid Schedule.) Submit separate worksheet(s) with each Alternate Bid

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY

ALASKA VETERAN PREFERENCE CERTIFICATION

In response to the advertised procurement for:

Project Name and Number _____,

Bidder (Contractor) _____

Operation of Alaska Veteran Preference

Procurement preferences under the Alaska Procurement Code are benefits that the State grants only to qualified bidders. Under AS 36.30.321, an eligible entity receives a five percent preference to the price of in the bidder's proposal if the bidder meets three requirements.
The bidder must be:

1. an "Alaska Veteran";
2. a "Qualifying Entity"; and
3. an "Alaska Bidder".

Unless a bidder satisfies all three requirements and furnishes corresponding certifications, it is not eligible for the Alaska Veteran Preference. This preference may not exceed $5,000.

Instructions regarding Alaska Veteran Preference

A bidder that claims the Alaska Veteran Preference must review and complete the "Alaska Veteran Certification", the "Qualifying Entity Certification", and the "Alaska Bidder Certification". The individual that signs a certification shall include his/her printed name and position within bidder's organization, *e.g.*, sole proprietor, partner, etc. If a bidder fails to submit properly completed certifications, the Department will not apply the claimed preference.

Alaska Veteran Certification

(*To be completed by individual(s) upon whom the bidder relies in claiming the Alaska Veteran status. If bidder is a partnership, limited liability company, or corporation, then a majority of partners, members, or shareholders who are Alaska Veterans must sign this Alaska Veteran Certification for the Bidder to be eligible for this preference.*)

I hereby represent to the Department that:

I served in the armed forces of the United States, a reserve unit of the United States armed forces, the Alaska Territorial Guard, the Alaska Army National Guard, the Alaska Air National Guard, or the Alaska Naval Militia; and
I was separated from service under a condition that was not dishonorable; and
I am Alaska resident in that I am physically present in the State of Alaska with the intent to remain in the State indefinitely and to make a home in the State.

I certify under penalty of perjury that the foregoing statements are true and correct as they apply to me.

_____ _____
By (signature) Date

_____ _____
Printed name Title

Qualifying Entity Veteran Certification

The bidding entity for which I am the duly authorized representative is a:

(*Check the appropriate box*)

- ☐ sole proprietorship owned by an Alaska Veteran;
- ☐ partnership under AS 32.06 or AS 32.11 and a majority of the partners are Alaska Veterans;
- ☐ limited liability company organized under AS 10.50 and a majority of the members are Alaska Veterans; or
- ☐ corporation that is wholly owned by individuals and a majority of the individuals are Alaska Veterans.

By applying my signature below, I certify under penalty of perjury that I am the duly appointed representative of this bidder, which has authorized and empowered me to legally bind it concerning the proposal and that the statement I have acknowledged above by checking the appropriate box is true and correct.

By (signature)	Date
Printed name	Title

Alaska Bidder Certification

(*To complete your claim for the Alaska Veteran Preference, you must also submit an Alaska Bidder Certification, which the bidder can view, download, and print from the AKDOT&PF's Bid Express Proposal page.*)

EXHIBIT A

Department of Public Safety
ABI Building Chiller and HVAC Controls Replacement

Construction Document Technical Specifications Submittal
Volume 1, Division 1 - 33

March 17, 2023

Prepared by:

Architects Alaska. Inc. 900 W. 5th Ave, Suite 403 Anchorage AK

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VOLUME 1 OF 1 - DIVISIONS 1-33

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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Access to site.
4. Work restrictions.
5. Specification and Drawing conventions.
6. Miscellaneous provisions.

B. Related Requirements:
1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: ABI Building Chiller and HVAC Controls Replacement project.

1. Project Location: Anchorage, Alaska.

B. Owner: State of Alaska Department of Public Safety.

1. Owner's Representative: Johann Mueller.

C. Architect: Architects Alaska, Inc.

D. Architect's Consultants: Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Mechanical and Electrical Engineering: AMC Engineers.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Replacement of the existing chiller unit located at the exterior of the ABI building, as well as replacement of existing pneumatic HVAC controls.

2. Repair and replacement of damaged portions of walls of exterior enclosure for the chiller unit.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways loading areas, 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 for storage of materials.

a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: 8am – 5pm.
2. Hours for Utility Shutdowns: 8am – 5pm.
3. Hours for noisy activity: No activity after 7pm.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Restricted Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Imperative mood and streamlined language are generally used in the Specifications. 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.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1

1. Base Bid: Existing duplex style heating pump and accessories to remain in place.
2. Alternate: Replace existing heating pump and accessories as indicated on mechanical and electrical drawings (M102, 202, E102 & E202) and Division 23 Section “Hydronic Pumps.” Provide all materials, equipment, parts and labor required for complete installation of replacement pump and accessories.

END OF SECTION

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Requirements:
1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 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, "Architect's Supplemental Instructions."

1.4 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 10 days or 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 forms 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 Division 1 Section "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.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Changes 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Requirements:
1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with continuation sheets.
   b. Submittal schedule.
   c. Items required to be indicated as separate activities in 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 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. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
      1) Labor.
      2) Materials.
      3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. 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.
   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
7. 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.
8. 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.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial 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: Submit Application for Payment to Architect by the 5th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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 for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:
      a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
      b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
      c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect. One 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.

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.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Products list (preliminary if not final).
   5. Submittal schedule (preliminary if not final).
   6. List of Contractor's staff assignments.
   7. List of Contractor's principal consultants.
   8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

9. Report of preconstruction conference.
10. Certificates of insurance and insurance policies.
11. Performance and payment bonds.
12. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues 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.
   2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, 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 G707, "Consent of Surety to Final Payment."
   6. Evidence that claims have been settled.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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. Requests for Information (RFIs).
   2. Project meetings.

B. Related Requirements:
   1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: 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, and telephone number 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.

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

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as 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. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings if required by relevant Technical Specification Section, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working 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 RFIs will be returned without action:
a. Requests for approval of submittals.
b. Requests for approval of substitutions.

c. Requests for coordination information already indicated in the Contract Documents.
d. Requests for adjustments in the Contract Time or the Contract Sum.
e. Requests for interpretation of Architect's actions on submittals.
f. 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 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 Division 01 Section "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 10 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 Semi-monthly. Use CSI Log Form 13.2B or Software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

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 seven days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings: Prepare and submit coordination drawing as required by individual Technical Specification Sections.

1.7 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.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Meeting Notes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting notes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: 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. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. Preparation of record documents.
      l. Use of the premises and existing building.
      m. Work restrictions.
      n. Working hours.
      o. Owner's occupancy requirements.
      p. Responsibility for temporary facilities and controls.
      q. Procedures for moisture and mold control.
      r. Procedures for disruptions and shutdowns.
      s. Construction waste management and recycling.
      t. Parking availability.
      u. Office, work, and storage areas.
      v. Equipment deliveries and priorities.
      w. First aid.
      x. Security.
      y. Progress cleaning.
   3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at semi-monthly intervals.
   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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. 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) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

3. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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.

B. Related Requirements:
   1. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   2. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 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. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Working electronic copy of schedule file, where indicated.
   2. PDF electronic file.
   3. Three paper copies. Architect will retain two copies. If Contractor requires more than one copy, submit additional copies

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

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

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. 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.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story 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. Procurement Activities: Include procurement process activities for the following long lead 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.
   3. Submittal Review Time: Include review and re-submittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   4. Startup and Testing Time: Include no fewer than 10 days for startup and testing.
   5. 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.
   6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. 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 Restrictions: Show the effect of the following items on the schedule:
      a. Coordination with existing construction.
      b. Uninterruptible services, if any.
      c. Use of premises restrictions.
   3. 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. Fabrication.
      e. Sample testing.
      f. Deliveries.
      g. Installation.
      h. Tests and inspections.
      i. Adjusting.
   4. 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. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion

E. 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 Division 1 Section "Payment Procedures" for cost reporting and payment procedures.

F. 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 Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 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, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 10 days of date established for the Notice to Proceed. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. 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.

B. 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.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
1. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Division 1 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

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.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule 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.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals, with the exception of base floor plan.
1. Contractor’s use of the Architect’s Digital Data Files are subject to the following terms:
a. Liability Disclaimer: Architects Alaska, Incorporated, assumes no responsibility for the accuracy or completeness of the electronic information and the Contractor will remain responsible for all construction coordination with respect to all trades. The Contractor shall indemnify and hold harmless Architects Alaska from any and all liability associated with use of the transmitted electronic information.

b. Reuse: The material contained in the electronic files is copyrighted by either Architects Alaska, Incorporated or the Engineers and Consultants who prepared them. The electronic information as transmitted may only be used as authorized by this agreement and may not be reused in any other form or manner in whole or in part, without the written consent of Architects Alaska, Incorporated.
c. Transmittance to Other Parties: The data contained in the electronic files may only used by the Contractor and Subcontractors participating in this project, and only for purposes of construction of this project. The Contractor may not transmit the material to any other parties without the expressed written consent of Architects Alaska, Incorporated.
d. Use Limitation: The information contained on this medium shall not be considered part of the Contract Documents for the project and no information contained shall be construed as authorizing any change to the Contract Documents as issued for the project.

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. Coordinate transmittal of different types of submittals for related parts of the Work 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.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:
a. Project name.
b. Date.
c. Name of Architect.
d. Name of Contractor.
e. Name of subcontractor.
f. Name of supplier.
g. Name of manufacturer.
h. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and the number 20036.01. Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 20036.01.A).

i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Other necessary identification.

4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
   a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
      1) Project name.
      2) Date.
      3) Destination (To:).
      4) Source (From:).
      5) Name and address of Architect.
      6) Name of Contractor.
      7) Name of firm or entity that prepared submittal.
      8) Names of subcontractor, manufacturer, and supplier.
      9) Category and type of submittal.
      10) Submittal purpose and description.
      11) Specification Section number and title.
      12) Specification paragraph number or drawing designation and generic name for each of multiple items.
      13) Drawing number and detail references, as appropriate.
      14) Indication of full or partial submittal.
      15) Transmittal number, numbered consecutively.
      16) Submittal and transmittal distribution record.
      17) Remarks.
      18) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file 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.
      a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., GCSD-20036.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., GCSD-20036.01.A).
   3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner**,** containing the following information:
      a. Project name.
      b. Date.
      c. Name and address of Architect.

d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

4. Metadata: Include the following information as keywords in the electronic submittal file metadata:
   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. 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's action stamp.

I. 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.

J. 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 action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:
   1. Submit electronic submittals via email as PDF electronic files.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit a minimum of four paper copies of each submittal unless otherwise indicated. Architect will retain three copies.
3. Informational Submittals: Submit a minimum of four paper copies of each submittal unless otherwise indicated. Architect will retain three copies.
4. Certificates and Certifications Submittals: Provide 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.

B. 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 not suitable 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 showing 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 or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.
   b. A minimum of four paper copies of Product Data unless otherwise indicated. Architect will retain three copies.

C. 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.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 22 x 34 inches.

a. A minimum of four opaque (bond) copies of each submittal. Architect will retain three copies.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of applicable Specification Section.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. 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.
5. 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.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
6. 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.
   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

E. 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. Submit product schedule in the following format:
   a. PDF electronic file.
   b. Three paper copies of product schedule or list unless otherwise indicated. Architect will return one copies.

F. Coordination Drawings Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

K. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action 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. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, 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.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. “No Exceptions Noted”, “Revise As Noted (re-submittal not required)”, “Revise as Noted and Resubmit”, and “Does Not Comply”.

C. 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.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

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. 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. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

C. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: 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 conflicting requirements that are different, but apparently equal, 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 REPORTS AND DOCUMENTS

A. 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. 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.

C. 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.

D. 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.

E. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
   1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

F. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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.

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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

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

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SECTION 01 50 00

TEMPORARY FACILTIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
1. Division 1 Section "Summary" for work restrictions and limitations on utility interruptions.

1.2 SCOPE OF THIS SECTION

A. Field Offices
B. Staging Areas.
C. Temporary Utilities, General.
D. Construction Electricity and Lighting.
E. Construction Telephone Service.
F. Construction Water Supply.
G. Construction Sanitary Facilities.
H. Barrier.
I. Cleaning During Construction.

1.3 QUALITY ASSURANCE

A. Electric Service: Use Existing Building Service

B. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 FIELD OFFICES

A. Field Office and Staging Area:
1. The Owner will provide space in the ABI Building for use by the Contractor as a field office. The field office will be provided with electrical power, lighting, and

heat. The Contractor will be required to provide any temporary telecommunications connections required for ongoing construction operations.

2.2 STAGING AND STORAGE AREA

A. Staging and Storage Area:
1. Construction Storage and Staging is permitted in the area designated on the site map included at the end of this section.
2. Contactor shall only store material and equipment necessary for the completion of the work of this Contract. Storage of other items not permitted.
3. Owner shall not be responsible for receiving, handling, staging, or security of shipped materials.
4. Limit on site storage of materials to designated staging areas. Contractor is responsible for security of stored materials.
5. Provide temporary security fencing with lockable gate(s) of height and designed deemed appropriate by the Contractor to provide adequate security. Remove temporary security fencing at the completion of the Project.

2.3 TEMPORARY UTILITIES, GENERAL

A. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. The Contractor is responsible for damage or harm to material, equipment, Work, personnel, etc. resulting from use of, or failure to use, temporary utilities.

C. The facility’s existing electrical utility system may be utilized. Owner will pay electrical utility costs for normal construction operations. The Contractor shall monitor usage and take measures to conserve usage.

D. The Contractor shall obtain approval of the Owner before interrupting, connecting, or disconnecting any utility services; temporary or permanent. Provide owner with a minimum of seven days notice prior to any interruption connection or disconnection.

2.4 CONSTRUCTION SANITARY FACILITIES

A. Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

2.5 CONSTRUCTION WATER SUPPLY

A. The Contractor may use existing building water supplies sanitary for sanitary and drinking water.

B. The Contractor may use building water supplies and janitorial facilities for construction and clean-up provided he coordinates their use with the Owner.

C. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

2.6 CONSTRUCTION ELECTRICITY AND LIGHTING

A. The Contractor may use existing building electrical power for operation of hand tools and campus electrical distribution system power to provide his construction office with power, provided:
   1. Circuits utilized have proper voltage and adequate ampacity.
   2. The Contractor has verified that the circuits utilized comply with NEC requirements for intended use.
   3. Use of the Owner's electrical power is at the Contractor's risk..
   4. Owner does not guarantee electrical power will be available at all times.

B. The Contractor shall not be charged for electrical power provided by the building service or base utility system provided that it is consumed only for performing work defined under these Contract Documents. The Contractor shall make all reasonable efforts to conserve energy.

2.7 CONSTRUCTION TELEPHONE SERVICE

A. Coordinate with the local telephone utility for phone service at Contractor's on site office. Contractor shall be responsible for paying for telephone service used for Contractor's ongoing construction operations.

2.8 OPERATION OF FACILITY'S MECHANICAL SYSTEMS

A. Install temporary one-inch-thick roll filter media over all air intake grills and openings subject to dust, debris and fumes.

2.9 BARRIERS

A. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
   1. Prohibit smoking in construction areas.
   2. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

2.10 CLEANUP DURING CONSTRUCTION

A. Control accumulation of waste materials and rubbish; periodically dispose of off-site.

PART 3 – EXECUTION – Not Used

END OF SECTION

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SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. 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; and comparable products.

B. Related Requirements:
   1. Division 01 Section "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained 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. Products salvaged or recycled from other projects are not considered new products.
   3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. No Substitution Product Specification: A specification in which a specific manufacturers’ product is names and accompanied by the words “no substitutions” including make or model number or other designation requires that the product specified be provided and installed without variation or substitution.

C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. 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 determine compliance with the Contract Documents and to determine 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 weather-tight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

5. Protect stored products from damage and liquids from freezing.
6. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
   2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for 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 indicated form properly executed.
   3. See Divisions 02 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, 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. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
   6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
   b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
   a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
   b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated 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. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.

4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Installation of the Work.
   2. Cutting and patching.
   3. Progress cleaning.
   4. Protection of installed construction.
   5. Correction of the Work.

B. Related Requirements:
   1. Division 01 Section "Summary" for limits on use of Project site.
   2. Division 01 Section "Submittal Procedures" for submitting surveys.
   3. Division 01 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.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
   2. 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. Operational elements include the following:
a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Mechanical systems piping and ducts.
d. Control systems.
e. Communication systems.
f. Fire-detection and -alarm systems.
g. Electrical wiring systems.

3. Other Construction Elements: Do not cut and patch other construction elements or 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. Other construction elements include but are not limited to the following:
a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Equipment supports.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction 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.

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching 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 provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

B. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. 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.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 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.

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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately

located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Allow for building movement, including thermal expansion and contraction.
2. 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.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. 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.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."

F. 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 neatly to minimum 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. Proceed with patching after construction operations requiring cutting are complete.

G. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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 minimize evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.

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. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

F. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

G. 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.

H. 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.

I. 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 STARTING AND ADJUSTING

A. Start any and operating components equipment affect by the Work to confirm proper operation. Report malfunctioning units to the Architect.

B. Adjust equipment affected by the Work for proper operation. Adjust operating components for proper operation without binding.

3.7 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.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Division 01 Section "Execution" for progress cleaning of Project site.
   2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
   3. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificate of Insurance: For continuing coverage.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, and similar final record information.
   2. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   3. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
   4. Submit test/adjust/balance records.
   5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 5 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Complete startup and testing of systems and equipment.
   3. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
   4. Complete final cleaning requirements, including touchup painting.
   5. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 5 days prior to date the work will be completed and ready for final inspection. 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, that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. 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. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization 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. Use CSI Form 14.1A or similar form with substantially similar content.
1. Organize list of spaces in sequential order, starting with exterior areas.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.
4. Submit list of incomplete items in either of the following formats:
   a. PDF electronic file. Architect will return annotated file.
   b. Three paper copies. Architect will retain two copies. If Contractor requires more than one copy, submit additional copies.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: 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, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

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: Perform 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 designated 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. Remove tools, construction equipment, machinery, and surplus material from Project site.
    d. Clean exposed exterior 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.
    e. Remove debris and surface dust from including roofs.
    f. Wipe surfaces of roof mounted mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

g. Clean plumbing fixtures in toilet facilities used by Contactor's personnel to a sanitary condition, free of stains, including stains resulting from water exposure.
h. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other transparent materials damaged by construction activities.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces damaged by construction activities. Replace finishes and surfaces that that already show evidence of repair or restoration.

END OF SECTION

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Product maintenance manuals.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
   2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:
1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent,

and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   4. Material and chemical composition.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
   1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
   1. Do not use original project record documents as part of operation and maintenance manuals.

2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

D. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

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SECTION 02 41 19

SELECTIVE DEMOLITION

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. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Division 01 Section "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Division 01 Section “Alternates” for demolition work connected with Additive Alternate #1.
3. Division 01 Section "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.

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: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. 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.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

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 materials, 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.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

B. 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 building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. 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: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

   1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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 ASSE A10.6 and NFPA 241.

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. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC 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. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. 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."

B. 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.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

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 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 48 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.
10. Dispose of demolished items and materials promptly.

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.

C. Removed and Salvaged Items:

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.

D. 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.

E. 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 during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 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.

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.

B. Burning: Do not burn demolished materials.

3.7 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.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Remove: Items as indicated on the Drawings

B. Remove and Reinstall: Items as indicated on the Drawings

C. Existing to Remain: Items as indicated on the Drawings

END OF SECTION

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SECTION 06 16 00

SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:
1. Division 07 Section "Water Drainage EIFS System" for water-resistive barrier applied over wall sheathing.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Wall sheathing.

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. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.

B. Field quality-control reports.

1.4 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 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1;Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

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 all plywood unless otherwise indicated.

2.3 WALL SHEATHING

A. Plywood Sheathing, Walls: Either DOC PS 1 or DOC PS 2, Exterior, Structural I sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 3/8 inch (9.5 mm).

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners of Type 304 stainless steel.

B. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

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 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. Wall Sheathing:
   a. Screw to cold-formed metal framing.
   b. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION

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SECTION 07 24 19

WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Water-drainage exterior insulation and finish system (EIFS).

1. EIFS-clad drainage-wall assemblies that are field applied over substrate.
2. Water-resistive barrier coatings.

B. Related Requirements:

1. Division 07 Section “Sheet Metal Flashing and Trim” for material used for coping flashings at top of enclosure wall.
2. Division 07 Section “Sheathing” for plywood sheathing used at enclosure walls.

1.2 DEFINITIONS

A. Definitions in ASTM E2110 apply to Work of this Section.

B. EIFS: Exterior insulation and finish system(s).

C. IBC: International Building Code.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each EIFS component, trim, and accessory, including water-resistive barrier coatings.

B. Shop Drawings:
1. Include details for parapet cap flashing.

C. Samples for Verification: 24-inch- (600-mm-) square panels for each type of finish-coat color and texture indicated, prepared using same tools and techniques intended for actual work.

1. Include exposed trim and accessory Samples to verify color selected.
2. Include a typical control joint filled with sealant of color selected, as specified in Division 07 Section "Joint Sealants."

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates: Signed by EIFS manufacturer, certifying the following:

1. EIFS complies with requirements.
2. Substrates to which EIFS is indicated to be attached are acceptable to EIFS manufacturer.
3. Accessory products installed with EIFS, including joint sealants, flashing, water-resistive barrier coatings, trim, whether or not furnished by EIFS manufacturer and whether or not specified in this Section, are acceptable to EIFS manufacturer.

C. Product Certificates: For cementitious materials and aggregates and for insulation and joint sealant, from manufacturer.

D. Product Test Reports: For each EIFS assembly and component, and for water-resistive barrier coatings, for tests performed by a qualified testing agency.

E. Field quality-control reports.

F. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For EIFS to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An installer who is certified in writing by AWCI International as qualified to install Class PB EIFS using trained workers.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened packages with manufacturers' labels intact and clearly identifying products.

B. Store materials inside and under cover; keep them dry and protected from weather, direct sunlight, surface contamination, aging, corrosion, damaging temperatures, construction traffic, and other causes.

1. Stack insulation board flat and off the ground.
2. Protect plastic insulation 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.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions and ambient outdoor air, humidity, and substrate temperatures permit EIFS to be applied, dried, and cured according to manufacturers' written instructions and warranty requirements.

1. Proceed with installation of adhesives or coatings only when ambient temperatures have remained, or are forecast to remain, above 40 deg F (4.4 deg C) for a minimum of 24 hours before, during, and after application. Do not apply EIFS adhesives or coatings during rainfall.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of EIFS-clad drainage-wall assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Bond integrity and weathertightness.
b. Deterioration of EIFS finishes and other EIFS materials beyond normal weathering.

2. Warranty coverage includes the following components of EIFS-clad drainage-wall assemblies:

a. EIFS finish, including base coats, finish coats, and reinforcing mesh.
b. Insulation installed as part of EIFS.
c. Insulation adhesive.
d. EIFS accessories, including trim components and flashing.
e. Water-resistive barrier coatings.
f. EIFS drainage components.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATER-DRAINAGE EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

A. Basis-of-Design Product: Subject to compliance with requirements, provide Dryvit Systems, Inc.; Outsulation MD, or a comparable product by one of the following:

1. Senergy; Master Builders Solutions.
2. Sto Corp.

B. Source Limitations: Obtain EIFS from single source from single EIFS manufacturer and from sources approved by EIFS manufacturer as compatible with EIFS components.

2.2 PERFORMANCE REQUIREMENTS

A. EIFS Performance: Comply with ASTM E2568 and with the following:

1. Weathertightness: Resistant to uncontrolled water penetration from exterior, with a means to drain water entering EIFS to the exterior.
2. Structural Performance of Assembly and Components:

a. Wind Loads:

1) Uniform pressure of <**Insert lbf/sq. ft. (Pa)**>, acting inward or outward.

3. Impact Performance: ASTM E2568, Medium impact resistance unless otherwise indicated.
4. Abrasion Resistance of Finish Coat: Sample consisting of 1-inch- (25.4-mm-) thick EIFS mounted on 1/2-inch- (12.7-mm-) thick gypsum board; cured for a minimum of 28 days and shows no cracking, checking, or loss of film integrity after exposure to 528 quarts (500 L) of sand when tested in accordance with ASTM D968, Method A.
5. Mildew Resistance of Finish Coat: Sample applied to 2-by-2-inch (50.8-by-50.8-mm) clean glass substrate; cured for 28 days and shows no growth when tested in accordance with ASTM D3273 and evaluated in accordance with ASTM D3274.
6. Drainage Efficiency: 90 percent average minimum when tested in accordance with ASTM E2273.

2.3 EIFS MATERIALS

A. Water-Resistive Barrier Coating: EIFS manufacturer's standard formulation and accessories for use as water-resistive barrier coating; compatible with substrate.

1. Water-Resistance: Comply with physical and performance criteria of ASTM E2570/E2570M.

B. Flexible-Membrane Flashing: Cold-applied, self-adhering, self-healing, rubberized-asphalt, and polyethylene-film composite sheet or tape and primer; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer.

C. Insulation Adhesive: EIFS manufacturer's standard formulation designed for indicated use; specifically formulated to be applied to back side of insulation in a manner that creates open vertical channels designed to serve as an integral part of the water-drainage system of the EIFS-clad drainage-wall assembly; compatible with substrate; and complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, and polymer-based adhesive specified for base coat.
2. Factory-mixed noncementitious formulation designed for adhesive attachment of insulation to substrates of type indicated, as recommended by EIFS manufacturer.

D. Drainage Mat: Three-dimensional, nonwoven, entangled filament, nylon or plastic mat designed to drain incidental moisture by gravity; EIFS manufacturer's standard or product recommended in writing by EIFS manufacturer, with manufacturer's standard corrosion-resistant mechanical fasteners suitable for intended substrate.

E. Molded, (Expanded) Rigid Cellular Polystyrene Board Insulation: Comply with ASTM E2430/E2430M, unless otherwise noted, and the following:

1. Flame-Spread and Smoke-Developed Indexes: 25 and 450 or less, respectively, in accordance with ASTM E84.
2. Dimensions: Provide insulation boards of not more than 24 by 48 inches (610 by 1219 mm), with thickness indicated on Drawings.

F. Reinforcing Mesh: Balanced, alkali-resistant, open-weave, glass-fiber mesh treated for compatibility with other EIFS materials, made from continuous multiend strands with retained mesh tensile strength of not less than 120 lbf/in. (21 dN/cm) in accordance with ASTM E2098/E2098M and the following:

1. Reinforcing Mesh for EIFS, General: Not less than weight required to comply with impact-performance level specified in "Performance Requirements" Article.
2. Strip-Reinforcing Mesh: Not less than 3.75 oz./sq. yd. (127 g/sq. m).
3. Corner-Reinforcing Mesh: Not less than 7.2 oz./sq. yd. (244 g/sq. m).

G. Base Coat: EIFS manufacturer's standard mixture complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.
3. Factory-blended dry formulation of portland cement, dry polymer admixture, and inert fillers to which only water is added at Project site.
4. Factory-mixed noncementitious formulation of polymer-emulsion adhesive and inert fillers that is ready to use without adding other materials.

H. Water-Resistant Base Coat: EIFS manufacturer's standard water-resistant formulation complying with one of the following:

1. Job-mixed formulation of portland cement complying with ASTM C150/C150M, Type I, white or natural color; and manufacturer's standard polymer-emulsion adhesive designed for use with portland cement.
2. Job-combined formulation of manufacturer's standard polymer-emulsion adhesive and manufacturer's standard dry mix containing portland cement.

I. Primer: EIFS manufacturer's standard factory-mixed, elastomeric-polymer primer for preparing base-coat surface for application of finish coat.

J. Finish Coat: EIFS manufacturer's standard acrylic-based coating complying with the following:

1. Factory-mixed formulation of polymer-emulsion binder, colorfast mineral pigments, sound stone particles, and fillers.

2. Colors: As indicated by manufacturer's designations.
3. Textures: Smooth.

K. Sealer: Manufacturer's waterproof, clear acrylic-based sealer for protecting finish coat.

L. Water: Potable.

M. Trim Accessories: Type as designated or required to suit conditions indicated and to comply with EIFS manufacturer's written instructions; manufactured from UV-stabilized PVC; and complying with ASTM D1784, manufacturer's standard cell class for use intended, and ASTM C1063.
1. Drip Screed/Track: Prefabricated, one-piece type for attachment behind insulation with face leg extended to form a drip, of depth required to suit thickness of coating and insulation, with face leg perforated for bonding to coating and back leg.
2. Expansion Joint: Closed-cell polyethylene backer rod and elastomeric sealant 3/4-inch- (19-mm-) minimum.
3. Parapet Cap Flashing: Type for both flashing and covering parapet top, with design complying with ASTM C1397.

2.4 MIXING

A. Comply with EIFS manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials, except as recommended by EIFS manufacturer. Mix materials in clean containers. Use materials within time period specified by EIFS manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine wall framing, flashings, openings, substrates, and junctures at other construction for suitable conditions where EIFS will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Begin coating application only after surfaces are dry.
2. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect contiguous work from moisture deterioration and soiling caused by application of EIFS. Provide temporary covering and other protection needed to prevent spattering of exterior finish coats on other work.

B. Protect EIFS, substrates, and wall construction behind them from inclement weather during installation. Prevent penetration of moisture behind drainage plane of EIFS and deterioration of substrates.

3.3 INSTALLATION OF EIFS, GENERAL

A. Comply with ASTM C1397, ASTM E2511, and EIFS manufacturer's written instructions for installation of EIFS as applicable to each type of substrate indicated.

3.4 APPLICATION OF SUBSTRATE PROTECTION

A. Water-Resistive Barrier Coating: Apply over sheathing to provide a water-resistive barrier.

1. Tape and seal joints, exposed edges, terminations, and inside and outside corners of sheathing unless otherwise indicated by EIFS manufacturer's written instructions.

B. Flexible-Membrane Flashing: Install over water-resistive barrier coating, applied and lapped to shed water; seal at openings, penetrations, and terminations. Prime substrates with flashing primer if required and install flashing.

3.5 INSTALLATION OF TRIM

A. Trim: Apply trim accessories at perimeter of EIFS, at expansion joints, and elsewhere as indicated. Coordinate with installation of insulation.

1. Weep Screed/Track: Use at bottom termination edges of water-drainage EIFS unless otherwise indicated.
2. Parapet Cap Flashing: Use where indicated on Drawings.

3.6 INSTALLATION OF DRAINAGE MAT

A. Drainage Mat: Apply wrinkle free, continuously, with edges overlapped and mechanically secured with fasteners over water-resistive barrier coating.

3.7 INSTALLATION OF INSULATION

A. Board Insulation: Adhesively attach insulation to substrate in compliance with ASTM C1397 and the following:

1. Apply adhesive to insulation by notched-trowel method, with notches oriented vertically to produce drainage channels that remain functional after the insulation is adhered to substrate.
2. Apply adhesive to insulation by notched-trowel method in a manner that results in coating the entire surface of drainage mat with adhesive once insulation is adhered to drainage mat.
3. Apply adhesive to ridges on back of channeled insulation by notched-trowel method in a manner that results in full adhesive contact over the entire surface of ridges, leaving channels free of adhesive once insulation is adhered to substrate.
4. Press and slide insulation into place. Apply pressure over entire surface of insulation to accomplish uniform contact, high initial grab, and overall level surface.
5. Allow adhered insulation to remain undisturbed for not less than 24 hours, before beginning rasping and sanding insulation or applying base coat and reinforcing mesh.

6. Apply insulation over substrates in courses with long edges of boards oriented horizontally.
7. Begin first course of insulation from screed/track and work upward. Work from perimeter casing beads toward interior of panels if possible.
8. Stagger vertical joints of insulation boards in successive courses to produce running bond pattern. Locate joints, so no piece of insulation is less than 12 inches (300 mm) wide or 6 inches (150 mm) high. Offset joints not less than 6 inches (150 mm) fromdoor openings and not less than 4 inches (100 mm) from aesthetic reveals.

    a. Adhesive Attachment: Offset joints of insulation not less than 6 inches (150 mm) from horizontal and 4 inches (100 mm) from vertical joints in sheathing.
9. Interlock ends at internal and external corners.
10. Abut insulation tightly at joints within and between each course to produce flush, continuously even surfaces without gaps or raised edges between boards. If gaps greater than 1/16 inch (1.6 mm) occur, fill with insulation cut to fit gaps exactly; insert insulation without using adhesive or other material.
11. Cut insulation to fit openings, corners, and projections precisely and to produce edges and shapes complying with details indicated.
12. Rasp or sand flush entire surface of insulation to remove irregularities projecting more than 1/16 inch (1.6 mm) from surface of insulation and to remove yellowed areas due to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm). Prevent airborne dispersal and immediately collect insulation raspings or sandings.
13. Cut aesthetic reveals in outside face of insulation with high-speed router and bit configured to produce grooves, rabbets, and other features that comply with profiles and locations indicated. Do not reduce insulation thickness at aesthetic reveals to less than 3/4 inch (19 mm).
14. Interrupt insulation for expansion joints where indicated.
15. Form joints for sealant application by leaving gaps between adjoining insulation edges and between insulation edges and dissimilar adjoining surfaces. Make gaps wide enough to produce joint widths indicated after encapsulating joint substrates with base coat and reinforcing mesh.

16. Form joints for sealant application with back-to-back casing beads for joints within EIFS and with perimeter casing beads at dissimilar adjoining surfaces. Make gaps between casing beads and between perimeter casing beads and adjoining surfaces of width indicated.
17. Before installing insulation and before applying field-applied reinforcing mesh, fully wrap board edges. Cover edges of board and extend encapsulating mesh not less than 2-1/2 inches (64 mm) over front and back face unless otherwise indicated on Drawings.
18. Treat exposed edges of insulation as follows:

    a. Except for edges forming substrates of sealant joints, encapsulate with base coat, reinforcing mesh, and finish coat.
    b. Encapsulate edges forming substrates of sealant joints within EIFS or between EIFS and other work with base coat and reinforcing mesh.
    c. At edges trimmed by accessories, extend base coat, reinforcing mesh, and finish coat over face leg of accessories.

19. Coordinate installation of flashing and insulation to produce wall assembly that does not allow water to penetrate behind flashing and water-resistive barrier coating.

B. Expansion Joints: Install at locations indicated, where required by EIFS manufacturer, and as follows:

1. At expansion joints in substrates behind EIFS.
2. Where EIFS adjoin dissimilar substrates, materials, and construction, including other EIFS.
3. Where EIFS manufacturer requires joints in long continuous elevations.

3.8 APPLICATION OF BASE COAT

A. Water-Resistant Base Coat: Apply full-thickness coverage to exposed insulation and to other surfaces indicated on Drawings.

B. Base Coat: Apply full coverage to exposed insulationwith not less than 1/16-inch (1.6-mm) dry-coat thickness.

C. Reinforcing Mesh: Embed reinforcing mesh in wet base coat to produce wrinkle-free installation with mesh continuous at corners, overlapped not less than 2-1/2 inches (64 mm) or otherwise treated at joints to comply with ASTM C1397. Do not lap reinforcing mesh within 8 inches (200 mm) of corners. Completely embed mesh, applying additional base-coat material if necessary, so reinforcing-mesh color and pattern are invisible.

D. Additional Reinforcing Mesh: Apply strip-reinforcing mesh around openings, extending 4 inches (100 mm) beyond perimeter. Apply additional 9-by-12-inch (230-by-300-mm) strip-reinforcing mesh diagonally at corners of openings (re-entrant corners). Apply 8-inch- (200-mm-) wide, strip-reinforcing mesh at both inside and outside corners unless base layer of mesh is lapped not less than 4 inches (100 mm) on each side of corners.

1. At aesthetic reveals, apply strip-reinforcing mesh not less than 8 inches (200 mm) wide.
2. Embed strip-reinforcing mesh in base coat before applying first layer of reinforcing mesh.

E. Double Base-Coat Application: Where indicated, apply second base coat in same manner and thickness as first application, except without reinforcing mesh. Do not apply until first base coat has cured.

3.9 APPLICATION OF FINISH COAT

A. Primer: Apply over dry base coat.

B. Finish Coat: Apply full-thickness coverage over dry primed base coat, maintaining a wet edge at all times for uniform appearance, to produce a uniform finish of color and texture matching approved sample and free of cold joints, shadow lines, and texture variations.

1. Embed aggregate in finish coat to produce a uniform applied-aggregate finish of color and texture matching approved sample.

C. Sealer Coat: Apply over dry finish coat, in number of coats and thickness required by EIFS manufacturer.

3.10 CLEANING AND PROTECTION

A. Remove temporary covering and protection of other work.

END OF SECTION

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. Steep-slope roof sheet metal fabrications.
4. Wall sheet metal fabrications.

B. Related Requirements:

1. Division 01 Section "Rough Carpentry" for wood nailers, curbs, and blocking.

1.2 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Low-slope roof sheet metal fabrications.
2. Wall sheet metal fabrications.

B. Product Data Submittals:

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.
4. Epoxy seam sealer.

C. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.

4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details of termination points and assemblies.
6. Include details of edge conditions.
7. Include details of special conditions.
8. Include details of connections to adjoining work.
9. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Special warranty.

1.6 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.

1.7 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.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

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.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to 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 are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. 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. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation, Grade 40 (Grade 275); prepainted by coil-coating process to comply with ASTM A755/A755M.

1. Surface: Smooth, flat and with manufacturer's standard clear acrylic coating on both sides.
2. Exposed Coil-Coated Finish:

    a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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 for seacoast and severe environments.

3. Color: <**Insert color**>.
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 minimum total dry film thickness of 0.5 mil (0.013 mm).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment: 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 in accordance with underlayment manufacturer's written instructions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Carlisle WIP Products; a brand of Carlisle Construction Materials.
    b. GCP Applied Technologies Inc.
    c. Henry Company; a Carlisle company.

2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F (minus 29 deg C) or lower.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, 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 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 Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

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 polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. 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.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. 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.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. 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.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

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.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Seams:
1. 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.

F. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12-foot- (3.6-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.

1. Coping Profile: as indicated on the Drawings.
2. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
3. Fabricate from the following materials:
   a. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch (1.02 mm) thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. 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 (50 mm).

B. 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 (100 mm).
2. Lap end joints not less than 12 inches (300 mm).

C. 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 (150 mm) staggered 24 inches (600 mm) between courses.
5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

D. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches (100 mm).

3.3 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. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches (300 mm) o.c.
6. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. 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 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.

1. Space movement joints at maximum of 10 feet (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

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.

a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
b. Form joints to completely conceal sealant.
c. 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.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION OF ROOF FLASHINGS

A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, 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. Copings:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated.

a. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch (400-mm) centers.
b. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch (600-mm) centers.

3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for specified FM Approvals' listing for required windstorm classification.

3.5 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate

installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.6 INSTALLATION 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.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. 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, as determined by Architect.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

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. Section Includes:
1. Silicone joint sealants.

B. Related Requirements:
1. Division 01 Section "Sheet Metal Flashing and Trim" for sealant at coping flashing.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. 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 Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency.

C. Field-Adhesion-Test Reports: For each sealant application tested.

D. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by

manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 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[or are below 40 deg F.
   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.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for porous substrates shall have a VOC content of 750 g/L or less.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; Bondaflex Sil 290.
d. Pecora Corporation; 301 NS.
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; Spectrem 1.

B. Single-Component, Non-sag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; NS Parking Structure Sealant.
b. May National Associates, Inc.; Bondaflex Sil 728 NS.
c. Pecora Corporation; 311 NS.
d. Tremco Incorporated; Spectrem 800.

2.3 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant

manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.

3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support 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 sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet 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.

F. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below 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 sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 2 tests for the first 20 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 100 feet of joint length thereafter or one test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints

   were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint Sealant Application: General use for locations which are not immersed in water.
1. Material: Silicone Joint Sealant.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION

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SECTION 20 00 00

MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Supplemental requirements in addition to Division 1 - General Requirements applicable to all Divisions 20, 23, 25 - Mechanical specification sections.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 13 - Common Motor Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Mechanical Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 07 00 - Mechanical Insulation
7. 20 41 00 - Mechanical Demolition
8. 23 05 93 - Testing, Adjusting and Balancing
9. 23 21 13 - Hydronic Piping and Specialties
10. 23 21 23 - Hydronic Pumps
11. 25 30 00 - Building Automation System Field Devices
12. 25 50 00 - Building Automation System
13. 25 90 00 - Sequence of Operations

1.2 REFERENCES

A. Codes and Standards:
1. Perform work in accordance with the legally enacted editions of applicable international, state and local codes with locally accepted amendments to include:
a. 2018 International Building Code (IBC).
b. 2018 International Mechanical Code (IMC).
c. 2018 International Fuel Gas Code (IFGC).
d. 2018 Uniform Plumbing Code (UPC).
e. 2018 International Fire Code (IFC).
f. 2018 NFPA 70, National Electric Code (NEC).
g. ASCE 7-16, Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
h. Standard for Accessible and Usable Buildings and Facilities (ANSI A117.1-2017).
2. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:
a. American Gas Association - AGA.
b. American National Standards Institute - ANSI.
c. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE.
d. American Society of Mechanical Engineers - ASME.
e. American Society for Testing and Materials - ASTM.
f. National Electrical Manufacturers' Association - NEMA.
g. National Fire Protection Association - NFPA.
h. Sheet Metal and Air Conditioning Contractors National Association, Inc. - SMACNA.

B. Definitions:

1. “Accessible” means arranged so that an appropriately dressed man 6'-2" tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended; and may then position himself to properly perform the task to be accomplished, without disassembly or damage to the surrounding installation.
2. “Authority Having Jurisdiction” is the individual official, board, department, or agency established and authorized by the political subdivision created by law to administer and enforce the provisions of the Code as adopted or amended.
3. “As Specified” denotes a product, system, or installation that:
   a. Includes salient characteristics identified in the Drawings and Specifications.
   b. Meets the requirements of the “Basis of Design”.
   c. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.
4. “Basis of Design” refers to products around which the design was prepared. Some or all of the particular characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as products that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and applicable Codes. Reference to a specific manufacturer’s product (even as “Basis of Design”) does not necessarily establish acceptability of that product without regard to compliance with other provisions of these specifications.
5. “Contracting Agency” is the Owner as defined in the General Conditions of the Contract.
6. “Demolish” means to permanently remove a component, equipment, or system and it's appurtenances with no intent for reuse and to properly disposal of it.
7. “Furnish” means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere, as noted or agreed, to be installed by supporting crafts.
8. “Install” means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.
9. “Product” is a generic term that includes materials, equipment, fixtures and any physical item used on the project.
10. “Provide” means furnish products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.
11. “Remove” means to remove a component, equipment, or system and its appurtenances and either store it for re-installation/reuse, or turn it over to the Contracting Agency.
12. “Rough-in and Connect” means provide an appropriate system connection such as water services with stops, continuous wastes with traps, shutoff valves, and piping connections, testing, etc., for proper operation, ready for furnished products to be installed. Equipment furnished is received, uncrated, assembled and set in place by supporting crafts unless prior arrangements are made to hire the rough-in installer for this work.
13. “Serviceable” means arranged so that the component or product in question may be properly removed and replaced without disassembly, destruction or damage to the surrounding installation. "Serviceable" components shall be "accessible".
14. “Shop Drawings” are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and coordination of all trades.
15. “Substitution” is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Project Manual, but that the Contractor warrants meets specific requirements listed in the Project Manual.
16. “System Drawing” is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the products interact to accomplish the function intended. Examples of system drawings include plumbing diagrams, control and instrumentation diagrams, and wiring diagrams. Some drawings, such as dimensioned

and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:
1. Provide labor, products and services required for the complete installation, checkout, and startup of mechanical systems shown and specified. Coordinate related work, including the work of other crafts, to provide each system complete and in proper operating order.
2. Cooperate with others involved in the project; with due regard to their work, to promote rapid completion of the entire project.
3. Become thoroughly familiar with the local conditions under which the work is to be performed. Schedule work with regard to seasons, weather, climatic conditions, and other local conditions that may affect the progress and quality of the work.
4. Coordinate and perform demolition in support of the project whether or not such requirements are described on the Drawings. Restore systems that are to remain but that are affected in any way by demolition work. Conduct a site visit prior to bid to determine Scope.
5. In general, the mechanical, electrical and building automation systems are interrelated. Coordinate the interface and operation of systems so that interrelated systems operate in proper synchronization and balance.
6. Provide labor, materials, and equipment to facilitate the commissioning process of systems and equipment within this scope of work. Perform tests and verification procedures required for the commissioning process as requested by the Contracting Agency.
7. Work and materials shall be in accordance with requirements of the applicable State and local Codes, regulations and ordinances, and the rules and regulations of other Authorities Having Jurisdiction. Nothing in drawings and specifications shall be construed to permit work not in conformance with applicable codes, rules, and regulations.
8. Where drawings or specifications call for a material or construction of a better quality or larger sizes than required by the above-mentioned Codes, rules and regulations, the provision of the specifications shall take precedence.
9. Furnish without any extra charge any additional material and labor when required for compliance with the listed codes, rules and regulations, even though the work may not be mentioned in the specifications or shown on the drawings. It is the responsibility of the successful bidder to bid in accordance with the minimum requirements of the applicable codes, rules, and regulations.

1.4 PRE-INSTALLATION MEETINGS

A. Meet with and coordinate Divisions 20, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, Mechanical and Electrical to identify and resolve potential conflicts.

B. Prior to installation of any Division 20, 23, and 25 component, coordinate installation with trades responsible for portions of other related sections of the Project Manual.

1.5 SUBMITTALS

A. Refer to Division 1 for general submittal requirements for the items listed below, supplemented with the additional requirements listed. In addition, prepare Divisions 20, 23, 25 submittals in accordance with the following, to include any supplemental requirements listed in the specific specification section:

B. General:
   1. The Contracting Agency's obligation to review submittals and to return them in a timely manner is conditioned upon the prior review and approval of the submittals by the Contractor as required by the Construction Contract.
   2. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Project Manual.
      a. Submittals will not be checked for quantity, dimension, fit, or for proper technical design of manufactured equipment.
      b. Provision of a complete and satisfactory working installation is the responsibility of the Contractor.
   3. Furnish suppliers with the applicable portions of the Project Manual and review and verify that the suppliers' submittals clearly represent products which comply with the Project Manual.
   4. Master Submittal Log]
      a. Create and maintain a master submittal log for items submitted in Divisions 20, 23, 25, including test results, certifications, record drawings, etc.
      b. Submit master submittal log, independent of other submittals, as the first submittal for review and approval by the Contracting Agency.
      c. Update submittal log with each submittal action.
      d. Share an electronic copy with Contracting Agency and Engineer at two week intervals, or as requested by the Contracting Agency.

C. Coordination:
   1. Prior to a submittal's submission for approval, hold a meeting of all construction trades to review shop drawings and submittals. Each trade shall cross-check shop drawings and submittals for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.
   2. Review, revise, correct, and appropriately annotate submittals prior to submission for approval.
   3. Keep a current copy of approved submittals and the submittal log at the job site.

D. Electronic Submittals:
   1. Provide electronic submittals in PDF format in addition to hard copy submittal. Maximum file size to be coordinated with Contracting Agency.
   2. Follow the organization and formatting required for paper submittals.
   3. Provide electronic bookmarks within the PDF document in place of tabs and sub-tabs.
   4. If individual PDF files are provided for a product or shop drawing sheet(s), organize files into folders and name files and folders to correspond with applicable specification sections or drawing titles.
   5. Create PDF documents without security, to be searchable, and to allow copy and paste. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.
   6. Reduce PDF file size by removing data and file creation elements not needed for final file presentation.

E. Product Data:
   1. General:
      a. This section describes in detail the preparation of mechanical product submittals. Submittals not provided as described shall be rejected without review. This procedure is designed to accelerate and improve the accuracy of the technical review process, as well as, simplify the preparation of the Installation, Operation, and Maintenance Manuals (IO&Ms).
      b. Product data for each specification section shall be submitted in one complete package, except as noted in this section.
   2. Submittal Organization:

a. Organize product submittal information in the same order as the products are specified. Provide a separate tabbed divider for each Divisions 20, 23, 25 specification section. Provide the typed section number on each tab.
b. Within each section, organize product information in the same order as products are specified in Part 2 of each applicable specification section. Provide sub-tabs within each section for each separate product article. Provide the typed product article number on each tab.
c. Provide product submittal information for each product specified in 8-1/2" x 11" format. Fold-out 11" x 17" format is also acceptable.
d. If a particular specified product is being omitted from the product submittal or will not be used for the project, provide a single sheet within the article tab identifying the product and annotated with a brief reason why the product is not being submitted, for example: "NOT USED," NO SUBMITTAL REQUIRED," "TO BE SUBMITTED BY (PROVIDE DATE)," etc. This will inform the reviewer that the product was not overlooked.
e. Partial submittals from individual subcontractors may be provided which cover a particular sub-contractor's scope of work. In this case, arrange partial submittals by system classification such as: PLUMBING, HEATING, FIRE SUPPRESSION, VENTILATION, BUILDING AUTOMATION SYSTEM, etc. Within each system classification, arrange product submittals by specification section, as described, such that each specification section can easily be reorganized into a master set of Divisions 20, 23, 25 product submittals organized by specification section. This will greatly simplify the preparation of IO&M manuals as described below.
f. Bind product submittal information in identical 3 inch wide, hard-backed, loose-leaf, 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
g. Provide a master table of contents at the front of each volume which lists the Divisions 20, 23, 25 specification sections and indicates which sections are located within each volume.
h. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
i. Provide identical cover and spine inserts for each product submittal volume, to include the following typed information:
    1). The Contracting Agency Name.
    2). Project Name.
    3). Contractor Name.
    4). Subcontractor Name preparing the submittal.
    5). Date that the submittal or resubmittal was initiated.
    6). "Mechanical Product Submittals" or "Plumbing Product Submittals" etc. as appropriate.
    7). "Volume 1 of X, Volume 2 of X," etc.

3. Product Information:
a. Indicate manufacturer's name and address, and local supplier's name, address, phone number.
b. Indicate each product as "Basis of Design", "Specified Equal" or "Proposed Substitution."
c. Identify catalog designation and/or model number.
d. Provide manufacturer's product literature. Neatly annotate to indicate specified salient features, appurtenances and performance criteria for each product specified to demonstrate compliance with the Project Manual to include scheduled information, drawing information and specified information.
e. Indicate product deviations from the Project Manual and mark out non-applicable items on generic "cut-sheets."
f. Include manufacturer provided dimensioned equipment drawings with rough-in mechanical and electrical connections.
g. Include operation characteristics, performance curves and rated capacities.

h. Include motor characteristics and wiring diagrams.
i. Include weight of equipment. Including accessories.
j. Provide basic manufacturer's installation instructions.

4. Product Substitutions:
   a. Clearly indicate both in the section table of contents and on the individual product submittal information each proposed substitution, deviation or change from the product as described in the Project Manual.
   b. Submittal approval does not include substitutions, deviations or changes from the requirements of the Project Manual unless they are specifically itemized and approved. The term "No Exceptions Taken" will not apply to substitutions, deviations or changes not clearly identified.
   c. Provision of a satisfactory working installation of equal quality to the system as described in the Project Manual shall be the responsibility of the Contractor.
   d. Correct unapproved deviations from the Project Manual discovered in the field as directed by and at no additional cost to the Contracting Agency.
   e. Cost of any design modifications as a result of proposed product substitutions shall be borne by the Contractor.

F. System Drawings:
1. Submit System Drawings for dynamic elements/systems of the project which are performance specified to include but not limited to: Fire Suppression Systems, Building Automation Systems and stand-alone packaged equipment.
2. Prepare system drawings on full sized sheets of the same size as the original construction drawings.
3. Include with each system a sequence of operation narrative which describes each mode of system operation in sufficient detail to demonstrate compliance with the Project Manual to the satisfaction of the Contracting Agency.

G. Shop Drawings:
1. General:
   a. The Project Manual documents are not intended for nor are they suitable for use as shop drawings. Project Manual documents shall not be utilized for the actual fabrication or installation of products or equipment.
   b. The Drawings are partly diagrammatic and do not show all offsets in piping or ducts, and may not show in minute detail all features of the installation; however, provide systems complete and in proper operating order.
   c. Locations of products are approximate unless dimensioned.
   d. Divisions 20, 23, 25 products and systems shall not be installed without shop drawings approved by the Contracting Agency.
   e. Rework, changes or additional engineering support required as a result of the installation of products and systems prior to the approval of applicable shop drawings by the Contracting Agency shall be provided at the Contractor's expense.
   f. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations, or identified on the drawings or specifications.
2. Preparation:
   a. Review each Divisions 20, 23, 25 specification section and identify the shop drawing requirements.
   b. Combine the shop drawing requirements first by system (i.e. ventilation system, heating system, plumbing system, etc.) and then by area (i.e. fan room, boiler room, etc.).
   c. Prepare shop drawings on full sized sheets of the same size as the original construction drawings.
   d. Arrange shop drawings to scale, showing dimensions where accuracy of location is necessary for coordination or communication purposes.

e. Incorporate the actual dimensions and configurations of the products and systems approved through the product submittal process into the shop drawings.
f. Provide dimensioned maintenance clearance areas around each product as recommended by the manufacturer.
g. Coordinate Divisions 20, 23, 25 work with the interrelated work of other trades including Architectural, Civil, Structural, and Electrical.
h. Identify and provide recommendations to resolve major conflicts which may impact the design of the systems as shown. Such conflicts will be resolved during the shop drawing review process.
i. Identify locations where field coordination between various trades is necessary to avoid conflicts.
j. Indicate elevation of piping, ductwork and equipment above or below finished floor at various locations and in sufficient detail to demonstrate clearance from structural elements and the work of other trades.
k. Coordinate placement of openings and holes through structure, walls, floors, ceilings, and roof with Structural and Architectural.

3. Submittal:
a. Submit dimensioned shop drawings as specified to demonstrate proper planning and sequencing of the applicable trades for the installation and arrangement of Divisions 20, 23, 25 with respect to other interrelated work.
b. Partial shop drawings submittals (i.e. heating system only) will be rejected without review, as the interrelationship with other related work and overall system fit cannot be evaluated.
1). Underslab shop drawings may be submitted separately for review to accommodate the construction schedule.
c. It is assumed that shop drawings submitted for review have been thoroughly prepared and coordinated and that the products and systems can and shall be installed as shown. Conflicts which are not clearly identified and annotated on the submitted shop drawings are assumed not to exist.
d. Installation conflicts arising from the failure to properly coordinate the work of related trades shall be provided at the Contractor's expense.

H. Certificates:
1. Review the submittal requirements for Certificates for each Divisions 20, 23, 25 specification section.
2. Submit copies of certificates as specified. This information may be included within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

I. Test and Evaluation Reports:
1. Review the submittal requirements for Test and Evaluation Reports for each Divisions 20, 23, 25 specification section.
2. Submit copies of reports as specified. Also include these reports within the Installation, Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

J. Installation, Operations and Maintenance (IO&M) Manuals:
1. Review the submittal requirements for IO&M manuals for each Divisions 20, 23, 25 specification section.
2. Begin the preparation of the mechanical IO&M manuals with a complete and fully approved set of mechanical product data submittals organized, annotated and with the product information as indicated within the "Product Data" submittals article above and in each Divisions 20, 23, 25 section.
3. Next, augment each individual product submittal with the written installation, operations and maintenance information for each approved product. This type of information is not applicable (or available) for bulk commodity or simplistic products such as copper pipe, basic pipe hangers or equipment tags, etc.

4. Annotate the installation, operations and maintenance information to indicate applicable information for the specific equipment model(s) installed.
5. Maintenance information shall include:
   a. Preventive maintenance requirements for each product, including the recommended frequency of performing each preventive maintenance task.
   b. Instructions for troubleshooting, minor repair and adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and that require no extensive special training or skills.
   c. Information of a maintenance nature covering warranty items, etc., that have not been discussed in the manufacturers' literature.
   d. Information on the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
   e. Recommended spare parts list.
6. Organize the IO&M manual information by specification section (not by sub-contractor) with a tabbed divider separating each section. Provide the typed section number on each tab.
7. Within each section, organize the product information in the same order as the products are specified in Part 2 of each applicable section. Provide sub-tabs within each section for each product. Provide the typed product article number on each tab.
8. Bind the information in identical 3 inch wide; hard-backed, loose-leaf, 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
9. Provide a master table of contents at the front of each volume which lists the Divisions 20, 23, 25 specification sections and indicates which sections are located within each volume.
10. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
11. Provide identical cover and spine inserts for each IO&M manual volume, to include the following typed information:
    a. The Contracting Agency Name.
    b. Project Name.
    c. "Mechanical Installation, Operations and Maintenance Manual".
    d. "Volume 1 of X, Volume 2 of X," etc.
12. Submit copies of Operation and Maintenance Manuals in electronic format (Adobe PDF).

1.6 CLOSEOUT SUBMITTALS

A. Warranty Documentation:
   1. Review the manufacturer's warranty requirements for each Divisions 20, 23, 25 specification section. Unless stated otherwise, provide 1-year warranty.
   2. Submit required warranty documentation to the applicable Manufacturer's Representative to validate standard manufacturer's warranty for each required product. Obtain written confirmation of receipt from each applicable Manufacturer's Representative.
   3. Provide Contracting Agency one copy of submitted warranty documentation and written confirmation of receipt for each applicable Manufacturer's Representative. This information may be included within the Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.
   4. Provide statement of Contractor's warranty of workmanship, labor, and materials, as described under Article 1.12 Warranty below.

B. Record Documentation:
   1. General: As the Work progresses, neatly annotate a designated and otherwise unused set of Divisions 20, 23, 25 Contract Drawings to show the actual locations and routing of Divisions 20, 23, 25 Work and the terminal connection points to related Work. As a minimum, include the following:
      a. Annotate record drawings to incorporate each applicable addendum.

b. Annotate record drawings as directed by each applicable Request for Information (RFI) and accepted Change Order Proposal.
c. Modify record drawings to show actual equipment sizes and locations and pipe and duct routing. Revise pipe and duct sizes as appropriate.
d. Provide dimensioned locations for permanently concealed piping and ductwork (i.e. piping cast in concrete or buried underground/underslab).
e. Show the actual locations of system isolation valves, especially valves which are concealed above ceilings and behind access panels.

2. Preparation:
a. Neatly annotate record drawings to provide clear interpretation to support electronic drafting by a third party.
b. Tape electronic sketches from addendums and/or RFIs directly to the record drawings as overlays.
c. Annotate the record drawings in colored pencil using the same symbols and abbreviations as indicated in the Divisions 20, 23, 25 legends and schedules of the Contract Drawings.
1). Red to add information.
2). Green to delete information.
3). Blue to provide additional clarifying information which is not to be drafted.
d. After submittal to the Contracting Agency, provide additional clarification, information or rework as necessary to support the accurate interpretation and electronic drafting of the record drawings.

3. Submittals:
a. Provide dimensioned underslab record drawings to the Contracting Agency prior to placing the slab. For slabs placed in multiple sections, provide record drawings for the applicable slab sections to the Contracting Agency prior to each pour.
b. Provide complete record drawings for concealed areas (i.e. above lay-in and hard ceilings and inside walls) to the Contracting Agency prior to concealment.
c. Provide the remaining portion of the record drawings for exposed areas to the Contracting Agency prior to the final completion of the project.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:
1. Furnish spare parts for systems and equipment as listed in applicable sections of Divisions 20, 23, 25.
2. Clearly label each part with name, manufacturer’s part number, system and/or equipment where used and location.
3. Deliver parts to location and person designated by the Contracting Agency, in durable storage boxes.
4. Group cartons containing smaller items by system or application and deliver in an appropriate number of storage boxes.

B. Extra Stock Materials:
1. Furnish extra stock as listed in applicable sections of Divisions 20, 23, 25.
2. Clearly label with name, manufacturer’s part number, system and/or equipment where used and location.
3. Deliver to location and person designated by the Contracting Agency, in durable storage boxes.

C. Tools: Provide three sets of special tools and testing and monitoring equipment as listed in applicable sections of Divisions 20, 23, 25.

1.8 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturers: Companies specializing in manufacturing the Products specified in the Divisions 20, 23, 25 sections with minimum 3 years documented experience.
2. Fabricators: Companies specializing in fabricating the Products specified in the Divisions 20, 23, 25 sections with minimum 3 years documented experience.
3. Installers: Perform the Work using qualified workmen that are experienced and usually employed in the trade.
4. Testing Agencies: Products requiring electrical connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and as indicated.

B. Product Testing and Certification:
1. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors shall be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.
2. Where the words Listed, UL Listed, UL Labeled, Underwriters Laboratories, Inc., UL, or variations of this terminology, appear under this Division of the Specifications or the associated drawings, it is understood that a comparable testing agency as defined by NRTL above is acceptable.
3. Such testing and certification is generally applicable to products within the following categories:
a. Life safety and fire suppression.
b. Fuel burning equipment, except certain classes of power or industrial equipment for which other recognized certification applies as well.
c. Factory fabricated and wired electrical control panels and packaged equipment with factory installed electrical controls or panels.
d. Components for life safety systems, fuel systems and medical gas systems.
4. The listing under Paragraph ‘3’ above is provided for illustration of requirements and is not exclusive. Provide products that have been tested and listed for the intended application when such products are available unless the Contracting Agency has provided written exemption on an itemized basis.
5. Provide electrical products listed and labeled by UL, FM, ETL or other approved NRTL. If listing and labeling is not available, stamp the submittal for these products by an Alaska Registered Professional Engineer approved by the Authority Having Jurisdiction, at no additional cost.
6. Where interpretation is required, the Contracting Agency will provide direction and will be the sole judge in cases of compliance with this subsection.

1.9 DELIVERY, STORAGE AND HANDLING

A. Delivery and Acceptance Requirements:
1. Verify products are new and delivered in original factory packaging/crating and are free from damage and corrosion.
2. Replace products delivered to job site that does not comply with above requirements at no expense to Owner.
3. Remove damaged, or otherwise unacceptable, products from the project site when directed by the Contracting Agency.

B. Storage and Handling Requirements:

1. Store products in covered storage area protected from the elements, outside the general construction area until installed. Maintain ambient conditions required by manufacturer of each product.
2. Store products in original factory packaging until actual installation.
3. Handle items carefully to avoid breaking, chipping, denting, scratching, or other damage.
4. Replace damaged items with same item in new condition.

1.10 WARRANTY

A. See Division 1 for general warranty requirements.

B. Warranty workmanship, labor, and materials for a period of one year from the date of final acceptance, without limitation, except where longer warranty periods are specified in a specific Section under this Division, or in the General Conditions of the Contract. Promptly coordinate and perform Warranty work at the Contractor's sole expense.

C. Submit necessary documentation to each appropriate Manufacturer's Representative to validate manufacturer's warranty.

D. Provide one copy of warranty documentation and confirmation receipt from the Manufacturer's Representative.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:
1. Cover and protect open ends and individual components of the ventilation and piping systems during construction when dust, dirt, debris, overspray, or other potential construction contaminates could enter the air distribution system or elements (ducts, fans, VAV boxes, silencers, etc.).
2. Provide temporary construction filters over return airshaft openings and at air handling unit return air dampers.

3.2 INSTALLATION

A. Interface with Other Work:
1. Electrical Work:
a. Coordinate with Division 26 [16].
b. See also specification section 20 0513 - Common Motor Requirements.
c. Suggested Coordination Schedule: The Contractor is responsible to provide heating, ventilating, and plumbing equipment motors and controls, including fire suppression controls. Unless otherwise indicated on the Drawings, it is recommended that motors and controls be furnished, set in place, and wired in accordance with the following schedule. "CC" applies to either a Control subcontractor working as a sub to the General Contractor or to the Divisions 20, 23, 25 Mechanical subcontractor. Coordinate work between subcontractors.

MC - Divisions 20, 23, 25-Mechanical CC - Divisions 20, 23, 25-Controls EC - Divisions 26, 27 and 28-Electrical	Furnished By	Set in Place By	Power By	Control By
Equipment Motors	MC	MC	EC	CC
*Magnetic motor starters:				
Automatic controlled, w/ or w/o HOA switches	EC	EC	EC	CC
Automatic controlled, w/ or w/o HOA switches, and that are furnished as part of factory wired equipment	MC	MC	EC	MC
*Manual Motor Starters:				
Manually controlled	EC	EC	EC	EC
Manually controlled, and that are furnished as part of factory wired equipment	MC	MC	EC	MC
Combination disconnect and motor starter	EC	EC	EC	CC
Variable Speed Drives	MC	EC	EC	CC
Push-button stations, pilot lights, contactors, multi-speed switches	EC	EC	EC	EC
Disconnect switches, thermal overload switches, manual operating switches	EC	EC	EC	--
Multi-speed switches furnished as part of factory wired equipment	MC	MC	EC	MC
Temperature control relays, transformers, electric thermostats, time clocks, etc., that are not part of factory furnished equipment	CC	CC	CC	CC
Remote bulb thermostats, motor valves, controls, which are an integral part of factory furnished mechanical equipment.	MC	MC	EC	MC

* Provide starters in accordance with the Electrical Division of these Specifications. Note that a thermal overload relay in each phase is required for each starter (packaged equipment included).

2. Coordination with Room Numbering:
   a. Certain systems provided under this Division rely on identification systems that are based on room names or numbers.
   b. The numbering scheme indicated in this Project Manual is based on room numbers assigned during the design process.
   c. The Contracting Agency reserves the right to change the numbers prior to Substantial Completion, and the final names and numbers will not necessarily match those found in the Project Manual.
   d. Obtain from The Contracting Agency the final room numbers prior to commencing the numbering of Divisions 20, 23, 25 systems.
   e. Tag and label system equipment and devices in accordance with the final numbering scheme at no additional cost.

3.3 REPAIR/RESTORATION

A. Touch-up, repair or replace product components broken during installation or startup with new replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Clean and repair existing identification tags/labels, hangers, supports, insulation, materials, instrumentation, and equipment that remain or are to be reused or are affected by this work. Materials and equipment which require major repair may be replaced at the Contractor's option.

D. Plug, patch and repair surfaces, adjacent construction, and finishes damaged during demolition and new work. Restore to original condition or better including fire, smoke or temperature ratings or listings. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish. Replace cracked or damaged ceiling tiles. Repair fire proofing, assembly fire ratings, and construction resistant to the passage of smoke.

3.4 SITE QUALITY CONTROL

A. Site Tests and Inspections:
1. The Contracting Agency may inspect and approve sample installation of systems and equipment prior to general installation of units.
2. Schedule, obtain, and pay for fees and/or services required by the local Authorities Having Jurisdiction and by these specifications, to test the mechanical systems.
3. Notify the Contracting Agency a minimum of 24 hours in advance of tests. Certify in writing that specified tests have been made in accordance with the specifications.
4. Immediately correct deficiencies that are discovered during the tests and repeat tests until system is approved. Do not cover or conceal piping, equipment or other portions of the mechanical installations until satisfactory tests are made and approved.
5. Under the direction of the Contractor and in the presence of the Contracting Agency, place the entire mechanical installation and/or any portion thereof in operation to demonstrate satisfactory operation.
6. Arrange for the Contracting Agency to witness tests. The Contracting Agency may waive witnessing any specific test at its discretion.

B. Non-Conforming Work:
1. Expediently remove and provide new for work not conforming to the Project Manual upon discovery; including warranty and discovery periods.
2. Warranty period shall start over for replaced equipment and installation from the date of accepted by the Contracting Agency.

C. Manufacturer Services:
1. Authorized manufacturer's representative shall be on-site for testing, start-up, functional check-out, and commissioning of equipment and systems.
2. Procurement, installation, start-up, and warranty services to be provided by manufacturer's authorized representative and service company.
3. Equipment, devices, hardware, and software to be approved for application, and of current production. Original manufacturer's parts, hardware, software, and support to be available for ten years after installation.

3.5 CLEANING

A. Upon completion of installation and prior to initial operation, remove debris, and clean and wipe down equipment, piping, ductwork and floor to eliminate dust and dirt.

3.6 CLOSEOUT ACTIVITIES

A. Demonstration: Provide demonstration, conducted by authorized factory start-up personnel, to the Contracting Agencies authorized personnel as listed in each individual specification section.

B. Training: In addition to training specified in each individual specification section, provide 4 additional hours of operational instruction conducted by qualified personnel, covering any of the mechanical systems and installation requested by the Contracting Agency to its authorized maintenance personnel.

3.7 PROTECTION

A. Provide finished products with protective covers during balance of construction.

B. Provide open duct ends, grilles and diffusers with protective covers during balance of construction.

C. Provide open pipe ends with protective caps during balance of construction.

END OF SECTION

SECTION 20 05 13

COMMON MOTOR REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements, products and methods of execution relating to electric motors in general and shall apply to motors furnished as integral parts of equipment specified in this and other Divisions.

B. Related Sections:
1. 01 91 00 - Commissioning
2. 20 00 00 - Mechanical General Requirements
3. 23 21 23 - Hydronic Pumps

1.2 REFERENCES

A. Codes and Standards:
1. See section 20 00 00 - Mechanical General Requirements.
2. National Electrical Manufacturers Association, NEMA, Standards Publication Motors and Generators, MG-1.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide product performance characteristics as specified or scheduled on drawings.

1.4 PRE-INSTALLATION MEETINGS

A. See section 20 00 00 - Mechanical General Requirements.

1.5 SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Provide a tabular listing of motors including the following information: Tag (from drawings), location, function, actual nameplate FLA, fuse size used, overload relay used, and overload setting.
2. Make copy of list available during Substantial Completion observation by the Contracting Agency. Include list in Operations and Maintenance Manuals.

1.6 CLOSEOUT SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.8 QUALITY ASSURANCE

A. See section 20 00 00 - Mechanical General Requirements.

B. Certifications: Motors shall conform to governing NEMA Standards and ASA Form C-50 for rotating machinery.

1.9 DELIVERY, STORAGE AND HANDLING

A. See section 20 00 00 - Mechanical General Requirements.

1.10 WARRANTY

A. Manufacturer Warranty: See section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

PART 2 - PRODUCTS

2.1 MOTORS IN ELECTRICAL CLASSIFIED LOCATIONS

A. Motors used in environments indicated to be NEC Class I, Division I shall be built and labeled as explosion-proof for the Group and autoignition temperature, NEC T-code.

B. Motors used in environments indicated to be NEC Class I, Division II:
1. Listed for Class I Division I environments.
2. Listed for Class I Division II environments.
3. Does not have arc-producing brushes or switching mechanisms which could act as ignition sources.
4. Motors that include a space heater, its surface temperature may not exceed 80% of the autoignition temperature of the hazard.

2.2 SUPPLY VOLTAGE

A. Supply voltage shall be determined from the electrical plans where nominal utility voltage will be indicated.

B. Motor voltage shall be stamped on the nameplate and relate to the nominal voltage as follows:

THREE PHASE MOTORS	
Nominal Volts	Motor Ratings
208 volts	200V, 208V, or 208/220V
240 volts	220V or 208/220V

480 volts	460V
SINGLE PHASE MOTORS	
Nominal Volts	Motor Ratings
120 volts	115V or 115/230V
240 volts	230V or 115/230V
208 volts	200V or 208V

Note: Provide nameplate indicating that voltage for a motor operating at 208 VAC is suitable.

C. Voltage variation: Motors shall be designed to operate within the parameters of these requirements at rated load and with a voltage variation from the name plate voltage of plus or minus ten percent.

D. Motors shall operate successfully at rated load and at rated voltage with a maximum frequency variation of five percent above or below rated frequency.

E. Motors shall operate successfully at rated load with a combined maximum variation in the voltage and frequency of five percent above or below rated voltage and rated frequency.

2.3 LOCKED ROTOR CURRENT

A. No motor above 15 HP shall have a locked rotor current in excess of NEMA code letter “G”. Smaller motors may have a higher locked rotor rating, but in no case exceeding the recommended NEMA rating as related to motor size.

2.4 MOTOR INSULATION

A. Unless otherwise specified, motor insulation shall be NEMA Class “B” (or better). Based on 40 degrees C. maximum ambient, and 90 degrees C. maximum rise, total maximum operating temperature shall not exceed 130 degrees C.

2.5 MOTOR LOADING

A. No motors shall be subjected to loads exceeding the motor nameplate rating, under any normal operating condition.

2.6 MOTOR RATING

A. Motors are sized in conformity with the manufacturer’s published information and shall not be interpreted as the final requirement. Check each motor for adequacy in relation to the specific application.

B. Motors indicated as being connected to variable speed drives (VSD) shall be rated for VSD service.

2.7 HIGH EFFICIENCY AC MOTORS

A. Furnished high efficiency electric motors for equipment that:

1. Require a three horsepower or larger drive motor.
2. Have duty cycles classified as continuous.

B. Efficiency of the motors shall be determined by NEMA Standard MG 1 - 12.536 and shall have efficiencies equal to or better than:

Motor Size	Nominal Efficiency
Through 3 HP	89 percent
Over 3 HP through 10 HP	91 percent
Over 10 HP through 30 HP	93 percent
Over 30 HP through 60 HP	94 percent
Over 60 HP through 100 HP	95 percent
Over 100 HP	95 percent

2.8 MOTOR HOUSING FEATURES

A. Open drip-proof, totally enclosed fan cooled (TEFC), or explosion-proof, as appropriate for the use intended and the environment where installed, or as noted. Provide totally enclosed fan cooled motors for equipment below grade, located outdoors, or operating in damp or dust-laden locations. Provide a continuous moisture drain that is screened against insect entry for totally enclosed motors.

B. Oversized external conduit boxes at least one size larger than NEMA standard.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions: Cover motors to protect them from construction dirt and debris.

3.2 INSTALLATION

A. Special Techniques:

1. Installation of motors shall be as required by the driven equipment. Make sure motor design and characteristics are suitable for the application.
2. Electrical connections for motors shall conform to NEC Articles 430 and 440 as applicable, and to any state and local code having jurisdiction.
3. Unless furnished as part of a complete package including disconnects and control, and/or motor fuse protection, protect motors by Bussmann Fusetron Dual-Element Time Delay fuses, or approved equal.
4. Megger motor windings prior to starting. Include log of megger readings in the Operations and Maintenance manuals.
5. Verify correct rotation of motors.
6. Comply with Article 460 of the National Electrical Code for installation of power factor correction capacitors.

7. Motor sizes shown on the Drawings are estimates based upon the mechanical design. Where motors actually furnished are of a different size than those shown, motor circuit components (starters, disconnects, overcurrent devices, and conductors) shall be revised to suit the motors actually furnished, without increase in the Contract amount. Similarly, motor overcurrent device sizes shown on the Drawings or specified are based upon estimated motor code letters, overcurrent device manufacturers' recommendations, and full-load currents from the NEC Tables. Where the motors actually furnished require different sizing, the sizes of the overcurrent devices shall be adjusted to conform to the NEC, without increase in the Contract amount.

3.3 REPAIR/RESTORATION

A. Repair any components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

END OF SECTION

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SECTION 20 05 29

MECHANICAL HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hanger, support and anchoring requirements for plumbing and mechanical appliances, equipment, and related distribution systems.
2. Building wall, floor, and roof penetration methods for the routing of plumbing and mechanical distributions systems (e.g., sleeving and sealants).

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 48 - Vibration and Seismic Control
3. 20 05 53 - Mechanical Identification
4. 20 07 00 - Mechanical Insulation
5. 22 11 00 - Domestic Water Piping and Specialties
6. 23 21 13 - Hydronic Piping and Specialties
7. 23 21 23 - Hydronic Pumps

1.2 RELATED WORK

A. The building structure shall be designed to support the weight of plumbing and mechanical appliances, equipment, and distribution systems (non-structural components), as well as related seismic and wind forces in accordance with ASCE/SEI 7.

B. See Structural drawings for appliance and equipment housekeeping pad material, construction, and attachment. Actual housekeeping pad locations, dimensions and through penetrations shall be coordinated with approved appliance and equipment base dimensions, weights, and anchoring requirements using the product submittal and shop drawing process.

1.3 REFERENCES

A. Codes and Standards:
1. Refer to Section 20 00 00 - Mechanical General Requirements for general Code and Standard references.
2. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
3. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
4. ASCE/SEI 7-16 Minimum Design Loads for Buildings and Other Structures - Chapter 13 (Anchorage Requirements) and Chapter 29 (Wind Load Requirements).

B. Abbreviations, Acronyms and Definitions:
1. See Section 20 00 00 - Mechanical General Requirements for general abbreviations, acronyms, and definitions.
2. See Mechanical Drawings (Legend and Abbreviations).

1.4 DESCRIPTION

A. This section applies to Division 20, 21, 22, 23, 25 equipment and systems:

1. Support fire suppression system piping and equipment in accordance with Section 21 10 00 - Water Based Fire Suppression Systems.
2. Support plumbing piping, appliances, and equipment in accordance with this section and Uniform Plumbing Code (UPC) requirements as applicable, whichever is more restrictive. In case of conflicts, follow UPC criteria.
3. Support mechanical system piping, appliances, and equipment in accordance with this section and International Mechanical Code (IMC) requirements as applicable, whichever is more restrictive. In case of conflicts, follow IMC criteria.
4. Support ductwork in accordance with Section 23 31 00 - Ducts and Accessories.
5. Provide additional seismic restraint as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 48 00 - Vibration and Seismic Control.

B. Design Requirements:
1. Appliance, equipment, and related distribution system support:
   a. Select and apply pipe hangers and supports using stock or production parts whenever possible.
   b. Design support spacing such that free span of piping does not exceed code or MSS SP58 criteria, whichever is most restrictive.
   c. Calculate required supporting force at each hanger location to confirm hanger type and hanger rod diameter selection.
   d. Provide hangers such that equipment connection points do not carry connected piping load.
   e. When possible, adjust hanger spacing, hanger rod length/diameter to meet the seismic design exclusion criteria of ASCE/SEI 7 to minimize the need for additional seismic restraint.
2. Vibration and seismic restraint systems: If the exclusion criteria of ASCE/SEI 7 cannot be met, provide additional seismic support as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 48 00 - Vibration and Seismic Control.
3. Building Design Criteria:
   a. This project is designated as an essential facility.
   b. Wind design data: See Structural Design Criteria Schedule.
   c. Seismic design data: See Structural Design Criteria Schedule.
   d. Component Importance Factors, Ip:
      1). Fire suppression systems: Ip = 1.5
      2). Fuel gas system: N/A
      3). Piping Importance Factor: Ip =1.5
      4). All other components: Ip = 1.5

C. General Performance Requirements:
1. Plumbing and mechanical distribution systems as shown are semi-diagrammatic.
2. Provide additional hangers, expansion loops, pipe anchors and pipe guide assemblies as required based on actual (as-built) distribution system layout/routing.
3. Coordinate hanger and support anchor locations and methods with structural.
4. Provide hangers and supports that allow for the free expansion and contraction of system piping without transferring tensile and compressive stresses to adjacent supports or connected equipment.

D. Special Performance Requirements for Open Ceiling Spaces:
1. Coordinate the routing and support of ductwork, piping, electrical conduit, lighting and other equipment in open ceiling spaces (using the shop drawing review process) to provide a uniform and symmetrical appearance.
2. In general, use trapeze hanger style support systems with hangers equally spaced based on the limiting component supported. Provide hanger rods vertical and straight. Trim hanger rod ends to provide a “finished” uniform appearance.

E. Equipment and Systems Subject to Wind Loading: Provide equipment anchorage and additional support in accordance with the manufactures recommended installation requirements, as well as ASCE/SEI 7 anchorage and wind load requirements (e.g., roof mounted equipment).

1.5 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Provide manufacturer's catalog data, including load capacity and anchor embedment requirements.
2. Manufacturer's Installation Instructions: Indicate special tools, procedures, and assembly of components.

C. Shop Drawings:
1. Submit dimensioned shop drawings for housekeeping pads and roof curbs (with dimensioned penetration locations).
2. Submit shop drawings for field fabricated support systems.
3. For plumbing and mechanical distributions system shop drawings:
   a. Overlay locations and types of hangers and supports to be provided.
   b. Include details for each hanger and support type with anchorage requirements.
   c. Dimension expansion loops and alignment guide locations and offsets.
   d. Coordinate additional seismic and vibration isolation requirements with Section 20 48 00 - Vibration and Seismic Control.

1.6 CLOSEOUT SUBMITTALS

A. Record Documentation:
1. Indicate installed hanger locations, supports and expansion control assemblies on applicable contractor as-built drawings.
2. Provide Operating and Maintenance Data (installation and adjustment instructions) for non-commodity products.

1.7 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 3 years documented experience.
2. Installers: Minimum 3 years' experience.
3. Provide piping and support systems designed and manufactured per MSS SP58.

1.8 DELIVERY, STORAGE, AND HANDLING

A. See Section 20 00 00 - Mechanical General Requirements.

1.9 WARRANTY

A. See Section 20 00 00 - Mechanical General Requirements.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. General:
1. Piping and support systems material: Malleable iron, steel, or copper.
2. Hot dipped galvanized ferrous hangers and supports installed outdoors or in unheated spaces.
3. Select and apply pipe hangers and supports per MSS SP58. Use stock or production parts when possible.
4. Fabricate and install pipe hangers and supports per MSS SP58 recommended practices.
5. Hangers shall securely lock using a mechanical fastener. Hangers and supports using gravity type locking are not acceptable. For example, adjustable swivel ring Type 6 is not allowed.
6. Pre-engineered support systems (e.g., Unistrut, Super-Strut, B-Line) may be used in accordance with manufacturer's load limits.
7. Manufacturers: Grinnell, M-CO Michigan Hanger Company, Kin Line or equal.

B. Plumbing Piping:
1. Conform to the Uniform Plumbing Code requirements.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
3. Hangers for DWV and Cold Pipe Sizes two inch and over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe sizes two to four inch: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes six inches and over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers under six inches: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes six inches and over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Supports: Welded steel bracket and wrought steel clamp.
9. Wall Support for Hot Pipe Sizes six inches and over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
11. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
12. Floor Support for Hot Pipe Sizes six inches and over: Adjustable cast iron roll and stand, steel screws, and steel support.
13. Vertical Support: Steel riser clamp.
14. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hydronic Piping:
1. Conform to ASME B31.9 and the International Mechanical Code.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
3. Hangers for Cold Pipe Sizes two inches and over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe sizes two to four inch: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe sizes six inches and over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes six inches and over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support: Welded steel bracket and wrought steel clamp.
9. Wall Support for Hot Pipe Sizes six inches and over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.

10. Vertical Support: Steel riser clamp.
11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
12. Floor Support for Hot Pipe Sizes up to four inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
13. Floor Support for Hot Pipe Sizes six inches and over: Adjustable cast iron roll and stand, steel screws, and steel support.
14. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Refrigerant Piping:
1. Conform to ASME B31.5.
2. Hangers for pipe sizes 1/2 to 1-1/2 inch: Adjustable swivel ring; split ring.
3. Hangers for pipe sizes two inches and over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support: Welded steel bracket and wrought steel clamp.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and steel support.
8. Provide copper plated hangers and supports for copper piping. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
9. Pre-insulated pipe hanger inserts to permit continuous insulation at the pipe hangers: Armaflex, Model IPPH or equal.

2.2 DUCTWORK, FLUES, STACKS, AND BREECHINGS HANGERS AND SUPPORTS:

A. Provide hangers and supports for ductwork in accordance with Section 23 31 00 - Ducts and Accessories.

B. Provide hangers, supports, and/or guy wires as applicable for flues, stacks, and breechings in accordance with Section 23 51 00 - Breechings, Chimneys and Stacks.

C. Provide hangers and supports for commercial kitchen appliances, equipment, and related distribution systems in accordance with Section 23 38 13 - Commercial Kitchen Ventilation Systems.

D. Provide spring vibration isolation hangers for generator engine exhaust system including engine exhaust silencer and connecting exhaust piping system.

2.3 ACCESSORIES

A. Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded.

B. Escutcheons: Nickel or chrome plate with screws or springs for holding plate in position.

C. Pipe Protection Saddles: Shop fabricate or purchase specially manufactured saddles specifically designed for the intended use. Provide saddles where roller type support is used, or where the pipe hanger is installed outside the insulation for protection of insulating jacket.

D. Outdoor applications: Metal components shall be galvanized or stainless steel.

2.4 INSERTS

A. Provide inserts to match the load bearing capacity of hangers.

B. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four (4) inch diameter.

C. Concrete deck inserts: Galvanized rod, steel plate, similar to Kin-Line Figure 293.

D. Screw insert for concrete: Malleable iron similar to Grinnell Figure 152.

2.5 PRE-ENGINEERED SUPPORT SYSTEMS

A. Manufacturers:
1. Unistrut.
2. Super-Strut.
3. B-Line.
4. K-Line.
5. Erico.
6. Approved equal.

B. Materials and Finish:
1. Heated Indoor Applications:
   a. Carbon steel with pre-galvanized zinc (PG) finish.
   b. Carbon steel with plain (PL), paintable galvanized, or phosphatized and primed when welding or painting will be required.
2. Outdoor Applications:
   a. Stainless steel (Type 304 or Type 316) were specifically specified for use in damp, corrosive, or marine environments.

C. Special Finishes:
1. Surface metal raceways: High performance epoxy coating (e.g., Unistrut Perma-Green III).

D. Channel:
1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.
2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Fittings: Match channel material and finish.

F. Nuts and Hardware:
1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).
2. Bolts, screws, and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).
3. Material and Finish:
   a. Heated indoor applications: Electro-galvanized (EG).
   b. Outdoor applications:
      1). Hot-dipped galvanized (HG).
      2). Stainless steel (Type 304) were specifically specified for use in damp, corrosive, or marine environments.

G. Mechanical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported, to include but not limited to:
1. Pre-insulated pipe hanger inserts to permit continuous insulation at the pipe clamps: Unistrut model PUX, Armaflex model IPPH.

2. Splice and gusset plates.
3. Corner angles.
4. Specialized support brackets.
5. Beam clamps with restraints.
6. Column supports.
7. Strut pipe clamps.
8. Straps.
9. Brackets.

2.6 EQUIPMENT ROOF CURBS

A. See Architectural for field fabricated roof curb construction requirements. Coordinate mechanical roof curb mounted equipment dimensional and attachment requirements with Architectural and Structural.

B. Provide prefabricated insulated equipment roof curbs for support of roof mounted mechanical equipment. Roof curbs shall be designed for both seismic and wind loading and shall include stamped structural engineering calculations.

C. Provide prefabricated structural roof curbs for roof top mounted air handling units in accordance with Section 23 73 00 - Central Air Handling Units.

2.7 PIPING ROOF SUPPORTS (NON-PENETRATING)

A. Manufacturers:
1. Cooper Industries (Dura-Blok).
2. Miro Industries, Inc.
3. Pipe Pier.
4. Mifab.

B. Resilient, non-abrasive, UV resistant base. Galvanized steel channel and clamps. Zinc plated, adjustable hardware. Compatible with roof system.

C. Roof supports shall be provided to maintain piping a minimum of 3-1/2 inches above the roof surface.

2.8 SEISMIC RESTRAINT SYSTEMS

A. See Section 20 48 00 - Vibration and Seismic Control.

2.9 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

A. Fabricate sleeves in non-load bearing walls from 20-gauge galvanized sheet steel conforming to ASTM A924 / A924M.

B. Fabricate sleeves in load-bearing walls from standard-weight galvanized steel pipe conforming to ASTM A53 / A53M.

C. Provide UL listed prefabricated fire rated sleeves and seals for pipes through fire rated and fire resistive floors and walls.

2.10 FRAMED OPENINGS

A. Provide structural steel members for framed openings conforming to ASTM A36 / A36M.

B. Closure Collars:
1. For round and rectangular ducts with a minimum dimension less than 16 inches, fabricate collars from 20 gauge galvanized steel.
2. For round and rectangular ducts with a minimum dimension of 16 inches or greater, fabricate collars from 18 gauge galvanized steel.

2.11 WALL PENETRATION WATER SEALS

A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening.

B. EPDM seals.

C. Type 316 stainless steel bolts and nuts.

D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.

E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Visually inspect appliances, equipment and distribution systems requiring anchorage/attachment to structure for installation location tolerance, interference and other conditions affecting installation.

B. Verify actual locations of cast-in-place anchors, structure reinforcements and other required attachments prior to installation.

C. Document and correct deficiencies or submit proposed design modifications for approval prior to the installation.

D. Note if Project contains cast in place radiant floor heating tubing. Coordinate slab penetration locations so as to not damage tubing.

3.2 PREPARATION

A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements using the shop drawing review process.

B. If exclusion criteria of ASCE/SEI 7 cannot be met, coordinate and provide additional seismic support as required for mechanical and plumbing appliances, equipment, and related distribution systems in accordance with 20 48 00 – Vibration and Seismic Control.

C. Submit shop drawings required by this section coordinated with the additional seismic design as required.

D. Do not install hangers and supports without approved shop drawings.

3.3 INSTALLATION

A. Attachment:
1. Hollow masonry: Toggle bolts.
2. Solid masonry and concrete: Preset inserts or expansion bolts.
3. Structural steel: Beam clamps which engage both sides of structural member or have retaining clips or other approved means for positive engagement.
4. Metal surfaces: Machine screws, bolts, or welding.
5. Wood construction: Wood or sheet metal screws.
6. Do not use powder-actuated fasteners for anchorage in tension applications. Obtain written permission from the Owner prior to using any type of powder -actuated studs.
7. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.

B. Pipe Hangers and Supports:
1. Install hangers and supports in accordance with manufacturer's instructions, applicable code requirements and approved shop drawings.
2. Support horizontal piping as scheduled.
3. Independently support piping at equipment, such that the equipment supports no weight.
4. Insulated piping: Coordinate with Section 20 07 00 - Mechanical Insulation. Provide insulation saddles or 18 gauge steel insulation shields combined with sections of calcium silicate or cellular glass or provide pre-insulated pipe hanger inserts to permit continuous insulation at the pipe hangers or clamps.
    a. Support cold piping outside the insulation and vapor barrier where continuous vapor barrier is specified:
    b. Subject to approval, hot piping may be insulated around the supports.
5. Provide trapeze hangers when more than three pipes run parallel and at same elevation.
6. Provide roller supports for hot pipes. Provide saddles where roller type support is used, or where the pipe hanger is installed outside insulation for protection of insulating jacket.
7. Design rods and cross members to support three times the weight of pipes and contents plus 250 pounds.
8. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
9. Place hangers within 12 inches of each horizontal elbow.
10. Use hangers with 1-1/2 inch minimum vertical adjustment.
11. Support horizontal cast iron pipe adjacent to each hub, with five feet maximum spacing between hangers.
12. Support riser piping independent of connected horizontal piping.

C. Piping Requiring Vibration Isolation:
1. Support main risers less than 20 feet in height only at mid-level, with riser guides at other levels.
2. Do not support vibration isolated piping along with non-isolated piping on a common trapeze.

3. Rigidly mount steel spring hanger boxes to the supporting structure. Do not locate in the middle of the hanger rod.
4. Rigid pipe anchors are not permitted in vibration isolated piping circuits.

D. Equipment Bases and Supports:
1. For cast-in-place concrete requirements see Section 03 30 00 - Cast-in-Place Concrete
2. Unless noted otherwise, provide 3-1/2 inch high (2x4 form) reinforced concrete housekeeping pads with 8 inches minimum extended, chamfered edge beyond base frame in all directions for floor mounted appliances and equipment. Where exterior isolators are used, this distance is measured from the outermost holes in the isolator base plate to the edge of the housekeeping pad.
3. Provide 5-1/2 inch high (2x6 form) reinforced concrete housekeeping pads for larger and heavier equipment to include fuel oil day tanks, steam generators, boilers, buffer tanks, water heaters, air compressors, expansion tanks, water cooled chillers and heat pumps, water storage tanks, pressure tanks, and kitchen makeup air unit MAU-2. Pads shall extend 8 inches minimum beyond equipment as noted above.
4. Provide 7-1/2 inch high (2x8 form) reinforced concrete housekeeping pads for central air handling units in level 4 mechanical rooms to provide adequate cooling coil and humidifier condensate drain trap water column height. Pads shall extend 8 inches minimum beyond equipment as noted above.
5. The 8-inch extended edge beyond base frame dimension may be reduced to 6 inches minimum with approved anchorage calculations.
6. Construct field fabricated equipment bases and supports from steel members and/or pre-engineered support systems. Prime and paint bases and supports gray or black in accordance with Section 09 91 00 – Painting.
7. Pre-engineered support systems, which are factory coated, are not required to be painted.

E. Roof Curbs:

1. Coordinate field fabricated roof curb locations and dimensional and support requirements for roof mounted equipment with Architectural and Structural.
2. Pre-engineered roof curbs are specified with the equipment being mounted. See applicable specification sections.

F. Equipment and Systems Subject to Wind Loads:
1. Provide equipment anchorage and additional support in accordance with the manufactures recommended installation requirements, as well as ASCE/SEI 7 anchorage and wind load requirements.
2. As applicable, provide wind restraint systems (e.g., guy wires, etc.) in compliance with the manufacturer’s written instructions, and certified and approved application engineering installation details.
3. Install wind restraints so as not to stress or misalign equipment, piping, and ductwork.

G. Penetrations:
1. Coordinate mechanical penetrations with Architectural and Structural construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.
2. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.
3. Provide penetrations through roof, exterior walls, and floors (See floor penetration seals) to be weather and water tight.
4. Provide UL rated fire-stopping assemblies for rated roof, wall, and floor penetrations in accordance with Division 07.
5. Seal penetrations through smoke partitions and barriers to resist the passage of smoke.
6. Sleeves:

a. Provide sleeves for pipe and round ducts less than 16 inches diameter passing through floors, walls, ceilings, or roofs.
b. Provide 1 inch clearance between the pipe/duct and sleeve opening. Oversize sleeves for cold piping to allow continuous insulation with vapor barrier through the sleeve. Coordinate with UL listed firestop through penetration details.

7. Framed Openings:
   a. Provide framed openings for round ducts 16-inch diameter and greater and rectangular ductwork passing through floors, walls, ceilings, or roofs.
   b. Provide 1-inch clearance between the duct and framed opening.
   c. Provide closure collars not less than 4 inches wide on each side of penetration.
   d. Escutcheons: Provide escutcheons for ductwork, piping and conduit passing through walls, floors, and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover sleeves. Secure escutcheons in position.
8. Wall Penetration Seals:
   a. Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.
   b. Select appropriate wall penetration sealing systems based on pipe/conduit material and nominal pipe/conduit size in accordance with the manufacturer's selection charts.
   c. Install piping/conduit and sealing system prior to waterproofing the wall. Grout void between water seal and outside face of foundation wall to provide continuous bearing surface for waterproofing fabric.
9. Floor Penetration Seals:
   a. Provide water-tight sleeves at floor penetrations and extend sleeve height two (2) inches above finished floor or as detailed.
   b. Sleeves may terminate flush with top of concrete housekeeping pads unless detailed otherwise.
   c. Grout and seal sleeves to floor and seal annulus between pipe and sleeve to create a watertight penetration assembly.
   d. Floor penetrations to include but not limited to plumbing and mechanical distribution system piping and ductwork.
   e. Coordinate with UL listed firestop through penetration details.
10. Roof Flashing: Provide roof penetration flashing in accordance with Division 07 as an integral part of the roofing system.

3.4 INTERFACE WITH OTHER WORK

A. Coordinate and sequence installation of hangers and supports with trades responsible for portions of this and other related sections of the Project Manual.

3.5 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

3.6 SITE QUALITY CONTROL

A. Non-Conforming Work: Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

3.7 CLEANING

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces.

END OF SECTION

SECTION 20 05 48

VIBRATION AND SEISMIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Performance requirements for the design, product selection and installation of seismic and vibration control anchors, bracing and supports for nonstructural mechanical, electrical, and plumbing (MEP) system components. This specification section also applies to owner furnished, contractor installed equipment (i.e., chiller CH-1).

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 29 - Hangers and Supports
3. 20 07 00 - Mechanical Insulation
4. 23 21 13 - Hydronic Piping and Specialties
5. 23 21 23 - Hydronic Pumps
6. Division 26 - Electrical

1.2 RELATED WORK

A. The building structure shall be designed to support the weight of the projects non-structural components, as well as related seismic and wind forces in accordance with ASCE/SEI 7.

1.3 REFERENCES

A. Codes and Standards:
1. Refer to Section 20 00 00 - Mechanical General Requirements for general Code and Standard references.
2. ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
3. 2019 ASHRAE Handbook: HVAC Applications, Chapter 47 Noise and Vibration Control.

B. Abbreviations, Acronyms and Definitions:
1. See Section 20 00 00 - Mechanical General Requirements and Section 26 00 00 - Electrical General Requirements for general abbreviations, acronyms, and definitions.
2. See Mechanical and Electrical Drawings (Legend and Abbreviations).
3. Seismic Design Firm (SDF): A firm specializing in the design, manufacturing, testing and certification of vibration and seismic restraint systems (and their individual components) for attachment and support of building mechanical and electrical equipment and associated distribution systems. The SDF provides certification that it's manufactured vibration and seismic restraint systems are seismically qualified for service by analysis, testing and/or experience data in accordance with ASCE/SEI 7, Chapter 13.
4. Seismic Design Firm Representative: Structural engineer regularly employed by the SDF. Proficient in the design and proper application of seismically qualified (certified) vibration and seismic control attachments and support systems for building mechanical and electrical equipment and distribution systems.
5. Seismic Design Engineer (SDE): Alaska licensed professional structural engineer with advanced formal education and training in structural engineering relating to seismic design.

Responsible for the design, field certification and as-built drawing documentation of the project's vibration and seismic control design.

6. Project Structural Engineer: The project's structural design engineer of record.

1.4 SYSTEM DESCRIPTION AND CRITERIA

A. Design Requirements:
   1. Provide vibration isolation and seismic control anchoring and support system products and application design and installation supervision services from a single pre-approved product manufacturer/Seismic Design Firm (SDF) and/or an Alaska licensed Structural Design Engineer serving as the SDE.
   2. Note that the project's structural design engineer of record may serve as the SDE.
   3. Provide the design to anchor, brace, and support the facility's non-structural components and associated distribution systems, including pre-engineered equipment, to the building's structure in accordance with ASCE/SEI 7 Chapter 13 (Seismic).

B. Building Design Data:
   1. See Section 20 05 29 - Hangers and Supports.
   2. See structural drawings.

C. Performance Requirements:
   1. Responsibilities of the SDF/SDE include:
      a. Review the contract documents to determine the scope of the vibration and seismic control design for the project.
      b. Work with the Contractor and provide recommendations regarding the physical routing of mechanical and electrical distribution systems to limit the need for additional seismic support. See ASCE/SEI 7, Section 13.6 Exceptions.
      c. Define the mechanical and electrical components and distribution systems which will require vibration and seismic support to comply with ASCE/SEI 7.
      d. Follow the recommended practices identified in 2019 ASHRAE Handbook: HVAC Applications, Chapter 47 Noise and Vibration Control for application and selection of vibration isolation and control products and procedures.
      e. Provide professional engineering seismic design force calculations, associated design drawings, details and selected products to be used to provide the necessary vibration isolation and/or seismic restraint at each required location.
      f. Coordinate vibration and seismic design force conditions with Project Structural Engineer and incorporate adjustments necessary to avoid overstressing the building structure.
      g. Submit vibration and seismic design for review by the Owner's Representative for approval.
      h. Supply and deliver packaged vibration isolation and seismic restraint products with detailed installation instructions to the project site.
      i. Provide onsite training to the Contractor to ensure the proper installation and performance of the project's vibration and seismic control systems.
      j. Review MEP product submittals for products which include factory provided vibration isolation and/or seismic restraint component(s) for compliance with the seismic design. Provide written review comments.
      k. Provide field certification that the project's vibration isolation and seismic attachments and supports installation is complete and conforms to the approved vibration and seismic control design.

1.5 SUBMITTALS

A. See Section 20 00 00 - General Mechanical Requirements and Section 26 00 00 - General Electrical Requirements for general submittal requirements.

B. Submit Quality Assurance qualifications for:
1. Seismic Design Firm (SDF).
2. Seismic Design Engineer (SDE).
3. Vibration isolation and seismic restraint product manufacturer.
4. Mechanical, electrical, and plumbing trade installers.
5. Contractor's Statement of Responsibility.

C. Submit stamped engineering design for the project's vibration isolation and seismic design by a qualified, Alaska licensed professional structural engineer to include:
1. Support and attachment (or anchoring) detail drawings for each application.
2. Product selection, size, and installation configuration for each application.
3. Seismic design force data, assumptions, and calculations for each application.
4. Coordination requirements for topping slabs for embedded mechanical or electrical systems (e.g., radiant tubing, conduit, sensors).
5. Include evidence of coordination with Project Structural Engineer.

D. Submit vibration and seismic control design as a single submittal package. For larger projects, the vibration and seismic control submittal may be broken down into multiple smaller submittal packages, with each package covering a specific area of the building (e.g., Area A – First Floor, Penthouse Mechanical Room, etc.).

E. Product Data:
1. Annotated product catalog cutsheets and/or data sheets for the selected vibration isolation and seismic restraint products to be provided.
2. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and restraints by referencing numbered descriptive drawings.

F. For Seismic Design Categories C thru F:
1. Life Safety Components: Submit approved agencies' Analytical or Shaker Test "Certificate of Compliance" certificates.
2. Components Needed for the Continued Operation of the Facility: Submit approved agencies' Analytical (experience data per ASCE/SEI 7-16) or Shaker Test "Certificate of Compliance" certifications.
3. Components Containing Hazardous or Flammable Materials: Submit approved agencies' Analytical or Shaker Test "Certificate of Compliance" certificates. Testing shall prove that no internal component will rupture to ensure against loss of hazardous or flammable (explosive) material which could support combustion, ignition or cause contamination.
4. Use of historical data is permitted if evidence confirms historical based component having the same construction and weight with accompanying center of gravity as the submitted unit and basis of historical claim conforms to loads derived in testing with accompanying accelerations based on ICC-ES AC-156, "Acceptance Criteria for Seismic Certification by Shake-table Testing of Nonstructural Components."
5. Components not listed and requiring only anchorage and load transfer compliance: The SDE shall submit stamped engineering calculations, drawings, and details to support the project specific equipment will accept anchorage through the component's load path to structure at its center of gravity, at the designated anchorage locations.

G. Substitutions:
1. The proposed substitution equipment manufacturer shall provide a letter certifying that the equipment's packaged or recommended vibration isolation and seismic restraint methods

are in compliance with the requirements of this specification. Letters from field offices or representatives are not acceptable.

2. The cost associated with converting to the specified vibration isolation and/or seismic restraints method shall be borne by the Contractor in the event of non-compliance.

H. Shop Drawings:
1. Submit floor plan shop drawings which include and identify the locations of:
   a. Approved major mechanical and electrical system components and their seismic restraint methods.
   b. Vibration isolated components and systems and their vibration isolation and seismic restraint methods.
   c. Mechanical and electrical distribution systems and their vibration isolation and seismic restraint locations and methods to include (as applicable):
      1). Piping and tubing systems.
      2). Ductwork systems and in-line components.
      3). Electrical conduit and cable trays.
      4). Bus Ducts.
      5). Plumbing.
      6). Pneumatic tube transport systems.
   d. Identify building seismic joint locations and calculated displacement at each floor level.
   e. Identify exempt components and distribution systems in accordance with ASCE/SEI 7 Chapter 13.
   f. Identify vibration isolation and seismic control attachment and support locations with reference to applicable detail drawing(s).

I. Quality Assurance/Control Submittals:
1. Contractor’s Quality Assurance and Quality Control procedures for the administration and tracking of special inspections and testing.
2. Design Data and Test Reports.
3. Certificates and Manufacturer’s Instructions.
4. SDF qualifications and E&O insurance certificate.
5. SDE professional license and seismic engineering qualifications.
6. Authority Having Jurisdiction submittal review comments and final approval notification.
7. Manufacturer’s Field Reports.
8. SDF and/or SDE certification of the correctness of completed installation.

J. Installation, Operation and Maintenance (IO&M) Manual:
1. Provide a copy of the manufacturer’s written installation, operation, and maintenance manual to include the following information:
   a. Manufacturer’s descriptive literature neatly annotated to clearly indicate information applicable to the equipment installed.
   b. Certified seismic design calculations and installation details.

K. Close-out Submittals:
1. Project record drawings: Annotate a clean copy of the project Contract Drawings to clearly indicate the actual installation location of each vibration and seismic restraint device type and keyed to the appropriate installation detail.
2. Provide a certificate from the Manufacturer's Representative indicating that the vibration and seismic restraint systems of the facility are installed and operational as designed.

1.6 QUALITY ASSURANCE

A. Manufacturer qualifications: Company specializing in manufacturing and testing of vibration and seismic control systems and components with a minimum of five (5) years documented experience.

B. Installer qualifications: Minimum five (5) years' experience in the installation of specialized vibration and seismic control systems.

C. SDF qualifications: Minimum five (5) years' experience in the design, selection, and inspection of specialized seismic control systems for facilities with similar occupancies and seismic criteria and acceptable to the Authority Having Jurisdiction.

D. SDE qualifications: Minimum five (5) years documented seismic engineering experience and acceptable to the Authority Having Jurisdiction.

E. Errors and Omissions Insurance Certificate:
1. Submit copy of the SDF/SDE E&O Insurance Certificate.
2. Product liability insurance certificates are not acceptable.

F. Pre-Installation Meetings:
1. Conduct a coordination meeting prior to the installation of vibration isolation and seismic restraint equipment.
2. Discuss the equipment and systems affected by this Section and the method to be used to coordinate the installation and inspection of vibration isolation and seismic restraint equipment.
3. Conduct additional meetings as required to coordinate the work.
4. The meeting will be attended by:
   a. The Contractor.
   b. Contractor's Commissioning Representative (if appliable).
   c. Trade foremen for the systems affected by the work.
   d. The SDF representative.

1.7 DELIVERY, STORAGE, AND HANDLING

A. See Section 20 00 00 - Mechanical General Requirements.

1.8 WARRANTY

A. See Section 20 00 00 - Mechanical General Requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Seismic Design Firms (SDF):
1. ISAT/Kinetics Noise Control.
2. Mason Industries.
3. VMC Group.
4. Pre-approved equal.

B. Vibration Isolation and Seismic Restraint Products:
   1. ISAT (Seismic Restraint).
   2. Kinetics Noise Control (Vibration Isolation).
   3. Mason Industries.
   4. VMC Group.
   5. Hilti.
   6. Unistrut, Tyco International.
   7. Pre-approved equal.

2.2 FINISHES

A. Product finishes for corrosion protection:
   1. Materials exposed to building exterior:
      a. Stainless steel or finished with a powder coating suitable for coastal marine climate.
      b. Hardware: Stainless steel.
      c. Springs and housings shall be powder coated and suitable for coastal marine climate.
   2. Materials used for indoors:
      a. Stainless steel, galvanized, or finished with powder coating.
      b. Hardware: Zinc electroplated, galvanized, or stainless steel.
      c. Hardware in contact with concrete and surfaces subject to liquids shall be stainless steel.
      d. Springs and housings shall be powder coated.

B. In public areas, exposed support systems and elements shall be painted, excluding dynamic assemblies which shall have manufacturer's coating:
   1. Clean and prepare pipe, fittings, hangers, restraints, supports, and miscellaneous items for areas to be painted.
   2. Refer to the requirements specified in Division 09.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Visually inspect appliances, equipment and distribution systems requiring vibration isolation and/or seismic restraint for installation location tolerance, interference and other conditions affecting installation.

B. Verify actual locations of cast-in-place anchors, structure reinforcements and other required attachments prior to installation.

C. Document and correct deficiencies or submit proposed design modifications for approval prior to the installation.

D. Note if Project contains cast in place radiant floor heating tubing. Coordinate slab penetration locations so as to not damage tubing.

3.2 INSTALLATION

A. When possible, and without compromising distribution system performance or maintenance/replacement accessibility, route distribution systems such as to limit the extent of seismic support required in accordance with ASCE/SEI 7 Chapter 13, Section 13.6 Exemptions.

B. When the exemption requirements of ASCE/SEI 7 cannot be met, provide vibration isolation and seismic restraint in accordance with the appliable sections of Section 13.6. and the following:
   1. Install seismic control systems in compliance with the approved seismic design drawings and details and approved product manufacturer's written installation instructions.
   2. Install seismic control so as not to stress or misalign equipment, piping, or ductwork.
   3. Provide flexible connections for piping, ductwork, and conduit connections to vibration isolated equipment.
   4. Do not install rigid connections directly between vibration isolated equipment and the building structure.
   5. Seismic restraint systems shall not interfere with installation or maintenance access to other building systems.
   6. Install seismic cable assemblies taut on non-vibration isolated systems.
   7. Install seismic cable assemblies with a slight amount of slack for vibration isolated systems to avoid sound/vibration short circuits.
   8. Seismic single arm braces may be used in place of cables on rigidly attached systems and in place of cables on isolated systems when resilient bushings are used.
   9. Conduct Special and Periodic Inspections in accordance with FIELD QUALITY CONTROL article requirements.

3.3 SEISMIC JOINTS

A. When possible, limit the crossing of building seismic joints with distribution systems.

B. When crossing a seismic joint cannot be avoided, install flexible connections in distribution systems at the seismic joint which exceed the maximum design seismic joint deflection. See Structural drawings for calculated seismic joint deflections.

C. Use Ip = 1.5 without exception to accommodate displacements across seismic joints for ductwork.

3.4 INSTALLATION OF EQUIPMENT

A. Install indoor floor mounted equipment on raised reinforced concrete housekeeping pads. Extend pads beyond equipment base rails/floor mounting plates equally in all directions to meet seismic anchor embedment requirements. See Section 15 05 29 - Mechanical Hangers and Supports for detailed housekeeping pad requirements.

B. Install exterior equipment on crowned reinforced concrete equipment pads. Extend pads beyond equipment base rails/floor mounting plates equally in all directions to meet seismic anchor embedment requirements.

C. Install pump and other equipment bases into position, at normal vibration isolator operating height, using temporarily support blocks or shims prior to the installation of the equipment, isolators, and seismic restraints.
   1. After the installation, and under full load (e.g., equipment filled with operating fluid), adjust isolators to transfer load from the temporary blocks to the isolators.
   2. Next, remove temporary blocks, shims, and debris from beneath the equipment and verify no vibrational "short circuits" exist.
   3. Confirm equipment is free to move in all directions, within the limits of the seismic snubbers (maximum 0.25 inches).
   4. Minimum operating clearance between top of housekeeping pad and underside of isolator mounted equipment is 2 inches.

D. Protect air handling equipment and centrifugal fans from excessive displacement resulting from air thrust in relation to equipment weight. Provide horizontal thrust restraints if horizontal motion exceeds 3/8 inch.

E. Provide earthquake ceiling clips or other approved means of positive attachment of ceiling mounted diffusers and lighting fixtures (less than 75 pounds) to the ceilings T-bar support grid. Where ceilings are not braced, provide lay-in lighting fixtures with 4 independent corner diagonal wire ties to structure.

3.5 CONSTRUCTION

A. Interface with other Work:
1. Coordinate and sequence installation of vibration and seismic control supports and bracing with trades responsible for portions of this and other related portions of the Work.
2. Rework required as a result of failure to follow the manufacturer's written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.
3. Coordinate and schedule special inspections related to systems under this specification section.

3.6 REPAIR/RESTORATION

A. Repair product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

3.7 FIELD QUALITY CONTROL

A. Special Inspections:
1. Perform Independent Special and Periodic Inspections with written reports of findings of the seismic restraint systems serving nonstructural MEP system components at the expense of the Owner.
2. Special Periodic Inspections: See IBC Section 1705.13.6 for minimum inspection requirements.
3. Submit special inspection written reports a maximum of 2 working days following site inspection.

B. Manufacturer's Field Services:
1. Upon completion of installation of vibration isolation and seismic restraint devices and systems, the SDF's representative shall inspect the completed project and certify in writing to the Contractor that systems are installed properly or provide detailed corrective action as required.
2. If corrections are required, additional inspections shall be completed by the SDF's representative until all the work is certified to be installed properly.
3. The Contractor shall submit a report to the Owner which includes the SDF's representative letter certifying correctness of the installation.

3.8 CLEANING

A. Upon completion of installation, remove construction debris from around seismically restrained components to allow free motion in all directions within the limits of the seismic restraining devices.

3.9 EQUIPMENT STARTUP

A. Prior to equipment startup, remove shipping restraints from vibration isolators and adjust in accordance with the appliable manufacturers written operating instructions.

B. During start-up, with attached piping systems filled (as applicable), verify proper vibration isolator active spring heights and snubber offsets.

C. Adjust vibration isolators and seismic restraints during equipment operation to allow normal movement and minimize the transmission of equipment sound and vibration through the building structure and attached distribution systems.

END OF SECTION

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SECTION 20 05 53

IDENTIFICATION FOR MECHANICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Equipment Nameplates.
2. Valve Tags.
3. Valve and Equipment Directories.
4. Pipe Identification.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 23 21 13 - Hydronic Piping and Specialties
3. 23 64 00 - Packaged Water Chillers

1.2 REFERENCES

A. Codes and Standards:
1. See section 20 00 00 - Mechanical General Requirements.
2. ANSI/ASME A13.1-2015 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.
3. ANSI Z535.1-2017 - Safety Colors.

A. Abbreviations, Acronyms and Definitions:
1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
1. Provide equipment nameplates, valve tags and labels for the mechanical systems provided under this contract.
2. Provide equipment nameplates, valve tags and labels for existing mechanical systems to remain in mechanical rooms.
3. Provide labels for piping. Paint exposed piping and pipe insulation in utility and mechanical rooms.

1.4 SUBMITTALS

A. Refer to Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Master Schedule of Equipment:
a. Submit master schedule of equipment, components, and systems that will be tagged and labeled for the project.

b. Include the proposed method of labeling to be implemented (nameplate, tag, label/marker, etc.), legend ("Domestic Cold Water," "PMP-1," etc.) and letter/background colors.
c. Match legend to Contract Document legend, abbreviations, and schedule symbols. Use standard mechanical identification products when available.

2. Equipment Directories: Submit separate proposed "Equipment Directories" (subset of the master schedule) for each mechanical room that includes the equipment located within the applicable space. Include system name, fluid or medium type, and normal operating properties and ranges.
3. Valve Directories: Submit separate proposed "Valve Directories" (subset of the master schedule) for each mechanical room that includes the valves located within the applicable space. Include valve designations, a brief description and normal position (open (NO), closed (NC), balanced to X GPM). For Example:

Valve Designator	Description	Normal Position
H-101	BLR-1 Supply Isolation	NO
H-102	BLR-1 Return Isolation	NO
H-103	BLR-1 Flow Balance	150 GPM
P-100	Domestic Water Service Isolation	NO
P-201	Supply Strainer Flush Valve	NC
ETC.		

C. Installation, Operation and Maintenance (IO&M) Manuals:
1. Provide completed, typed "Master Schedule of Equipment."
2. Provide completed, typed "Equipment Directories."
3. Provide completed, typed "Valve Directories" with balance valve settings obtained from the final balance report.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Marking Services Incorporated (MSI).

B. Seton Identification Products.

C. Craftmark.

D. Approved equal.

2.2 EQUIPMENT NAMEPLATES

A. Plastic Engraved Equipment Nameplates:
1. Minimum letter height: 3/4 inch.
2. Tag size: Minimum 2 inches high, length to fit equipment tag lettering requirements. Provide uniform size for similar types of equipment.
3. Plastic thickness: 1/16 inch minimum.
4. Fastening method:
a. Mounting holes.
b. Adhesive backing may be provided for labeling equipment where drilling holes is not feasible, with the pre-approval of the Contracting Agency.

5. Color coding: As designated by the Contracting Agency. If specific direction is not provided, select white letters on black background.
6. Legend: As designated by the Contracting Agency. If specific direction not provided, match scheduled equipment symbols.

2.3 VALVE TAGS

A. General:
1. Small equipment, such as in-line pumps may be identified with tags in lieu of nameplates if inadequate room is available.
2. Provide service indicator on top line of tag, using system abbreviations provided in Part 3 Pipe Identification Table.
3. Provide valve number on bottom line of tag. Start valve numbering with “001” for each legend series/service indicator. Assign valve numbers in a logical sequence from the source (i.e. service water entry point, gas meter service isolation) or heat source (boiler or water heater supply) and continue numbering outward to the most remote terminal connection point.

B. Plastic Engraved Tags:
1. Round, 1-1/2 inches diameter, engraved plastic.
2. Text stamped and filled black:
   a. 1/4 inch service indicator on top.
   b. 1/2 inch valve number below.
3. Beaded chain tag fasteners.
4. Provide tag color coding to match pipe marker coding or as designated by the Contracting Agency.

C. Brass Stamped Tags:
1. Round, 1-1/2 inches diameter, brass with smooth edges.
2. Text stamped and filled black:
   a. 1/4 inch service indicator on top.
   b. 1/2 inch valve number below.
3. Beaded chain tag fasteners.

2.4 VALVE AND EQUIPMENT DIRECTORIES

A. Equipment and Valve Directory Frame:
1. 8-1/2” x 11” aluminum frame with plastic lens.
2. Provide multiple frames as required.

2.5 PIPE IDENTIFICATION, MARKING

A. Identify both service and flow direction.

B. Colors and Lettering: Conform to ANSI/ASME A13.1; see tables under Article 3.2E below.

C. Plastic Pipe Labels:
1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.
2. Larger sizes may have maximum sheet size with plastic nylon ties or straps.

D. Plastic Tape Pipe Labels: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to be painted or directly receive adhesive labels.

B. Install identifying devices after completion of coverings and painting.

3.2 INSTALLATION

A. Do not install identifying devices over factory installed equipment labels.

B. Locate identifying devices in clear view for simple identification.

C. Tag automatic controls, instruments, and relays. Key these to control system schematic drawings.

D. Frame and install approved equipment and valve directories in each mechanical room, at a location designated by the Contracting Agency.

E. Pipe Identification:
1. Identify piping, concealed or exposed, using ANSI A13.1 compliant pipe labels. Identify both service and flow direction in accordance with the following table.

Abbreviation	Legend	Color (Letters/Background)
HWS	Heating Water Supply	White/Green
HWR	Heating Water Return	White/Green
GHS	Glycol Heating Supply	White/Green
GHR	Glycol Heating Return	White/Green
GCS	Glycol Cooling Supply	White/Green
GCR	Glycol Cooling Return	White/Green

2. Pipe label letters shall be a minimum of 1/2" high and increase with pipe diameter as follows:

Pipe Outside Diameter	Letter Height
0.75" to 1.25"	0.5"
1.5" to 2"	0.75"
2.5" to 6"	1.25"

3. Install labels in unobstructed view and aligned with horizontal or vertical axis of piping as appropriate. For piping located above the normal line of vision, place labels below the horizontal centerline of the pipe for clear unobstructed view from below.
4. Install labels not to exceed 20 foot intervals along straight piping runs (including risers and drops), close to valves, adjacent to changes in direction and branches, on each side of pipe penetrations through walls or floors, and at each access panel.

END OF SECTION

SECTION 20 07 00

MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Specific requirements, products and methods of execution which relate to the insulation of pipes on mechanical systems.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 29 - Mechanical Hangers and Supports
3. 20 05 48 - Vibration and Seismic Control
4. 23 21 13 - Hydronic Piping and Specialties

1.2 REFERENCES

A. See section 20 00 00 - Mechanical General Requirements.

B. ASHRAE 90.1 - 2010 Energy Standard for Buildings Except Low-Rise Residential Buildings.

C. NFPA 90A - 2002 Standard for the Installation of Air Conditioning and Ventilating Systems.

D. NFPA 90B - 2006 Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

E. MSS Standard Practice SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

1.3 DESCRIPTION

A. Provide thermal insulation for ventilation system ductwork and building service piping.

B. Provide insulation for exposed ADA plumbing fixture piping.

1.4 PRE-INSTALLATION MEETINGS

A. See section 20 00 00 - Mechanical General Requirements.

1.5 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Qualifications: Submit manufacturer and Applicator qualifications.

1.6 QUALITY ASSURANCE

A. See section 20 00 00 - Mechanical General Requirements.

B. 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. Preference will be given to those who have successfully completed a manufacturer's installation training program, such as the 'Armacell Qualified Installer Program' (AQIP) or similar.

C. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products listed and labeled in accordance with UL 723 or in accordance with ASTM E84, by a testing and inspecting 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. Submit test reports:
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.

1.7 DELIVERY, STORAGE AND HANDLING

A. See section 20 00 00 - Mechanical General Requirements.

B. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.8 WARRANTY

A. See section 20 00 00 - Mechanical General Requirements.

PART 2 - PRODUCTS

2.1 FIRE RATING OF MATERIALS

A. Provide insulation products used aboveground in building with burning characteristics in compliance with NFPA Standards 90A and 90B: Flame Spread 25, Fuel Contributed 50, Smoke Developed 50. Tested according to UL 723, ASTM E84, or NFPA 255. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

B. Insulation specified for use underground and aboveground away from the building might have other burning characteristics. Use such products only where specifically required.

2.2 FIBERGLASS INSULATION

A. Piping: Provide insulation products as follows:
1. Thermal conductivity K equals 0.24 at 100 degrees F mean temperature, ASTM C335.

2. Factory applied vapor-barrier, flame retardant all service jacket and tape, with permeability rating equal to 0.02 perms, ASTM E 96.
3. Temperature limits for fiberglass pipe insulation: 350 degrees F, unless otherwise indicated.
4. Manufacturers: Johns Manville, Owens Corning, Knauf Fiber Glass, or approved equal.

2.3 FLEXIBLE ELASTOMERIC FOAM INSULATION

A. Thermal Conductivity: 0.27.

B. Water Vapor Transmission: 0.08.

C. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Grade 1, Type I for tubular materials.
1. AP ArmaFlex or AP ArmaFlex Black LapSeal (basis of design).
2. Aeroflex USA, Inc.
3. K-Flex USA.
4. Approved equal.

2.4 METAL JACKETING

A. 27 gauge (U.S. Standard) heavy corrugated aluminum.

B. Preformed fitting covers.

2.5 COATINGS

A. Coatings: UL labeled.

B. On cold or dual service lines, use vapor barrier type coatings.

2.6 PREFORMED FITTING COVERS

A. One piece pre-molded PVC jacketing and fitting covers specifically designed for the service intended.

B. Install per manufacturer's instructions and secure with manufacturer's color matching PVC tape.

C. Manufacturer: J-M “Zeston”, TeeCee, Proto, Certainteed.

PART 3 - EXECUTION

3.1 GENERAL

A. Do not apply insulation materials until surfaces to be covered are clean and dry and foreign material such as rust, dirt, etc. is removed. Keep insulation clean and dry during installation and during the application of any finish.

B. Do not install the insulation on pipe fittings and pipe joints until the piping has been tested and approved.

C. Do not install the insulation on ducts or fittings until the ductwork has been tested and approved.

D. Do not apply under conditions of excessive humidity or at temperatures below 50 degrees F or above 100 degrees F.

E. Provide insulation support blocks, shields, and transitions for hangers, supports, anchors, and guides. Coordinate insulation requirements through rated assemblies and Listing penetration's requirements.

F. Adjust hangers, guides, anchors, and supports after insulation installation has been approved.

3.2 PIPE INSULATION

A. Cold Piping:
1. Includes chilled water, and other cold piping to zero degrees F.
2. Insulate indoor piping with sectional fiberglass insulation and provide a completely sealed vapor barrier. Insulate outdoor piping with flexible elastomeric insulation. Provide insulation thickness per Insulation Thickness Table.
3. Insulate valves, unions, flanges, fittings, tanks, vessels, air separators, heat exchangers, and similar components, except where indicated otherwise.

B. In addition to specified jackets, provide heavy corrugated aluminum jacket on piping insulation anywhere piping is exposed below eight feet zero inches above floor in public areas.

C. Insulation Thickness Table (units are in inches):

Fluid Design Operating Temperature Range	Less than 1	1 to <1-1/2	1-1/2 to <4	4 to <8	8 and up
Cooling Systems (Well water, Chilled Water and Glycol Solutions, and Refrigerant):					
40 °F to 60 °F	1.5	1.5	1.5	1.5	1.5
Below 40 °F	1.5	1.5	1.5	1.5	1.5

3.3 TECHNIQUE FOR APPLICATION TO PIPES

A. Close longitudinal joints of pipe insulation firmly and butt insulation sections firmly together. Neatly and smoothly adhere laps and butt strips.

B. Clean the contact area on jacket for adhesive lap strips and butt strips so it is free from fingerprints, oil, construction dust and other contaminants. Clean surfaces with tack rags, methanol, or other suitable agent before attempting to adhere the strip. Apply pressure to adhesive strip with suitable tool immediately after adhering. Remove insulation with inadequately sealed joints and install new sections. Outwardly clinching staples may be used to reinforce joints.

C. Continuously seal vapor barriers. If staples are used at laps, seal the entire length of stapled lap with adhesive jacket tape applied as specified above for laps and butts. Sectionalize vapor barrier by sealing ends of insulation sections at not more than 25 feet intervals, to prevent moisture migrating lengthwise. Apply butt strips over joint as above.

D. Provide double insulation thickness on piping in outside walls and within five feet of vehicle doors or other large openings.

E. Except as indicated, locate pipe hangers and rollers outside insulation. Provide insulation saddles or sheet metal shields around insulation. On pipes two inches and larger, within the area of each insulation shield, use calcium silicate or cellular glass on the lower half of the insulation, equal in thickness to adjacent insulation.

F. Where piping is installed outdoors, provide two-layer glass cloth and four-layer weatherproof vapor barrier adhesive coating, in addition to jacket specified.

3.4 TECHNIQUE FOR APPLICATION TO PIPE FITTINGS, UNIONS FLANGES, EQUIPMENT, AND VALVES

A. Insulate fittings, valves, and flanges to the same thickness as the pipe insulation.

B. Any of the following methods of insulation are acceptable:
1. Blanket Wrap: Wrap the fitting with compressed glass fiber blanket. Wire the blanket securely in place and cover with a smooth layer of insulating/finishing cement. Cover with glass mesh tape, adhering it with an adhesive coating.
2. Fabricated Segments: Cut mitered segments from pipe insulation that has the same wall thickness as adjacent pipe insulation to form a cover which will fit snugly around the fitting. Wire the segments firmly in place and seal the joints with insulating/finishing cement. Apply adhesive coating and wrap with glass mesh tape, then apply another layer of the same coating over the whole assembly.
3. Cement: Apply insulating or insulating/finishing cement, molding it to the contour of the fitting. When area is large, apply an under layer of cement, wrap this with glass mesh tape, then apply an outer layer of cement. If the insulation is not concealed the exposed surface of insulating/finishing cement shall have a final glass mesh tape wrap embedded in adhesive.

C. In each of the listed methods, to protect the insulation against contact damage, apply an adhesive coating when the cement is completely dry and hard, then wrap with glass mesh tape. Apply another coating of adhesive over the whole assembly.

D. In each of the listed methods, pre-formed fitting covers may be substituted for the tape and adhesive covering specified. Cement and tape fitting covers on cold piping to provide a positive vapor barrier.

E. Removable insulation blankets of comparable insulation value for valves and where equipment require frequent adjustments or maintenance shall be provided; identify and coordinate during submittal process.

F. After insulation has been installed adjust hangers for proper fit, maintain pipe grade and support.

END OF SECTION

SECTION 20 05 05

MECHANICAL DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Demolition and removal of selected mechanical systems, equipment, and selected components.

B. See Division 1 for general demolition requirements and disposal of demolished materials.
1. Coordinate the demolition and disposal of materials and equipment with Contracting Agency.
2. Provide Contracting Agency with the first right of refusal for the salvage of demolished equipment and materials.

C. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 25 50 00 - Building Automation System

1.2 REFERENCES

A. See section 20 00 00 - Mechanical General Requirements.

1.3 DEFINITIONS

A. Demolish: 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 ready for reuse.

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.

1.4 SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

B. Submit a demolition and construction plan for review by the Contracting Agency prior to beginning work. Describe procedures that will be used to protect and maintain cleanliness of the adjacent building areas/systems during construction.

1.5 QUALITY ASSURANCE

A. See section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Standards: Comply with ANSI A10.6 - Safety and Health Program Requirements for Demolition Operations, and NFPA 241 - Standard For Safeguarding Construction, Alteration, And Demolition Operations.

D. Pre-demolition Meetings: Conduct coordination meetings prior to demolition as required by Division 1.

1.6 PROJECT CONDITIONS

A. Adjacent portions of the building will remain partially occupied during selective demolition. Conduct demolition such that Owner's operations will not be disrupted.

B. Drawings and specifications involving existing conditions are based on building record drawings and limited field observation. Provide field verification. Addition building record drawings are available from the Owner with a written request.

C. Notify Contracting Agency of discrepancies between existing conditions and the Contract Documents before proceeding with demolition.

D. Hazardous Materials: The existing roof construction, to include the existing mechanical penetrations through the roof is likely to include materials which contain asbestos. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Contracting Agency and coordinate the demolition of such hazardous materials in accordance with the hazardous materials abatement procedures specified in Division 1.

E. Maintain existing utilities to the maximum extent possible. Coordinate outages, if necessary, in accordance with Division 1.

F. Maintain fire-protection systems in service during mechanical demolition operations.

G. Storage or sale of removed items or materials on-site is not permitted.

1.7 WARRANTY

A. See section 20 00 00 - Mechanical General Requirements.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Drawings and specifications involving existing conditions are based on building record drawings and limited field observation.

B. Conduct a site inspection prior to submission of Bid to become thoroughly familiarized with the Scope of Work. Review actual site conditions and compare with the Contract Documents mechanical demolition drawings. Obtain direction from Contracting Agency for identified conflicts.

C. Inventory and record the condition of items to be removed, removed and reinstalled, or removed and salvaged. Provide Contracting Agency with first right of refusal for the salvage of demolished equipment and materials.

D. Verify field measurements, locations, sizes, and routing arrangements and site conditions.

E. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contracting Agency for direction.

F. Commencement of demolition implies Contractor accepts existing conditions.

3.2 PREPARATION

A. Maintain existing utilities in operation to the maximum extent possible during the selective demolition of mechanical systems. When utility outages are necessary, coordinate outages and their duration with Contracting Agency in accordance with Division 1. Arrange to shut off indicated utilities with utility companies.

B. “Tag” equipment and systems to be demolished. Identify the extent to which each system will be demolished.

C. Locate, identify, isolate, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

D. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

E. Coordinate with the Contracting Agency to provide a central staging area for the temporary storage of demolished equipment and systems.

F. Identify hazardous materials which will be demolished (i.e. mercury thermostats, etc.). Provide and designate a segregated temporary storage area for demolished hazardous materials organized by hazard type.

3.3 DEMOLITION - GENERAL

A. General:

1. Demolish and remove existing mechanical equipment and systems 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:
2. Terminate ductwork and piping back to branch connections and replace tees and fittings with straight couplings. Terminate electrical circuits back to panel (See Divisions 26, 27 and 28). Remove unused ductwork, piping, conduit and associated hangers and other support devices.
3. Abandonment in place of unused equipment and systems affected by the remodel is not allowed.
4. 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.
5. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
6. 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.
7. Promptly transport and dispose of demolished equipment, systems and material at the closest, approved dump site.
8. Heating System: Drain, flush and clean the existing hydronic heating systems throughout the entire building. Dispose of existing circulation solutions in an approved manner.

B. Controls:
1. Sequence limited demolition of the controls system.
2. Limited schedules outages are acceptable for system cross-over.
3. Coordinate outages with Contracting Authority 24 hours in advance of the scheduled outage.

C. Indoor Air Quality:
1. Maintain cleanliness and indoor air quality in areas adjacent to construction areas.
2. Submit a demolition and construction plan for review by the Contracting Agency prior to beginning work.
3. Reference SMACNA IAQ Guidelines for Occupied Buildings Under Construction - Second Edition - 2007.

D. Fire Protection: Notify the Contracting Agency and the Fire Department Agencies at least 24 hours before partially or completely disabling Fire Protection Systems.

E. Removed and Salvaged Items:
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 Contracting Agency.
4. Transport items to Contracting Agency designated on-site storage area.
5. Protect items from damage during transport and storage.

F. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
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.

G. Existing items to Remain:
1. Protect construction indicated to remain against damage and soiling during selective demolition.
2. When permitted by Contracting Agency, items may be removed to a suitable, protected storage location during demolition and cleaned and reinstalled in their original locations after demolition operations are complete.

3.4 CLEANING AND REPAIRS

A. Plug, patch and repair surfaces, adjacent construction, and finishes damaged during demolition and new work. Restore to original condition or better. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish. Repair fire proofing.

B. Clean construction areas after completion of the project. Wipe down new and existing surfaces including but not limited to walls, floors, ductwork, piping and equipment. Clean adjacent equipment and systems to remain and building surfaces of dust, dirt, and debris caused by demolition operations.

C. Return adjacent areas to the condition existing before demolition operations began.

END OF SECTION

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SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: General requirements and methods of execution relating to the testing and balancing of the mechanical systems provided on this project.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 13 - Common Motor Requirements
3. 23 21 13 - Hydronic Piping and Specialties
4. 23 21 23 - Hydronic Pumps
5. 25 90 00 - Sequence of Operations

1.2 REFERENCES

A. Codes and Standards:
1. See section 20 00 00 - Mechanical General Requirements.
2. National Environmental Balancing Bureau - Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
3. National Environmental Balancing Bureau - Testing, Adjusting, Balancing Manual for Technicians.
4. SMACNA - HVAC SYSTEMS Testing, Adjusting, and Balancing.

B. Abbreviations and Acronyms:
1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.
3. TAB: Testing, Adjusting, and Balancing.
4. NEBB: National Environmental Balancing Bureau

C. Definitions:
1. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
2. Accuracy: Capability of an instrument to indicate the true value of a measured quantity.
3. Adjusting: Varying of system flows by partially closing balancing devices, such as dampers, and valves, and varying fan speeds to achieve optimum system operating conditions within design and installation limitations.
4. Balancing: Methodical proportioning of air and hydronic flows through the system main, branches, and terminal devices using acceptable procedures to achieve the specified air or hydronic flow with testing and design limitations.
5. Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.
6. NEBB Certified TAB Firm: A Firm that has met and maintains all the requirements of the NEBB for Firm certification in TAB and is currently certified by NEBB. A NEBB Certified Firm shall employ at least on NEBB Qualified TAB Supervisor in the full time management position.
7. NEBB Certified TAB Report: Data presented in a NEBB Certified TAB Report accurately represents system measurements obtained in accordance with the current edition of the

NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems. Variances from design quantities that exceed NEBB or contract document tolerances are to be noted in the TAB report project summary.

8. NEBB Qualified TAB Supervisor: Full time employee of the TAB Firm in a management position who has successfully passed the supervisor level written and practical qualification examinations and maintains the Supervisor re-qualification requirements of NEBB.
9. NEBB Qualified Technician: Full time employee of the TAB Firm who has met the technician level experience requirements of NEBB and has successfully passed the technician level written and practical qualification examinations. A NEBB Qualified TAB Technician shall be supervised by a NEBB Qualified TAB Supervisor. Supervision does not infer constant oversight; a NEBB Qualified Technician is capable of performing assigned tasks with periodic supervision.
10. Precision: Ability of an instrument to produce repeatable readings of the same quantity, or a tightly grouped set of values, under the same conditions.
11. Range: Upper and lower limits on an instrument's ability to measure the value of a quantity for which the instrument is calibrated.
12. Resolution: Smallest change in a measured variable that an instrument can detect.
13. Testing: Use of specialized and calibrated instruments to measure temperatures, pressures, rotational speeds, electrical characteristics, velocities, and air and hydronic quantities for an evaluation of flow conditions.
14. Testing and Balancing: As used in these specifications, testing and balancing refers to testing, adjusting, and balancing (TAB) as described in the above references.
15. TAB: A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in this document.

1.3 SYSTEM DESCRIPTION

A. Design Requirements: This section describes specific requirements, products and methods of execution for the testing, adjusting and balancing of the project.

B. Performance Requirements: Furnish the services of a qualified and approved TAB Firm to perform the work of this specification section.

C. The work of this section includes but is not necessarily limited to:
1. Test and balance hydronic chilled water cooling system.
2. Measure sound power levels if so directed.
3. Provide a final report.

D. The work of this section does not include:
1. Adjusting burners for proper combustion operation.
2. Liquid waste transfer system adjustment.
3. Refrigeration work.
4. Control system adjustments, unless noted otherwise herein.

1.4 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data: Sample report forms and outlines indicating adjusting, balancing, and equipment data required prior to commencing work.

C. Certificates:
   1. Submit the name and qualifications of TAB Firm for approval with general product submittals. Submit copy of TAB Firm's NEBB certification.
   2. Submit the names and certifications of the Firm's NEBB Qualified TAB Supervisor and NEBB Certified Technician.

D. Balancing Report:
   1. Submit a complete report of the testing and balancing of all devices in a format equivalent to that shown in the SMACNA HVAC Systems Testing, Adjusting and Balancing manual. Compile the test data and submit eight copies of the complete test data for acceptance and/or analysis and recommendations.
   2. Provide report in soft cover, letter size, comb bound binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include drawings within report.
   3. Report Cover Sheet. Include the following data:
      a. Project Name.
      b. Project Address.
      c. Names of Architect and Engineer.
      d. Names of General Contractor and HVAC Contractor.
      e. Report date.
      f. Names of TAB technicians responsible for the measurements and report.
   4. System Review Sheet:
      a. List air and hydronic systems balanced, with systems highlighted that were found to be performing outside design tolerances.
      b. Include a summary of problems encountered, deviations from design, deficiencies in performance, remaining problems, recommendations, and comments.
   5. Instrument Calibration Report:
      a. Include a complete list of test equipment used, including apparatus manufacturer's name, model number, serial number, and date last calibrated.
      b. List the instruments used on the project during the balancing work, on an NEBB "Instrument Calibration Report" form, or equivalent form. This includes flow measuring hoods and other related devices.
   6. Hydronic Heating and Cooling Systems Reports. Prepare a report for each hydronic system balanced. Tabulate data separately for each system. Describe balancing method used for each system. At minimum, include the following:
      a. Schematic Diagram: Include heat exchange equipment and locations of flow measuring devices.
      b. Pump Test Report: Confirm test data was recorded and properly entered on form. Attach manufacturer's pump capacity curves, with the actual pump operating point plotted, to the test report form. List how the actual pump flow rate was determined (flow meter, pump curve, etc.).
      c. Primary Heat Exchange Equipment: Confirm that appropriate test data has been recorded for the boilers, heat exchangers, chillers, and other primary heat exchange equipment. List how the actual flow rate(s) of each item was determined.
      d. Terminal Heat Exchange Equipment: Confirm that heating coil and terminal unit temperatures and pressures were recorded and properly entered on form. List how each terminal unit flow rate was determined.
      e. Include complete identification of elements. Identify by equipment tag number, room name and number, baseboard symbol, orientation in room, etc., as necessary to clearly and positively identify the location of each element.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. The work described in this section shall be performed by a Firm certified by the National Environmental Balancing Bureau for air and hydronic balancing.
2. The Firm shall have a record of operation within Alaska for at least three years prior to bid date of this project and shall have demonstrated satisfactory completion of five projects of similar size and scope in the State of Alaska. Provide references if requested.
3. The Firm's Technician and Supervisor for this project shall be NEBB certified for their respective positions.
4. Bids by suppliers, contractors or any Firm whose principal business is not that of testing, adjusting, and balancing HVAC systems are not acceptable.

B. Balancing Standards:
1. Perform total system balance in accordance with NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
2. Maintain one copy of balancing procedural document on site.
3. Use standard NEBB forms.

C. Timing of Work:
1. Sequence work to commence after completion of systems. Do not begin balancing and testing until the systems are complete and in full working order.
2. Schedule the testing and balancing work in cooperation with other trades.
3. Schedule completion of testing and balancing before Substantial Completion of Project.

D. Construction team responsibility to TAB Agency: Refer to 20 00 00 - Mechanical General Conditions.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify systems are complete and operable before commencing work.

B. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

C. Report defects and deficiencies that may preclude proper TAB of systems and equipment.

3.2 PREPARATION

A. Schedule work under the provisions of Section 20 00 00 - Mechanical General Conditions.

B. Provide calibrated instruments required for testing, adjusting, and balancing operations.

C. Prior to starting work, review drawings and actual field conditions for additional balancing devices or components required for correct balance. Coordinate provision of additional balancing devices as required elsewhere in these specifications. Refer to Related Sections above.

D. Preliminarily adjust grille, register, and diffuser blades or pattern controllers per drawings. If airflow blow patterns are not shown on drawings, adjust for uniform diffusion pattern(s) or diffusion into long dimension of room.

3.3 SPECIAL TECHNIQUES:

A. Use instrumentation in accordance with NEBB requirements, calibrated to the accuracy standards specified by this organization.

B. Flow measuring hoods are acceptable for measurement of ceiling diffuser performance if used in a manner as recommended by the manufacturer and calibration and accuracy data is provided with the balancing report.

C. Upon request, make available to the Contracting Agency copies of current calibration certificates.

3.4 ACCEPTABLE CRITERIA

A. Systems will be considered balanced in accordance with NEBB *Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems* when the following conditions are satisfied:
   1. Hydronic Systems:
      a. Manually balanced systems:
         1). Measured fluid flow quantities are within plus or minus 10 percent of design.
         2). There is at least on direct path with fully open balancing valves from the pump discharge balancing valve (if present) to a terminal device. Additionally, if a system contains branch balancing valves, there will be at least one wide open path downstream of every adjusted branch balancing valve.
      b. Automatically balanced systems: Pressure drops across a sample of system's automatic balance valves are within the manufacturer's recommended operating range for the device.

B. If systems or components cannot be adjusted to within specified tolerances:
   1. Coordinate the replacement of sheaves, belts, or other components or devices needed for correct balance as required elsewhere in these specifications.
   2. Note deficiencies in the TAB report.

3.5 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on equipment sheaves, belts, dampers, valves, air outlets and inlets and each system according to the procedures contained in the current edition of the NEBB *Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems* and this section.

B. Adjustments shall be made with air handler filters blanked off to create a filter pressure drop of 60 percent of the manufacturer's recommended filter final pressure. Where multiple filters are encountered each set shall be individually blanked off, for a cumulated pressure drop of 60 percent of each filters final pressure.

C. Ensure recorded data represents actual measured or observed conditions.

D. Permanently mark final settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Contracting Agency.

H. Schedule and provide assistance in final adjustment and test of fire alarm system with Authority Having Jurisdiction.

3.6 SITE QUALITY CONTROL

A. Make calibrated test instruments available to Contracting Agency to facilitate spot checks during testing and commissioning as appropriate.

B. Re-balance components or systems found to be out of tolerance at no additional expense to the Owner.

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for:
a. Hydronic cooling piping.
b. Equipment drains and overflows.
2. Piping accessories.
3. Flexible pipe connectors.
4. Hydronic Specialties:
a. Strainers.
b. Flow indicators, controls, meters.
c. Flushing agents.
d. Glycol specialties.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 29 - Mechanical Hangers and Supports
3. 20 05 48 - Vibration and Seismic Control
4. 20 05 53 - Mechanical Identification
5. 20 07 00 - Mechanical Insulation
6. 20 41 00 - Mechanical Demolition
7. 23 05 93 - Testing, Adjusting and Balancing
8. 25 30 00 - Building Automation System Field Devices
9. 25 50 00 - Building Automation System
10. 25 90 00 - Sequence of Operations

1.2 REFERENCES

A. Codes and Standards:
1. See section 20 00 00 - Mechanical General Requirements.
2. ANSI/ASHRAE/IENA Standard 90.1-2001 Energy Standard for Buildings Except Low-Rise Residential Buildings.
3. ASME Boilers and Pressure Vessel Code (1998), Sections IV & VI.

B. Abbreviations, Acronyms and Definitions:
1. Refer to Division 01 for general abbreviations, acronyms, and definitions.
2. Refer to Section 20 00 00 - Mechanical General Requirements for general mechanical related definitions.
3. Refer to Mechanical Drawings legend sheet for general mechanical related abbreviations.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. This section describes specific requirements, products, and methods of execution for the system of liquid heat transfer throughout the project. The system of heat generation is specified elsewhere.
2. Design expansion compensation system to adequately protect piping and structure from thermal expansion and contraction forces.

B. Performance Requirements:
1. Provide performance and output shown or scheduled on drawings.
2. Provide loops or pipe offsets where required or indicated.
3. Pipes shall be capable of thermal expansion movement without disengagement of supports or forces on equipment connections.
4. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.

1.4 PRE-INSTALLATION MEETINGS

A. See section 20 00 00 - Mechanical General Requirements.

1.5 SUBMITTALS

A. See Section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Submit product literature for items specified in Part 2 and those products required by the performance standards of this section. Literature clearly annotated to indicate specified salient features and performance criteria.
2. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
3. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
4. Submit selection calculations for expansion joints and compensators.
5. Design Data: Submit calculations for performance specified products and systems.

C. Shop Drawings:
1. Submit shop drawings for performance-specified products and systems.
2. Submit shop drawings for piping systems to demonstrate proper layout and coordination.
3. Provide shop drawings to show system layout with location and detail of flexible pipe connectors and expansion joints.
4. Drawings of boiler room, fan rooms, and other areas with high-density piping, shall be shown at 1/4-inch scale or larger.
5. Indicate elevation of piping above finish floor.
6. Indicate dimensions and weights of equipment, and placement of openings and holes.
7. Include reference to ductwork and other equipment where space coordination is necessary to avoid conflicts.
8. Indicate mechanical and electrical service locations and requirements.

D. Manufacturer Reports:
1. Certificates, Manufacturer’s Instructions, and Manufacturer’s Field Reports:

a. Provide a complete manufacturer's written installation, operation and maintenance manual for each type of installed equipment. Annotate the manual to indicate applicable information for the specific equipment model(s) installed.
b. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
1). Printed names and signatures of the installers.
2). Documentation from Manufacturer's representative and Contracting Agency that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.

2. Test reports:
a. Provide certificate that cleaning of hydronic systems has been accomplished.
b. Provide certificate listing satisfactory results for the hydrostatic pressure tests.
c. Provide certificate listing satisfactory results for the operational tests.

3. Submit a letter to document that the training was conducted. Include in the letter the date, start/stop times for the training, list of attendees and signature/title of the person(s) providing the training.

1.6 CLOSEOUT SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

B. Operation and Maintenance (IO&M) Manuals:
1. Refer to Section 20 00 00 - Mechanical General Requirements, for IO&M Manual formatting requirements and number of copies required.
2. Include the following:
a. Copies of approved submittal information.
b. Manufacturer's installation, operating and maintenance/repair instructions, parts listings, and spare parts list for each product. Annotate the manual to indicate applicable information for the specific equipment model(s) installed.
c. Computer software manuals and applicable licenses.
d. Completed start-up and operational test report as required to validate equipment warranty.
e. Start-up and operational test reports for each piece of equipment. Report shall include printed names and signatures of the installers and documentation that the equipment has been properly installed and is fully operational, thus validating the equipment warranty.

C. Record Documentation: Record actual locations of equipment, valves, strainers, air vents, flexible pipe connectors, expansion joints, other components, and locations of access doors required for maintenance access in accordance with Section 20 00 00 - Mechanical General Requirements.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.8 QUALITY ASSURANCE

A. See section 20 00 00 - Mechanical General Requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. See section 20 00 00 - Mechanical General Requirements.

1.10 WARRANTY

A. Manufacturer Warranty: See section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Glycol Systems (Copper or Steel Option):
1. Copper pipe three inches and smaller:
a. Type L copper, wrought copper fittings.
b. Fit joints using 430 silver solder, 95-5 tin-antimony or other approved lead-free solder. Solder type must be compatible with pipe and fittings. Solder containing lead shall not be allowed on the job site.
c. Soldering flux: Water flushable, low corrosivity type meeting the requirements of ASTM B813. Flux shall have label indicating it meets these requirements.
2. Steel pipe four inches and larger: Welded pipe and fittings. No threaded pipe allowed.
a. Grade B, seamless, ASTM A53 or A106.
b. Schedule 40 black with ANSI B16 butt weld fittings of type and wall thickness to suit pipe.
3. Viega ProPress copper press-fit joint-type pipe systems are not permitted.
4. Victaulic mechanical joint-type pipe systems are not permitted.
5. Galvanized piping is not permitted.

B. Equipment drains and overflows: Type L copper pipe, wrought copper fittings.

2.2 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 PSIG saturated steam or 200 PSIG WOG. Packing material or seals shall not contain asbestos.

B. Manufacturers: Crane, Nibco, Hammond, Jenkins, Grinnell, Milwaukee, Stockham.

C. Ball Valves 2 inch and smaller: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, blowout proof stem, 150 PSIG pressure/temperature rating (steam).

A. Ball Valves 2-1/2 inches through 4 inch: Two piece type, full port, bronze body and silicone bronze ball or chrome plated brass ball, TFE seats, 150 PSIG pressure/temperature rating (steam). May be substituted for gate valves except where otherwise indicated.

B. Gate Valves, two inch and smaller: Bronze body and trim, rising stem, solid wedge. Use only where shown on drawings.

C. Globe Valve two inch and smaller: Bronze body, renewable disc suitable for service.

D. Globe or Angle Valve 2-1/2 inch and larger: Iron body, bronze trim, flanged, bronze disc. Bronze valves optional for 2-1/2 inch and three-inch.

E. Swing Check Valves two inch and smaller: Bronze body, horizontal swing, Y-pattern, Buna-N-disc for water, oil and gas. TFE disc for steam.

F. Swing Check Valves 2-1/2 inch and larger: Iron body, horizontal swing, bolted bonnet, renewable bronze seat and disc, flanged or grooved. Bronze valves optional for 2-1/2 inch and three-inch.

G. Drain Valves: Full port ball valve with threaded hose adapter with bronze end cap. Do not use sillcocks or butterfly valves as drain valves.

H. Valves Specified Elsewhere: Provide special valves such as motor-operated valves, relief valves, temperature regulating valves, etc., as specified under the individual system, or as indicated on the drawings.

2.3 UNIONS (STANDARD)

A. Steel Piping (Threaded):
1. Class 150 (150 PSIG steam, 300 PSIG WOG) malleable iron, ground joint, ASME B1.20.1, ASME B16.39. McMaster-Carr.
2. Where indicated: Class 250 malleable iron ground joint, copper or copper alloy seat. McMaster-Carr.

B. Copper Piping (Sweat): Cast bronze, ASTM B584 Alloy C84400, copper to copper. Nibco No. 733.

2.4 DIELECTRIC ISOLATORS (ELECTRICALLY INSULATING)

A. Provide dielectric unions for two inch pipe and smaller.

B. Provide dielectric flanges for 2-1/2 inch pipe and larger.

C. Insulating gaskets shall be suitable for fluid type, temperature, and pressure.

D. Galvanized pipe to copper: Brass threaded end and sweat copper end.

E. Black steel to copper: Zinc plated steel threaded end and sweat copper end.

F. Manufacturers: Capitol, Epco, Control Plastics, Watts, or approved equal.

2.5 PRESSURE GAUGES

A. Provide where shown on drawings, specified in Part 3, or as required.

B. Bourdon tube type with 4-1/2-inch dial (minimum) accuracy plus or minus one-percent span, recalibratable. Normal operating pressure near midpoint of range. Industrial quality.

C. Gauge cock on gauges and pulsation damper (snubber). Steam gauges shall have siphon to isolate gauge from steam, except where remotely mounted and connected by looped tubing.

D. Differential pressure gauges shall be piston or diaphragm type with range suitable for application and static pressure capability suitable for system pressure. Orange Research.

2.6 THERMOMETERS

A. Provide where shown on drawings, specified in Part 3, or as required.

B. Liquid in glass type: Industrial quality blue-reading with nine-inch scale length (minimum). Straight angle or adjustable as necessary for visibility. Trerice, Marsh, Weksler, or approved equal.

C. Dial Type: Industrial quality three-inch dial with a 270 degrees (minimum) scale. Straight, angle or remote as necessary for visibility. Trerice, Marsh, Weksler, or approved equal.

D. Digital, self-powered type: Weiss DVU or equal.

E. Normal operating temperature at scale midpoint and sufficient range to cover operating conditions.

F. Provide separable wells of suitable material for piping and mounting hardware for ducts. Set probe in heat transfer paste recommended by thermometer manufacturer.

2.7 PRESSURE AND TEMPERATURE TEST PLUGS

A. Provide where shown on drawings, specified in Part 3 or as required.

B. Standard type for 1/8-inch diameter pressure or temperature probes. Self seal when probe removed and complete with threaded cap. Minimum continuous rating 125 PSIG and 220 degrees F coincident. Sealing element suitable for fluid in pipe.

C. Provide one thermometer and one pressure gauge for each range required by system parameters.

D. Manufacturers: Sisco, Peterson Equipment, or approved equal.

2.8 FLEXIBLE PIPE CONNECTORS

A. General:
1. System Application: Hot water heating or 50 percent propylene glycol solution (heating) or 50 percent propylene glycol solution (cooling).
2. System Maximum Operating Temperature: 210 degrees F.
3. Pressure: Internal.
4. Installation: Straight or Offset as shown.
5. Movement: Constant or Intermittent.
6. Maximum offset: Not to exceed 25 percent of the centerline bend radius.
7. Determine appropriate minimum “live hose length” (flexible portion of assembly) based on the centerline bend radius for each application in accordance with manufacturer’s sizing tables.

B. Steel Pipe Flexible Connectors - Large Diameter:
1. Size: 3 inch through 10 inch nominal pipe size (NPS).
2. Pipe Ends: 150 LB plate steel flat faced flange.

3. Corrugated Hose: Type 304 stainless steel.
4. Outer Braid: Single braided Type 304 stainless steel.
5. Minimum Working Pressure Rating: 150 PSIG at 250 degrees F.
6. Maximum Temperature Rating: 250 degrees F.

C. Manufacturers: Metraflex, Keflex, or equal.

2.9 AIR VENTS

A. Coin operated vent: Manual low profile vent for use in baseboard and other enclosures where automatic vent will not fit. 150 PSIG working pressure, 212 degrees F. operating temperature. Bell & Gossett No. 4V or approved equal.

B. Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
2. Iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
3. Operating pressure 150 PSIG, 250 degrees F maximum temperature, intended for use in hot or cold lines. Provide ball type isolation valves for air vents that do not have integral shut off valves.
4. Manufacturers: Spirotherm Spirotop, Honeywell EA791004, or equal.

2.10 STRAINERS

A. Size two inch and under:
1. Screwed brass or iron body for 175 PSIG working pressure.
2. Y pattern with 1/32-inch stainless steel perforated screen.

B. Size 2-1/2 inches to four inches:
1. Flanged or grooved iron body for 175 PSIG working pressure.
2. Y pattern with 3/64-inch stainless steel perforated screen.

C. Manufacturers: Armstrong, Crane, Hayward, Watts Regulator, Hoffman, Sarco.

2.11 FLUSHING AGENT

A. Synthetic organic dispersant manufacturer: CH2O, Product 6149 or approved equal.

2.12 GLYCOL SYSTEMS

A. Provide equipment and products specifically designed and approved for continuous operation with the glycol solution specified.

B. Glycol Solution:
1. Inhibited propylene glycol solution premixed to 40 percent by volume for use with hydronic cooling system.
2. Inhibited propylene glycol solution premixed to 50 percent by volume for use with hydronic heating system.
3. Fluid analysis test kit.

4. Manufacturer: Dow Chemical Company Dowfrost. No substitutes.

C. Automatic Glycol Make-up System:
1. Provide packaged glycol make-up system as scheduled with single point electrical connection.
2. Fill glycol make-up tank one half full with clean solution after testing and final system check out has been completed.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Installer: Perform work by experienced personnel previously engaged in hydronic system construction and under the supervision of a qualified installation supervisor.

3.2 PREPARATION

A. Protection of In-Place Conditions: Cover equipment and plug piping connections to protect components from construction dirt and debris.

B. Surface Preparation:
1. Prior to installation of equipment, verify concrete housekeeping pads are complete and properly sized for equipment mounting.
2. Prior to installation of piping and equipment, verify that shop drawings are approved, and locations and routing have been coordinated with the work of other trades.

3.3 INSTALLATION

A. Special Techniques:
1. Install equipment in accordance with manufacturer’s instructions and requirements of the codes specified herein.
2. Provide finished products with protective covers during balance of construction.
3. Provide accessible ball type isolation valves at major piping branches, and on main lines as shown, and at terminal devices. Provide drains and manual vents at main line and branch line valves to facilitate draining and filling piping sections. Provide caps on drain outlets.
4. Install balancing valves and automatic flow limiting valves to be accessible and adjustable.
5. Install piping to maintain headroom, conserve space, and not interfere with use of space.
6. Use of bullhead tee with opposed flow, double inlet configuration not allowed.
7. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
8. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
9. Thermal Expansion:
   a. Install piping to allow for normal thermal expansion and contraction without stressing pipe, joints, or connected equipment.
   b. Provide anchors where necessary and as shown.
   c. Piping shall be guided and restrained as recommended by the manufacturer.
10. Provide test plugs on both inlet and outlet sides of heat transfer elements to allow measurement of both fluid pressure drop and differential temperature.
11. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

12. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor the other end. Install in horizontal plane unless indicated otherwise.
13. Provide pipe anchors and offsets as required to control the expansion of pipelines.
14. Flushing:
    a. Where hydronic piping installed under this project is connected to an existing hydronic system, provide branch isolation valves and provision for cleaning and flushing consisting of tees with valve, hose fittings and caps immediately adjacent to the branch isolation valves.
    b. Clean internal surfaces of the completed heating system as follows:
        1). Flush hydronic piping to remove black magnetic iron oxide and mill scale from the system.
        2). Flush system piping with synthetic organic dispersant to remove grease. Circulate solution through system at 150 degrees F or greater for 12 to 24 hours.
        3). Repeat process until the system is clean to the satisfaction of the Contracting Agency.
        4). Flush system with fresh water as necessary to remove residual cleaning agent.
        5). Exercise proper care during flushing and cleaning of systems to make sure no damage is done to equipment, valves, fittings, or Work of other trades. Restore damaged system components or Work of other trades to new or original condition at no additional cost to Owner.
15. Provide conductive compound paste in the temperature sensor wells.

B. Interface with Other Work: Coordinate and sequence installation of hydronic products with trades responsible for portions of this and other related sections of the Project Manual.

3.4 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

C. Touch-up finished surfaces with touch-up paint provided by the equipment manufacturer.

3.5 SITE QUALITY CONTROL

A. Non-Conforming Work: Rework required as a result of failure to follow the manufacturer’s written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

B. Manufacturer Services:
1. Verify units are installed and operational in accordance with the manufacturer’s written installation instructions.
2. Both the Contractor and Manufacturer’s Representative(s) shall sign start-up and operational checklist to confirm proper unit installation and operation.
3. Provide samples of the inhibited propylene glycol solution to the manufacturer for testing using the fluid analysis test kit provided.
4. The manufacturer of the inhibited propylene glycol solution shall provide free testing of the solution 24 hours after system startup and again 90 days later to verify proper fluid performance for both tests.
5. Provide one copy of manufacturer's test reports to the Owner. Adjust fluid concentration and/or correct deficiencies as addressed in the report.

C. Hydronic System Cleaning and Treatment Coordination Meeting:
   1. Conduct a meeting prior to flush cleaning and treatment of the hydronic heating and cooling systems to discuss cleaning agents, treatment chemicals and procedures to be used. Discuss system fill procedures with inhibited propylene glycol solution.
   2. Participants shall include the Contractor and Subcontractor directly performing the work and the Owner's Maintenance Staff personnel.
   3. Provide one week notice prior to the meeting.
   4. Cleaning, filling, and treatment of any hydronic system is not permitted until this coordination meeting has been conducted and the Contracting Agency's concerns have been adequately addressed.

D. System fill:
   1. After flush cleaning the hydronic cooling system, fill the system with inhibited propylene glycol solution as specified.
   2. After flush cleaning the hydronic heating system, fill the system with inhibited propylene glycol solution as specified.
   3. Thoroughly vent the systems to include piping high points and equipment vents (pump casings, air separators, etc.).

E. Site Tests:
   1. Hydrostatic Pressure Test:
      a. Make sure hydronic cooling system is filled with clean operating fluid. Hydrostatically test system to 100 PSIG. System must hold test pressure for a two hour period with no pressure drop to pass test.
      b. Inspect system during test and repair leaks.
      c. Provide written report indicating that the pressure test has been satisfactorily completed.
   2. Operational Test:
      a. Inspect system for proper fluid circulation, sufficient clearance for expansion and contraction of piping and proper system pressure control.
      b. Note and correct discrepancies and deficiencies.
      c. Provide written report indicating that the operational test has been satisfactorily completed.
   3. Test results shall be certified in writing as required by General Conditions. Include dates and sections tested, test pressure, test duration, printed names and signatures of person performing the test and Contracting Agency witnessing the test.

F. Inspection:
   1. Arrange for inspections and provide written notice to the Contracting Agency when the entire work or logical portions thereof, is ready for inspection.

G. Verify penetrations are installed to maintain assembly integrity.

3.6 SYSTEM STARTUP

A. Start-up and operate hydronic heating systems and equipment in accordance with the manufacturer's written installation and operation manual checklist.

B. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

3.7 ADJUSTING

A. Adjust functional components for proper operation in accordance with manufacturer's recommendations, or as otherwise directed.

B. Coordinate and work directly with the Balancing and Testing Agency and the requirements of Section 23 05 93 - Testing, Adjusting and Balancing, to provide systems in proper operating order.

C. Make corrections and adjustments as required by the Testing, Adjusting and Balancing (TAB) Agency in a timely manner.

3.8 CLEANING

A. Waste Management: After construction is completed, clean and wipe down exposed surfaces of pumps, piping, and appurtenances.

3.9 CLOSEOUT ACTIVITIES

A. Demonstration: Provide 1 hours of demonstration conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

B. Training: Provide 2 hours of operational instruction conducted by authorized factory start-up personnel to the Contracting Agencies authorized maintenance personnel.

END OF SECTION

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SECTION 23 21 23

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Vertical in-line pumps.

B. Related Sections:
1. 20 00 00 - Mechanical General Requirements
2. 20 05 13 - Common Motor Requirements
3. 20 05 29 - Mechanical Hangers and Supports
4. 20 05 48 - Mechanical Vibration and Seismic Control
5. 20 05 53 - Mechanical Identification
6. 20 41 00 - Mechanical Demolition
7. 23 05 93 - Testing, Adjusting and Balancing
8. 23 21 13 - Hydronic Piping and Specialties
9. 25 30 00 - Building Automation System Field Devices
10. 25 50 00 - Building Automation System
11. 25 90 00 - Sequence of Operations

1.2 REFERENCES

A. Codes and Standards:
1. See section 20 00 00 - Mechanical General Requirements.
2. UL 778 - Motor Operated Water Pumps.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
1. This section describes specific requirements, products and methods of execution for interrelated systems necessary for the pumping of heating fluid, which will be distributed to the locations shown.
2. The method of generation of, and distribution of, this heat is specified elsewhere.

B. Performance Requirements:
1. Select pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
2. Provide performance and output shown or scheduled on drawings.

1.4 PRE-INSTALLATION MEETINGS

A. See section 20 00 00 - Mechanical General Requirements.

1.5 SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements for general submittal requirements for the items listed below, supplemented with the additional requirements listed.

B. Product Data:
1. Provide manufacturers' product literature, clearly annotated to indicate specified salient features and performance criteria.
2. Include the following:
a. Catalog data sheets for each pump scheduled. Indicate which model is being submitted.
b. Certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
c. Dimensional data.
d. Features and appurtenances being provided.
e. Electrical characteristics and connection requirements.

C. Shop Drawings:
1. Submit fully dimensioned shop drawings of boiler room showing major equipment and housekeeping pads, with clear callouts indicating deviations from layout shown.
2. Indicate mechanical and electrical service locations and requirements.

D. Quality Assurance/Control Submittals:
1. Design Data and Test Reports: Provide design data and test reports for each pump.
2. Certificates, Manufacturer's Instructions, and Manufacturer's Field Reports:
a. Provide a complete manufacturer's written installation, operation and maintenance manual for each installed pump. Clearly annotate the manual to indicate applicable information for the specific equipment model(s) installed.
b. Test pump operation and sequencing in accordance with the manufacturer's written installation and testing instructions and Section 25 9000 - Sequence of Operations.
c. Submit a letter of certification indicating that the pump installation and start-up has been completed, that the pumps are properly adjusted and operating within the tolerances as specified by the manufacturer, and that the sequence of operation is fulfilled.
d. Included with the manual one copy of the completed start-up and operation checklist. The checklist shall include:
1). Printed names and signatures of the installers.
2). Documentation from Manufacturer's representative and Contracting Agency that the pumps have been properly installed and each is fully operational, thus validating the equipment warranty.

1.6 CLOSEOUT SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

B. Closeout Submittals:

C. Project Record Documents: Record actual locations of pumps and associated valves, and areas required for maintenance access.

D. Operation and Maintenance (IO&M) Manuals:
1. Provide copies of approved submittal information for inclusion within the project IO&M Manual.

2. Include manufacturer's descriptive literature, operating instructions, installation instructions, assembly views, lubrication instructions, maintenance and repair data, parts listings, and spare parts list.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.8 QUALITY ASSURANCE

A. See section 20 00 00 - Mechanical General Requirements.

B. Regulatory Requirements: Products Requiring Electrical Connection shall be listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE AND HANDLING

A. See section 20 00 00 - Mechanical General Requirements.

1.10 WARRANTY

A. Manufacturer Warranty: See section 20 00 00 - Mechanical General Requirements, for general mechanical warranty requirements.

PART 2 - PRODUCTS

2.1 VERTICAL IN-LINE PUMPS

A. Type: Single stage, single suction, split coupled, vertical in-line pump with motor suitable for VSD operation.

B. Materials:
1. Pump Body: Cast iron, with 125 PSIG ANSI flanged connections.
2. Impeller: Stainless Steel.
3. Bearings: Sleeve, Oil Lubricated.
4. Shafts: Stainless steel.
5. Mechanical Seal Assembly.
   a. Stationary face: Carbon.
   b. Rotating face: Tungsten Carbide.

C. Performance:
1. As scheduled.
2. Maximum working temperature: 230 degrees F.
3. Maximum working pressure: 145 PSIG.

D. Electrical Characteristics:
1. As scheduled.
2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

E. Manufacturers: Grundfos (Basis of Design), Armstrong, Bell and Gossett, Taco.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection: Cover pumps and plug piping connections to protect pumps from construction dirt and debris.

B. Preparation: Prior to installation of pumps, verify that electrical power is available and of the same voltage and phase characteristics as the pump being installed.

3.2 INSTALLATION

A. Install pumps, pump supports, suction guides, mechanical seal piping, pressure gauges and other pump appurtenances in accordance with the manufacturer's written installation instructions.

B. Provide access space around pumps for service. Provide no less than the minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings.

D. Provide line sized shut-off valve on pump suction, and line sized soft seat check valve.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Provide gauges with connections to suction and discharge.

H. Check, align, and certify alignment of base mounted pumps prior to start-up.

I. Lubricate pumps before start-up.

3.3 CONSTRUCTION

A. Interface with Other Work:
1. Coordinate and sequence installation of pumps and appurtenances with trades responsible for portions of this and other related sections of the Project Manual.
2. Rework required as a result of failure to follow the manufacturer’s written installation instructions or to properly coordinate with related Work shall be completed at no additional expense to the Owner.

3.4 REPAIR/RESTORATION

A. Repair any product components broken during installation or startup with replacement parts supplied by the product manufacturer.

B. Substitute replacement parts from other manufacturers are not acceptable.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:
   1. After completion of the installation, a qualified representative of the pump manufacturer shall conduct pump start-up and written certification.
   2. Start-up and adjust the system to within the tolerances as specified by the equipment manufacturer. Verify pump impellers rotate in the correct direction.
   3. Provide two hours operating instruction to authorized Owner's Representative.
   4. Test pump operation and sequencing in accordance with submittal requirements.
   5. Submit a letter of certification indicating that the pump installation and start-up has been completed.

3.6 ADJUSTING

A. Coordinate and work directly with the Testing, Adjusting and Balancing Agency to provide systems in proper operating order. Make corrections and adjustments as required by the Balancing and Testing Agency in a timely manner.

3.7 CLEANING

A. After construction is completed, clean and wipe down exposed surfaces of pumps, piping and appurtenances.

B. Touch up marred or scratched factory finished surfaces using finish materials furnished by manufacturer.

3.8 DEMONSTRATION & START-UP

A. Start-up and operate hydronic pumps in accordance with the manufacturer's written installation and operation manual checklist.

B. Document start-up and operational checks using the checklist and submit in accordance with submittal requirements.

END OF SECTION

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SECTION 25 30 00

BUILDING AUTOMATION SYSTEM FIELD DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Requirements, products, procedures, performance requirements, and methods of execution relating to the Building Automation System (BAS) terminal devices and field hardware.
2. Refer to related sections for other technical requirements, products, and methods of execution relating to the controls system for monitoring and control of mechanical systems.

B. Related Sections: Refer to Section 25 50 00 - Building Automation System

1.2 REFERENCES

A. Refer to Section 25 50 00 - Building Automation System.

1.3 SYSTEM DESCRIPTION

A. Refer to Section 25 50 00 - Building Automation System.

1.4 SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

1.5 CLOSEOUT SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.7 QUALITY ASSURANCE

A. Refer to Section 25 50 00 - Building Automation System.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 25 50 00 - Building Automation System.

1.9 WARRANTY

A. Refer to Section 25 50 00 - Building Automation System.

PART 2 - PRODUCTS

2.1 PRODUCTS AND COMPONENTS FOR CLASSIFIED AREAS

A. Products and components used in environments indicated to be NEC Class I, Division I shall be built and labeled as explosion-proof for the Group.

B. Products and components used in environments indicated to be NEC Class I, Division II shall be listed for Class I Division I environments or Class I Division II environments.

2.2 TEMPERATURE SENSOR

A. Digital room sensors:
1. Temperature monitoring range: 55/95 degrees F.
2. Network jack.
3. Output signal: Changing resistance.
4. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
5. Wall Mounted unit with finished cover:
   a. Private offices and rooms:
      1). LCD display, day/night override button, and setpoint slide adjustment override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.
      2). Set Point and Display Range: 55 degrees to 95 degrees F.
   b. Public Spaces: Blank Cover.

B. Liquid immersion temperature:
1. Temperature monitoring range: Minus 40/240 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: Plus or minus 0.5 degree F.
4. Provide immersion sensor assembly as specified. Immersion sensors shall include a separate thermowell for sensor installation. Annular space between well and sensor shall be filled with heat conductive compound.

C. Duct (single point) temperature:
1. Temperature monitoring range: 20/120 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
4. Sensing element shall be located a minimum of 25 percent across duct width.

D. Duct Average temperature:
1. Temperature monitoring range: 20/120 degrees F.
2. Output signal: 4-20 mA DC.
3. Accuracy at Calibration point: Plus or minus 0.5 degrees F.
4. Sensor Probe Length: 25 feet.

E. Outside air temperature:
1. Temperature monitoring range: Minus 58/122 degrees F.
2. Output signal: 4-20 mA DC.
3. Accuracy at Calibration point: Plus or minus 0.5 degrees F.

4. Provide NEMA3R rated mounting assembly (rain tight).

2.3 ELECTRIC THERMOSTAT

A. Electric Room Thermostats: Low voltage, two position devices as indicated on the plans. Furnish standard manufacturing configurations of single or multi-stage as well as heating/cooling arrangements as required to provide an operable system. Thermostats shall be dual setpoint with dead band for heating and cooling.

2.4 HIGH AND LOW LIMIT THERMOSTATS

A. Provide electric, high or low limit thermostats as required by sequence of operation.

B. Freeze Protection Thermostats: Employ a 20 foot element. If any one foot section of the element is subjected to temperatures below 35 degrees F, the respective electric or pneumatic circuit opens, causing action to fans and dampers as required under the sequence of operations. Provide with automatic reset.

C. High Limit Thermostats (Fire Stats, etc.): Employ rod and tube type elements that extend approximately ten inches into the duct. If instrument is subjected to temperatures above 135 degrees F., action required by sequence of operation occurs.

2.5 DIGITAL STATUS POINTS

A. Digital status shall be monitored by sensing normally closed contacts (contact closed in alarm conditions). The addition of the monitoring relay shall not affect the operation of the systems involved.

2.6 DIGITAL COMMAND POINTS

A. Command relays shall be momentary, automatic, maintained, or magnetic latch fail/safe as required. Maintained contacts located in occupied spaces or plenum spaces shall be mechanically latched. Relays shall be plug in and field replaceable. Contact ratings shall be in accordance with service.

B. Accuracy plus or minus 0.5 percent of full scale. Linearity plus or minus 0.1 percent.

2.7 DIFFERENTIAL FLUID PRESSURE SENSOR

A. Provide integral pressure transducer and transmitter with 4-20 mA output signal proportional to the input pressure span.

B. Provide NEMA 1 aluminum enclosure.

C. Transmitter range shall be selected so that the normal operating setpoint is midway between the upper and lower range of the transmitter. Transmitter range shall be unidirectional.

D. The range for the sensor serving the hydronic heating system is 0-10 PSIG.

E. Temperature operating range: Minus 40 to 175 degrees F.

F. Each transmitter shall have field adjustable span and zero adjustments for field calibration. Accuracy plus or minus 1.0 percent of full scale.

2.8 FLUID PRESSURE SENSOR

A. Provide integral pressure transducer and transmitter with 4-20 mA output signal proportional to the input pressure span.

B. Provide watertight enclosure.

C. Transmitter range shall be selected so that the normal operating setpoint is midway between the upper and lower range of the transmitter. Transmitter range shall be unidirectional.

D. The range for the sensor serving the hydronic heating system is 0-50 PSIG.

E. Temperature operating range: Minus 40 to 200 degrees F.

F. Each transmitter shall have field adjustable span and zero adjustments for field calibration. Accuracy plus or minus 1.0 percent of full scale.

2.9 CURRENT SENSOR

A. Provide current sensors that convert AC current to a proportional (4-20 mA) DC current.

B. Provide reverse voltage and high over current capacity.

C. Provide red LED light to indicated relay status and power.

D. Temperature operating range: 5 to 140 degrees F.

E. Provide UL Listed device.

2.10 CURRENT SENSING RELAY

A. Provide solid-state, self-calibrating, current operated relay suitable for equipment status monitoring. Provide a relay that changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.

B. Provide red LED light to indicated relay activation.

C. Temperature operating range: minus 30 to 140 degrees F.

D. Provide UL Listed device that is rated for plenum installation.

2.11 RELAYS

A. Applications: Relays external to the controls shall include (but not be limited to) the following:
   1. Control relays for start/stop or open/close control of equipment.
   2. Monitoring relays for electrical circuit on/off or open/closed status detection.
   3. Interposing relays to provide interface between solid state circuitry and ac-driven control relays.

B. Requirements: Relays shall be housed in dust-tight cases conveniently located for wiring and inspection:
   1. Control Relay: Control relays shall be suitable for continuous operation of 120 VAC and be able to interrupt the control circuits of various HVAC equipment. The number of contacts required for the relay shall be determined from the number of independent equipment to be controlled. The number of control relays required for the motor start/stop circuit shall be determined from examination of the equipment to be controlled.
   2. Monitoring Relay: Monitoring relays shall be suitable for continuous operation at the voltages of the circuits to be monitored. The monitoring relays shall be connected in such a way that the operation of the relay contact shall represent the change of status of the monitored circuit (i.e. ON/OFF, etc.) or duplicate the operation of the existing alarm circuit (i.e. high/low, etc.). The addition of the monitoring relay shall not affect the operation of the systems involved.
   3. Interposing Relay: Interposing relays shall be DC driven and be utilized to provide interface between solid state circuitry and ac-driven control relays as required.

2.12 CONTROL VALVE

A. Control Valve: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

B. Globe Valve 2 inch and Smaller: Bronze body, bronze trim, rising stem, renewable composition disc, and sweat ends.

C. Globe Valve 2-1/2 inch and Larger: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.

D. Hydronic system globe valve shall have the following characteristics:
   1. Rating: ANSI Class 125 for service at 125 PSIG and 32/250 degrees F operating conditions.
   2. Internal Construction:
      a. Replaceable plugs and seats of stainless steel or brass.
      b. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom of guided plugs.
      c. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom of guided plugs.
   3. Sizing: 3 PSIG maximum pressure drop at design flow rate.
   4. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics. Operators shall close valves against pump shutoff head.
   5. Select heating valves shall fail to a Normally Open to heat position, unless otherwise indicated. Select cooling valves to normally closed to cooling position.
   6. Three-way valves: Mixing type, unless otherwise indicated.

2.13 CONTROL DAMPER

A. Rectangular:
   1. Frame: Five inches by one inch by minimum 0.125 inch 6063-T5 extruded aluminum hat-shaped channel, mounting flanges on both sides of frame, reinforced at corners.
   2. Blades: Provide airfoil-shaped, single-piece blades made of heavy-duty 6063-T5 extruded aluminum. Maximum six inch blade width.
   3. Bearings: Molded synthetic sleeve, turning in hole in frame.
   4. Seals:

a. Blade: Extruded vinyl type for ultra-low leakage from minus 50 degrees F. to 350 degrees F. Mechanically attached to blade edge.
b. Jamb: Flexible metal compression type.

5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2-inch diameter plated steel, hex-shaped, mechanically attached to blade.
7. Finish: Mill aluminum.
8. Performance Data:
   a. Temperature Rating: Withstand minus 50 degrees F. to 350 degrees F.
   b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions:
      1). Closed Position: Maximum pressure of 13 inches W.C. at a 12-inch blade length.
      2). Open Position: Maximum air velocity of 6,000 feet per minute.
   c. Leakage: Maximum 2.0 cubic feet per minute per square foot at 1.0 W.C. for sizes 24 inches wide and above.
   d. Pressure Drop: Maximum 0.03 inch W.C. at 1,500 feet per minute across 24 inch by 24 inch damper.
9. Manufacturer: Ruskin CD50, Louvers and Dampers, Air Balance, Pottorff, or equal.

B. Round:
1. Frame:
   a. Under 6 inches Diameter: 2 inches by 1/2 inch minimum 12 gage galvanized steel tube.
   b. 6 thru 12 inches Diameter: 2 inches by 1/2 inch by minimum 14 gage galvanized steel channel.
   c. Above 12 thru 24 inches Diameter: 2 inches by 1/2 inch by minimum 1/8 inch galvanized steel channel.
   d. Above 24 inches Diameter: 2 inches by 1 inch by minimum 3/16 inch galvanized steel channel.
2. Blade: Provide single-piece construction made of the following material:
   a. 18 inches diameter and smaller: Minimum 12 gage galvanized steel.
   b. Over 18 inches diameter: Minimum 10 gage galvanized steel, stiffeners as required.
3. Blade Seals: Closed cell polyethylene foam rubber fully encompassing and mechanically attached to blade edge.
4. Bearings: Self-lubricating stainless steel sleeve.
5. Axles:
   a. 22 inches Diameter and smaller: Minimum 1/2 inch diameter, full length, plated steel, mechanically attached to blade.
   b. Over 22 inches Diameter: Minimum 3/4 inch diameter, full length, plated steel, mechanically attached to blade.
6. Finish: Mill.
7. Performance Data.
   a. Temperature Rating: Withstand maximum 250 degrees F.
   b. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.
      1). Closed Position: Maximum pressure of 10 inches W.C.
      2). Open Position: Maximum air velocity of 4,000 feet per minute /min.
   c. Leakage: Maximum 10 cubic feet per minute total at 1 inch W.C.
   d. Pressure Drop: Maximum 0.05 inch W.C. at air volume of 7,000 cubic feet per minute through 24 inch diameter damper.
8. Manufacturer: Ruskin CDR25, Louvers and Dampers, Air Balance, Pottorff, or equal.

2.14 VALVE AND DAMPER ACTUATORS

A. General:

1. Provide electronic direct-coupled actuation for control valves and dampers.
2. Proportional actuators shall accept a 0-10 VDC or 0-20 mA control input and provide a 2-10 VDC or 4-20 mA operating range. Damper actuators and control valve actuators serving valves larger than 3/4" shall provide a 2-10 VDC position feedback signal. The feedback signal shall be independent of the input signal.
3. Actuators indicated by Normally Closed or Normally Open designation on drawings or in sequence of operation shall be spring return type.
4. The actuator shall have electronic overload circuitry to prevent damage to the actuator.
5. Provide actuators listed by Underwriters Laboratories Standard 873 Standard for Safety Temperature-Indicating and -Regulating Equipment.

B. Damper Actuator:
1. Provide damper actuator shall be direct-coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage.
2. Spring return actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation.
3. Non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque capacity shall have a manual crank for this purpose.
4. Provide actuators in sufficient size, quantity and type to match application. Provide a minimum of one damper actuator for each 24 square feet of damper area. Damper areas shall not exceed manufacturer's ratings.
5. Outside air and return air dampers on mixing boxes shall be linked such that one opens while the other closes. It shall not be possible to close both dampers simultaneously.
6. Dampers: Size for minimum running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-pounds/sq. ft. of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-pounds/sq. ft. of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-pounds/sq. of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-pounds/sq. ft. of damper.
   e. Dampers with 2 to 3 Inches water column. of Pressure Drop or Face Velocities of 1000 to 2500 FPM: Multiply the minimum full-stroke cycles above by 1.5.
   f. Dampers with 3 to 4 Inches water column. of Pressure Drop or Face Velocities of 2500 to 3000 FPM: Multiply the minimum full-stroke cycles above by 2.0.
   g. Values noted above do not include normally open or normally closed open spring return dampers. Provide additional torque as required.
7. Size operators with ample power to overcome friction of damper linkage and air pressure acting on the damper blades.

C. Valve Actuator:
1. Provide actuators with enough torque and force required for proper valve close-off against the system pressure.
2. The valve actuator shall be sized based on valve manufacturer's recommendations for flow and pressure differential.

2.15 INSTRUMENT ENCLOSURE

A. Steel construction with hinged and lockable doors.

B. NEMA 12 construction only in areas where panels are subject to moisture damage.

C. Wiring connections including I/O and power shall be extended to a numbered, color-coded, and labeled terminal strip for ease of maintenance and expansion.

D. Provide labeling and color coding for wiring. Wiring shall follow a common format typical for the entire facility. Terminal strip color coding and numbering shall follow a common format. Wiring shall be neatly installed in plastic trays or tie-wrapped.

E. Line voltage wiring shall be segregated from I/O wiring and shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

F. Provide a convenience 120 VAC duplex receptacle shall be provided in each enclosure, fused on/off power switch, and required transformers. Provide convenience receptacle for enclosures containing equipment that can be configured or adjusted with a portable computer.

2.16 POWER SUPPLY

A. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75 percent of the rated capacity of the power supply.

B. Input: 120 VAC plus 10 percent, 60Hz.

C. Output: 24 VDC.

D. Line Regulation: Plus 0.05 percent for 10 percent line change.

E. Load Regulation: Plus 0.05 percent for 50 percent load change.

F. Provide an appropriately sized fuse and fuse block shall be provided and located next to the power supply.

G. Provide a power disconnect switch shall be provided next to the power supply.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Special Techniques:
   1. Wiring:
      a. The HVAC Control Contractor shall provide conduit, wiring, accessories, and wiring connections required for the installation of the control system, as herein specified, unless specifically shown in Divisions 26.
      b. Conduit and wiring shall comply with the requirements of applicable portions of Divisions 26 and local and national electric codes, unless specified otherwise in this section.
      c. System input wiring shall be twisted shielded pair, minimum 20 gauge wire. System analog output wiring shall be twisted shielded pair/3-wire as required, minimum 20 gauge wire. Preconfigured cables between Terminal Unit Controllers and Thermostats are acceptable, minimum 24 gauge.
      d. Internal panel device wiring for binary outputs and pilot relay shall be minimum 16 gauge wire.
      e. Provide separate conduit for control system power wiring including but not limited to 120 VAC and greater. I/O sensor wiring and data communication cabling shall be segregated from 120 VAC control system power wiring.
      f. Wiring in mechanical rooms shall be in conduit. Minimum control wiring conduit size 3/4 inch. One half inch conduit may be used for thermostats and valve stub-ups where conduit contains only a single pair.

2. Temperature Sensors:
   a. Temperature sensor assemblies shall be readily accessible and adaptable to each type of application in such manner as to allow for quick, easy replacement and servicing without special tools or skills.
   b. Outdoor installations shall be of weatherproof construction or in appropriate NEMA enclosures. These installations shall be protected from solar radiation and wind effects. Protective shield shall be stainless steel.
   c. Wall Mounted Sensor and Thermostats:
      1). Install wall mounted room sensors at a height of four feet zero inches above finish floor level, or to match existing conditions (replacement).
      2). Locate sensors as shown on the Drawings.
      3). Provide insulated base for sensors mounted on sheet metal, steel columns or exterior walls. Wire penetrations shall be caulked airtight to prevent thermal convection.
   d. Fluid Temperature Sensor: The sensor shall have a separable well suitable for insertion in a pipeline or vessel. Cable connections shall be suitable for the highest temperature expected and low temperature sensors shall be sealed to exclude condensation of atmospheric moisture.
   e. Fluid Temperature Sensors: Provide sensors with thermal wells fabricated and installed for the intended service. Wells shall be non-corrosive to the medium being measured and shall have sufficient physical strength to withstand all pressures, (including test pressures) and velocities to which they are subjected. Well shall not restrict flow area to less than 70 percent of line-size-pipe normal flow area. Where piping is smaller than the length of the well or exceeds the area requirements, the well shall be installed at an elbow and installed to effect uniform flow across the well. Sensors installed in wells shall be installed in horizontal piping below the pipe centerline.
   f. Low Temperature Detection Thermostats: Mount sensor element similar to Mixed Air Temperature Sensors.
3. Differential Fluid Pressure Sensor:
   a. Locate sensors as shown on the Drawings. Mount in accessible location.
   b. Controls subcontractor to furnish differential pressure sensor snubbers. Installation of snubbers by plumbing subcontractor.
4. Fluid Pressure Sensor:
   a. Locate sensors as shown on the Drawings. Mount in accessible location.
   b. Controls subcontractor to furnish fluid pressure sensor snubbers. Installation of snubbers by plumbing subcontractor.
5. Current Sensors:
   a. Provide flow proof for constant volume fans and pumps with a current sensor connected to the motor wiring at the starter. Set upper alarm limit to the maximum rated current of the motor, or as advised by the TAB Agency. Set lower alarm limit at 1/2 the motor running amps.
   b. Provide flow proof for variable speed control system through utilization of the variable speed drive serial communication option. Drive will communicate directly with BAS system.
6. Digital Status, Digital Command Points:
   a. Provide relays in a separate instrument enclosure or control panel adjacent to the monitored or controlled equipment. The relays shall mounted and connected in a manner that does not violate controlled equipment listing or code requirements.
   b. Provide relays that operate in conjunction with the motor control system. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
   c. Coordinate motor control requirements with Divisions 26.
7. Identification:

a. Panel and Instrument Enclosure Identification: Panels and instrument enclosures shall be identified by a plastic engraved nameplate securely fastened to the outside of the controller enclosure.
b. Field Devices: Field devices shall be identified by a typed (not handwritten) securely attached tag label.
c. Panel or Instrument Enclosure Devices: Devices shall be identified by a typed label securely fastened to the backplane of the local control panel or instrument enclosure.
d. Wall Mounted Temperature Sensors: Device covers shall be identified by a typed label securely fastened to the front cover. The label shall indicate the terminal unit zone identification tag.
e. Raceway Identification: The covers to junction and pull boxes of the control system raceways shall be painted blue or have identification labels stating “Control System” affixed to the covers. This requirement includes control system tubing. Labels shall be typed, not hand written.
f. Wire Identification: Low and line voltage control wiring shall be identified by a number, as referenced to the associated control diagram, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

3.2 SYSTEM STARTUP

A. Perform tests and verification procedures required for a startup / commissioning process and as directed by the Owner.

3.3 MAINTENANCE

A. Arrange work so that wherever possible serviceable or operable products are located within mechanical or electrical spaces and are accessible.

END OF SECTION

SECTION 25 50 00

BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: This section describes requirements, products, and methods of execution relating to the building automation controls system for the project.

B. Related Sections: Refer to related sections for other technical requirements, products, and methods of execution relating to the controls system for monitoring and control of mechanical systems.
1. 20 00 00 - Mechanical General Requirements
2. 23 05 93 - Testing, Adjusting and Balancing
3. 25 30 00 - Building Automation System Field Devices
4. 25 90 00 - Sequence of Operations
5. Divisions 26 - Electrical

1.2 REFERENCES

A. Codes and Standards. Perform work in accordance with applicable national, state and local codes to include:
1. See section 20 00 00 - Mechanical General Requirements.
2. ANSI-C2, National Electrical Safety Code - NESC.
3. Underwriters Laboratory (UL) or approved equal.
4. Institute of Electrical and Electronics Engineers - IEEE.
5. National Electrical Manufacturers' Association - NEMA.

B. Abbreviations and Acronyms:
1. Building Automation System (BAS).
2. Direct Digital Control (DDC).

C. Definitions:
1. ASHRAE: The American Society of Heating, Refrigerating and Air-Conditioning Engineers.
2. BACnet: A Data Communication Protocol for Building Automation and Control Networks, ANSI/ASHRAE Standard 135-current edition, developed under the auspices of ASHRAE.
3. Bridge: A device that routes messages or isolates message traffic to a particular segment, sub-net or domain of the same physical communication media.
4. Building Automation System (BAS): Collection of sensors, operators, controllers, and interconnecting wiring that control the operation of the building mechanical and electrical systems as described in these specifications.
5. Field device or field control device: A physical component such as a temperature sensor, pressure sensor, contact, motor operated valve, and motor operated damper. Generally considered to bring only one point to a controller.
6. Gateway: A hardware/software package that allows communication between dissimilar (“foreign”) systems and different protocols. Gateways are typically custom built, configured, and used only for transmitting and receiving data between different systems. System programming through gateways is not possible within the scope of this definition.
7. LonTalk: An open protocol for communication developed privately by the Echelon Corporation in Palo Alto, California.

8. Operator workstation: The central personal computer for the user to implement day to day operation of the system.
9. Router: A device for connecting different local-area network segments within a network. Routers that are used between networks with different protocols are limited. Point mapping in this type of router is automatic and requires less than one hour to configure. This device is not capable of storing point map information.
10. TCP/IP (Transmission Control Protocol/Internet Protocol): The communication language or protocol that defines the Internet. TCP/IP can also be used as a communication protocol in private networks.
11. Terminal Unit Controller: A device to control very specific applications such as a VAV box, cabinet unit heater, fan terminal unit and the like. These units may have predefined operating sequences with limited custom programming available. (Also called an "application specific controller").

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
1. The HVAC Control System will consist of a flat, open architecture based upon BACNet meeting the requirement of ANSI/EIA 709.1 and ASHRAE Standard 135. Provide necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers.
2. The system shall operate as a low-voltage multiplexed data system. The controls and instrumentation specified herein shall be integrated and installed as a complete package by the Contractor.
3. The completed system shall be integrated such that graphics, reports, and system interfaces from the Operators workstation appears as if there is one system.
4. No BAS system components requiring the use of gateways will be accepted.
5. To provide future flexibility, router domains shall not exceed nominally 75 percent of the maximum number of devices in the domain, unless specified otherwise.

B. Performance Requirements:
1. This section specifies the requirements for the BAS to be installed in conjunction with this project.
2. Controls contractor shall furnish and install an integrated building automation system, incorporating DDC for energy management, equipment monitoring and control, and subsystems as herein specified. Controls contractor will complete the temperature control system as specified herein.
3. Materials and equipment used shall be standard components, regularly manufactured for this and/or other systems and not custom designed especially for this project. Systems and components shall have been thoroughly tested and proven in actual use for at least two years.
4. Controls contractor shall be responsible for BAS and temperature control wiring for a complete and operable system. Wiring shall be done in accordance with Divisions 26 of this specification and local and national codes.
5. Control and monitoring for mechanical systems installed under this Contract, including:
   a. Building ventilation systems.
   b. Building heating systems.
   c. Building cooling systems.
   d. Boiler monitoring.
   e. Chiller monitoring.
6. The Work under this Section includes furnishing and installing wiring, conduit, connectors, terminal strips, and any other equipment required to interface each sensor or control point to the control system.

7. Provide control system and subsystem network cabling, routers, and other devices required for the systems shown and specified, except as specifically noted or shown on the drawings.
8. Providing sequences of operation described in Section 25 90 00 - Sequence of Operations.
9. Installation of control instrumentation and hardware specified in Section 25 3000 - Building Automation System Field Devices, necessary for a complete system of controls.
10. Integrating the controls under this Contract with the Owner's HVAC Supervisory System.
11. Start up and commissioning support activities as required, including installation examination and performance test activities, training, and IO&M requirements.
12. System functional requirements include, but are not limited to:
    a. BAS system shall provide all normal and off-normal control functionality without reliance upon PC file server or workstation.
    b. Programming information, graphics, databases, and other information required to restore the entire system in the event of equipment failure or malfunction or human error shall be protected with a centralized back-up system.
    c. Systems shall be designed to maximize multiple-vendor flexibility to replace or modify any portion of the system.
13. Software upgrades for PC and control network operating systems, the supervisory system, web browser, programming/binding tools, etc., without limitation shall be provided at no additional charge for a period of one year after Substantial Completion of the BAS.
14. A training program shall be provided to include: Data acquisition and report generation on the Operator’s workstation.
15. The cost of providing power from the building electrical system shall be included in the bid. Power sources are subject to submittal requirements, and review and approval.

1.4 SUBMITTALS

A. Refer to Section 20 00 00 - Mechanical General Requirements for general submittal requirements.

B. Product Data:
1. Provide manufacturer’s literature that demonstrates compliance with the manufacturing methods, appurtenances and salient features specified.
2. Equipment tagging method specifically listing each device and the identification tag to be applied.
3. Sequence of Operations.
4. Riser Diagrams.
5. Control Diagrams.
6. Panel layouts.
7. Valve and Damper schedules.
8. Point Summary Report.
9. Blank (Reserved for Enhanced Alarm Report).
10. Blank (Reserved for Commented PPCL).
11. Blank (Reserved for Trend Logs).
12. Blank (Reserve for Electronic Plans Room file).

C. Shop Drawings:
1. Riser Diagrams.
2. Control Diagrams.
3. Panel layouts.
4. Valve and Damper schedules.

D. Quality Control Submittals:
1. Pre-functional Installation (PC) and Functional Performance Test (FT) Checklists in accordance with Section 01 91 00 - Commissioning.

2. Incorporate BAS control requirements into the applicable equipment PC/FT checklists.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data. The O&M Manuals will consist of the following (Progression from Submittal to O&M Manual takes place using the same binders):
1. Sequence of Operations.
2. Riser Diagrams.
3. Control Diagrams.
4. Panel layouts.
5. Valve and Damper schedules.
6. Point Summary Report.
7. Enhanced Alarm Report.
8. Commented PPCL (Program Code).
9. Trend Logs.
10. Product Data including items reused from existing control system as noted.
11. Electronic Plans Room file.

1.6 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturers: Companies specializing in manufacturing the products specified in this section with a minimum of three (3) years documented experience.
2. Installers: Minimum three (3) years' experience in the installation, programming and start-up of building automaton systems.
3. Testing Agencies: Regulatory requirements for products requiring electrical connection – Listed and classified by Underwriters Laboratories Incorporated, or by a testing firm acceptable to the Municipality of Anchorage.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements:
1. Verify equipment and associated appurtenances are delivered in original factory packaging/crating and are free from damage and corrosion.
2. Replace equipment delivered to job site that does not comply with above requirements at no expense to the Owner.

B. Storage and Handling Requirements:
1. Store products in covered storage area, protected from the elements, outside the general construction area until installed.
2. Handle items carefully to avoid breaking, chipping, denting, scratching, or other damage.
3. Replace damaged items with same item in new condition.

1.8 WARRANTY

A. Manufacturer Warranty:
1. Provide in accordance with Section 20 00 00 - General Mechanical Requirements.
2. Provide maximum 4 hour response time to service/warranty calls from the Owner during the warranty period.

B. Special Warranty:

1. The warranty shall consist of a commitment by controls contractor to provide, at no cost to the Owner, parts and labor as required to repair or replace such parts of the control system that prove inoperative due to defective materials or installation practices.
2. The warranty expressly excludes routine service such as instrument calibration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Siemens Industries.

B. LONG (Control Contractors, Inc.).

C. Convergint (ATS Alaska).

D. Management Level Network (MLN). Acceptable manufacturers are limited to the following:
1. See above manufacturers list.

E. Building Level Network (BLN). Acceptable manufacturers are limited to the following:
1. See above manufacturers list.

F. Floor Level Network (FLN). Acceptable manufacturers are limited to the following:
1. See above manufacturers list.

2.2 APPLICATION SPECIFIC CONTROLLER (ASC)

A. General Requirements:
1. Application Specific Controllers shall be equipped with a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.
2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.
3. The ASC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.
4. ASC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement.

B. ASC Interface Software:
1. General: ASC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of ASC shall not be required for configuration.
2. ASC shall provide a selection of control applications performable through configuration of the device. Download of new application should not be required for one of these applications.

C. ASC Device Software:
1. General: An ASC shall operate in standalone mode as needed for specified control applications if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

2. Operating system software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage network communications, and scan inputs and outputs. The operating system shall also contain built in diagnostics.

2.3 APPLICATION GENERIC CONTROLLER (AGC)

A. General Requirements:
1. Application Generic Controllers shall be equipped with a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.
2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.
3. The AGC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.
4. AGC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. Network and power wiring shall allow for ‘pass-thru’ of signal when electronic boards are removed.

B. AGC Interface Software:
1. General: AGC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of AGC shall not be required for configuration.
2. AGC shall provide a selection of control applications performable through configuration of the device. Download of new applications from network management tool shall be possible, but not required.

2.4 CUSTOM APPLICATION CONTROLLER (CAC)

A. General Requirements:
1. Custom Application Controllers shall be equipped with a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.
2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.
3. CAC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.
4. CAC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. The complete CAC including accessory devices such as relay, transducers, power supplies, etc. shall be factory-mounted, wired and housed in a NEMA 1 enclosure or as required by the location and local code requirements.
5. Equip CAC’s with diagnostic indicators for the following:
   a. Transmit.
   b. Receive.
   c. Power up test.
   d. Power up fail.

e. Power up test okay.
f. Bus error.

B. CAC Software:
1. General: A CAC shall operate in standalone mode as needed for specified control applications if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.
2. Operating system software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage CAC to OI communications, and scan inputs and outputs. The operating system shall also contain built in diagnostics.
3. Input/Output Point Processing Software shall include:
   a. Continuous update of input and output values and conditions. Connected points are to be updated at a minimum of one-second intervals.
   b. Analog to digital conversion, scaling and offset, correction of sensor non-linearity, sensing no response or failed sensors, and conversion of values to 32 bit floating point format. Both the maximum and minimum values sensed for each analog input are to be retained in memory. It shall be possible to input subsets of standard sensor ranges to the A/D converter and assign gains to match the full-scale 32-bit conversion to achieve high accuracy readout.
   c. A reasonability check on analog inputs against the previously read value and discard those values falling outside pre-programmed reasonability limits.
   d. Assignment of proper engineering units and status condition identifiers to analog and digital input and outputs.
   e. Analog input alarm comparison with the ability to assign two individual sets of high and low limits (warning and actual alarm) to an input or to assign a set of floating limits (alarm follows a reset schedule or control point) to the input. Each alarm shall be assigned a unique differential to prevent a point from oscillating into and out of alarm. Alarm comparisons shall be made each scan cycle.
   f. Debounce of digital inputs to prevent nuisance alarms. Debounce timing shall be adjustable from two seconds to two minutes in one second increments.
4. Alarm lockouts:
   a. Alarm lockout software shall be provided to prevent nuisance alarms. on initial start-up of air handler and other mechanical equipment a "timed lockout" period shall be assigned to analog points to allow them to reach a stable condition before activating alarm comparison logic. Lockout period is to be programmable on a per point basis from 0 to 90 minutes in one minute increments.
   b. A "hard lockout" shall also be provided to positively lock out alarms when equipment is turned off or when true alarm is dependent on the condition of an associated point. Hard lockout points and lockout initiators are to be operator programmable.
   c. Design the power supply to accommodate the power requirements of all components (or nodes) connected, plus 50 percent.
5. Run Time Totalization or Point Trending:
   a. Run time shall be accumulated based on the status of a digital input point. It shall be possible to totalize either on time or off time up to 10,000 hours with one-minute resolution. Run time counts shall be resident in non-volatile memory and have CAC resident run time limits assignable through the operator's terminal.
   b. Totalized run time or trended data shall be batch downloaded using FTP to the SS on a daily or weekly basis. Trended data shall reside on the SS database server. The automatic update of this data shall be determined by the SS and facility management application requirements.
6. Transition Counting:
   a. A transition counter shall be provided to accumulate the number of times a device has been cycled on or off.

b. Counter is to be non-volatile and be capable of accumulating 600,000 switching cycles.
c. Limits shall be assignable to counts to provide maintenance alarm printouts.

7. Custom Direct Digital Control (DDC) Loops:
   a. Custom DDC programs are to be provided to meet the control strategies as called for in the sequence of operation sections of these specifications.
   b. Each CAC shall have residential in its memory and available to the programs a full library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences:
      1). Proportional Control, Proportional plus Integral (PI), Proportional plus Integral plus Derivative (PID), and Adaptive Control (self-learning): The adaptive control algorithm shall be used on control loops, as indicated in I/O summary, where the controlled medium flow rate is variable (such as VAV units and variable flow pumping loops). The adaptive control algorithm shall monitor the loop response characteristics in accordance with the time constant changes imposed by variable flow rates. The algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of the system dynamics so that on system shutdown and restart, the learning process starts from where it left off and not from ground zero. Standard PID algorithms are not acceptable substitutes for variable flow applications since they will provide satisfactory control at only one flow rate and will require continued manual fine tuning.
      2). DDC setpoints, gains and time constants associated with DDC programs shall be available to the operator for display and modification via the SS operator interface.
      3). The execution interval of each DDC loop shall be adjustable from 2 to 120 seconds in one-second increments.
      4). DDC control programs shall include an assignment of initialization values to outputs to assure that controlled devices assume a fail-safe position on initial system start-up.

2.5 VAV CONTROLLERS

A. Provide manufacturer's thermostat matched to controller. Refer to Section 25 30 00 - Building Automation System Field Devices, for requirements.

B. Coordinate with Section 23 36 00 - Air Terminal Units to have VAV controllers factory mounted on the VAV terminal unit.

C. For applications requiring consistent airflow for space pressure control, provide VAV controllers with an auto-zero module to allow for periodic airflow sensor calibration without interruption of airflow.

2.6 ROUTERS, BRIDGES, REPEATERS AND TRANSCEIVERS

A. Routers, Bridges and Repeaters:
   1. Equip each router and bridge with a network transceiver on each network port (inbound and outbound) as dictated by the network type (Type 1 - FTT, Type 2 - TP, Type 3 - PL, Type 4 - LP, Type 5 - RF).
   2. The network router shall be designed to route messages from a segment, sub-net, or domain in full duplex communication mode.
   3. Routers with TCP/IP capability shall be provided where TCP/IP backbone is used.
   4. Routers, bridges and repeaters shall be fully programmable and permit a systems integrator to define message traffic, destination, and other network management functions.

5. The routers, bridges, and repeaters shall be capable of DIN rail or panel mounting and be equipped with status LED lights for Network traffic and power.

B. Transceivers:
1. Type 1 Network Transceiver, Free Topology, Twisted Pair: Provide a transformer isolated, twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:
   a. Differential Manchester encoded signaling for polarity insensitive network wiring.
   b. Transformer isolated for common mode rejection.
   c. 78 Kbps network bit rate up to distances of 2000m.
   d. Free topology supports star, home run, multi drop and loop wiring topologies.
   e. Complies with FCC and VDE requirements.
   f. UL recognized component.
2. Type 2 Network Transceiver, Twisted Pair: Provide a transformer isolated twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:
   a. Differential Manchester encoded signaling for polarity insensitive network wiring.
   b. Transformer isolation for common mode rejection.
   c. 1.25 Mbps network bit rate up to distances of 1000 meters.
   d. Unpotted construction.
   e. Less than 1 mA power consumption with +5VDC input voltage.
   f. FCC and VDE Level B requirements compliance.
   g. UL Listed.
3. Type 3 Network Transceiver, Power Line:
   a. Provide a direct sequence, spread spectrum power line transceiver which is equipped with the following signal processing and error correction capabilities to provide robust and error free communications.
      1). Forward Error Correction (FEC) to enable the system to read and reconstruct corrupted packets without sacrificing throughput. The FEC shall require only six percent overhead for error correction.
      2). Automatic sensitivity adjustment algorithm that dynamically changes the receiver sensitivity based on noise characteristics.
      3). Oversampling correlation filter and adaptive data recovery algorithm to synchronize instantaneously to incoming packets.
      4). Tri-state power amplifier/filter combination to provide a powerful output signal with a minimum number of components.
   b. The transceiver shall be able to operate using the controller power supply and coupling circuit. Provide the following general features as a minimum:
      1). Packaged in a rugged, potted module.
      2). Programmable clock output (1.25, 2.5, 5 or 10 Mhz).
      3). 10 Kbps network transmission rate.
      4). Packet detect output to drive a status indicator LED.
      5). Minus 20 to plus 85 degrees C. operating temperature range.
      6). UL Listed.
4. Type 4 Network Transceiver, Link Power: Provide a twisted pair transceiver that utilizes the twisted pair communication media to provide power for Controller(s). The transceiver shall meet the following specifications:
   a. Free single-in-line package (SIP) construction.
   b. Send both network data and power on a twisted wire pair.
   c. Differential Manchester encoded signaling for polarity insensitive network wiring.
   d. 78 Kbps network bit rate up to distances of 320 meters.
   e. Supports star, home run, multidrop, and loop wiring.
   f. Supplies +5VDC @ 100 mA maximum for node power.
   g. Compliance with FCC and VDE requirements.
   h. UL Listed.

5. Type 5 Network Transceiver, Radio Frequency: Provide a direct sequence, spread spectrum RF transceiver that meets the following specifications:
   a. 100 meter open field range.
   b. Wireless communications extends network between buildings and to vehicles and portable devices.
   c. FCC type certifiable, 48 MHz.
   d. Low-cost miniature circuit board, SMT components.
   e. Carrier detect output to drive a status indicator LED.
   f. Plus 7 to plus 15VDC input voltage.
   g. Minus 20 to plus 60 degrees C. operating temperature range.

2.7 OPERATOR WORKSTATION

A. The central personal computer for the user to implement day to day operation of the system. The workstation is generally capable of allowing the operator to accomplish the following functions:
   1. Operate in a network environment.
   2. Monitor the entire control system.
   3. Change set points.
   4. Maintain, set, and monitor alarms.
   5. Maintain and monitor operating schedules.
   6. Control interactively using graphical representations of the system.
   7. Manually command points.
   8. Trend the behavior of selected points.
   9. Archive history.
   10. Backup data.
   11. Print results.
   12. Modify custom programs and sequences of operation.

2.8 PERSONAL COMPUTER OPERATOR WORKSTATION HARDWARE

A. A new graphical operator workstation “client” shall be provided as specified in this section. The new client workstation shall communicate directly with the existing controls database server. Communication shall take place over the Owner’s existing Wide Area Network. Programming, graphics and databases created as part of this project shall be incorporated into the existing controls system. Provide a complete, secure backup of the host database at the completion of this project.

B. Provide one graphical operator workstation for command entry, information management, network alarm management and database management functions. The workstation shall communicate seamlessly with the existing Alerton controls system.
   1. Provide one workstation of equal or greater capability located as indicated on the contract documents.
   2. Workstation shall consist of a personal laptop computer with minimum Windows 10 Pro, 11th Generation Intel Core i7 processor (8 Cores), 16GB RAM, 1 TB solid state hard drive, minimum 16” screen size, video card capable of supporting 1920 × 1080 or above, integrated webcam, USB 3.0 (Type-A and Type-C), WiFi 6, Gigabit network interface card, trackpad, Bluetooth mouse and Kensington combination laptop lock with tamper resistant desk mount anchor point.

2.9 WORKSTATION OPERATOR INTERFACE

A. Basic Interface Description:

1. Operator workstation interface software shall minimize operator training through the use of English language prompting, 30-character English language point identification, on-line help, and industry standard PC application software. Interface software shall simultaneously communicate with up to 4 Building Level Networks and share data between any of the 4 networks. The software shall provide, as a minimum, the following functionality:
   a. Real-time graphical viewing and control of environment.
   b. Scheduling and override of building operations.
   c. Collection and analysis of historical data.
   d. Point database editing, storage and downloading of controller databases.
   e. Alarm reporting, routing, messaging, and acknowledgment.
   f. Display dynamic data trend plot.
   g. Definition and construction of dynamic color graphic displays.
   h. Program editing.
   i. Transfer trend data to third party software.
   j. Scheduling reports.
   k. Operator Activity Log.
2. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device and "point and click" approach to menu selection.
3. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously. The operator shall be able to work in Microsoft Word, Excel, and other Windows based software packages, while concurrently annunciating on-line BAS alarms and monitoring information.
4. Operator specific password access protection shall be provided to allow the user/manager to limit workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password. Operator privileges shall "follow" the operator to any workstation logged onto (up to 999 user accounts shall be supported).
5. Scheduling and Override: Provide a calendar type format for simplification of time-of-day scheduling and overrides of building operations. Schedules reside in the PC workstation, DDC Controller, and HVAC Mechanical Equipment Controller to ensure time equipment scheduling when PC is off-line, PC is not required to execute time scheduling. Provide override access through menu selection or function key.
6. Collection and Analysis of Historical Data: Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or change of value, both of which shall be user-definable. Trend data may be stored on hard disk for future diagnostics and reporting. Additionally, trend data may be archived to network drives or removable disk media for future retrieval.

B. Dynamic Color Graphic Displays:
1. Create at least one color graphic display for each piece of mechanical equipment, including air handling units, hot water boiler systems, and room level terminal units. Provide floor plans to facilitate navigation. Point information to be displayed on the graphics shall be provided by the BAS contractor to optimize system performance and analysis and to speed alarm recognition.
2. The operator interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection or text-based commands. Graphics software shall permit the importing of submittal AutoCAD drawings and scanned pictures for use in the system.
3. Dynamic temperature values, flow values and status indication shall be shown in their actual respective locations and shall automatically update to represent current conditions without operator intervention and without pre-defined screen refresh rates.
4. Colors shall be used to indicate status and change as the status of the equipment changes. The state colors shall be user definable.

5. The windowing environment of the PC operator workstation shall allow the user to simultaneously view several applications at a time to analyze total building operation or to allow the display of a graphic associated with an alarm to be viewed without interrupting work in progress.
6. A dynamic display of the site-specific architecture showing status of controllers, PC workstations and networks shall be provided.

C. System Configuration and Definition:
1. Network wide control strategies shall not be restricted to a single DDC Controller, but shall be able to include data from any and all other network panels to allow the development of Global control strategies.
2. Provide automatic backup and restore of DDC controller databases on the workstation hard disk. In addition, database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate DDC Controller. Changes made at the DDC Controllers shall be automatically uploaded to the workstation, ensuring system continuity.

D. Alarm Management:
1. Alarm Routing shall allow the user to send alarm notification to selected PC locations based on time of day, alarm severity, or point type.
2. Alarm Display shall list the alarms with highest priority at the top of the display. The alarm display shall provide selector buttons for display of the associated point graphic and message. The alarm display shall provide a mechanism for the operator to sort alarms.
3. Alarm messages shall be customizable for each point to display detailed instructions to the user regarding actions to take in the event of an alarm.

2.10 NETWORKING COMMUNICATIONS

A. The design of the BAS shall network an operator workstation(s) and stand-alone DDC Controllers. The network architecture shall consist of three levels; a Management Level Network (MLN) Ethernet network based on TCP/IP protocol, a high performance peer-to-peer building level network (BLN) and DDC Controller floor level local area networks (FLN). Access to the system shall be totally transparent to the user when accessing data or developing control programs.

B. Management Level Network:
1. PCs shall simultaneously direct connect to the Ethernet and Management Level Network without the use of an interposing device.
2. The Management Level Network shall not impose a maximum constraint on the number of operator workstations.
3. Simultaneous user access to network limited to number of sight licenses issued to user.
4. When appropriate, any DDC controller residing on the peer-to-peer building level network shall connect to Ethernet network without the use of a PC.
5. Any PC on the Ethernet Management Level Network shall have transparent communication with controllers on the building level networks connected via Ethernet as well as directly connected building level networks. Any PC shall be able to interrogate any controller on the building level network in addition to being able to download program changes to individual controllers.
6. The Management Level Network shall reside on industry standard Ethernet utilizing standard TCP/IP, IEEE 802.3.
7. Access to the system database shall be available from any client workstation on the Management Level Network.

C. Peer-to-Peer Building Level Network (BLN):

1. The system shall have the ability to support integration of third party systems (fire alarm, security, lighting, variable speed drives, PLCs, condensers, boilers) via a panel mounted open protocol processor. This processor shall exchange data between the two systems for inter-process control. Exchange points shall have full system functionality as specified herein.
2. Data transfer via Ethernet.

D. Floor Level Network (FLN):
1. This level communication shall support a family of application specific controllers and shall communicate with the peer-to-peer network through DDC Controllers for transmission of global data.

2.11 CONTROL PANELS

A. Terminal Equipment Controllers will be mounted in enclosed control panels with screwed, removable covers.

B. Control devices located in exposed areas subject to outside weather conditions or near circulator pumps (spray due to shaft seal failures) shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.

C. Nameplates shall be provided beneath each panel face mounted control device describing the function of each device. Nameplates shall have white letters engraved on blue Lamicoid, or approved equal.

D. Control panels shall bear a UL label compatible with the application.

E. Electrical devices within the panel shall be pre-wired to terminal strips, with inter-device wiring within the panel completed prior to installation of the system.

F. BLN level controllers shall be provided with standby/emergency power to provide power quality and minimum 15 minutes operation.

2.12 UNINTERRUPTIBLE POWER SUPPLY

A. Acceptable manufactures are limited to the following:
1. Powerware.
2. Alternate Brand Request or Substitution Request required.

2.13 ACCESS PANELS

A. Access panels provided under Division 08.

B. Coordinate access panel location with the Owner’s Representative and Division 08 requirements. Provide access to concealed control devices.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Special Techniques:

1. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is external of the insulation. See Section 20 05 29 - Hangers and Supports.
2. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.
3. Identification: Permanently tag controllers, switches, relays, thermostats and actuators for identification using the tagging format shown on the BAS control drawings.
4. Sensors and Switches:
   a. Pump flow or fan flow, etc., shall be sensed using current switch unless indicated otherwise. Calibrate current switch to distinguish between loaded or unloaded motor condition due to belt or coupler breakage.
   b. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support with capillary clips and maintain minimum 1 inch tubing bending radius.
5. Wiring:
   a. Install, connect and wire the items included under this Section. This work includes providing required conduit, wire, fittings, and related wiring accessories. Install wiring in exposed or inaccessible areas in EMT conduit. Plenum-rated cable may be used in concealed, accessible areas only.
   b. Provide wiring between thermostats and unit heater motors, and control and alarm wiring.
   c. Provide conduit and wiring between the BAS panels and the temperature, humidity, or pressure sensing elements, including low voltage control wiring in conduit or plenum-rated cable.
   d. Provide conduit and control wiring for devices specified in this Section.
   e. Provide conduit and signal wiring between motor starters in motor control centers and high and/or low temperature relay contacts and remote relays in BAS panels located in the vicinity of motor control centers.
   f. Provide conduit and wiring between the PC workstation, electrical panels, metering instrumentation, indicating devices, miscellaneous alarm points, remotely operated contactors, and BAS panels, as shown on the drawings or as specified.
   g. Wiring shall be compliant with the Divisions 26 requirements and the NEC.
   h. Provide electrical wall boxes and conduit sleeves for wall-mounted devices. Mount thermostats at 54 inches AFF unless otherwise noted.
   i. Ethernet drop at or near designated BAS control panel(s), and as needed.

B. Interface with Other Work:
1. The Contractor is responsible to furnish and install complete and operational systems. The following breakdown is recommend; carefully coordinate work between subcontractors.
2. Products furnished by BAS contractor for installation by the mechanical contractor:
   a. Control valves.
   b. VAV box controllers.
   c. Wells for hydronic temperature sensors.
3. Products furnished and installed by mechanical contractor:
   a. VAV boxes. BAS contractor shall furnish VAV box controls to the VAV box manufacturer for factory installation at the expense of the box manufacturer.
   b. VAV box controller enclosures will be provided by box manufacturer.
   c. Gauges, thermometers and thread-o-lets for BAS contractor furnished control sensor wells.
   d. Airflow measuring stations.
   e. Control and balancing dampers.
   f. Smoke and fire/smoke dampers actuators.
4. Electrical contractor (Div. 16) provides:
   a. Wiring of power feeds through disconnect starters to electrical motors.
   b. Wiring of any remote start/stop switches and manual or automatic motor speed control devices not furnished by controls contractor.

c. Duct smoke detectors including installation and wiring.
d. Power wiring of smoke/fire dampers provided by Divisions 20, 21, 22, 23, 25.
e. Stand-alone packaged controls and wiring of stand-alone packaged controls to their remote sensors and devices.
f. Mounting and wiring of Variable Speed Drives (VSDs) furnished by the Mechanical Contractor per Divisions 20, 21, 22, 23, 25.

C. System Integration. Products to receive integration under this section:
1. Variable Speed Drives:
a. Connect directly to the BAS through three twisted pair for Start/Stop, speed control and remote communications.
b. Factory-furnished with the appropriate communication hardware and software to allow communication.
c. Connections to VSD provided under this section.
2. Fire Alarm/Life Safety System:
a. The BAS shall communicate with the fire alarm/life safety system via an alarmable point in the form of a dry contact.
b. The device will be provided and terminated by Divisions 26. This section will provide wiring to the termination device.

3.2 PROGRAMMING

A. Programming and graphics shall be included to implement the controls sequences specified in Section 25 90 00 - Sequence of Operations, and to implement the systems and features included in Facility Services Divisions 20-28. It shall not be necessary for the Contracting Agency to further program the system.

B. Provide licensed copies of software tools and programming aids used to install, develop and troubleshoot the controls system to the Contracting Agency. Assist the Contracting Agency in registering the software in Contracting Agency's name.

C. Implement the control sequences for the equipment on this project as contained in Section 25 90 00 - Sequence of Operations.

D. Point identifiers shall be chosen for easy identification of the actual equipment being controlled or monitored. They shall include equipment tag identifiers shown on the drawings, and may include additional characters to identify floor, area, etc. Maintain a listing of identifiers used in this project, with their plain English names. Submit the listing for review and information.

3.3 GRAPHICS

A. Graphical Mechanical Displays: Create graphical displays of major mechanical equipment for this project and install graphics on the PC-based workstations. At a minimum, these graphical displays shall include building floor plans derived from architectural AutoCAD representations and graphical representations of the equipment controlled under this contract.
1. Plans:
a. Provide a central site plan for the entire facility and immediate surroundings. As a minimum indicate the following:
1). Area designation.
2). Number of levels on each area.
3). Adjacent street names.
4). North arrow.
b. Provide floor overall floor plans for each level of the facility. As a minimum indicate the following:
1). Area designation and level.
2). Mechanical and electrical rooms.
3). Control panel locations.

4). North arrow.

c. Provide individual floor plans for the facility. As a minimum indicate the following:
1). Walls, doors, and general floor plan arrangement.
2). Mechanical and electrical rooms.
3). Temperature sensors.
4). Temperature control zones.
5). Control panel locations.
6). North arrow.
7). List of major HVAC systems serving the area including but not limited to the following:
a) Air handling systems.
b) Exhaust fans.
c) Toilet exhaust fans.
d) Heating systems.
e) Cooling systems.

d. As a minimum provide the following functional links on for each floor plan:
1). Provide links back and forth between the plan screens noted above.
2). On floor plan with temperature sensor, provide dynamic color coding for each sensor as follows:
a) Blue indicates space temperatures less than 65 degrees F.
b) Green indicates space temperatures between 66 degrees and 74 degrees F.
c) Red indicates space temperatures above 75 degrees F.
3). Provide a link to each VAV terminal unit from the associated temperature sensor.
4). Provide a link to each major mechanical system serving the temperature sensor.

2. Room Reheat coils:
a. Indicate the following information for each unit:
1). Room Temperature.
2). Coil valve position percent.
3). Fintube valve position percent.

3. Air Handling: Indicate the following information for each AHUs/MAUs, relief/exhaust fans, and toilet exhaust fans:
a. Put control points and adjustable set points on the screen.
b. Define action of dampers and valves (N/O or N/C);
c. Fan schedule override commands.
d. Reset schedules.
e. Outside air CFM and minimum requirement.
f. Duct static set point.

4. Building static pressure: Provide a common screen for the building and fan room static pressure sensors for the entire facility. Put control points, adjustable set points, and reset schedules on the screen.

5. Boiler Room: Indicate the following information for the heating pumps, boiler room ventilation equipment, and other boiler room equipment:
a. Put control points and adjustable set points on the screen.
b. Define action of dampers and valves (N/O or N/C).
c. Pump override commands.
d. Boiler override commands.
e. Reset schedules.
f. GPM flows.
g. Outside air temperature.

B. Graphical Electrical Displays: Create graphical displays of electrical equipment specified for connection to this system. Coordinate with Divisions 26 and provide graphics on the PC-based workstations. At a minimum, these graphical displays shall include building floor plans utilized for Graphical Mechanical Displays.
1. Emergency/Standby Generating System:

a. Operating parameters, generation equipment and ATS status, and alarm information.
b. Refer to Section 26 3213 Engine Generator, for additional information.

2. Power Monitoring and Control System:
   a. System alarm and status information.
   b. Refer to Section 26 0900 - Power Monitoring and Control System, for additional information.
3. Building Lighting Control:
   a. Status information.
   b. Put control points and adjustable set points on the screen.
   c. Lighting override commands.
4. Site Lighting Control:
   a. Status information.
   b. Put control points and adjustable set points on the screen.
   c. Lighting on/off override commands.

C. Use approved designations for room names, spaces, equipment tags, etc.

3.4 SITE QUALITY CONTROL

A. Programming BAS to provide system operation and monitoring in accordance with Section 25 90 00 - Sequence of Operation and other referenced sections.

B. Trend Logs:
1. Prepare trend logs for all points required to demonstrate BAS calibration, control and stability.
2. Trend logs shall document building operation after applicable PC/FT checklists are completed and building site commissioning is satisfactorily completed.
3. Set points, valve positions, etc. may be temporarily adjusted to artificially induce the intended sequences to occur.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration:
1. Provide demonstrations in accordance with Section 01 79 00 - Demonstrations and Training.
2. Demonstrate the proper operation and control of systems controlled and monitored by the BAS.
3. The demonstration shall include, but not necessarily be limited to, the following:
   a. Review of the Trend Logs.
   b. Complete and proper operation of control systems including simulations.
   c. Access to devices for required maintenance.
   d. Review of associated graphics on Host.

B. Training:
1. Provide 24 hours of on-site instruction by BAS contractor to familiarize operating personnel with the control system. Instructions will include:
   a. A brief description of the controls' sequence of operation.
   b. A discussion and explanation of alarms, switches and gauges.
   c. A summary and explanation of steps to be taken in response to specific alarms or control malfunctions.
   d. Building walk-through to physically locate and examine control devices and demonstrate control setpoint adjustment procedures.
   e. Instructions regarding adjustment procedures shall emphasize methods for continual building "fine-tuning".

END OF SECTION

SECTION 25 90 00

SEQUENCE OF OPERATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: This section describes the building automation system (BAS) control sequences for the heating, ventilating, and air-conditioning (HVAC) systems, electrical systems and plumbing systems provided for this project.

B. Related Sections: Refer to Section 25 50 00 - Building Automation System

1.2 REFERENCES

A. Refer to Section 25 50 00 - Building Automation System.

1.3 SYSTEM DESCRIPTION

A. Refer to Section 25 50 00 - Building Automation System.

1.4 SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

B. Product Data:
1. Provide BAS manufacturers' product literature, clearly annotated to indicate performance criteria to include the following:
a. Building level to floor level network controller riser diagrams. Include building locations and equipment controlled by each controller.
b. Sequences of operation for HVAC, electrical and plumbing systems.
c. Process control diagrams to support each sequence of operation. Show field mounted control device locations and circuit routing.
d. Complete electrical and pneumatic BAS points list.

C. Quality Assurance/Control Submittals:
1. Installation and Functional Performance Test Letter.
a. Provide a letter certifying that the building automation system hardware is completely installed and sequences of operation have been programmed, operationally tested, with physically verification, to comply with the sequences of operation as specified. The installer(s), sub-contractor(s) and the Contractor must sign the letter.
b. Include as an attachment, a list of programming deviations from the specified sequences of operation with justification to support each deviation.
c. Include as an attachment, a table of final adjustable setpoint values for each applicable control point.

D. Installation, Operation and Maintenance Data:

1. Refer to Section 20 00 00 – Mechanical General Requirements, for IO&M Manual formatting requirements and number of copies required.
2. Provide approved submittal information, revised to reflect the actual installation as addressed in the attachments provided with the Installation and Functional Performance Test Letter, for inclusion within the project IO&M Manual.

1.5 CLOSEOUT SUBMITTALS

A. Submit in accordance with Section 25 50 00 - Building Automation System and in accordance with Division 1.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. See section 20 00 00 - Mechanical General Requirements.

1.7 QUALITY ASSURANCE

A. Refer to Section 25 50 00 - Building Automation System.

B. Qualifications of Installers/Programmers: Minimum 3 years' experience in the installation and programming of direct digital control systems.

1.8 WARRANTY

A. Refer to Section 25 50 00 - Building Automation System.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 FIRE ALARM PANEL MONITORING

A. Monitor the building fire alarm panel alarm status output.

3.2 VENTILATION SYSTEMS (EXISTING AHU'S AND RTU'S)

A. In general, intent is to replicate and maintain existing sequences. As appropriate, utilize the following suggested sequences to supplement existing.

B. AHU Ventilation System Operation:
1. Full Shutdown Mode:
    a. Supply fans off.
    b. Return/relief fan off.
    c. Mixing box outside air damper shut.
    d. Mixing box return air damper fully open.
    e. Return/relief fan relief damper shut.
    f. Chiller is disabled.
2. Start Sequence:

a. Provide independent, adjustable, automatic start/stop sequence for each air handling system based on time-of-day schedule.
b. Provide a minimum 5-second time delay between the start of each AHU/RTU supply fan and return/relief fan.

3. Return/Relief Fan Control: Fan operates in conjunction with corresponding AHU/RTU.
4. Supply Temperature Control:
   a. Pre-Occupancy Warm-Up/Cool-Down Mode:
      1). Initial Conditions: The ventilating system is in Full Shutdown Mode.
      2). Initiate pre-occupancy warm-up/cool-down cycle one hour prior to scheduled Occupied Mode operation.
      3). Start AHU.
      4). Warm-Up: Modulate preheat and heating coil hydronic control valves to maintain 60 degrees F (adjustable) supply air setpoint temperature as measured downstream of supply fan. The outside air damper remains shut, the return air damper remains fully open, and the relief damper remains shut.
      5). Economizer Cool-Down: If outdoor air temperature is greater than 45 degrees F and less than 65 degrees F, modulate outside air damper open and modulate return air damper shut to maintain 55 degrees F supply air setpoint temperature.
      6). Mechanical Cool-Down: If outdoor air temperature is greater than 65 degrees F, the outside air damper remains shut, the return air damper remains fully open, and the relief damper remains fully shut. Modulate open hydronic cooling control valves to maintain supply air setpoint temperature.
   b. Occupied Mode:
      1). System has completed Pre-Occupancy Warm-Up/Cool-Down Mode and zones are at Occupied Mode temperature setpoints.
      2). Command outside air damper to occupied mode from the BAS. Outside air damper modulates open to minimum outside air volume flow rate (CFM).
      3). Return air damper modulates proportionally to outside air damper.
      4). Relief damper modulates to maintain building static pressure.
      5). Measure mixing box mixed air temperature. If mixed air temperature is less than 55 degrees F setpoint shift to Heating Mode. Modulate heating coil hydronic control valve to maintain 55 degrees F supply air setpoint temperature measured downstream of supply fan.
      6). If mixed air temperature is greater than 55 degrees F setpoint, and the heating coil hydronic control valve has been shut for 3 minutes, shift to Economizer Cooling Mode. Modulate open outside air damper and modulate shut return air damper proportionally to maintain supply air temperature setpoint. Modulate relief damper.
      7). If the outside air damper is fully open and return air damper is fully shut for 5 minutes, supply air temperature is greater than setpoint temperature, and the outside air temperature increases to 5 degrees F greater than return air temperature, shift to Mechanical Cooling Mode. Modulate the outside air damper to the minimum outside air position. Modulate return air damper open and modulate relief damper to maintain building static pressure setpoint. Modulate cooling coil hydronic control valve to maintain supply air temperature setpoint.
   c. Unoccupied Mode:
      1). AHUs/RTUs are initially operating in Occupied Mode.
      2). Shift ventilation systems to Full Shutdown Mode.
      3). The hydronic heating system operates to maintain 65 degrees F night setback temperature setpoint plus 3, minus 0 degrees F using perimeter heat only.
      4). If any zone falls below setback temperature setpoint, operate the applicable ventilating system using Pre-Occupancy Warm-Up Mode sequences.
      5). Provide 15-minute minimum supply fan run time and 5-minute minimum system off time.

C. Typical Zone VAV Temperature Control with Reheat:

1. Zone Sensors:
   a. Zone thermostat: Provide wall-mounted zone thermostat with input to zone VAV terminal equipment controller.
   b. Zone supply air temperature: Provide duct mounted temperature sensor downstream of each VAV terminal reheat coil.
2. Occupied Mode Operation:
   a. Heating Mode: Modulate the VAV terminal unit control damper between Minimum CFM and Maximum Heating CFM to maintain zone day setpoint temperature plus or minus 1-degree F. Modulate VAV reheat coil control valve in parallel with control damper.
   b. Cooling Mode: Modulate the VAV terminal unit control damper between Minimum CFM and Maximum Cooling CFM to maintain zone day setpoint temperature, plus or minus 1-degree F. Reheat coil control valves remain shut.
3. Unoccupied Mode Operation:
   a. Heating Mode: When AHU is operating, modulate VAV terminal unit control damper between Minimum CFM and Maximum Heating CFM to maintain zone night setpoint temperature plus 0, minus 3 degrees F. Modulate VAV reheat coil control valve in parallel with control damper.
   b. Cooling Mode: Ventilation system remains off regardless of zone temperature.

D. Typical Zone VAV Temperature Control with Reheat and Auxiliary Heat (Fintube):
1. Zone Sensors:
   a. Zone thermostat: Provide wall-mounted zone thermostat with input to zone VAV terminal equipment controller.
   b. Zone supply air temperature: Provide duct mounted temperature sensor downstream of each VAV terminal reheat coil.
2. Occupied Mode Operation:
   a. Heating Mode: Modulate the VAV terminal unit control damper between Minimum CFM and Maximum Heating CFM to maintain zone day setpoint temperature plus or minus 1-degree F. Modulate reheat coil and auxiliary heat control valves in parallel with control damper.
   b. Cooling Mode: Modulate the VAV terminal unit control damper between Minimum CFM and Maximum Cooling CFM to maintain zone day setpoint temperature plus or minus 1-degree F. Reheat coil and auxiliary heat control valves remain shut.
3. Unoccupied Mode Operation:
   a. Heating Mode: When AHU is operating, modulate VAV terminal unit control damper between Minimum CFM and Maximum Heating CFM to maintain zone night setpoint temperature plus 0, minus 3 degrees F. Modulate VAV reheat coil and fintube control valves in parallel with control damper.
   b. Cooling Mode: Ventilation system remains off regardless of zone temperature.

E. Safety Shutdowns:
1. General:
   a. “Hardwire” system safety shutdowns to provide safe, reliable operation in the event of Building Automation System (BAS) failure.
   b. Where equipment is provided with packaged stand-alone controls, capable of operating the equipment independently from the BAS, provide control logic which shifts the equipment to stand-alone operation in the event of BAS failure.
2. Low Temperature Shutdown:
   a. If supply air temperature decreases to 45 degrees F:
      1). Command applicable ventilating system in Full Shutdown Mode.
      2). Provide “AHU-X Low Temperature Shutdown” alarm.
      3). Require manual restart of the ventilation system through the BAS.

F. Maintenance and Alarm Monitoring:
1. Zone Temperature Monitoring:

a. Generate “AHU-X Zone Temperature High/Low” maintenance alarm if any zone temperature is not being maintained within setpoint band tolerance as described in Occupied Mode and Unoccupied Mode sequences.
b. During optimized start period, generate “AHU-X Zone Temperature High/Low” maintenance alarm if any zone temperature fails to meet occupied temperature setpoint.
c. Generate “AHU-1 Zone Low Temperature” critical alarm if any zone temperature falls below 55 degrees F.

3.3 EXHAUST FAN OPERATION

A. In general, intent is to replicate and maintain existing sequences. As appropriate, utilize the following suggested sequences to supplement existing.

B. Fans to be operating during Occupied Mode (business hours).

C. Fans to be off during Unoccupied Mode.

3.4 MECHANICAL ROOM VENTILATION SYSTEM

A. Unit is currently not operating. Coordinate with Owner if Owner decides to re-energize this unit.

3.5 TELECOMMUNICATIONS/COMPUTER ROOM AIR-CONDITIONING SYSTEMS

A. Replicate and maintain existing sequences.

3.6 HYDRONIC HEATING SYSTEM OPERATION

A. In general, intent is to replicate and maintain existing sequences. As appropriate, utilize the following suggested sequences to supplement existing.

B. General System Description:
1. The hydronic heating system consists of two identical hydronic boilers (BLR-1, BLR-2). The boilers are arranged in a primary/secondary piping arrangement. Each boiler has a dedicated primary loop circulator, pumps PMP-1 and PMP-2 respectively.
2. A secondary heating loop pump (PMP-3) provides circulation to VAV boxes and terminal heating units throughout the facility.
3. A secondary heating loop pump (PMP-4) provides circulation to the Air Handling Unit (AHU-1) preheat and heating coils.
4. A set of secondary heating loop pumps (PMP-5/6), arranged in parallel, and each sized for 100 percent system zone flow provide circulation to terminal heating units in the Garage Bay 126.

C. Coordination with Packaged Boiler Controls.
1. Coordinate connection of the BAS to the packaged burner controllers.
2. Provide boiler enable/disable and sequencing, circulator pump operation and secondary loop temperature reset utilizing the BAS.

D. Full Shutdown Mode (Initial conditions):
1. Both boilers off.
2. Boiler circulator pumps off (PMP-1 and PMP-2).

3. Secondary heating loop circulator pumps off (PMP-3, PMP-4, PMP-5/6).

E. Operating Mode:
1. System Enable:
a. Manual Mode:
1). Provide three-position on/off/auto switch located on each burner control cabinet to allow local manual enable, disable or automatic burner control from the BAS (normal condition).
2. Lead/Lag Control:
a. Provide lead/lag control for boilers (BLR-1 and BLR-2). Alternate lead boiler monthly (adjustable) during the heating season.
b. Provide lead/lag control for secondary loop circulators (PMP-5/6). Alternate lead loop pump monthly (adjustable) during the heating season.
3. System Start-up:
a. Start lead secondary loop circulator pumps (PMP-3, PMP-4, and PMP-5). Operate secondary circulator pumps with lead pump in “run” and standby pump in “standby.” If lead pump fails to start as determined by analog current sensor, disable lead pump and start standby pump.
b. After secondary loop flow has been established for 10 minutes (adjustable), enable boiler operation.
4. Boiler Operation:
a. Utilize existing sequences.
5. System Shutdown:
a. Initiate Full Shutdown Mode in the following events:
1). Manual “off” mode.
2). Low water cutoff shutdown of either boiler.

F. Hydronic System Monitoring and Alarm.
1. Boiler safeguard alarms (BLR-1 and BLR-2):
a. Generate a separate “BLR-X Flame Failure” alarm if any boiler is shut down by its flame safeguard control system.
2. Boiler circulator pump trouble alarms (PMP-1 and PMP-2):
a. Provide current sensing (analog) for each pump.
b. Disable applicable flame safeguard circuit and generate an alarm if any pump fails to run when its respective boiler is enabled.
3. Secondary loop pump trouble alarms (PMP-3, PMP-4, and PMP-5/6):
a. Provide current sensing (analog) for each pump.
b. Generate an alarm if pumps fail to operate in their normal sequence, i.e. alarm if:
1). Pumps are off when OSA temperature is below System and Pump Setpoint).
2). Lead pump fails to operate and system switches to lag pump (PMP-5/6).
3). Both pumps (PMP-5/6) are running.
4. Hydronic System Low Pressure Alarms:
a. Monitor both the heating loop system pressure with analog sensor pressure sensor.
b. Generate a separate low-pressure alarm if system pressure falls below 10 PSIG (adjustable).

3.7 HYDRONIC HEATING SYSTEM DEVICES

A. Air Handler Heating Coils (AHU-1): See ventilation system control sequences.

B. Zone VAV Terminal Reheat Coils (AHU-1): See ventilation system control sequences.

C. Hydronic Unit Heaters and Cabinet Unit Heaters:

1. At 65 degrees F. (adjustable) and decreasing, start recirculating fan and open two-way hydronic control valve (as applicable).
2. At 68 degrees F. (adjustable) and increasing, stop recirculating fan and shut two-way hydronic control valve (as applicable).

3.8 PLUMBING

A. Domestic Hot Water Circulation Pump (CP-1): Run hot water circulator pump continuously.

B. Domestic Water Heater (WH-1): Not controlled or monitored by the BAS.

C. Water Meter Monitoring: Not controlled or monitored by the BAS.

D. Gas Meter Totalizing: Not controlled or monitored by the BAS.

END OF SECTION

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SECTION 26 00 00

ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. This section describes specific requirements, products, and methods of execution, which are typical throughout the electrical work of this project. Additional requirements for the specific systems may modify these requirements.

C. This Section applies to all Division 26 specifications and is part of all other Division 26 specifications.

D. Index of Electrical Specifications:
1. 26 00 00 - Electrical General Requirements
2. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
3. 26 05 26 - Grounding and Bonding for Electrical Systems
4. 26 05 29 - Hangers and Supports for Electrical Systems
5. 26 05 33 - Raceway and Boxes for Electrical Systems
6. 26 05 53 - Identification for Electrical Systems
7. 26 28 00 - Low Voltage Circuit Protective Devices
8. 26 28 16 - Enclosed Switches and Circuit Breakers

1.2 REFERENCES

A. Codes: Perform work in strict accordance with applicable national, state and local codes; including, but not limited to the latest legally enacted editions of the following specifically noted requirements:
1. NFPA 70, National Electrical Code - NEC.
2. ANSI-C2, National Electrical Safety Code - NESC.
3. International Building Code - IBC.
4. International Fire Code - IFC.
5. Underwriters Laboratory (UL) or approved equal.

B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:
1. American National Standards Institute - ANSI.
2. American Society for Testing and Materials - ASTM.
3. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE.
4. Institute of Electrical and Electronics Engineers - IEEE.
5. Insulated Cable Engineers Association - ICEA.
6. National Electrical Manufacturers' Association - NEMA.
7. National Fire Protection Association - NFPA.

1.3 DEFINITIONS

A. "Accessible" means arranged so that an appropriately dressed man, 6 feet-2 inches tall, weighing 250 pounds, may approach the area in question with the tools and products necessary for the work intended and may then position himself to properly and safely perform the task to be accomplished, without disassembly or damage to the surrounding installation.

B. “Authority Having Jurisdiction” is the individual official, board, department, or agency established and authorized by the political subdivision created by law to administer and enforce the provisions of the Code as adopted or amended.

C. "As Specified" denotes a product, system, or installation that:
   1. Includes all of the salient characteristics identified in the Drawings and Specifications;
   2. Meets all of the requirements of the "Basis of Design"; and
   3. Is produced by a manufacturer listed as acceptable on the Drawings or in the Specifications.

D. "Basis of Design" refers to products around which the design was prepared. Some or all of the particular characteristics of Basis of Design products may be critical to the fit or performance of the completed installation. Such characteristics are often subtle. Where substitutions are made to products that are the Basis of Design, the Contractor is alerted that nominally acceptable substitutions may produce undesirable side effects such as switchboards that no longer fit the space due to increased product dimensions. The Contractor is responsible for resolving all impacts of substitutions. Approval of a substitution request does not relieve the Contractor of complying with the design intent and all Codes.

E. "Contracting Agency" is the Owner as defined in the General Conditions of the Contract.

F. “Demolish” means to permanently remove a component, equipment, or system and it's appurtenances with no intent for reuse and to properly dispose of it.

G. "Furnish" means to purchase material as shown and specified, and cart the material to an approved location at the site or elsewhere as noted or agreed to be installed by supporting crafts.

H. "Install" means to set in place and connect, ready for use and in complete and properly operating finished condition, material that has been furnished.

I. “Product” is a generic term that includes materials, equipment, fixtures and any physical item used on the project.

J. "Provide" means furnish all products, labor, subcontracts, and appurtenances required and install to a complete and properly operating, finished condition.

K. “Remove” means to remove a component, equipment, or system and it's appurtenances and either store it for re-installation, reuse, or turn it over to the Contracting Agency.

L. "Rough-in and Connect" means provide an appropriate system connection such as conduit with junction boxes, wiring, switches, disconnects, etc., and wiring connections. Equipment furnished is received, uncrated, assembled, and set in place under the Division in which it is specified.

M. "Serviceable" means arranged so that the component or product in question may be properly removed, and replaced without disassembly, destruction or damage to the surrounding installation. "Serviceable" components shall be "accessible".

N. "Shop Drawings" are dimensioned working construction drawings drawn to scale to show an entire area of work in sufficient detail to demonstrate service and maintenance clearances and complete coordination of all trades.

O. "Substitution" is a product, system or installation that is not by a listed manufacturer or does not conform to all salient characteristics identified in the Contract Documents, but which the Contractor warrants meets all specific requirements listed in the Contract Documents.

P. "System Drawing" is a diagrammatic engineered drawing that shows the interconnection and relationship between products to demonstrate how the products interact to accomplish the function intended. Examples of system drawings include control and instrumentation diagrams, and wiring diagrams. Some drawings, such as dimensioned and complete Fire Suppression Drawings may be both System Drawings and Shop Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Provide labor, products and services required for the complete installation, checkout and startup of electrical systems shown and specified. Where the work of several crafts is involved, coordinate related work to provide each system in complete and in proper operating order.

B. Lay out the work in advance and avoid conflict with other work in progress. Physical dimensions shall be determined from existing conditions. Verify locations for junction boxes; disconnect switches, stub-ups, etc., for connection to equipment furnished by others, or in other Divisions of this Work.

C. Refer to the “Suggested Coordination Schedule” in Section 20 0000 - Mechanical General Requirements.

D. Cooperate with others involved in the project, with due regard to their work, to promote rapid completion of the entire project.

E. Coordinate installation of panels, equipment, system components, and other products to provide proper service areas and access for items requiring periodic maintenance inspection or replacement.

F. Reference to a specific manufacturer’s product (even as “Basis of Design”) does not necessarily establish acceptability of that product without regard to compliance with all other provisions of these specifications.

G. Local Conditions: The Contractor shall thoroughly familiarize himself with the work as well as the local conditions under which the work is to be performed. Schedule work with regard to seasons, weather, climatic conditions and other local conditions which may affect the progress and quality of the work.

H. Demolition: Coordinate related demolition in support of the project. Restore circuits and systems, which are to remain, but which are affected in any way by demolition Work. Conduct a site visit prior to bid to determine Scope. Refer to Part 3 of this Section for execution requirements.

1.5 SUBMITTALS

A. Refer to Division 1 for general submittal, closeout submittal and product substitution requirements. In addition, prepare Divisions 26, 27 and 28 submittals in accordance with the following.

B. Specification section drawings, calculations, and products shall be complete and submitted together in one package.

C. General:
1. The Contracting Agency's obligation to review submittals and to return them in a timely manner is conditioned upon the prior review and approval of the submittals by the Contractor as required by the Construction Contract.
2. Streamlining: in many instances, the products, reference standards, and other itemized specifications have been listed without verbiage. In these cases, it is implied that the Contractor shall provide the products and perform in accordance with the references listed.
3. Submittal review is for general design and arrangement only and does not relieve the Contractor from any of the requirements of the Contract Documents.
4. Submittals will not be checked for quantity.
5. Submittals will not be exhaustively checked for dimension or fit, or for proper technical design of manufactured equipment. Provision of a complete and satisfactory working installation is the responsibility of the Contractor.
6. Furnish suppliers with the applicable portions of the Contract Documents and review and verify that the suppliers' submittals clearly represent products which comply with the Contract Documents.
7. Provide submittal(s) in electronic PDF format.

D. Electronic Submittals:
1. Provide electronic submittals in PDF format, unless noted otherwise. Maximum file size to be coordinated with Department.
   a. Electronic submittals shall follow the organization and formatting required for paper submittals.
      1). Provide electronic bookmarks within the PDF document in place of tabs and sub-tabs.
      2). If individual PDF files are provided for each product or shop drawing sheet, organize files into folders and name files and folders to correspond with applicable specification sections or drawing titles.
   b. Create PDF documents without security, to be searchable, and to allow copy and paste. For scanned documents, run the optical character recognition (OCR) function to ensure the document is searchable and can be copied and pasted.
   c. Electronic submittals may be transmitted via Email or download from a Department approved project or construction Website.

E. Coordination:
1. Create and maintain a master submittal log. Submit master submittal log with first submittal.
2. Prior to submission for approval hold a meeting of all trades to review all shop drawings and submittals. All trades shall cross-check all shop drawings and submittals for conflicts, clearances, physical space allocation and routing, discrepancies, dimensional errors, omissions, contradictions, departures from the Contract requirements, correct electrical/mechanical services and connections, and provisions for commissioning.
3. Revise, correct, and appropriately annotate submittals prior to submission for approval.
4. A current copy of approved submittals and the submittal log shall be kept at the job site.

F. Product Submittals
1. General: This section describes in detail the preparation of electrical product submittals. Submittals not provided as described shall be rejected without review. This procedure is designed to accelerate and improve the accuracy of the technical review process, as well as, simplify the preparation of the Installation, Operation, and Maintenance Manuals (IO&Ms) during project closeout.
2. Submittal Organization:

a. Organize product submittal information in the same order as the products are specified to simplify the technical review process. Provide a separate tabbed divider for each Division 26 specification section. Provide the typed section number on each tab.
b. Within each section, organize the product information in the same order as the products are specified in Part 2 of each applicable specification section. Provide sub-tabs within each section for each separate product article. Provide the typed product article number on each tab.
c. Provide product submittal information for each product specified in 8-1/2" x 11" format. Fold-out 11" x 17" format is also acceptable.
d. If a particular specified product is being omitted from the product submittal or will not be used for the project, provide a single sheet within the article tab identifying the product and annotated with a brief reason why the product is not being submitted, for example: "NOT USED," NO SUBMITTAL REQUIRED," "TO BE SUBMITTED BY (PROVIDE DATE)," etc. This will inform the reviewer that the product was not overlooked.
e. Partial submittals from individual subcontractors may be provided which cover a particular sub-contractor's scope of work. In this case, arrange partial submittals by system classification such as: LIGHTING, POWER DISTRIBUTION, FIRE ALARM, ACCESS CONTROL SYSTEM, etc. Within each system classification, arrange product submittals by specification section, as described, such that each specification section can easily be reorganized into a master set of Division 26 product submittals organized by specification section. This will greatly simplify the preparation of IO&M manuals as described below.
f. Provide a master table of contents at the front of each volume which lists the Division 26 specification sections and indicates which sections are located within each volume.
g. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
h. Provide identical cover and spine inserts for each product submittal volume.
i. For multiple volumes, label each volume. Include the following typed information on the front cover and spine inserts of each volume:
   1). The Contracting Agency Name
   2). Project Name
   3). Contractor Name
   4). Subcontractor Name preparing the submittal.
   5). Date that the submittal or resubmittal was initiated.
   6). "Electrical Product Submittals", etc. as appropriate.
   7). "Volume 1 of X, Volume 2 of X," etc.

3. Product Information:
   a. Indicate manufacturer's name and address, and local supplier's name, address, phone number.
   b. Indicate each product as "Basis of Design", "As Specified" or as "Proposed Substitution."
   c. Identify Catalog designation and/or model number.
   d. Neatly annotate each salient characteristic and design options of the product to demonstrate compliance with the Contract Documents to include: Scheduled information, drawing information and specified information. Clearly indicate product deviations from the Contract Documents and mark out non-applicable items on generic "cut-sheets."
   e. Include manufacturer provided dimensioned equipment drawings with mechanical and electrical rough-in connections.
   f. Include operation characteristics, performance curves and rated capacities.
   g. Include motor characteristics and wiring diagrams for the specific system.
   h. Provide basic manufacturer's installation instructions.
4. Provide coordination data to check protective devices.

5. Provide information required to verify compliance with the short circuit withstand and interrupting ratings, as shown on the Drawings or further stated in these Specifications.
6. Product Substitutions:
   a. Clearly indicate both in the section table of contents and on the individual product submittal information each proposed substitution, deviation or change from the product as described in the Contract Documents.
   b. Submittal approval does not include substitutions, deviations or changes from the requirements of the Contract Documents unless they are specifically itemized and approved. The term “No Exceptions Taken” will not apply to substitutions, deviations or changes not clearly identified.
   c. Provision of a satisfactory working installation of equal quality to the system as described in the Contract Documents shall be the responsibility of the Contractor.
   d. Correct unapproved deviations from the Contract Documents discovered in the field as directed by the Contracting Agency at no additional cost to the Owner.

G. Shop Drawings:
1. General:
   a. The Contract Documents are not intended for nor are they suitable for use as shop drawings. Do not use Contract Drawings for direct fabrication or installation of products or equipment.
   b. Division 26 products and systems shall not be installed without shop drawings approved by the Contracting Agency.
   c. Rework, changes or additional engineering support required as a result of the installation of products and systems prior to the approval of applicable shop drawings by the Contracting Agency shall be provided at the Contractor’s expense.
2. Preparation:
   a. Review each Division 26 specification section and identify the project’s shop drawing requirements.
   b. Prepare shop drawings on full sized sheets of the same size as the original construction drawings.
   c. Arrange shop drawings to scale, showing dimensions where accuracy of location is necessary for coordination or communication purposes.
   d. Incorporate the actual dimensions and configurations of the products and systems approved through the product submittal process into the shop drawings.
   e. Provide dimensioned maintenance clearance areas around each product as recommended by the manufacturer.
   f. Meet with and coordinate Division 26 work with the interrelated work of other trades including Architectural, Civil, Structural, and Mechanical to identify and resolve potential conflicts.
   g. Clearly identify and provide recommendations to resolve major conflicts which may impact the design of the systems as shown. Resolve such conflicts during the shop drawing review process.
   h. In cases where one or more equipment items in a mechanical or electrical room or space differ in dimensions or configuration from Basis of Design (BOD) equipment, the working drawing shall show the entire area. The drawing shall be dimensioned to indicate that required aisle ways and maintenance clearances are being maintained to at least the degree shown on the Contract Drawings.
   i. Provide shop drawings for all products, systems, system components, and special supports that are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor. In addition provide shop drawings for:
      1). Electrical rooms and spaces, including all equipment. Demonstrate all required clearances and working spaces are provided.
      2). Routing and interdisciplinary coordination of groups of conduits numbering more than one and over two inch trade size.
      3). Where noted on the drawings.
      4). Where noted in other Division 26 sections.

j. Prepare shop drawings using the latest release of AutoCAD.
k. Record Shop Drawings: Provide a copy of the final, corrected, approved shop drawings for the project, updated to show as-built conditions. Drawings shall indicate exact device locations and conduit and wire routing. Prepare drawings using the latest release of AutoCAD and deliver files to the Contracting Agency. Refer to other specification sections for additional system specific requirements.

3. Shop Drawing Submittal:
   a. Submit dimensioned shop drawings as specified to demonstrate proper planning and sequencing of the applicable trades for the installation and arrangement of Division 26 with respect to other interrelated work.
   b. Installation conflicts arising from the failure to properly coordinate the work of related trades shall be resolved at the Contractor's expense.

H. Record Drawings
1. General: As the Work progresses, neatly annotate a designated and otherwise unused, set of Division Contract Drawings to show the actual locations and routing of Division 26 work and the terminal connection points to related work. As a minimum, include the following:
   a. Annotate record drawings to incorporate each applicable addendum.
   b. Annotate record drawings as directed by each applicable Request for Information (RFI) and accepted Change Order Proposal.
   c. Modify record drawings to show actual equipment sizes and locations.
   d. Provide fully dimensioned locations for permanently concealed conduits (i.e. conduit cast in concrete or buried underground/underslab).
   e. Show routing of work in permanently concealed blind spaces within the building.
   f. Maintain drawings in an up-to-date fashion in conjunction with the actual progress of installation. Accurate progress mark-ups shall be available on-site for examination by the Contracting Agency or his representative at all times.
2. Preparation:
   a. Neatly annotate record drawings to provide clear interpretation to support electronic drafting by a third party.
   b. Tape electronic sketches from addendums and/or RFIs directly to the record drawings as overlays.
   c. Annotate the record drawings in colored pencil using the same symbols and abbreviations as indicated in the Division 26 legend and schedules of the Contract Drawings.
      1). Red to add information.
      2). Green to delete information.
      3). Blue to provide additional clarifying information which is not to be drafted.
   d. After submittal to the Contracting Agency, provide additional clarification, information or rework as necessary to support the accurate interpretation and electronic drafting of the record drawings.
3. Submittals:
   a. Provide dimensioned underslab record drawings to the Contracting Agency prior to pouring the slab. For slabs poured in multiple sections, provide record drawings for the applicable slab sections to the Contracting Agency prior to each pour.
   b. Provide complete record drawings for concealed areas (i.e. above lay-in and hard ceilings and inside walls) to the Contracting Agency prior to concealment.
   c. Provide the remaining portion of the record drawings for exposed areas to the Contracting Agency prior to the final completion of the project.
   d. Prepare wiring diagrams using the latest release of AutoCAD for individual special systems as installed. Identify components and show wire and terminal numbers and connections. Include diagrams from the shop drawings and submittals, updated to show as-built condition.

I. Test Certificates:

1. Review the submittal requirements for Quality Assurance/Control Submittals for each specification section.
2. Submit copies of design data, test reports, certificates, manufacturer's instructions and field test reports as specified. This information may be included within the Operations and Maintenance (IO&M) Manuals as determined by the Contracting Agency.

J. Operations and Maintenance (IO&M) Manuals:
1. Provide specific product IO&M information for each section as detailed within each Division 26 section.
2. Begin the preparation of the electrical Operation and Maintenance Manuals with a complete and fully approved set of electrical product submittals organized, annotated and with the product information as indicated within the "Product Submittals" article for each specification section.
3. Next, augment each individual product submittal with the written installation, operations and maintenance information for each specific product. Obviously, this type of information is not applicable (or available) for bulk commodity or simplistic products such as conduit or equipment tags, etc.
4. Maintenance information shall include:
   a. Preventive maintenance requirements for each product, including the recommended frequency of performance of each preventive maintenance task.
   b. Instructions for troubleshooting, minor repair and adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and that require no extensive special training or skills.
   c. Information of a maintenance nature covering warranty items, etc., that have not been discussed in the manufacturers' literature.
   d. Information data for spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.
   e. Recommended spare parts list.
5. Organize the Operation and Maintenance Manual information by specification section (not by sub-contractor) with a tabbed divider separating each section. Provide the typed section number on each tab.
6. Within each section, organize the product information in the same order as the products are specified in Part 2 of each applicable section. Provide sub-tabs within each section for each product. Provide the typed product article number on each tab.
7. Bind the information in identical, 3 inch wide; hard backed loose leaf 3 ring binders with clear front and spine insert pockets. Divide information into multiple volumes so that the pages in each binder rest naturally on one side of rings.
8. Provide a master table of contents at the front of each volume which lists the Division 26 sections and indicates which sections are located within each volume.
9. Provide a table of contents within each section which lists the Part 2 products for that section in the same order as the applicable specification section.
10. Provide identical cover and spine inserts for each IO&M manual volume.
11. For multiple volumes, label each volume.
12. Include the following typed information on the front cover and spine inserts of each volume:
    a. The Contracting Agency Name.
    b. Project Name.
    c. "Electrical Operations and Maintenance Manual".
    d. "Volume 1 of X, Volume 2 of X," etc.
13. Submit copies of all Operation and Maintenance Manuals in electronic format (Adobe PDF).

1.6 QUALITY ASSURANCE

A. Qualifications: Perform the Work using qualified workmen that are experienced and usually employed in the trade.

B. Product Testing and Certification:
1. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors shall be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.
2. Further details on the specific NRTLs, as well as the product standards that they are specifically recognized to evaluate equipment in accordance with, can be found on the OSHA Web site: http://www.osha.gov/dts/otpca/nrtl/

C. Drawings and Specifications:
1. The Drawings and specifications are complementary. Do not scale the Drawings. Locations of devices, fixtures, and equipment are approximate unless dimensioned.
2. The Drawings are partly diagrammatic and do not show precise routing of conduits or exact location of all products, and may not show in minute detail all features of the installation; however, provide all systems complete and in proper operating order.
3. Drawing symbols used for basic materials, equipment and methods are commonly used by the industry. Special items are identified by a supplementary list of graphical illustrations, or called for on the Drawings or in the specifications.

D. Tests and Inspections:
1. Schedule, obtain, and pay for permits and fees required by local authorities and by these specifications.
2. Request for Tests: Notify the Contracting Agency a minimum of 72 hours in advance of tests. In the event the Contracting Agency does not witness the test, certify in writing that all specified tests have been made in accordance with the specifications.
3. Deficiencies: Immediately correct deficiencies that are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal electrical installations until satisfactory tests are made and approved.
4. Operating Tests: Upon request from the Contracting Agency, place the entire electrical installation and/or any portion thereof, in operation to demonstrate satisfactory operation.
5. The Contracting Agency may inspect and approve sample installation of systems and equipment prior to general installation of units.
6. Test Witness: Arrange for the Contracting Agency to witness tests. The Contracting Agency may waive witnessing any specific test at its discretion.
7. Certificate of Completion: Submit at time of request for final inspection, a complete letter in the following format:
I,_____(Name), of_____(Firm), certify that the electrical work is complete in accordance with Contract Plans and Specifications, and authorized change orders (copies of which are attached hereto) and will be ready for final inspection as of_____(Date). I further certify that the following Specifications requirements have been fulfilled:
a. Megger readings performed, ____ copies of logs attached.
b. Operating manuals completed and instruction of operating personnel performed, _____ (Date) _____(Signed)
Owner's Representative
c. Record document drawings up-to-date, accurate, and ready to deliver to Contracting Agency.
d. Ground-fault system performance test complete, copies of logs attached.

e. Other tests required by Specifications have been performed.
f. Specified Owner training complete.
g. Systems are fully operational. Project is ready for final inspection.

SIGNED:_____DATE:_____
TITLE:_____

1.7 WARRANTY

A. Warranty work shall be promptly coordinated and performed at the Contractor's sole expense. Workmanship, labor and materials (without limitation) in this Division shall be warranted for the longer of the following:
1. As called for in the General Conditions of the Contract.
2. For a minimum period of one year from the date of final acceptance.
3. For the extended warranty period specified in a specific Section under this Division.

B. Where a specific product carries a longer warranty as a standard offering of its manufacturer, extended warranty coverage beyond these requirements shall be retained by the Owner. The Owner will have recourse back to the manufacturer only in these cases, when the warranty as specified in A above has expired.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT FURNISHED IN DIVISION

A. Materials furnished and installed in permanent construction shall be new, full-weight, standard in every way, and in first class condition.

B. Materials shall conform to the standards of an organization acceptable to the Authority Having Jurisdiction and concerned with product evaluation that maintains periodic inspection of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. Only materials designed for the purpose employed shall be used.

C. Materials shall be identical with apparatus or equipment that has been in successful operation for at least two years. Materials of similar class or service shall be of one manufacturer.

D. Capacities, sizes, and dimensions given are minimums unless otherwise indicated. Systems, materials and equipment proposed for use on this project shall be subject to review for adequacy and compliance with Contract Documents.

2.2 MATERIALS AND EQUIPMENT FURNISHED IN OTHER DIVISIONS

A. Controls, including conduit, wiring, and control devices required for the operation of systems furnished in other Divisions shall be provided complete under the Division of the Specifications in which the equipment is specified, unless otherwise noted or specified.

B. Work on the project that falls under the jurisdiction of the electrical trade shall be performed by Licensed Electricians in conformance with the electrical specifications.

C. Provide complete power connections to equipment including but not limited to feeders, connections, disconnects and motor running overcurrent protection. Where starters are provided

as part of packaged equipment, overcurrent heaters shall be provided under Divisions 26, 27 and 28.

PART 3 - EXECUTION

3.1 COORDINATION WITH ROOM NUMBERING

A. Certain systems provided under this Division rely on identification systems that are based on room names or numbers. Systems labeled in this fashion include, but are not limited to, panelboards, circuit directories, etc.

B. The numbering scheme indicated in these Contract Documents is based on room numbers assigned during the design process. The Owner reserves the right to change the numbers prior to substantial completion, and the final names and numbers will not necessarily match those found in the Documents. Obtain from the Owner the final room numbers prior to commencing the numbering of Division 26 systems. Tag and label all system circuits and devices in accordance with the final numbering scheme at no additional cost.

3.2 EXISTING FIRE ALARM SYSTEM

A. As part of the building wide pneumatic control system replacement with a DDC system, provide inputs from the existing fire alarm system to the DDC system to monitor:
1. Fire alarm system alarm condition
2. Fire alarm system trouble condition

Coordinate specific requirements with the Division 25 Contractor and Specification Section 25 50 00 and 25 90 00.

3.3 INSTALLATION

A. Skilled craftsmen shall install materials and equipment. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the National Electrical Contractors' Association "National Electrical Installation Standards", which herewith is made part of these specifications.

B. Repair surfaces and furnish all required material and labor to maintain fireproof, airtight and waterproof characteristics of the construction.

C. Installation of equipment shall be in accordance with manufacturers' instructions.

3.4 MULTIWIRE BRANCH CIRCUITS

A. Multiwire branch circuits shall not be used on this project. Each branch circuit shall be provided with its own dedicated neutral conductor.

3.5 MOUNTING HEIGHTS

A. Mounting height shall be to center of box above finished floor (AFF) as noted below unless otherwise shown or indicated. Other mounting heights are indicated on the Drawings by detail. Specific dimensions AFF are shown adjacent to the symbol. Where devices are shown on architectural elevations, the elevation height shall govern.

Convenience outlets in mechanical, boiler rooms and workrooms	48 inches
Motor controllers	60 inches to top
Exterior WP convenience outlets	24 inches AFG
Telecommunications (Data/Telephone) outlets	18 inches (see note below)

B. NOTE: In locations where baseboard-heating enclosures are to be installed, outlet-mounting height shall be raised to 6 inches above top of enclosure unless otherwise noted on drawings.

3.6 CUTTING & PATCHING

A. Obtain written permission of the Contracting Agency before cutting or piercing structural members.

B. Wall and floor penetrations shall be in accordance with Section 26 0529 - Hangers and Supports.

C. Holes through existing concrete shall be core drilled. X-ray concrete before core drilling. Do not cut rebar without specific authorization from the Contracting Agency. Seal openings with UL Listed fire resistant resilient sealant.

3.7 VAPOR RETARDER/BARRIER PENETRATIONS

A. Provide solid blocking installed flat at all vapor retarder penetrations. Provide flat blocking at the interior face of the exterior stud wall. Blocking shall be a minimum of 4 inches larger than the penetration. Locate the penetration at the centerline of the flat blocking. Secure vapor retarder to blocking.

B. Seal the interior of raceways penetrating the vapor retarder inside the building. Between point of sealing inside of raceway (typically at junction box or condulet) and vapor retarder penetration, seal conduit joints (connectors and couplings) with vapor retarder tape, paint on sealer or approved means acceptable to Contracting Agency.

C. Penetrations of the building vapor retarder/barrier caused by the electrical installation shall be minimized, and where they are required, the opening in the vapor retarder/barrier shall be cut smaller than the penetrating object, so that the penetration will be a stretch fit. The penetration shall then be securely sealed with vapor barrier tape or an adhesive or caulk compatible with the surfaces being sealed.

D. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating walls with vapor retarder/barriers shall be sealed airtight using STI Series SSP Firestop Putty Pads. Mold putty pads around electrical junction boxes and conduits and behind vapor retarder/barrier to form an airtight seal in accordance with manufacturer’s installation instructions.

3.8 FIRE RESISTIVE CONSTRUCTION

A. Where electrical raceways or other features penetrate fire rated building surfaces, they shall maintain the integrity of the building surface being penetrated. This shall be accomplished with either of the following methods:
   1. Sealing the penetration with an approved fire rated caulk or putty.

a. Fire rated caulk or putty: 3M Fire Barrier Caulk No. CP25, 3M Fire Barrier Moldable Putty, or as approved.

2. Firestopping shall be applied according to the manufacturer's recommendations, and in a manner that is listed by a nationally recognized independent testing agency (such as UL) as preserving the fire time rating of the construction.

3.9 PROTECTIVE FINISHES

A. Take care not to scratch or deface factory finish of electrical apparatus and devices. Repaint all marred or scratched surfaces.

B. Provide hot dip galvanized components for ferrous materials exposed to the weather.

3.10 SEPARATION OF SYSTEMS

A. Conductors and equipment of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency, etc.) shall not share the same raceways or enclosures unless specifically shown on the Drawings or approved by the Contracting Agency, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.)

3.11 TESTING

A. Prior to final test, switches, panelboards, devices and fixtures shall be in place.

B. Test electrical systems. They shall be free from short circuits and unintentional grounds.

C. Make changes necessary to balance the actual electrical loads on the complete system. Arrange for balanced conditions of circuits under connected load demands, as contemplated by the normal working conditions. Final load and balance test shall be demonstrated in the presence of the Contracting Agency.

D. Feeder cables and branch circuit cables larger than #4 AWG shall be megger tested prior to final termination. If conductor fails test, replace wiring or correct defect and retest. Perform a 1,000 volt megohm meter test between the following circuit cables in each raceway:
1. A phase and B phase conductors
2. A phase and C phase conductors
3. B phase and C phase conductors
4. A phase and Grounded (Neutral) conductors
5. B phase and Grounded (Neutral) conductors
6. C phase and Grounded (Neutral) conductors
7. A phase and Equipment Grounding conductors
8. B phase and Equipment Grounding conductors
9. C phase and Equipment Grounding conductors
10. Grounded (Neutral) and Equipment Grounding conductors

E. Feeder cables shall be megger tested prior to final termination. If conductor fails test, replace wiring or correct defect and retest. Perform a 1,000 volt megohm meter test on each circuit cable rated 600 volts between the conductor and ground. Submit logs of megger readings. The insulation resistance between conductors shall not be less than 100 Megohms.

F. Furnish one (1) copy of certified test results to the Contracting Agency prior to final inspection.

3.12 STORAGE AND HANDLING

A. Items shall be delivered and stored in original containers, which shall indicate manufacturer's name, the brand, and the identifying number. Items subject to moisture and/or thermal damage shall be stored in a dry, heated place. Items shall be covered and protected against dirt, water, chemical, ultraviolet (UV) and/or mechanical damage.

3.13 PROTECTION OF MATERIAL AND EQUIPMENT

A. The Contractor shall be responsible for materials and equipment to be installed under this Contract. The Contractor shall make good at his own cost any injury or damage which said materials or equipment may sustain from any source or cause whatsoever before final acceptance.

B. Cover and protect electrical equipment during construction from dust, dirt, debris, overspray, or other construction contaminates.

3.14 CLEANING AND REPAIR

A. Throughout the work, the Contractor shall keep the work area reasonably neat and orderly by frequent periodic cleanups.

B. Prior to substantial completion, clean equipment and systems used during construction.

C. Repair surfaces damaged or impacted by the work. Restore to original condition or better. Retexture surfaces to match surrounding surfaces. Repaint affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish.

D. As independent parts of the installation are completed, they may be tested and utilized during construction.

3.15 ACCESS DOORS

A. Provide access doors required for access to equipment provided under Division 26. Doors shall be rated for the surrounding construction. Use of access doors shall be minimized, and all locations and cosmetic features shall be submitted for approval in advance.

B. Doors shall be finished to match surrounding surfaces as approved by the Contracting Agency.

3.16 DEMOLITION

A. Examination Prior to Bid: Drawings involving existing conditions are based on building record drawings and/or limited field observation. Conduct a site inspection prior to submission of Bid to become thoroughly familiarized with the Scope of Work. Report discrepancies to Contracting Agency. Submission of bid certifies acceptance of existing conditions.

B. Examination Prior to Start of Demolition: Conduct a thorough site inspection before disturbing existing installation. Verify field measurements and circuiting arrangements. Verify that abandoned wiring and equipment serve only abandoned facilities. Beginning of demolition certifies acceptance of existing conditions.

C. Preparation:
1. Disconnect electrical systems in walls, floors, ceilings, etc., scheduled for removal.
2. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
3. Existing Electrical Service: Maintain existing systems in service until new systems are complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Contractor shall not be entitled to any additional compensation due to inability of Owner to grant an outage at the desired time. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

D. Demolition of Existing Electrical Work:
1. Remove, relocate, and extend existing installations to accommodate new construction.
2. Remove abandoned wiring to source of supply.
3. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut concealed conduit flush with walls and floors, and patch surfaces.
4. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed. In finished areas, blank covers shall be blank plates matching the device plates specified for new work, unless otherwise noted or specified.
5. Disconnect and remove abandoned panelboards and distribution equipment.
6. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
7. Disconnect and remove abandoned light fixtures. Remove brackets, stems, hangers, and other accessories.
8. Repair adjacent construction and finishes damaged during demolition and extension work.
9. Maintain access to existing electrical installations that remain active. Modify installation or provide access panels as appropriate.
10. Restore circuits and systems to remain that are affected in any way by demolition Work, such as loads downstream of demolished equipment, switched lighting circuits where selected fixtures are demolished, etc.
11. Salvage or disposal of removed items shall be as noted on the Drawings or as directed by the Contracting Agency. Items, which the Owner does not desire to retain, shall be disposed of at a legal disposal site.

E. Cleaning and Repair:
1. Clean and repair existing materials and equipment that remain or are to be reused or are affected by this work.
2. Panelboards: Clean exposed surfaces and interior of cabinet and retorque electrical connections. Provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

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SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes specific requirements, products, and methods of execution relating to wire and cable, 600 volts or less, approved for use on this project.

B. Related Sections
1. 26 05 33 - Raceways and Boxes for Electrical Systems
2. 26 05 53 - Identification for Electrical Systems

1.2 REFERENCES

A. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

1.4 QUALITY ASSURANCE

A. Conductors shall be sized according to American Wire Gauge (AWG). Stranding, insulation, rating and geometrical dimensions shall conform to UL and ICEA specifications.

PART 2 - PRODUCTS

2.1 INSULATION TYPES

A. Branch circuit conductors shall be 600 volt insulated, and unless otherwise noted on the Drawings, shall have the following insulation types:
1. Heated indoor spaces - THHN/THWN or XHHW.
2. Outdoors, wet locations (such as slab-on-grade), or other cold locations (such as unheated attics) – XHHW-2 or XHHW.

B. Feeder conductors shall be 600 volt insulated, and unless otherwise noted on the Drawings, shall have the following insulation types
1. Heated indoor spaces - THHN/THWN or XHHW-2.

2. Outdoors, wet locations (such as slab-on-grade), or other cold locations (such as unheated attics) - XHHW-2.

C. Nylon-jacketed conductors such as Types THHN or THWN shall not be used in any location subject to ambient temperatures below 20° F.

D. Special applications: Conductors in high temperature locations shall have one of the special insulation types suitable for the use and as permitted by the NEC.

2.2 FLEXIBLE CORD

A. Flexible cord shall be Type SO or ST, or for the larger sizes, Type G.

2.3 MISCELLANEOUS

A. Miscellaneous: Miscellaneous wire and cable for special purpose applications and not covered in the categories as indicated above or otherwise specified, shall be as shown on the plans and/or required by the intended use.

2.4 MINIMUM SIZE

A. Unless specified otherwise minimum wire sizes shall be as follows:
1. #12 AWG for branch circuit wiring.
2. #20 AWG for low voltage switching circuits if part of an approved cable assembly, #18 AWG otherwise.
3. #14 AWG for control circuit wiring.
4. #16 AWG for light fixture whips, refer to specification section 26 0533 - Raceway and Boxes for Electrical Systems, for maximum fixture whip lengths.

B. On 20A circuits, with one-way conductor lengths measured from panel to farthest receptacle, or center of lighting string (as applicable):
1. #10 AWG for 120V circuits of 75 feet to 120 feet.
2. #8 AWG for 120V circuits of 120 feet to 200 feet.
3. #10 AWG for 277V circuits of 130 feet to 215 feet.
4. #8 AWG for 277V circuits of 215 feet to 330 feet.

C. Similar oversizing shall apply to circuits of other ratings and/or greater lengths, as necessary to comply with the voltage drop limitations in Part 3 of this Section.

D. Cable or conductors for fire alarm systems and other special systems shall be as described in other sections of the specifications, noted on the drawing, or recommended by the equipment manufacturer, whichever is greater.

2.5 CONDUCTORS

A. Conductors used on this project shall be copper, solid or stranded for wiring #10 and smaller, stranded for #8 and larger.

B. Stranded control, communication, and alarm conductors shall have compression terminations where terminated on screw terminals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise noted or specified, all conductors shall be run in raceways as specified in Section 26 0533 – Raceways and Boxes for Electrical Systems. Raceways shall be installed as a complete system, free from obstructions, and clean before conductors are installed.

B. Provide conductors from outlet to outlet and splice branch circuit conductors only at outlet or junction boxes. Install all conductors in a single raceway at one time and leave sufficient cable at all fittings or boxes. Keep conductors within the manufacturer's allowable tension. Do not violate minimum bending radii. Lubricants for wire pulling, if used, shall conform to UL requirements for the insulation and raceway material.

C. Do not install Type XHHW conductors in temperatures below -10° F, or the other types in temperatures below +20° F.

D. Conductors that extend below grade shall be suitable for wet locations (type XHHW or XHHW-2). The use of THHN below grade is not acceptable.

3.2 CONDUCTOR SUPPORT

A. Provide conductor supports as recommended by the NEC or cable manufacturer in vertical conduits.

3.3 SPLICING

A. No splicing or joints are permitted in branch circuits except at outlet or accessible junction boxes. Prior to splicing, conductors shall be stripped to the exposed length recommended by the splicing device manufacturer.

B. Utilize compression type solderless connectors when making splices or taps in conductors No. 8 AWG or larger. Provide heat or cold shrink type insulating tubing on splices and tape outer surface continuously with Scotch #88 plastic tape to secure insulation strength equal to that of the conductors joined.

C. Utilize pre-insulated connectors, hard-shell type only, Ideal Industries, Inc., "Wing-Nut" or “Twister Pro” or "In-Sure Push-in Connectors" for splices and taps in conductors No. 10 AWG and smaller in dry locations.

D. Utilize Ideal “Twister DB Plus”, water repellent, sealant filled, UL 486D Listed connector splices and taps in conductors No. 10 AWG and smaller in damp or wet locations.

E. Utilize “Buchanan pre-insulated crimp connectors” on stranded conductors for fire alarm control and alarm circuits.

F. Feeder conductors shall be installed with no splices unless otherwise noted on the Drawings. Splices in feeder conductors, where specifically allowed, shall be compression type butt splices.

3.4 CONDUCTOR TERMINATION

A. Provide power and control conductors that terminate on equipment or terminal strips with solderless lugs or T & B "Sta-Kon" terminals.

B. Prior to termination, conductors shall be stripped to the exposed length recommended by the termination device manufacturer.

3.5 CONDUCTOR PHASE COLOR CODING

A. Service, feeder and branch circuit conductors throughout the project secondary electrical system shall be color coded as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray (see following)
Green	Ground	Green

B. Where color coded conductors are not commercially available, colored non-aging, plastic tape may be utilized where permitted by NEC.

C. Where neutrals of different systems exist on the project, neutral conductor identification method shall satisfy the Authority Having Jurisdiction, as to compliance with NEC Article 200. Branch circuit neutral conductors shall have a color stripe matching the corresponding phase conductor where neutral is not shared.

D. Phases in panelboards and similar equipment shall be connected Phase A, B, C from left to right, top to bottom, or front to back.

3.6 DERATING OF CONDUCTORS

A. Derating of conductors shall be per National Electrical Code.

3.7 VOLTAGE DROP

A. The maximum total voltage drop shall not exceed three (3) percent in branch circuits or feeders, for a total of five (5) percent to the farthest outlet based on steady state design load conditions. Wire sizes shown on the Drawings are for minimum ampacity. Wire and conduit sizes shall be increased to limit voltage drop based upon actual lengths required in the field. Base voltage-drop calculations on NEC Chapter 9, Table 9.

B. Secondary transformer voltage taps may be used to offset voltage drop as long as no load voltage does not exceed 125 volts phase to neutral/ground at transformer secondary.

3.8 TESTING

A. Feeder and branch circuit cables larger than #4 AWG shall be megger tested prior to final termination in accordance with Section 26 00 00 – Electrical General Requirements.

END OF SECTION

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SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements, products and methods of execution relating to the furnishing and installation of a complete grounding system as required for this project.

1.2 REFERENCES

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only, latest edition.

NUMBER	TITLE
ANSI/IEEE C2	National Electrical Safety Code
ANSI/NFPA 70	National Electrical Code
IEEE Draft P1250 (D4)	Guide on Service to Equipment Sensitive to Momentary Voltage Disturbances
IEEE Std 142	Recommended Practice for Grounding of Industrial and Commercial Power Systems
NFPA 70	National Electric Code (NEC) - Codebook and Handbook
REA PE-33	(1985) Shield Bonding Connectors
UL 467 Edition 6	Grounding and Bonding Equipment

1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1. Include copies of catalog cuts, data sheets and other descriptive information for all specified materials.

1.4 MINIMUM REQUIREMENTS

A. The minimum requirements for the system shall conform to Article 250 of the NEC.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Grounding conductors and equipment required for ground systems shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL), and be in accordance with U.L. 467 and as follows:
   1. Grounding conductors shall be copper. Unless specified otherwise, raceway for service grounding conductor shall be Schedule 40 PVC.

2.2 CONNECTIONS

A. Terminations above grade shall be made with solderless lugs, securely bolted in place.

B. Clamps, lugs, connectors, bonding bushings, and other such grounding and bonding items shall be:
1. Labeled or listed for the purpose.
2. Shall be made (both body and hardware) of hot dip galvanized steel, bronze, or other corrosion resistant alloy (except bushing throats shall be plastic).
3. Shall be the products of O-Z/Gedney, T & B, Raco, or accepted equals.
4. In outdoor, damp, or corrosive environments, metals for these items shall be copper (with or without tin-plating), bronze, or other corrosion resistant alloys only; O-Z/Gedney or accepted equal.

2.3 IDENTIFICATION AND LABELING

A. Grounding conductors shall be labeled in accordance with Specification Section 26 05 53.

PART 3 - EXECUTION

3.1 EQUIPMENT GROUND

A. The raceway system shall be bonded in conformity with NEC requirements to provide a continuous ground path. Where required by Code or Ordinance or where called for on the plans an additional grounding conductor shall be provided, sized in conformity with Table 250.122 of the NEC, unless larger size is noted.

B. Provide separate grounding conductor securely bonded and effectively grounded to the enclosures at both ends of all non-metallic raceways and all flexible conduit.

C. Provide an equipment grounding conductor sized in conformity with Table 250.122 of the NEC, unless larger size noted, for feeder and branch circuit conduits. Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately according to circular mil area.

D. Refeeding existing feeder/branch circuits that do not have an existing equipment grounding conductor: Bond equipment grounding conductor of new feeder or branch circuit to junction box and new and existing conduits.

3.2 CONCEALED CONNECTIONS

A. Permanent grounding connections, where permitted by the NEC to be concealed, shall not be so concealed until inspected and accepted by the Contracting Agency. Failure to comply with this requirement shall make the Contractor liable for all expenses incurred in the process of re-exposing the connections for inspection, and subsequent repair and patching of the concealing construction, including the work of other trades. The Contractor shall schedule inspection of such connections at least one work week in advance of concealment, and shall not be entitled to any additional compensation or time extension for delays caused by inability of the Contracting Agency's representative to be available at the desired time.

3.3 CORDS AND NONMETALLIC CABLES

A. Unless specifically permitted otherwise, cords and nonmetallic cables shall be furnished with integral Code-sized grounding conductor. Securely bond metal components and effectively ground the entire electrical system.

3.4 EXTERNAL BONDING JUMPERS

A. Not permitted; bonding jumpers shall be run inside the raceways for the circuits they serve.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:
   1. General hanger and support requirements for electrical equipment, conduit and cable trays not required to be vibration and/or seismically controlled.
   2. Penetrations, sleeves and seals.

B. Products Installed But Not Supplied Under this Section:
   1. Vibration Isolation and Seismic Control anchoring and support systems furnished under Section 20 05 48 – Mechanical Vibration and Seismic Control.

C. Related Sections:
   1. 20 05 48 - Mechanical Vibration and Seismic Control
   2. 26 00 00 - Electrical General Requirements
   3. 26 05 33 - Raceways and Boxes for Electrical Systems
   4. 26 29 00 - Low Voltage Controllers
   5. 26 28 16 - Enclosed Switches and Circuit Breakers

1.2 REFERENCES

A. NFPA 70: National Electrical Code (NEC) latest legally enacted edition.

1.3 DESCRIPTION

A. Provide general hanger, support and seismic support requirements for electrical equipment, conduit and cable trays and other nonstructural equipment in accordance with the manufacture's written installation instructions and NFPA 70.

1.4 SUBMITTALS

A. See Section 26 00 00 - General Electrical Requirements for general submittal requirements

B. Product Data:
   1. Provide manufacturers catalog data for each product specified. Indicate channel gauge and maximum load capacities of the selected products.
   2. Manufacturer's Installation Instructions: Include assembly instructions, recommended parts and special procedures as required.

C. Design Requirements:
   1. Obtain the services of a specialized and qualified design firm (Seismic Design Firm) to design the overall vibration and seismic control restraint systems for the non-structural elements of this Project in accordance with the International Building Code (IBC) Chapters 16 and 17.
   2. Duties of the Seismic Design Firm include:

a. Specialized design, product review, and product selection.
b. Site verification and written certification that the installed vibration and seismic control and related products and systems meet the specialized design requirements.

3. Exceptions.
a. Pre-engineered seismically designed and certified assemblies in accordance with IBC, accompanied with written “Certificate of Compliance” acceptable to the Authority Having Jurisdiction, AHJ.
b. Pre-manufactured equipment designed in accordance with IBC accompanied with written “Certificate of Compliance” acceptable to the Authority Having Jurisdiction.

D. Shop Drawings:
1. Provide a single shop drawing submittal which integrates the shop drawing requirements of this section along with the additional requirements of Section 20 0548 – Mechanical Vibration and Seismic Control – Mechanical Vibration and Seismic Control.
2. Provide shop drawings to include the following:
a. Pre-engineered and field fabricated support system details for each installation location. To include but not limited to:
1). Raceway support.
2). Conduit and control panel support.
3). Trapeze hangers.
4). Electrical equipment support.
b. Equipment locations and conduit and cable tray routing coordinated with mechanical equipment and systems. Indicate routing height above finished floor.
c. Indicate hanger type/attachment method and hanger spacing intervals.

E. Project Record Information:
1. Indicate installed locations of hangers and supports on project as-built shop drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Acceptance at Site:
1. Verify products are delivered in original factory packaging and are free from damage and corrosion.
2. Replace equipment delivered to job site that does not comply with above requirements at no expense to the Owner.

B. Storage and Protection:
1. Store products in covered storage area, protected from the elements, outside the general construction area until installed.
2. Handle items to avoid damage.
3. Replace damaged items with same item in new condition.

1.6 WARRANTY

A. Provide warranty in accordance with Section 26 00 00 - General Electrical Requirements.

PART 2 - PRODUCTS

2.1 PRE-ENGINEERED SUPPORT SYSTEMS

A. Manufacturers:
1. Unistrut

2. Super-Strut
3. B-Line
4. K-Line
5. Erico.

B. Material:
1. Cold worked steel.

C. Finish:
1. Heated indoor areas: Pre-galvanized zinc coating.
2. Outdoor areas: Hot dipped galvanized finish. In addition, coat hot dipped galvanized finish channel field cuts with zinc rich paint provided by the support system manufacturer.
3. Painted areas: Paintable galvanizing or phosphatized and primed.
4. Surface metal raceways: U.L. Listed epoxy coating.

D. Channel:
1. Standard Size: 1-5/8 inch x 1-5/8 inch. Gauge thickness as required for attached load.
2. Standard Hole Pattern: Slotted. Provide solid channel in exposed public areas.

E. Nuts and Hardware:
1. Channel nuts: Hardened steel (ASTM-A675 and ASTM A36).
2. Bolts, screws and nuts: Hardened steel (ASTM-A307, ASTM A563 and SAE J429).
3. Finish: Electroplated zinc.

F. Fittings: Plate steel (ASTM A635). Epoxy or electroplated zinc coating.

G. Electrical Accessories: Provide accessories from the support system manufacturer designed for the specific equipment to be supported to include but not limited to:
1. Outlet box adapters.
2. Snap-in closures.
3. Conduit connection plates.
4. Junction box adapters.
5. Strut joiners.
6. "Caddy" fasteners are permitted for support of conduit to concealed metal studs and for conduit concealed above suspended acoustical ceilings.

2.2 SLEEVES, ACOUSTICAL SEALS AND FIRE-STOPPING

A. See Part 3 - PENETRATIONS.

B. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing: UL listed prefabricated fire rated sleeves and seals.

2.3 WALL/FLOOR PENETRATION WATER SEALS

A. Mechanical seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the conduit and the wall and/or floor opening.

B. EPDM seals.

C. 316 Stainless steel bolts and nuts.

D. Hot-dipped galvanized or coated sleeve with full water stop flange with continuous weld on both sides.

E. Manufacturer: Metraflex, Thunderline, Crouse-Hinds, or pre-approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prior to installation, prepare detailed shop drawings of the planned installation of hanger and support products specified by this section. Coordinate the location, type and size of hangers and supports, housekeeping pads (thickness/perimeter overhang dimensions) and roof curbs with Architectural and Structural elements utilizing the shop drawing review process.

B. Submit shop drawings required by this section coordinated with the seismic design and associated shop drawings required by Section 20 05 48 – Mechanical Vibration and Seismic Control – Mechanical Vibration and Seismic Control as a single submittal.

C. Do not install hangers and supports without approved shop drawings.

3.2 GENERAL INSTALLATION

A. Install hangers and supports in accordance with manufacturer’s instructions, applicable Code requirements (NFPA 70) and approved shop drawings.

B. See Section 26 00 00 – Electrical General Requirements for electrical equipment wall mounting heights.

3.3 VIBRATION AND SEISMIC CONTROL PRODUCT INSTALLATION

A. Install vibration isolators, seismic control and wind restraint systems in strict compliance with the manufacturer’s written instructions and certified and approved application engineering installation drawings and details.

3.4 INSERT AND ATTACHMENT INSTALLATION

A. Inserts
1. Provide inserts or cast-in-place channels for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
3. Use expansion type anchor bolts with pre-cast concrete including concrete masonry units within loading limits of the pre-cast material and anchor bolt manufacturer's recommendations.
4. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
5. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.

B. Attach electrical equipment to structure as follows:
1. Hollow masonry: Toggle bolts.

2. Solid masonry and concrete: Preset inserts or expansion bolts.
3. Structural steel: Beam clamps which engage both sides of structural member or have retaining clips or other approved means for positive engagement.
4. Metal surfaces: Machine screws, bolts or welding.
5. Wood construction: Wood or sheet metal screws. Bugle head drywall screws or deck screws are not allowed.
6. Do not use powder actuated fasteners for anchorage in tension applications. Obtain written permission from the Owner prior to using any type of powder powered studs.
7. Attachment to plaster or gypsum board (sheet rock) not approved. Equipment shall be attached to or supported from structure.

3.5 RACEWAY INSTALLATION

A. Support raceways using approved types of wall brackets, ceiling trapeze hangers or malleable iron straps utilizing attachment methods described above. "Perforated plumber's strap" is not permitted as a means of support.

B. Support raceways independent of ceiling systems, piping and ductwork. Exceptions: Lighting fixtures and outlet boxes (i.e. ceiling speaker boxes) specifically designed for attachment to suspended ceiling systems

C. Support EMT conduit (1-1/2 inch and smaller/dry locations) using hanger rods with spring steel fasteners.

D. Support cable trays and multi-conduit runs independently from other support systems utilizing double hanger rods at each support point.

3.6 PENETRATIONS

A. Coordinate electrical penetrations with architectural, structural and mechanical construction details prior to installation. Set sleeves in position in concrete formwork. Provide reinforcement around sleeves as required.

B. Provide compatible materials, fasteners, adhesives, sealants, and other products required for proper installation.

C. Penetrations through roof, exterior walls and floors shall be weather and water tight (see floor penetration seals).

D. Firestopping: Provide UL rated firestopping assemblies for rated roof, wall and floor penetrations in accordance with Division 7.

E. Conduit Sleeves
1. Provide sleeves for conduit passing through floors, walls, ceilings, or roofs.
    a. Fabricate sleeves in non-load bearing walls from 20 gauge galvanized sheet steel conforming to ASTM A 924/A 924M.
    b. Fabricate sleeves in load bearing walls from standard weight galvanized steel pipe conforming to ASTM A 53/A 53M.
    c. Provide 1/2 inch clearance between conduit and sleeve opening.

2. Provide escutcheons for conduit passing through walls, floors and ceilings in finished areas, below counters and inside closets and casework subject to view when doors are open. Size escutcheons to cover sleeves. Secure escutcheons in position.

F. Wall Penetration Seals
1. Provide pre-engineered wall penetration water seal systems for exterior wall penetrations.
2. Select appropriate wall penetration sealing systems based on conduit material and nominal conduit size in accordance with the manufacturer's selection charts.
3. Install conduit and sealing system prior to waterproofing the wall. Grout void between water seal and outside face of foundation wall to provide continuous bearing surface for waterproofing fabric.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes specific requirements, products, and methods of execution relating to conduit, conduit fittings, surface raceways, multi-outlet assemblies, wireways, outlet boxes, pull boxes and junction boxes approved for use on this project. Type, size and installation methods shall be as shown on Drawings, required by Code and/or specified in this Section.

B. Related Sections
1. 26 05 19 – Low Voltage Electrical Power Conductors and Cables
2. 26 05 26 – Grounding and Bonding for Electrical Systems
3. 26 05 29 – Hangers and Supports for Electrical Systems

1.2 REFERENCES

A. American National Standards Institute/Underwriters Laboratory
1. ANSI C80.1 – Electrical Rigid Steel Conduit
2. ANSI C80.3 – Steel Electrical Metallic Tubing
3. ANSI C80.5 – Electrical Rigid Aluminum Conduit
4. ANSI C80.6 – Electrical Intermediate Metal Conduit
5. ANSI/UL 1 – Flexible Metal Conduit
6. ANSI/UL 6 – Electrical Rigid Metal Conduit – Steel
7. UL 6A – Standard for Electrical Rigid Metal Conduit – Aluminum and Stainless Steel
8. UL 360 – Standard for Liquid Tight Flexible Steel Conduit
9. UL 514A – Metallic Outlet Boxes
10. UL 514B – Conduit, Tubing and Cable Fittings
11. UL 651 – Standard for Schedule 40 and 80 Rigid PVC Conduit and Fittings
12. ANSI/UL 797 – Electrical Metallic Tubing – Steel
13. ANSI/UL 1242 – Electrical Metal Intermediate Conduit – Steel

B. National Electrical Manufacturers Association
1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)
2. NEMA FB 1 – Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing and Cable
3. NEMA OS 1 – Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports
4. NEMA RN 1 – Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
5. NEMA WD 6 - Wiring Device Configurations.

C. NECA (National Electrical Contractors Association) Standard of Installation.

1.3 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Product Data: Provide dimensions, knockout sizes and locations, materials, fabrication details, surface raceway finishes (custom factory pre-painting, color as selected by architect), and accessories.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.4 QUALITY ASSURANCE

A. Raceways and boxes shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and be in conformity with applicable standards and UL listings.

B. Surface raceways shall be of the latest approved design as manufactured by a nationally recognized manufacturer and shall be listed by the Underwriters' Laboratory and bear the UL label.

C. Pull and junction boxes 50 cubic inches and smaller shall conform to specifications for outlet boxes.

D. Pull and junction boxes larger than 50 cubic inches shall conform to U.L. Standard 50, Cabinets and Boxes.

E. Perform work in accordance with NECA Standard of Installation.

F. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Conduit types specifically approved for use on this project shall be of the following types only:
1. Galvanized rigid metal conduit - GRC or RMC.
2. Intermediate metal conduit - IMC.
3. Rigid copper-free aluminum conduit.
4. Electrical metallic tubing - EMT.
5. Flexible metal (steel) conduit - FMC or flex: In short lengths as specifically permitted.
6. Liquid-tight flexible steel conduit - LFMC: In short lengths as specifically permitted.
7. Extreme temperature liquid-tight flexible steel conduit - AT: Shall have temperature rating of -67 ° F to +220 ° F, Liquatite “ATLA”, or as approved.
8. Types specifically identified on the Drawings or in the Specifications
9. Other products not specifically approved such as ENT, MC Cable, etc., are not allowed.
10. Manufactured wiring systems are not approved.

2.2 CONDUIT FITTINGS

A. Fittings utilized with rigid steel, IMC, and aluminum shall be galvanized steel or iron or copper-free aluminum and shall be threaded. Conduit bushings shall be provided and shall be of the insulated types. Where grounding bushings are required, provide insulated grounding bushings with integral pressure type ground lugs, Thomas & Betts “Blackjack”, or as approved.

B. Couplings and connectors for EMT shall be made of steel or malleable iron. Die-cast products shall not be used. Connectors shall have insulated throats. Connectors and couplings shall be setscrew or compression type.

C. Fittings for flexible metal conduit shall be steel or malleable iron only. Throats shall be insulated.

D. Fittings for liquid-tight flexible conduit shall be steel or malleable iron, of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. Throats shall be insulated.

E. Unless otherwise noted on the Drawings, surface wireway in exposed or concealed locations shall be sheet metal channel suitable for use as a wiring trough, with hinged or screw cover, sized in accordance with the NFPA 70. Wireway shall be Square D Class 5100, 5120, 5140, as appropriate for the environment, or as approved.

F. Finish shall be ANSI-49 gray epoxy paint finish applied by cathodic electrodeposition over a corrosion resistant phosphate preparation.

2.3 CAST BOXES

A. Cast boxes with threaded hubs, external mounting brackets or holes, and gasketed covers shall be used in the following locations:
1. Exterior locations.
2. Wet or damp locations.
3. Shops, mechanical rooms, pump stations, bag makeup areas, etc., where exposed to mechanical damage.
4. Exposed interior locations below 48 inch above floor where subject to damage.
5. Where shown on Drawings.

2.4 STEEL BOXES

A. Galvanized pressed steel boxes may be used wherever they are permitted by Code, except in areas indicated in the preceding paragraph.

B. Flush mounted, pressed steel boxes shall be equipped with external mounting brackets for attachment to framing members with screws or nails.

C. Grounding Screw: All stamped steel boxes shall have a drilled and tapped hole in the back of the box for a grounding screw.

D. Accessories: Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

2.5 INDOOR PULL AND JUNCTION BOXES

A. Indoor pull and junction boxes shall conform to Article 314 of the NEC and the following requirements:
1. Sheet metal boxes are approved for use in all dry, interior, nonhazardous locations.
2. Boxes installed in wet locations shall be NEMA 3R, unless otherwise noted.
3. Furnish such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.

4. Special boxes, as noted on the Drawings, shall be installed in areas of specific service and/or hazards.

B. Junction box extension rings will not be accepted on new boxes. Appropriate size boxes shall be used for each application.

2.6 OUTDOOR ABOVE-GROUND PULL AND JUNCTION BOXES

A. Boxes exposed to rain or installed in wet locations shall be NEMA 3R unless otherwise noted.

B. Outdoor pull and junction boxes and conduit bodies for use with galvanized conduits shall be made of galvanized ferrous metal or cast aluminum, with integral threaded hubs or Myers-type weathertight hubs of matching composition and finish.

C. Furnish such boxes, whether shown or not, in order to conform to requirements for maximum pulling length and maximum number of bends allowed.

PART 3 - EXECUTION

3.1 CONDUIT USES PERMITTED

A. Conduits shall be of the sizes shown on the Drawings or as required by the NEC, whichever is larger. Base sizes on using type XHHW for wire sizes #6 and smaller and type THHN/THWN wire for wire sizes #4 and larger. Unless otherwise noted, conduits installed in the following locations shall be of the types specifically identified only:
1. Underground or encased in concrete - rigid steel or IMC.
2. Outdoors aboveground or damp locations – RMC or extreme temperature liquid-tight flexible steel conduit (where required).
3. Dry indoor locations, concealed or exposed - RMC, rigid aluminum, EMT (where not susceptible to physical damage), flexible conduit where necessary, or IMC.
4. Indoor locations, exposed, where susceptible to physical damage - RMC or IMC.
5. Motor and equipment flexible connections - LFMC or FMC (when installed in plenum spaces).

3.2 RACEWAY INSTALLATION METHODS - GENERAL

A. Concealed raceways: In occupied areas, conduit and raceways shall be concealed unless specifically noted otherwise. In service spaces (mechanical equipment rooms, electrical rooms, storage closets, etc.), approved raceways may be surface-mounted for connection to equipment in exposed surface mounted locations and in exterior locations as noted on the Drawings.

B. Concealed raceways shall be routed as directly as possible with a minimum of bends. Concealed raceways above lay-in ceilings shall be installed a minimum of 12 inches above the ceiling grid.

C. Exposed Raceways: Where allowed by this Specification or specifically noted on the Drawings, raceways may be mounted on the surface of walls, ceilings and other surfaces. Exposed raceways shall comply with the following:
1. Exposed raceways shall be run parallel or perpendicular to building lines and bent symmetrically or made up with standard elbows or fittings.
2. Surface-mounted conduit, junction boxes, pull boxes, outlet boxes, etc. installed in finished areas shall be painted to match the surrounding surfaces.

3. Connectors and fittings for raceways and conduits installed on the surface in exterior locations shall be suitable for and Listed for use in a wet location.
4. Conduits installed in exterior locations shall be painted to match the exterior finish of the building surface to which they are attached. This shall include conduits attached via racks and stand-off brackets, or attached directly to the surface.

D. There shall not be more than the equivalent of four quarter bends (360 degrees total) between pull points. Pull boxes added to conduit runs as a result of this requirement shall be in accordance with this Section.

E. Conduit and tubing shall be cut square and reamed smooth at the ends and all joints made tight. Conduit threads shall be lubricated with an approved thread lubricant.

F. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a locknut/bushing on the inside, or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. Connections shall be made wrench tight. Locknuts shall be the bonding type with sharp edges and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into threaded connections. Conduit runs shall be protected from the entrance of foreign material prior to the installation of conductors.

G. Conduit or tubing deformed or crushed in any way shall not be installed. Conduit shall be bent only with approved bender (hydraulic or hickey). Bending machines shall be used to make field bends in conduit of 1-1/4 inch size and larger. Torches shall not be used in making conduit bends.

H. Raceways shall be spaced at least 6 inches from parallel runs of heating system pipes, flues, other high temperature piping systems, and other heat sources. This basic spacing shall be increased if necessary to ensure that raceways experience no significant temperature rise from external sources. Raceways shall not be embedded in any spray applied insulation, fireproofing, or other materials that would restrict heat dissipation.

I. Pull wires shall be provided in spare and unused conduits. (Nylon "jet-line" or as approved.)

J. Clean conduits 3 inches and larger utilizing conduit mandrels.

K. Conduits stubbed up out of floor and terminating inside of an enclosure shall have insulating grounding bushings installed.

L. Raceways penetrating vapor barriers or traversing from warm to cold areas shall be sealed on the inside with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall be taped airtight to the vapor barrier on the outside. Refer to Section 26 0000 for additional requirements and limitations regarding penetration of vapor barriers. Larger conduits (2-1/2 inch and larger) shall be sealed with Polywater FST two part foam sealant or approved equal on warm indoor side of penetration.

M. Raceways (particularly PVC) shall be provided with expansion joints where necessary to allow for thermal expansion and contraction. Set initial opening of expansion joints per manufacturer's instructions, to suit the ambient temperature at the time of installation.

N. Provide flexible conduit connection at seismic joints to allow for displacement of conduit in all three axes. Provide appropriate lengths of flexible conduits at seismic joints and appropriate amounts of slack in conduit to allow movement of conduit/cabling in accordance with the design of the seismic joint. Slack shall be maintained in conduit after cabling is installed. Minimum lengths of flexible conduit and minimum amount of slack for various size conduits shall be as follows:
1. 2 inch and greater: 4 foot length, 4-6 inches slack.

2. 1-1/2 inch and smaller: 2 foot length, 3 inches slack.

O. Flexible metal conduit with supplemental ground jumper shall be used for connection to vibrating equipment, or where installation conditions warrant its use with express permission. Flexible conduit shall not penetrate walls. Liquid-tight flexible conduit with supplemental ground jumper shall be used for motor and transformer connections (except utilize flexible metal conduit in plenum spaces). The ground jumper in flexible conduits shall be routed within the conduit.

P. Length of flexible conduit shall not exceed 36 inches, except for lighting fixture whips and where specifically noted. Fixture whips shall not exceed 72 inches. Flexible conduit shall not penetrate walls or vapor barrier retarder/barrier.

Q. Electrical raceways may penetrate roofing membranes only where absolutely necessary. Submit intended locations to Contracting Agency for approval prior to installation. Such penetrations shall be flashed and sealed as required for mechanical piping penetrations of roof. Where practical, conduits stubbed up to roof mounted equipment shall be routed within the equipment curb supporting the equipment.

3.3 CONDUIT SIZES – GENERAL

A. Minimum sizes for rigid steel, IMC, rigid aluminum and PVC-40 conduits shall be ¾ inch.

B. Minimum size for EMT shall be ½ inch.

C. Minimum size for flexible conduits shall be ½ inch, except fixture whips may be 3/8 inch as allowed by the NEC.

3.4 STRUCTURAL COORDINATION

A. Layout conduits in slabs to avoid compromising structural integrity. Obtain approval from Structural Engineer for maximum conduit sizes, quantities, arrangement, and placement in structural slabs.

B. Structural members shall not be cut, drilled, or notched for raceways or other electrical features unless specifically accepted by the Contracting Agency.

3.5 EXISTING CONDUIT

A. Accurately measure the physical length of all existing underground conduits by the use of True Tape or an approved equivalent prior to the purchase or installation of any cable, wire, or innerduct. Costs incurred as a result of not obtaining accurate lengths of underground conduits prior to the purchase or installation of cable, wire, or innerduct; such as the need to replace cable, or wire shall be the responsibility of the Contractor.

3.6 OUTLET BOX INSTALLATION

A. Outlet boxes shall be securely fastened in position and supported independently of the conduit system.

B. Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified in other sections of the specification.

C. Provide the best suitable box for each outlet requirement. Extension rings shall not be used on new construction except where needed to bring an outlet box out to 1/8 inch of the finished wall or ceiling line.

D. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.

E. Boxes shall be rigidly secured in position. Recessed boxes shall be so set that the front edge of the box shall be flush with the finished wall or ceiling line, or not more than 1/8 inch back of same. This requirement is more stringent than NEC requirements.

F. Boxes shall be accessible.

G. Provide boxes for each application that will not violate the fire rating of the wall, floor or ceiling assembly in which the box is installed.

H. Recessed boxes shall not be placed back-to-back in adjacent rooms. They shall be offset at least 12 inches, or greater as required by codes and standards applicable to the specific construction.

I. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating fire rated walls, walls with vapor retarder/barriers, wall types that extend to structure or wall types that contain batts shall be sealed airtight with approved Firestop Putty Pads to reduce sound transmission, reduce air transmission and increase fire resistance. Mold putty pads around electrical junction boxes and conduits to form an airtight seal in accordance with manufacturer's installation instructions.

3.7 JUNCTION BOX AND PULL BOX INSTALLATION

A. Junction and pull boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

B. Select boxes properly sized per NEC for power and lighting applications.

END OF SECTION

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SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide identification of on equipment, raceways, boxes and conductors.

B. Section includes:
1. Nameplates
2. Labels
3. Wire markers
4. Conduit markers
5. Miscellaneous Electrical Identification

C. Related Sections: Division 26 Sections.

1.2 SUBMITTALS

A. Division 1 and Section 26 00 00 – Electrical General Requirements.

B. Product Data:
1. Submit manufacturer’s catalog literaturefor each product required.
2. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Electrical Distribution Equipment Labels and Nameplates
1. Name equipment in accordance with Contract Documents.
2. Nameplates shall be laminated plastic, 0.125 inch thick, with matte finish and square corners. Minimum lettering size as noted elsewhere in this section.
a. Label and Nameplate Colors:
1). Normal Equipment: White letters on a black background.
b. Securely attach labels with threaded fasteners or pop-rivets. Adhesive attachment not acceptable.
c. Temporary markings not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.
3. Include item designation and branch circuit designation (panel and circuit number) on disconnects, starters, equipment and device nameplates, e.g., “FAN No. 4, Circuit LA-30”).

2.2 WIRE AND CABLE MARKERS

A. Wire and Cable Markers: Wrap on labels, cloth tape type wire markers or tubing type for all phase, neutral and ground conductors.

2.3 LABELS

A. Adhesive film label with clear protective overlay: Machine printed, in black, by thermal transfer process or equivalent. Minimum lettering size as noted elsewhere in this section. Overlay shall provide a weatherproof and UV resistant seal for label.

PART 3 - EXECUTION

3.1 NAMEPLATE INSTALLATION

A. Install nameplate parallel to equipment lines.

B. Mechanically fasten nameplates using threaded fasteners or pop rivets.

C. Mechanical fasteners shall have no sharp edges or points which can damage conductors or injure personnel.

D. Temporary markings are not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.

E. No labeling abbreviations are permitted without prior approval.

3.2 NAMEPLATE LOCATIONS

A. Provide 1/2-inch minimum height letters on following equipment:
   1. Secondary feeder breakers in distribution equipment. Designation as required by load served.
   2. Special equipment housed in cabinets, as designated on plans, on outside of door.
   3. Equipment housed in equipment cabinets, as designated on plans, on inside of cabinet door.

B. Provide 1/4-inch minimum height letters on:
   1. Switches and receptacles where item controlled is not visible from the switch, or as noted on Drawings.
   2. External Power Sources: Provide 1/4 inch white letters on red background on all starters or controllers that receive power from an external source that is not de-energized by operating the associated disconnecting means.
   3. Designated electrical equipment.
      a.

3.3 DISTRIBUTION/BRANCH CIRCUIT PANELBOARD CIRCUIT LABELING

A. Distribution Panels and Branch Circuit Panelboard Directories: Provide neatly typed schedule (odd numbered circuits on left side or top, even on right side or bottom) under plastic jacket or protective cover to protect the schedule from damage or dirt. Securely mount on inside face of panelboard door. Define briefly, but accurately, nature of connected load (i.e., Lighting Room

201, Receptacles Janitor Room 155, Etc.) as approved. Sequentially numbered schedules shall not be used.

B. Use final approved room numbers from finished construction (not necessarily as indicated on the drawings).

C. Provide numbering for terminals on terminal strips in the terminal enclosure that identifies the origin, function and destination of each conductor.

D. Install wire marker for each conductor inside panelboards (phase, neutral and ground conductors). Locate label within 6 inches of termination. Labels shall be visible with panel dead front installed.

3.4 WIRE MARKER INSTALLATION

A. Install wire marker for each conductor (phase, neutral and ground conductors) at panelboards, pull boxes, outlet and junction boxes, and each load connection. Locate label within 6 inches of termination in panelboards. Labels shall be visible with panel dead front installed.

B. Wire markers are not required on conductors in a pull or junction box that contains only an individual branch circuit, however, source panel and circuit number shall be noted on pull or junction box cover as noted elsewhere in this section.

C. Power Circuits: Panelboard name and branch circuit or feeder number.

D. Control Circuits: Control wire number as indicated on schematic and/or shop drawings.

E. Color Code:
1. Color code phases, neutral, and ground per NEC requirements and Section 26 0519 – Low Voltage Electrical Power Conductors and Cables.
2. Color code all low voltage system wiring in accordance with applicable Sections.

3.5 MISCELLANEOUS ELECTRICAL IDENTIFICATION

A. System junction boxes: Color code raceway system junction boxes (except those in finished areas) by spray paint as follows:
1. 480Y/277 Volt Power – Orange.
2. 208Y/120 Volt Power – White.
3. Building Automation System (BAS) – Green

B. Junction Boxes: Mark the circuit number(s) and panel source of wiring on all junction boxes with sheet steel covers. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover.

C. Conduits
1. Mark all conduits entering or leaving panelboards with indelible black magic marker with the circuit numbers of the circuits contained inside.
2. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits.

D. Junction Boxes
1. Markings shall be made with indelible black marker.
2. On exposed junction boxes in finished areas markings shall be on inside of cover.

3. Mark the circuit numbers of wiring on all junction boxes with sheet steel covers.
4. Mark all Special System junction boxes with sheet steel covers with appropriate system designation, e.g., "Intercom", "Clock", "Telecom", “Video Surveillance”, etc. Fire Alarm System: Paint all fire alarm junction boxes inside and out with red paint where installed in concealed accessible location. Where installed in exposed locations paint boxes to match the adjacent surface.

3.6 CODE REQUIRED MARKINGS AND WARNINGS:

A. Provide all placards, markings and identification systems required by Code and/or the Contract Documents, such as (but not limited to):
1. Conductor insulation color identification.
2. Special conductor identification and legends.
3. Warning messages shall include an appropriate plain language imperative command, such as "DANGER HIGH VOLTAGE - KEEP OUT".

END OF SECTION

SECTION 26 28 00

LOW VOLTAGE CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Thermal Magnetic Molded Case Circuit Breakers.
2. Fusible switches and fuses.

1.2 REFERENCES

A. The circuit breaker(s) referenced herein shall be designed and manufactured according to the latest revision of the following standards.
1. ANSI/NFPA 70 - National Electrical Code (NEC).
2. NEMA AB 1 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches.
3. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures.
4. UL 943 - Standard for Ground Fault Circuit Interrupters.
5. UL 1053 – Ground Fault Sensing and Relaying Equipment.

1.3 SYSTEM DESCRIPTION

A. Provide overcurrent protective devices as specified herein and as shown on schedules and/or drawings.

1.4 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Submit product data for each type of overcurrent protective device, ground fault protector, accessory, and component indicated. Include dimensions and manufacturer’s technical data on features, performance, electrical characteristics, ratings, and finishes.

C. Provide outline drawings with dimensions, and ratings for voltage, amperage and maximum interruption. Include instructions for circuit breaker mounting, trip unit functions and adjustments, trouble shooting, accessories and wiring diagrams.

D. Coordination data to check protective devices: Manufacturer shall provide electronic and hard copy time/current characteristic trip curves (and Ip & I^2t let through curves for current limiting circuit breakers) for each type of circuit breaker.

E. Provide information required to verify compliance with the short circuit withstand and interrupting ratings, as shown on the Drawings or further stated in these Specifications.

1.5 QUALITY ASSURANCE

A. Devices shall be the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with applicable standards and UL listings.

B. Nationally Recognized Testing Laboratory (NRTL) Labeling: Electrical equipment and conductors installed in the State of Alaska must be “Approved,” “Certified,” “Identified,” or “Listed” and “Labeled” to establish that the electrical equipment is safe, free of electrical shock and fire hazard, and suitable for the purpose for which it is intended to be used. The manufacturer shall have the specific authorization of one of the Occupational Safety and Health Administration (OSHA) approved Nationally Recognized Testing Laboratories (NRTLs) in accordance with the applicable national standards to label the equipment as suitable.

C. The overcurrent protection device manufacturing facility shall be Registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9000 Series Standards for quality.

PART 2 - PRODUCTS

2.1 PRODUCT

A. The Basis of Design is equipment from Square D by Schneider Electric to set a standard for quality. Equipment from Eaton, Seimens Energy & Automation, General Electric, or alternative systems will be considered providing that sufficient documentation is provided to the Contracting Agency that the equipment meets the requirements of the Specifications and matches the Basis of Design on all points that are pertinent to the Project.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. General Characteristics:
   1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle, and the accessory mounting area.
   2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which shall provide quick make, quick break contact action. The circuit breaker shall have common tripping of all poles.
   3. The circuit breaker handle shall reside in a tripped position between on and off to provide local trip indication. Circuit breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings.
   4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
   5. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes (except Type QO/EDB/EGB/EJB).
   6. MCCBs shall be able to receive a device for locking in the isolated position. MCCBs that serve as the main service disconnect shall be provided with a device for locking in the isolated position.
   7. Electronic components shall withstand temperatures up to 221°F (105°C).
   8. Circuit breakers shall be UL listed to accept field installable/removable mechanical type lugs (except Type (except Type QO/EDB/EGB/EJB/QB/QD/QG/QJ).

9. Lugs shall be UL listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 75°C rated wire or 90 C rated wire, sized according to the 167°F (75°C) temperature rating in the NEC.

B. Trip Unit:
1. General:
   a. MCCBs with ratings up to 400 amperes shall be equipped with thermal magnetic trip units.
   b. Circuit breakers with permanent trip units shall be UL listed for reverse connection without restrictive line and load markings and shall be suitable for mounting in any position.
   c. The trip units shall not augment overall circuit breaker volume.
2. Thermal Magnetic (400 Ampere Frame and Below):
   a. Basis of Design: PowerPact Q, H and J Frame, FA, LA, and LH as manufactured by Square D by Schneider Electric.
      1). General:
   a) Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true RMS sensing and thermally responsive to protect circuit conductor(s) in a 104 F (40 C) ambient temperature. Circuit breaker frame sizes above 150 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker
3. Type QO (for use in NQ Series Panelboards) and Type EDB/EGB/EJB (for use in NF Series Panelboards) as manufactured by Square D by Schneider Electric.
   a. Breakers shall have two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing.
      1). Where indicated on drawings, Circuit breakers shall be equipped with a ground fault module (GFM) with 20 ampere to 200 ampere sensitivity level or earth leakage module (ELM) with sensitivity ranges between 30 mA and 3 amperes, or approved equal.
4. Accessories:
   a. General:
      1). Circuit breakers shall be equipped with UL listed electrical accessories as noted on the Drawings or schedules or they may be field installable.
      2). The addition of auxiliaries shall not increase the volume of the circuit breaker.
   b. Equipment Ground Fault Protection Modules (Thermal Magnetic Circuit Breakers):
      1). Basis of Design: PowerPact H and J Frame as manufactured by Square D by Schneider Electric.
      2). General:
   a) Circuit breakers shall be equipped with a ground fault module (GFM) with 20 ampere to 200 ampere sensitivity level or earth leakage module (ELM) with sensitivity ranges between 30 mA and 3 amperes, or approved equal.
   b) Ground fault sensing system shall be modified zero sequence (GFM) or zero sequence (ELM) sensing type.
   c) The ground fault system shall require no external power to trip the circuit breaker.
   d) Companion circuit breaker shall be equipped with a ground fault shunt trip.
   e) The ground fault sensing system shall be suitable for use on solidly grounded systems. The ground fault sensing system shall be suitable for use on three phase, three wire circuits where the system neutral is grounded but not carried through the system or on three phase, four wire systems. ELM shall be suitable for use on three phase, three wire circuits only.
   f) Ground fault pickup current setting and time delay shall be field adjustable. A switch shall be provided for setting ground fault pickup point. A means to seal the pickup and delay adjustments shall be provided.
   g) The ground fault sensing system shall include, but shall not be limited to, a ground fault memory circuit to sum the time increments of intermittent arcing ground faults above the pickup point.

h) A means of testing the ground fault system to meet the onsite testing requirements of NEC Section 230-95(c) shall be provided.
i) Local visual ground fault trip indication shall be provided.
j) The companion circuit breaker shall be capable of being group mounted.
k) The ground fault sensing system shall not affect interrupting rating of the companion circuit breaker.

c. Handle Accessories:
1). Provide circuit breaker handle accessories required for locking handle in the on and off position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings. Install circuit breakers in accordance with manufacturer's instructions, the National Electrical Code and applicable local codes.

B. Size devices as shown and specified, or as required by the load being served.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes general requirements, products, and methods of execution relating to fusible and non-fusible disconnecting devices approved for use on this project.

B. Related Sections:
1. 26 05 19 - Low Voltage Electrical Power Conductors and Cables
2. 26 05 26 - Grounding and Bonding for Electrical Systems
3. 26 05 29 - Hangars and Supports for Electrical Systems
4. 26 05 53 - Identification for Electrical Systems

1.2 SUBMITTALS

A. Provide submittals for products in accordance with Section 26 00 00 - Electrical General Requirements and Division 1.

1.3 QUALITY ASSURANCE

A. Devices shall be of the latest approved design as manufactured by a nationally recognized manufacturer and in conformity with U.L. listings and the governing NEMA standards.

B. Disconnects shall be of the same manufacturer as switchboards and panelboards.

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

A. Safety switches, fusible and non-fusible, shall conform to NEMA Standard KS1 for type HD (Heavy Duty) unless otherwise noted.
1. Switch Interior: Switches shall have switch blades that are fully visible in the OFF position when the door is open. Switches shall be of dead front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and/or aluminum cables and be front removable.
2. Switch Mechanism: Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the box, not the cover. Switches shall have a defeatable dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. The switch shall be capable of being locked in the OFF position with three (3) padlocks.
3. Enclosures: Switch enclosure shall be suitable for the environment in which the switch is mounted. NEMA 1 enclosure shall be code gauge, UL-98, sheet steel, treated with a rust inhibiting phosphate and finished in gray, baked enamel. NEMA 3R enclosure--same requirements as NEMA 1 except galvanized prior to painting.
4. Rating: Ampere, volt and horsepower ratings, as well as number of poles and presence of neutral bar shall be shown on the nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate details pertaining to size of motor and/or equipment, location and requirements to enclosure, ratings, etc., so as to provide the most suitable unit for the intended purpose.

B. Provide nameplates for disconnects. Coordinate names with mechanical equipment lists.

C. Where the rating of a fused disconnect exceeds the ampacity of the conductors being protected, a permanent label noting maximum fuse size shall be installed in a conspicuous location within the switch.

D. Where recommended or required by the equipment manufacturer, or required by underwriters' laboratories, disconnects shall be the fusible type, fused in accordance with the equipment nameplate information.

E. Provide code required disconnects.

END OF SECTION

ALASKA BUREAU OF INVESTIGATION BUILDING

CHILLER REPLACEMENT

ANCHORAGE, AK

CONSTRUCTION DOCUMENTS

Project No: 22072.01

Issue Date: 03/17/23

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701 E TUDOR RD., ANCHORAGE, AK, 99503

ELECTRICAL ENGINEERING — AMC ENGINEERS
701 E TUDOR RD., ANCHORAGE, AK, 99503

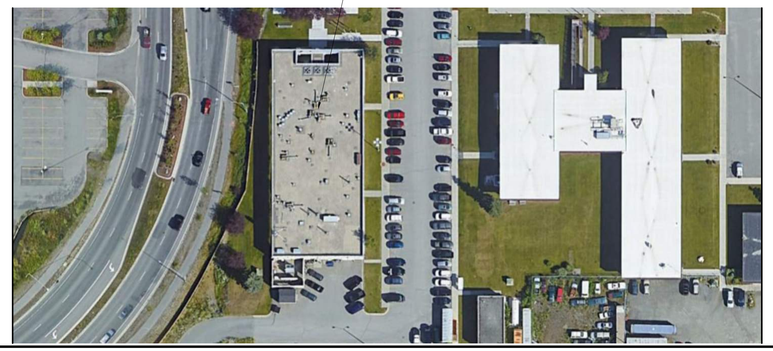
DRAWING FILE: w:\2022\220272.01 abi bldg chiller replacement\dwg\220272_g101.dwg

PLOT DATE: 3/17/2023 11:48 AM

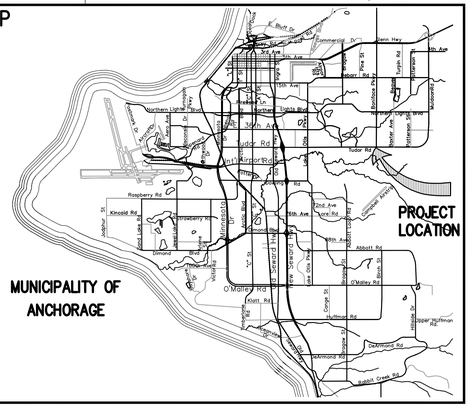
VICINITY MAP

BUILDING ADDRESS: 5500 EAST TUDOR ROAD, ANCHORAGE, AK 99507

PROJECT LOCATION



LOCATION MAP



PROJECT DESCRIPTION

THIS PROJECT CONSISTS OF THE REPLACEMENT OF THE EXISTING CHILLER UNIT FOR THE BUILDING AS WELL AS CONVERSION TO DDC CONTROLS FOR THE EXISTING BUILDING HVAC SYSTEM. MINOR EXTERIOR WORK IS INCLUDED IN THE FORM OF REPAIR TO AN EXISTING ENCLOSURE WALL.
THE SCOPE OF THE PROJECT INCLUDES ARCHITECTURAL, MECHANICAL AND ELECTRICAL WORK. NEITHER THE INTERIOR SPACE LAYOUT NOR THE BUILDING USE AND OCCUPANCY ARE BEING ALTERED BY THIS RENOVATION.

ARCHITECTURAL ABBREVIATIONS

&	AND	CONT	CONTINUOUS	F.O.B.	FACE OF BLOCK	JAN	JANITOR	PARA	PARALLEL
∠	ANGLE	COOR	COORDINATE	F.O.F.	FACE OF FINISH	JT	JOINT	PART	PARTITION
@	AT	CORR	CORRIDOR	F.O.S.	FACE OF STUD			PERF	PERFORATED
℄	CENTERLINE	C.R.	COLD ROLLED	F.O.	FACE OF (Conc. etc.)	KIT	KITCHEN	PERM	PERMANENT
ø	DIAMETER	C.R.C.	COLD ROLLED CHANNEL	F.R.P.	FIBER REINFORCED PANEL			PERP	PERPENDICULAR
#	NUMBER	C.T.	CERAMIC TILE	FRPF	FIREPROOFING	LAB	LABORATORY	P.J.C.	PRECAST INSULATED CONCRETE
		CTR	CENTER	FRT	FIRE-RETARDENT TREATED	LAM	LAMINATE OR LAMINATED	PL.	PLATE
ABV	ABOVE			FT	FOOT OR FEET	LAV	LAVATORY	P.LAM	PLASTIC LAMINATE
AC	ASPHALTIC CONCRETE	DBL	DOUBLE	FTG	FOOTING	LB	POUND	PLAST	PLASTER
ACP	ACOUSTICAL CEILING PANEL	DEPT	DEPARTMENT	FURR	FURRING	LH	LEFT HAND	PLYWD	PLYWOOD
ACT	ACOUSTICAL CEILING TILE	D.F.	DRINKING FOUNTAIN	FUT	FUTURE	LL	LIVE LOAD	PR	PAIR
ACOUS	ACOUSTICAL	DET	DETAIL			L.O.W.	LIMITS OF WORK	PREFAB	PREFABRICATED
ADD	ADDITION	DIA	DIAMETER	GA	GAUGE	L.P.	LOW POINT	PROJ	PROJECT
AFF	ABOVE FINISH FLOOR	DIAG	DIAGONAL	GAL	GALLON			PT	POINT
AHU	AIR HANDLING UNIT	DIM.	DIMENSION	GALV	GALVANIZED	MAT'L	MATERIAL	PT	PAINT
ALT	ALTERNATE	DISP	DISPENSER	G.B.	GRAB BAR	MAX	MAXIMUM	PTD	PAPER TOWEL DISPENSER
ALUM	ALUMINUM	DL	DEAD LOAD	G.I.	GALVANIZED IRON	MECH	MECHANICAL	PRMA	PROTECTED MEMBRANE ROOF ASSEMBLY
APPROX	APPROXIMATE	DN.	DOWN	GL	GLASS	MET OR MTL	METAL		
ARCH	ARCHITECTURAL	DS	DOWNSPOUT	GT	GLASS TYPE	MFR	MANUFACTURER	R	RISER
ASPH	ASPHALT	DWG	DRAWINGS	GWB	GYPSUM WALL BOARD	MH	MANHOLE	R	RADIUS
AVG	AVERAGE			GYM	GYMNASIUM	MIN	MINIMUM OR MINUTE	R.D.	ROOF DRAIN
		E	EAST	GYP.	GYPSUM	MISC	MISCELLANEOUS	REF	REFERENCE
BD	BOARD	(E)	EXISTING			M.O.	MASONRY OPENING	REFR	REFRIGERATOR
BLDG	BUILDING	EA	EACH	H.B.	HOSE BIB	MULL	MULLION	REINF	REINFORCING
BLKG	BLOCKING	E.I.F.S.	EXTERIOR INSULATION & FINISHING SYSTEM	H.C.	HOLLOW CORE			REQ	REQUIRE(D)
BLW	BELOW			HCC	HONEYCOMB CORE	N	NORTH	RH	RIGHT HAND
BM	BENCH MARK	ELEV	ELEVATION	HDWD	HARDWOOD	NIC	NOT IN CONTRACT	R.L.	RAIN LEADER
B.O.	BOTTOM OF	ELEV	ELEVATOR	HDWR	HARDWARE	NO	NUMBER	RM	ROOM
B.S.	BOTH SIDES	ELEC	ELECTRICAL	H.M.	HOLLOW METAL	NOM	NOMINAL	R.O.	ROUGH OPENING
BTU	BRITISH THERMAL UNIT	EQ	EQUAL	H.M.F.	HOLLOW METAL FRAME	NTS	NOT TO SCALE	R.O.W.	RIGHT OF WAY
BUR	BUILT-UP ROOF	EQUIP	EQUIPMENT	HORIZ	HORIZONTAL				
		E.G.	EACH SIDE	H.P.	HIGH POINT	O	OVER	S	SOUTH
CAB	CABINET	EXIST	EXISTING	HR	HOUR	O.C.	ON CENTER	SAN	SANITARY
C.B.	CATCH BASIN	EXT	EXPOSED	HT	HEIGHT	O.D.	OUTSIDE DIAMETER	S.C.	SOLID CORE
CEM	CEMENT	EXP.AGG.	EXPANSION EXPOSED AGGREGRATE	HW	HOT WATER	OFD	OVERFLOW DRAIN	SCHED	SCHEDULE
C.F.C.I.	CONTRACTOR FURNISHED, CONTRACTOR INSTALLED	EXP.JT.	EXPANSION JOINT EXTERIOR	HW	HARDWARE	OFF	OFFICE	SECT	SECTION
				HWY	HIGHWAY	OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED	SHEATH	SHEATHING
C.I.	CAST IRON	F.B.	FLAT BAR			OFOI	OWNER FURNISHED, OWNER INSTALLED	SHT	SHEET
CIRC	CIRCULAR	F.D.	FLOOR DRAIN	I.D.	INSIDE DIAMETER	OH	OVERHEAD	SIM	SIMILAR
CLG	CEILING	FDN	FOUNDATION	(") OR IN	INCHES	OPNG	OPENING	SND	SANITARY NAPKIN DISPENSER
CLR.	CLEAR	F.E.	FIRE EXTINGUISHER	IHM	INSULATED HOLLOW METAL	OPP	OPPOSITE	SPEC(S)	SPECIFICATION(S)
C.M.P.	CORRUGATED METAL PIPE	F.E.C.	FIRE EXTINGUISHER CABINET	INSUL	INSULATION			SQ	SQUARE
CMU	CONCRETE MASONRY UNIT	FIN	FINISH	INT	INTERIOR			S.S.	STAINLESS STEEL
COL	COLUMN	FF	FACTORY FINISH(ED)					STD	STANDARD
COMP	COMPOSITION	FF	FINISH FLOOR						
CONC	CONCRETE	FLUOR	FLUORESCENT						
CONSTR	CONSTRUCTION								

DRAWINGS INDEX

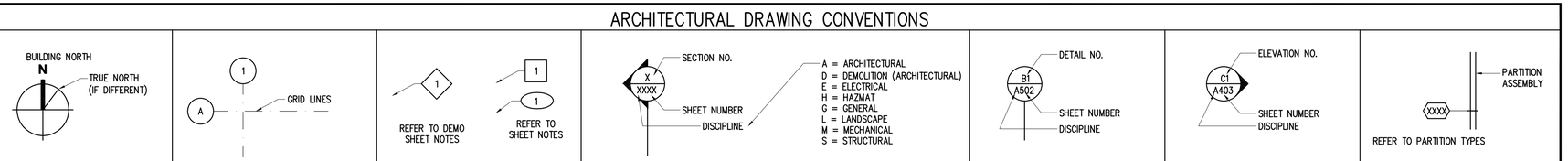
ALTERNATES

ADDITIVE ALTERNATE #1: DEMO AND REPLACE EXISTING DUPLEX STYLE HEATING PUMP AND ACCESSORIES.

GENERAL PROJECT NOTES

1. ALL WORK SHALL BE INSTALLED IN ACCORDANCE WITH THE PROVISIONS OF THE 2012 INTERNATIONAL BUILDING CODE, AND ALL OTHER STATE AND LOCAL CODES, INCLUDING ALL AMENDMENTS.
2. ALL WORK SHALL CONFORM TO THE AMERICAN DISABILITIES ACT (A.D.A.) ACCESSIBILITY GUIDELINES FOR BUILDING AND FACILITIES (A.D.D.A.G.) AND ICC/ANSI 117.1 UNLESS NOTED OTHERWISE.
3. ALL WALL AND CEILING FINISHES SHALL MEET THE REQUIREMENTS OF CHAPTER 8 I.B.C. TABLE 803.13 2018 EDITION.
4. ALL MATERIALS INDICATED ARE NEW UNLESS SPECIFICALLY NOTED AS EXISTING.
5. ALL DIMENSIONS ARE TO FACE OF STUD, FACE OF CONCRETE, FACE OF C.M.U., TO CENTERLINE OF STRUCTURAL COLUMN, OR TO STRUCTURAL GRID-LINE UNLESS NOTED OTHERWISE.
6. DIMENSIONS NOTED AS 'CLEAR' (OR CLR.) SHALL BE TO FINISHED FACE AND TAKE PRECEDENCE OVER OTHER DIMENSIONS.
7. DO NOT SCALE THE DRAWINGS TO OBTAIN CONSTRUCTION DIMENSIONS. DRAWINGS ARE INTENDED TO PROVIDE INFORMATION FOR CONTRACTORS DETERMINATION OF SCOPE OF WORK.
8. CONTRACTOR SHALL FIELD VERIFY DIMENSIONS AND LOCATIONS OF EXISTING CONSTRUCTION PRIOR TO COMMENCEMENT OF THE WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS ARE INTENDED AS GUIDELINES ONLY AND MUST BE VERIFIED. THE EXISTING CONDITIONS SHOWN ON THE DRAWINGS ARE BASED ON EITHER SITE OBSERVATION, ORIGINAL DRAWINGS OR WERE ASSUMED BASED ON EXPECTED CONDITIONS. IF THE EXISTING CONDITIONS DO NOT CLOSELY MATCH THE CONDITIONS SHOWN ON THE DRAWINGS, OR IF THE EXISTING MATERIALS ARE OF QUESTIONABLE OR SUBSTANDARD QUALITY, NOTIFY THE ARCHITECT PRIOR TO COMMENCING ANY WORK.

ARCHITECTURAL DRAWING CONVENTIONS



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03/17/23

ALASKA STATE TROOPERS

ABI BLDG. CHILLER REPLACEMENT

5500 EAST TUDOR ROAD

Revisions		
No.	Description	Date

Drawn by: SLH	Date: 03/17/23
Checked: SLH	Job No.: 22072.01

Sheet Contents
GENERAL PROJECT INFORMATION, SHEET INDEX, LEGENDS AND ABBREVIATIONS

Sheet No.
G101

CODE STUDY

BUILDING CODE REVIEW (IBC AND IFC 2018 EDITION AS ADOPTED AND AMENDED BY THE M.O.A.)

BUILDING OCCUPANCY: TYPE B (BUSINESS)

BUILDING CONSTRUCTION: V–B

ALLOWABLE AREA: 9,000 SF (TWO STORIES)

ACTUAL AREA: 17,565 SF (ONE STORY)

TOTAL ALLOWABLE AREA WITH SPRINKLERS AND FRONTAGE INCREASE: 42,750 SF PER FLOOR

EXITING: 2 MAIN EXITS PROVIDED OUT OF BUILDING.
NUMBER OF EXITS PROVIDED IS NOT ALTERED BY THIS RENOVATION.

INTERNATIONAL EXISTING BUILDING CODE (IEBC 2018)

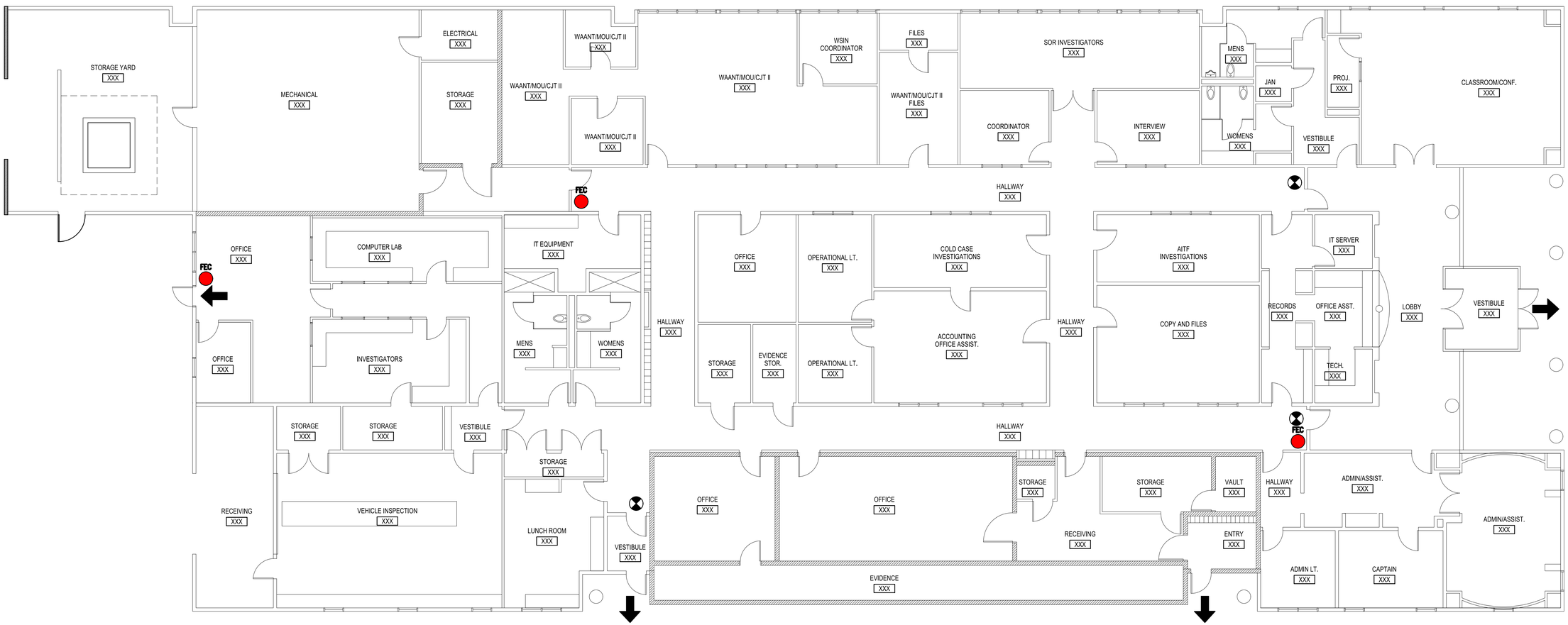
CLASSIFICATION: THIS PROJECT IS CLASSIFIED AS A LEVEL 1 ALTERATION. EXISTING ELEMENTS AND EQUIPMENT ARE BEING REPLACED USING NEW ELEMENTS AND EQUIPMENT THAT SERVE THE SAME PURPOSE.

LIFE SAFETY PLAN LEGEND

FEC — FIRE EXTINGUISHER IN CABINET UL–RATED: 2A–10B: C

EXIT DISCHARGE

EXIT SIGN LOCATION



N

A1 / LS101

LIFE SAFETY PLAN

SCALE: 1/8" = 1'-0"

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Drawn by: SLH	Date: 03/17/23
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Sheet Contents: LIFE SAFETY PLAN

Sheet No.: LS101

GENERAL NOTES

1. PATCH, MATCH AND REPAIR ALL EXISTING FINISHES DISTURBED AS PART OF INSTALLATION OF MECHANICAL CONTROLS AND REPLACEMENT THERMOSTATS.

2. REPAIR OR REPLACE ALL CEILING TILE AND GRIDS DAMAGED AS PART OF CONTROL SYSTEM REPLACEMENT.

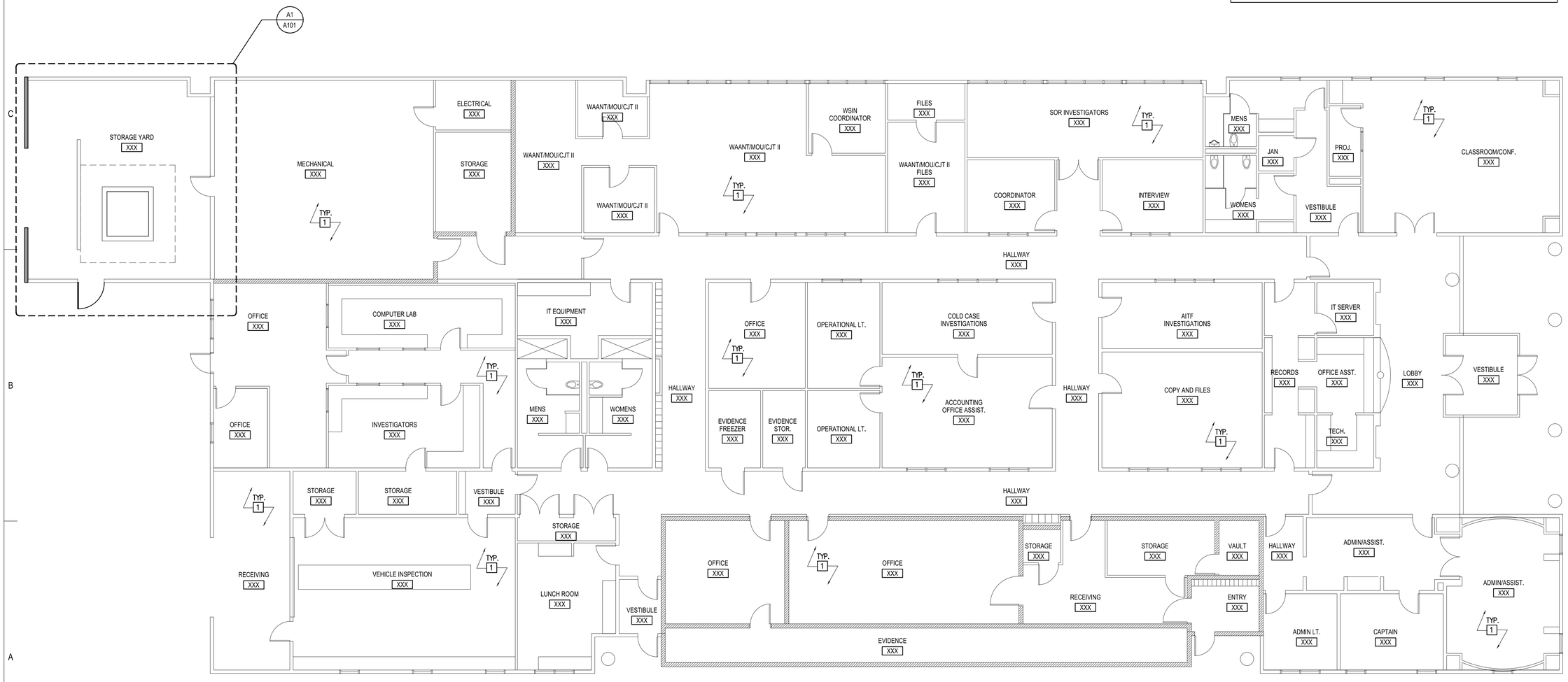
3. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR FULL EXTENT OF DEMOLITION AND NEW WORK WITHIN THE BUILDING.

4. AN INTERIOR REMODEL OF THE ABI BUILDING WILL BE OCCURRING UNDER A SEPARATE CONTRACT. COORDINATE WITH OWNER AND REMODEL CONTRACTOR AS REQUIRED FOR PHASING OF WORK WITHIN THE BUILDING.

5. DRAWING INFORMATION IS BASED ON AVAILABLE OWNER DRAWINGS AND LIMITED FIELD VERIFICATION. FIELD VERIFY DIMENSIONAL INFORMATION PRIOR TO BEGINNING CONSTRUCTION.

SHEET FLAG NOTES

1 REPLACE EXISTING THERMOSTATS AND CONTROLS – SEE MECHANICAL FOR EXTENTS OF WORK.



N

A1
A100

OVERALL FLOOR PLAN

SCALE: 1/8" = 1'-0"

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Sheet Contents
EXTERIOR ENCLOSURE REPAIR
OVERALL FLOOR PLAN

Sheet No.
A100

LEGEND

EXISTING WALL

NEW WALL

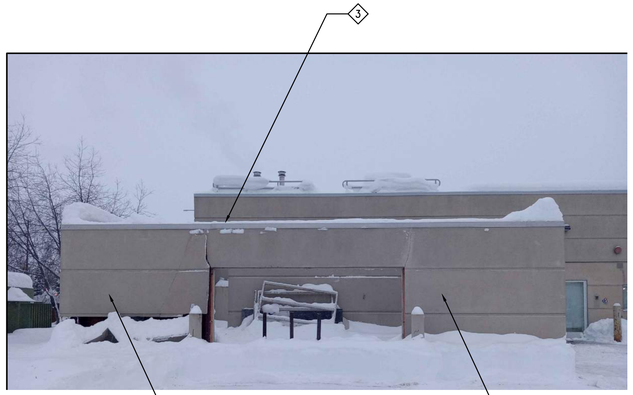
GENERAL NOTES

1. PATCH, MATCH AND REPAIR ALL EXISTING FINISHES DISTURBED AS PART OF INSTALLATION OF REPLACEMENT CHILLER UNIT AND ASSOCIATED MECHANICAL CONTROLS.

2. DRAWING INFORMATION IS BASED ON AVAILABLE OWNER DRAWINGS AND LIMITED FIELD VERIFICATION. FIELD VERIFY DIMENSIONAL INFORMATION PRIOR TO BEGINNING CONSTRUCTION.

DEMOLITION SHEET FLAG NOTES

1. REMOVE SECTION OF EXISTING DAMAGED EIFS FINISH PANELS.
2. REMOVE SECTION OF EXISTING METAL STUDS AND PLYWOOD
3. REMOVE METAL COPING FLASHING AS REQUIRED TO REPLACE METAL STUDS AND WALL PANEL FINISHES.
4. REMOVE EXISTING METAL DOOR.

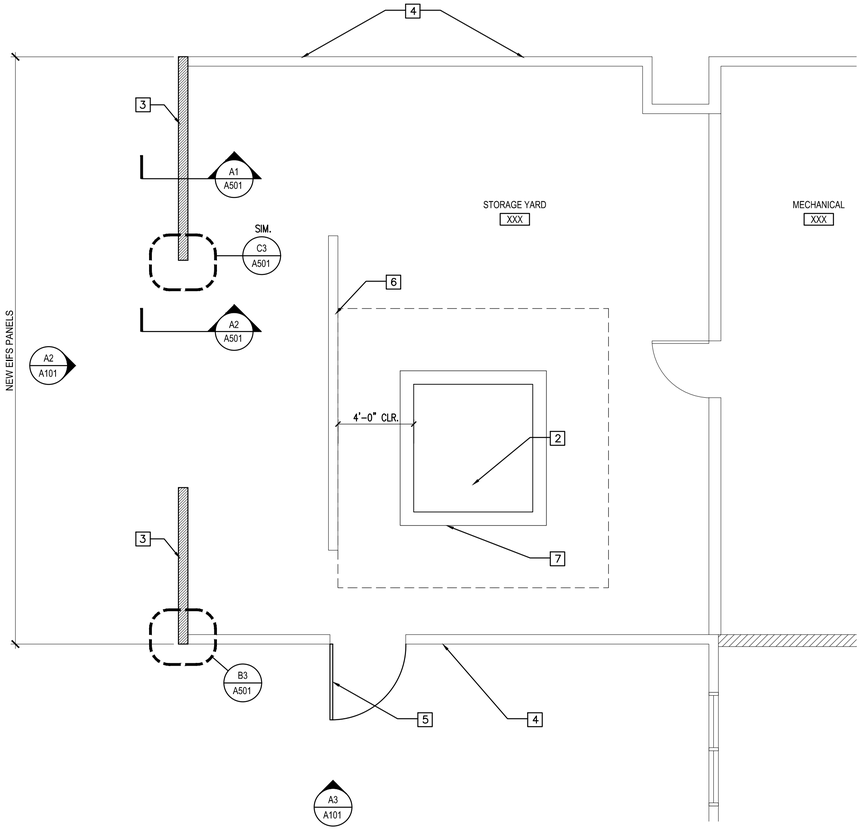


VIEW A - NORTH ELEVATION

VIEW B - EAST ELEVATION

C1 / A101 EXISTING/DEMO PHOTOS

SCALE: 1/4" = 1'-0"



A1 / A101 ENLARGED ENCLOSURE PLAN

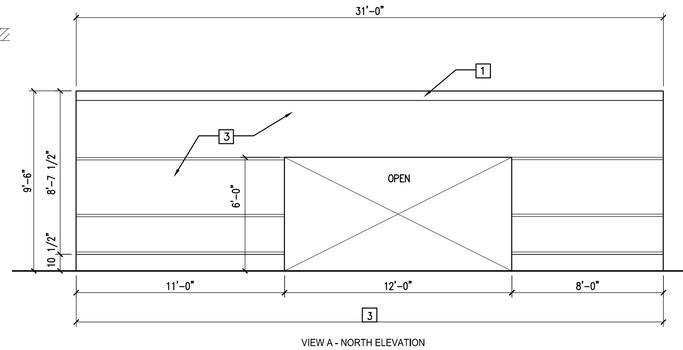
SCALE: 1/4" = 1'-0"

TYPICAL ENCLOSURE WALL ASSEMBLY

(EXTERIOR TO INTERIOR FACE)
- 2" THICK EIFS
- 5/8" MARINE PLYWOOD SHEATHING
- 6" METAL STUDS @ 16" O.C.
- 5/8" MARINE PLYWOOD SHEATHING – PAINT

SHEET FLAG NOTES

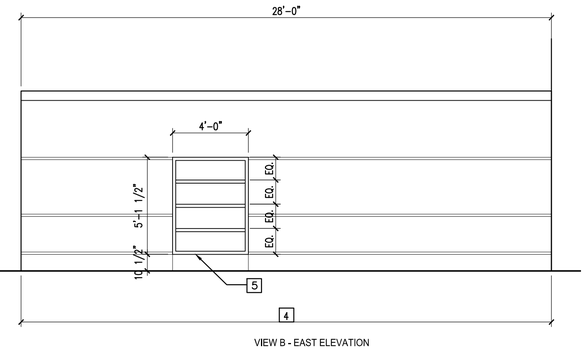
1. INSTALL NEW PARAPET COPING FLASHING WHERE REQUIRED.
2. NEW CHILLER UNIT; SEE MECHANICAL DRAWINGS.
3. NEW EIFS SECTION OF ENCLOSURE WALL.
4. EXISTING ENCLOSURE WALL TO REMAIN, TYPICAL.
5. NEW METAL DOOR.
6. EXISTING WALL
7. ENLARGE HOUSEKEEPING PAD FOR CHILLER UNIT; SEE MECHANICAL DRAWINGS.



VIEW A - NORTH ELEVATION

A2 / A101 ENCLOSURE ELEVATIONS - NEW WORK

SCALE: 1/4" = 1'-0"



VIEW B - EAST ELEVATION

A3 / A101 ENCLOSURE ELEVATIONS - NEW WORK

SCALE: 1/4" = 1'-0"

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Revisions

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Drawn by	Date
SLH	03/17/23
Checked	Job No.
SLH	22072.01

Sheet Contents
EXTERIOR ENCLOSURE REPAIR
ENLARGED PLAN AND ELEVATIONS

Sheet No.
A101

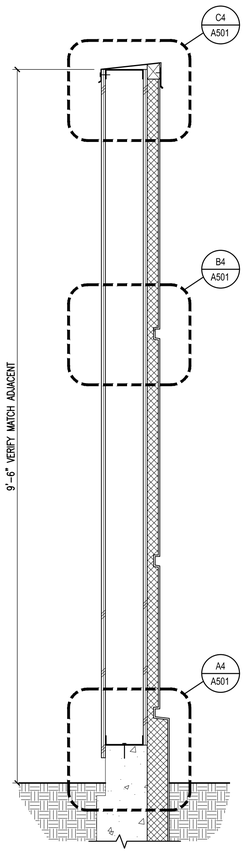
GENERAL NOTES

1. PATCH, MATCH AND REPAIR ALL EXISTING FINISHES FOR PORTIONS OF EXTERIOR ENCLOSURE ADJACENT TO NEW WALL SECTIONS.

2. DRAWING INFORMATION IS BASED ON AVAILABLE OWNER DRAWINGS AND LIMITED FIELD VERIFICATION. FIELD VERIFY DIMENSIONAL INFORMATION PRIOR TO BEGINNING CONSTRUCTION.

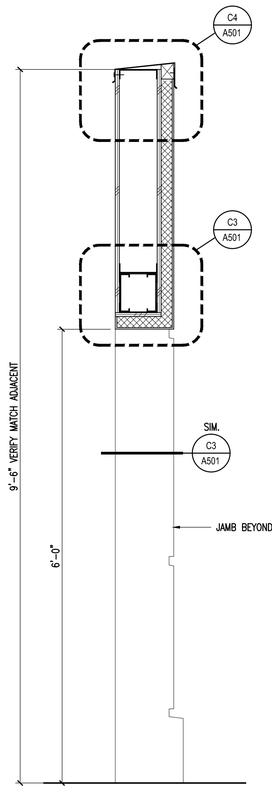
3. FRAME STUD WALLS WITH 20 GAGE STRUCTURAL STEEL STUDS, TYPICAL, UNLESS OTHERWISE NOTED.

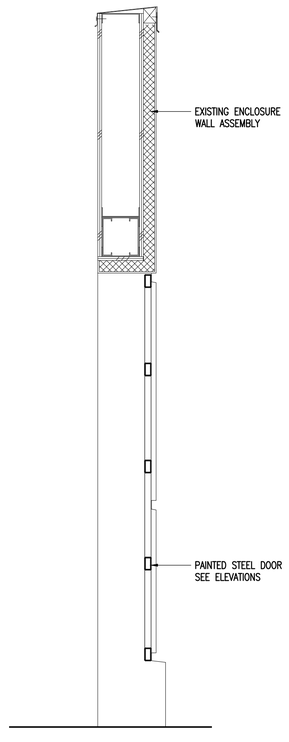
4. PROVIDE SEPARATOR MATERIAL BETWEEN METAL MATERIALS AND PRESERVATIVE TREATED WOOD, TYPICAL, AND USE STAINLESS STEEL FASTENERS.



A1 / A501 — WALL SECTION

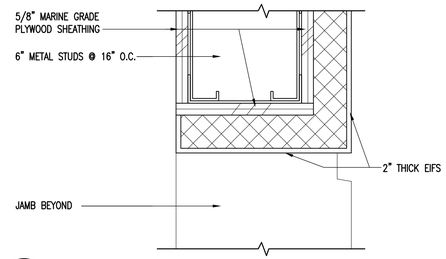
SCALE: 1" = 1'-0"





A2 / A501 — WALL SECTIONS AT OPENINGS

SCALE: 1" = 1'-0"

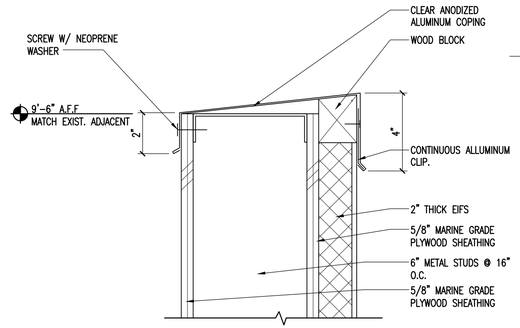


C3 / A501 — HEAD DETAIL (JAMB SIM.)

SCALE: 1 1/2" = 1'-0"

B3 / A501 — OUTSIDE CORNER PLAN DETAIL

SCALE: 1 1/2" = 1'-0"

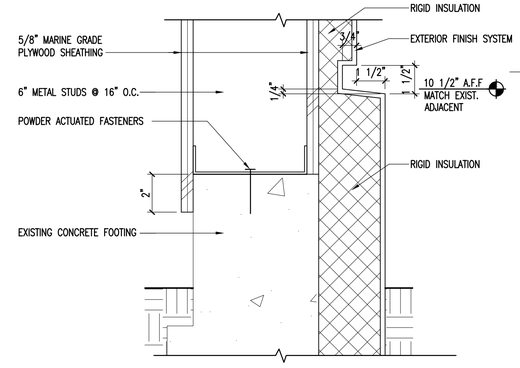


C4 / A501 — PARAPET DETAIL

SCALE: 1 1/2" = 1'-0"

B4 / A501 — REVEAL DETAIL

SCALE: 1 1/2" = 1'-0"



A4 / A501 — SILL DETAIL

SCALE: 1 1/2" = 1'-0"

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Checked: SLH	Job No.: 22072.01

Sheet Contents: EXTERIOR DETAILS

Sheet No.: A501

ABBREVIATIONS

@	AT	IN HG	INCHES MERCURY
&	AND	IN WC	INCHES WATER COLUMN
#	NUMBER	INSUL	INSULATION
%	PERCENT	IPS	INTERNATIONAL PIPE STANDARD
AD	ACCESS DOOR	K	THERMAL CONDUCTIVITY
AAP	AREA ALARM PANEL	KW	KILOWATT
ADA	AMERICANS WITH DISABILITIES ACT	KWH	KILOWATT HOUR
AFF	ABOVE FINISHED FLOOR	LAT	LEAVING AIR TEMPERATURE
AFG	ABOVE FINISHED GRADE	LB/HR	POUNDS PER HOUR
AHJ	AUTHORITY HAVING JURISDICTION	LBS	POUNDS
AHU	AIR-HANDLING UNIT	LF	LINEAR FEET
ALT	ALTERNATE	L	LENGTH
AMB	AMBIENT	LWT	LEAVING WATER TEMPERATURE
AMCA	AIR MOVEMENT AND CONTROL ASSOCIATION	LOC	LOCATION/LOCATED
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	LP	LOW PRESSURE
APD	AIR PRESSURE DROP	LR	LONG RADIUS
APPROX	APPROXIMATE	MAN	MANUAL
AR	ACID RESISTANT	MAT	MIXED AIR TEMPERATURE
ARCH	ARCHITECTURAL	MAV	MANUAL AIR VENT
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	MAX	MAXIMUM
ATM	ATMOSPHERE	MBH	THOUSAND BTU PER HOUR
AUTO	AUTOMATIC	MECH	MECHANICAL
AVG	AVERAGE	MFR	MANUFACTURER
AWG	AMERICAN WIRE GAUGE	MH	MANHOLE
BAS	BUILDING AUTOMATION SYSTEM	MIN	MINIMUM, MINUTE
BDD	BACKDRAFT DAMPER	MPH	MILES PER HOUR
BHP	BRAKE HORSEPOWER, BOILER HORSEPOWER	MTD	MOUNTED
BLDG	BUILDING	N/A	NOT APPLICABLE
BLW	BELOW	NC	NOISE CRITERIA, NORMALLY CLOSED
BOD	BOTTOM OF DUCT	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
BOP	BOTTOM OF PIPE		NOT IN CONTRACT
BTU	BRITISH THERMAL UNIT	NO	NORMALLY OPEN, NUMBER
BTUH	BTU PER HOUR	NTS	NOT TO SCALE
C	COMMON, CONDENSATE	OD	OUTSIDE DIAMETER
C-C	CENTER TO CENTER	OFOI	OWNER FURNISHED, OWNER INSTALLED
CAP	CAPACITY, END CAP	OSA	OUTSIDE AIR
CCW	COUNTER-CLOCKWISE	OZ	OUNCE
CF	COOLING FAN, CIRCULATING FAN, CUBIC FOOT	PD	PRESSURE DROP OR DIFFERENCE
CFM	CUBIC FEET PER MINUTE	PG	PROPYLENE GLYCOL
CI	CAST IRON	PL	PLATE
CL	CENTER LINE	PLBG	PLUMBING
CLG	CEILING	POC	POINT OF CONNECTION
CMPR	COMPRESSOR	PNL	PANEL
COEF	COEFFICIENT	PH	PHASE (ELECTRICAL)
CONC	CONCRETE	PPM	PARTS PER MILLION
COND	CONDENSER	PSI	POUNDS PER SQUARE INCH
CTR	CENTER	PRESS	PRESSURE
CU	COPPER, CONDENSING UNIT	PRI	PRIMARY
CU IN	CUBIC INCH	R-407C, R-410A	REFRIGERANT (407C,410A,ETC.)
CV	VALVE FLOW COEFFICIENT		
CW	CLOCKWISE	R/A	RETURN AIR
DB	DECIBEL	RAD	RADIANT OR RADIATION
DBT	DRY-BULB TEMPERATURE	RCVR	RECEIVER
DDC	DIRECT DIGITAL CONTROL	RECIRC	RECIRCULATE
DEG OR °	DEGREE	RED	REDUCER
DEG C	DEGREE CENTIGRADE	REFRIG	REFRIGERATION
DEG F	DEGREE FAHRENHEIT	REV	REVOLUTIONS
DEMO	DEMOLITION	RF	RELIEF FAN OR RETURN FAN
DENS	DENSITY	RH	RELATIVE HUMIDITY
DGM	DIAGRAM	RM	ROOM
DI	DUCTILE IRON	RPM	REVOLUTIONS PER MINUTE
DIA OR ø	DIAMETER	RPS	REVOLUTIONS PER SECOND
DIFF	DIFFERENCE OR DELTA	S/A	SUPPLY AIR
DIP	DUCTILE IRON PIPE	SAT	SATURATION
DISS	DIAMETER-INDEX SAFETY SYSTEM	SCHD	SCHEDULE
DN	DOWN	SCFM	STANDARD CUBIC FEET PER MINUTE
DO	DITTO	SD	STORM DRAIN
DTL	DETAIL	SEC	SECONDARY
DWDI	DOUBLE WIDTH DOUBLE INLET	SF	SQUARE FEET
DWG	DRAWING	SH	SENSIBLE HEAT
(E)	EXISTING	SHG	SENSIBLE HEAT GAIN
EA	EACH	SHR	SENSIBLE HEAT RATIO
E/A	EXHAUST AIR	SHT	SHEET
EAT	ENTERING AIR TEMPERATURE	SHWR	SHOWER
EF	EXHAUST FAN	SP	STATIC PRESSURE
EFF	EFFICIENCY	SPD	STATIC PRESSURE DROP
EG	ETHYLENE GLYCOL, EXHAUST GRILLE	SPEC	SPECIFICATION, SPECIFIED
ELEC	ELECTRICAL	SPKLR	SPRINKLER
ELEV	ELEVATION	SR	SHORT RADIUS
EMB	EMBEDMENT	SWSI	SINGLE WIDTH SINGLE INLET
ENT	ENTERING	SQ	SQUARE
EQIV FT	EQUIVALENT FEET	SS	STAINLESS STEEL, SANITARY SEWER
ESP	EXTERNAL STATIC PRESSURE	STD	STANDARD
EVAP	EVAPORATOR	SUCT	SUCTION
EXP	EXPANSION	TA	TRANSFER AIR
EWT	ENTERING WATER TEMPERATURE	TEMP	TEMPERATURE, TEMPORARY
°F	FAHRENHEIT	THRU	THROUGH
FA	FACE AREA	TOD	TOP OF DUCT
F-F	FACE TO FACE	TONS	TONS OF REFRIGERATION
FD	FIRE DAMPER	TOP	TOP OF PIPE
FLEX	FLEXIBLE	TYP	TYPICAL
FLR	FLOOR	UG	UNDERGROUND
FOB	FLAT ON BOTTOM	UNO	UNLESS NOTED OTHERWISE
FOT	FLAT ON TOP	UPC	UNIFORM PLUMBING CODE
FP	FREEZING POINT	V	VOLTS OR VOLTAGE
FPM	FEET PER MINUTE	VAC	VACUUM
FPS	FEET PER SECOND	VAC	VOLTS (ALTERNATING CURRENT)
FSD	FIRE-SMOKE DAMPER	VAL	VALVE
FSDM	FIRE-SMOKE DAMPER, MODULATING	VAP PR	VAPOR PRESSURE
FT OR '	FOOT OR FEET	VAR	VARIABLE
FV	FACE VELOCITY	VAV	VARIABLE AIR VOLUME
GA	GAGE OR GAUGE	VDC	VOLTS (DIRECT CURRENT)
GAL	GALLONS	VEL	VELOCITY
GPM	GALLONS PER MINUTE	VERT	VERTICAL
GR	GRAINS	VFD	VARIABLE FREQUENCY DRIVE
GRD	GRILLES, REGISTERS, DIFFUSERS	VOL	VOLUME
HD	HEAD	VP	VELOCITY PRESSURE
HDPE	HIGH DENSITY POLYETHYLENE	VSD	VARIABLE SPEED DRIVE
HG	HEAT GAIN	VTR	VENT THROUGH ROOF
HT	HEIGHT	W	WATT
HP	HORSEPOWER	W/	WITH
HR	HOUR(S)	W/O	WITHOUT
HVAC	HEATING, VENTILATING & AIR-CONDITIONING	WB	WET BULB TEMPERATURE
HZ	FREQUENCY	WC	WATER COLUMN
IAW	IN ACCORDANCE WITH	WH	WATT-HOUR
ID	INSIDE DIAMETER	WP	WEATHER PROOF, WATER PROOF
IE	INVERT ELEVATION	WPD	WATER PRESSURE DROP
IBC	INTERNATIONAL BUILDING CODE	WT	WEIGHT
IFC	INTERNATIONAL FIRE CODE	YD	YARD
IMC	INTERNATIONAL MECHANICAL CODE	ZVB	ZONE VALVE BOX
IN OR "	INCH OR INCHES		

NOTE: THIS IS A STANDARD LEGEND, SOME OF THE SYMBOLS SHOWN ON LEGEND ARE NOT NECESSARILY ON THE DRAWINGS.

GENERAL

SYMBOL	DESCRIPTION
1 / 2.	SHEET NOTE CONVENTION: REFERENCED SHEET NOTE; GENERAL SHEET NOTE
	NORTH ARROW
1 / M0.1	DETAIL REFERENCE: DETAIL NUMBER; SHEET WHERE DETAIL APPEARS
A / M0.1	SECTION REFERENCE: SECTION LETTER; SHEET WHERE SECTION APPEARS
	POINT OF CONNECTION
P-#	PLUMBING FIXTURE NUMBER
ID / EQ#	EQUIPMENT TAG: EQUIPMENT DESIGNATION; EQUIPMENT NUMBER
ID / CFM	AIR OUTLET TAG: AIR OUTLET DESIGNATION; CFM
XXX	AIR TERMINAL UNIT TAG
	LINE CONVENTION: NEW OR REINSTALLED ITEM; ITEM TO BE DEMOLISHED; EXISTING ITEM TO REMAIN; EXISTING ITEM TO BE RELOCATED

VENTILATION

SYMBOL	ABBR.	DESCRIPTION
		DOUBLE LINE DUCTWORK
		SINGLE LINE DUCTWORK
		FLEX DUCTWORK
		SLOT GRILLES/REGISTERS/DIFFUSERS
	S/A	GRILLES/REGISTERS/DIFFUSERS - SUPPLY AIR
	R/A	GRILLES/REGISTERS/DIFFUSERS - RETURN AIR
	E/A	GRILLES/REGISTERS/DIFFUSERS - EXHAUST AIR
OR		AIR FLOW ARROW
VD	VD	AIR VOLUME DAMPER
FD	FD	FIRE DAMPER
SD	SD	SMOKE DAMPER
FSD	FSD	FIRE-SMOKE DAMPER
	AL	ACOUSTICAL DUCT LINING
		DUCT INSULATION
12ø		DUCT: ROUND
20X12		DUCT: RECTANGULAR FIRST FIGURE SIDE SHOWN
20X12 F.O.		DUCT: FLAT OVAL FIRST FIGURE SIDE SHOWN
M	MOD	MOTORIZED OPERATED DAMPER
	OBD	OPPOSED BLADE DAMPER
	PBD	PARALLEL BLADE DAMPER
	BDD	BACK DRAFT DAMPER
		DAMPER

SUPPLY RETURN EXHAUST ROUND — DUCT TURNING UP OR TOWARD

SUPPLY RETURN EXHAUST ROUND — DUCT TURNING DOWN OR AWAY

GENERAL PIPING

SYMBOL	ABBR.	DESCRIPTION
	V	VENT
		BALL VALVE
	GV	GATE VALVE
		GLOBE VALVE
	BV	BUTTERFLY VALVE
	TDV	TRIPLE DUTY VALVE
	CV	CHECK VALVE
		BACKFLOW PREVENTER ASSEMBLY
		PRESSURE REDUCING VALVE
		PRESSURE REGULATOR VALVE
		PLUG VALVE
S	SOV	SOLENOID OPERATED VALVE
M OR	MOV	2 WAY MOTOR OPERATED VALVE
M OR	MOV	3 WAY MOTOR OPERATED VALVE
		2 WAY PNEUMATIC OPERATED VALVE
		3 WAY PNEUMATIC OPERATED VALVE
		BALANCING VALVE
	FCV	AUTOMATIC FLOW CONTROL VALVE
	SV	SAFETY VALVE, PRESSURE RELIEF VALVE
	VB	VACUUM BREAK
	AAV	AIR VENT, AUTO WITH ISOLATION VALVE
	MAV	AIR VENT, MANUAL
	PTTP	PRESSURE & TEMP TEST PLUG
		STRAINER W/ BLOWDOWN HOSE FITTING
		EQUIPMENT OR PIPE DRAIN VALVE W/HOSE FITTING
		EQUIPMENT OR PIPE DRAIN PLUG W/HOSE FITTING
		REDUCER (CONCENTRIC)
		REDUCER (ECCENTRIC)
		FLOW ARROW
		ANCHOR
		PIPE GUIDE
		PIPE SLEEVE
		PIPE UNION
		PIPE FLANGE
		FLEXIBLE CONNECTION
M		METER
		LINE BREAK
		END CAP
		PIPE UP / TEE UP
		PIPE DOWN (ELBOW)
		PIPE DOWN (TEE)

CONTROLS

SYMBOL	ABBR.	DESCRIPTION
T	TSTAT	THERMOSTAT
		LOW VOLTAGE CONTROL
CS	CS	CURRENT SWITCH
CT	CT	CURRENT TRANSMITTER
FS	FS	FLOW SWITCH
TT	TT	TEMPERATURE TRANSMITTER
TIT	TIT	TEMPERATURE INDICATOR TRANSMITTER
PIT	PIT	PRESSURE INDICATOR TRANSMITTER
DPS	DPS	DIFFERENTIAL PRESSURE SWITCH
DPI	DPI	DIFFERENTIAL PRESSURE INDICATOR
PI OR	PI	PRESSURE INDICATOR, GAUGE
TI OR	TI	TEMPERATURE INDICATOR, THERMOMETER
AFMS	AFMS	AIRFLOW MEASURING STATION
FI	FI	FLOW INDICATOR

PLUMBING

SYMBOL	ABBR.	DESCRIPTION
	CW	COLD WATER
	HW	HOT WATER
	HWC	HOT WATER CIRCULATION
	V	VENT
	W	WASTE WATER
	ARW	ACID RESISTANT WASTE
	ARV	ACID RESISTANT VENT
	IW	INDIRECT WASTE
	SD	STORM DRAIN
	RL, ORL	RAINLEADER, OVERFLOW RAINLEADER
	HB	HOSE BIB
	WHA	WATER HAMMER ARRESTER
A	PDI	PLUMBING AND DRAINAGE INSTITUTE WATER HAMMER ARRESTER SIZE A, B, C, D, OR E
TP		AUTOMATIC TRAP PRIMER VALVE
	FCO, YCO	FLOOR CLEANOUT, YARD CLEANOUT
	WCO	WALL CLEANOUT
	FD, FS	FLOOR DRAIN, FLOOR SINK
	RD, ORD	ROOF DRAIN, OVERFLOW ROOF DRAIN

NOTE: THIS IS A STANDARD LEGEND, SOME OF THE SYMBOLS SHOWN ON LEGEND ARE NOT NECESSARILY ON THE DRAWINGS.

GENERAL NOTES

1. DRAWING INFORMATION IS BASED UPON AVAILABLE OWNER DRAWINGS AND LIMITED FIELD VERIFICATION. DRAWING INFORMATION DOES NOT REPRESENT AS-BUILT CONDITIONS. FIELD VERIFY INFORMATION, INCLUDING PIPES, DUCTS, AND EQUIPMENT LOCATIONS, ROUTING, CONTROLS, AND APPURTENANCES PRIOR TO START OF WORK.
2. FIELD COORDINATE THE EXACT LOCATIONS OF EQUIPMENT, PIPING, DUCT WORK, AND CONTROLS WITH EXISTING AND NEW WORK, INCLUDING RATED ASSEMBLIES, CONSTRUCTION PHASING AND STRUCTURAL REQUIREMENTS.
3. REMOVE ABANDONED OR INDICATED FOR DEMOLITION PIPES, DUCTS, MEDICAL GAS LINES, EQUIPMENT AND CONTROLS. REMOVE BRACKETS, STEMS, HANGERS, CONDUIT, CONDUCTORS, DEVICES AND OTHER ACCESSORIES.
4. PLUG, PATCH, REPAIR HOLES AND SURFACES. REFINISH SURFACE AND REPAIR ASSEMBLIES TO MATCH EXISTING FIRE, TEMPERATURE, AND/OR SMOKE RATINGS. REPAIR DAMAGED SURFACES, INSULATION, CEILING TILES AND FIREPROOFING. SEAL ROOM PENETRATIONS TO MAINTAIN PRESSURE RELATIONSHIPS TO ADJACENT SPACES.
5. OBTAIN AND REVIEW EQUIPMENT VENDORS PREINSTALLATION/INSTALLATION DRAWINGS AND MANUALS BEFORE STARTING WORK. CONFLICTS BETWEEN VENDOR REQUIREMENTS AND CONTRACT DOCUMENTS SHALL BE RESOLVED WITH OWNER AND ENGINEER BEFORE STARTING WORK. CONFIRM VENDOR FURNISHED EQUIPMENT AND MATERIALS FOR CONTRACTOR INSTALLATION.
6. SHOP DRAWINGS AND ANY PHASING PLANS SHALL BE REVIEWED BY CONTRACTOR WITH ALL SUB-CONTRACTORS AND SIGNED-OFF AS ACCEPTABLE BEFORE PROCEEDING WITH WORK. COPIES OF SIGNED-OFF DRAWINGS SHALL BE SUBMITTED TO OWNER AND ENGINEER.
7. COORDINATE SERVICE DISRUPTIONS WITH THE OWNER AND OBTAIN SPECIFIC AGREEMENT OF THE TIMES AND DURATIONS OF SYSTEM DISRUPTIONS BEFORE STARTING WORK. BUILDING WILL BE OPERATIONAL DURING CONSTRUCTION.
8. ARRANGE WORK TO PROVIDE WORKABLE ACCESS TO SERVICEABLE OR OPERABLE EQUIPMENT. LOCATION OF VALVES, STRAINERS, MOTORS, DAMPER OPERATORS, ETC., SHALL BE EASILY ACCESSIBLE BY A PERSON STANDING ON THE FLOOR OR STEP LADDER. ITEMS NOT IN THE OPEN SHALL BE READILY ACCESSIBLE THROUGH ACCESS OPENINGS IN THE BUILDING CONSTRUCTION. PROVIDE U.L. LISTED ACCESS PANELS TO MATCH FIRE RATING OF ASSEMBLIES.

DRAWING INDEX

PACKAGED AIR COOLED CHILLER SCHEDULE

SYMBOL	LOCATION	CAPACITY (TONS)	REFRIG. TYPE	FULL LOAD EFFICIENCY (BTUH/W)	EVAPORATOR FLUID TYPE	EVAPORATOR EWT (DEG F)	EVAPORATOR LWT (DEG F)	EVAPORATOR FLOW (GPM)	EVAPORATOR MAX PD (PSI)	CONDENSER MIN AMBIENT (DEG F)	CONDENSER DESIGN AMBIENT (DEG F)	MOTOR (HP,V,PH)	WEIGHT (LBS)	REMARKS, BASIS OF DESIGN
SECTION 23 6400 - PACKAGED WATER CHILLERS														
CH-1	OUTDOORS	30.0 (NOM.)	R410A	10.02	40% PG	54	44	73.2	11	32	95	208,3 163A MCA 10A,115,1 OUTLET	3,000	PACKAGED AIR COOLED CHILLER: THIS IS AN OWNER FURNISHED, CONTRACTOR INSTALLED UNIT. SCROLL COMPRESSORS, CONDENSER FANS, 65 kA SCCR, SEISMIC RESTRAINED VIBRATION SPRING ISOLATORS. EPOXY COATED CONDENSER COILS, 115V CONVENIENCE OUTLET, BACNET IP COMPATIBLE. DAIKIN AGZ031E.

PUMP SCHEDULE

SYMBOL	LOCATION	SERVICE	FLUID	TEMP. (DEG F)	GPM	HEAD (FT)	MOTOR (HP,V,PH)	REMARKS BASIS OF DESIGN
SECTION 23 2123 HYDRONIC PUMPS								
PMP-3	MECHANICAL ROOM 146	BUILDING VAV'S	50% P.G.	180	53	30	0.75,208,1	VERTICAL INLINE PUMP: CAST IRON CONSTRUCTION, 1-1/2" PIPING CONNECTIONS. 6.3 INCH IMPELLER DIAM. TACO 1915. BID ALTERNATE #1 WORK.
PMP-4	MECHANICAL ROOM 146	AHU-1 COILS	50% P.G.	180	58	25	0.75,208,1	VERTICAL INLINE PUMP: CAST IRON CONSTRUCTION, 1-1/2" PIPING CONNECTIONS. 6.2 INCH IMPELLER DIAM. TACO 1915. BID ALTERNATE #1 WORK.

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STATE OF ALASKA 49TH — Mark D. Landberg — 3/14/2023 — ME-8055 — REGISTERED PROFESSIONAL ENGINEER — © 19802

ALASKA STATE TROOPERS ABI BUILDING CHILLER REPLACEMENT

5500 EAST TUDOR ROAD

CONSTRUCTION DOCUMENTS

Revisions		
No.	Description	Date

Drawn by ERP/DTY	Date 03/17/23
Checked MDL	Job No. 22072.01

Sheet Contents: LEGEND, SCHEDULE, AND ABBREVIATIONS

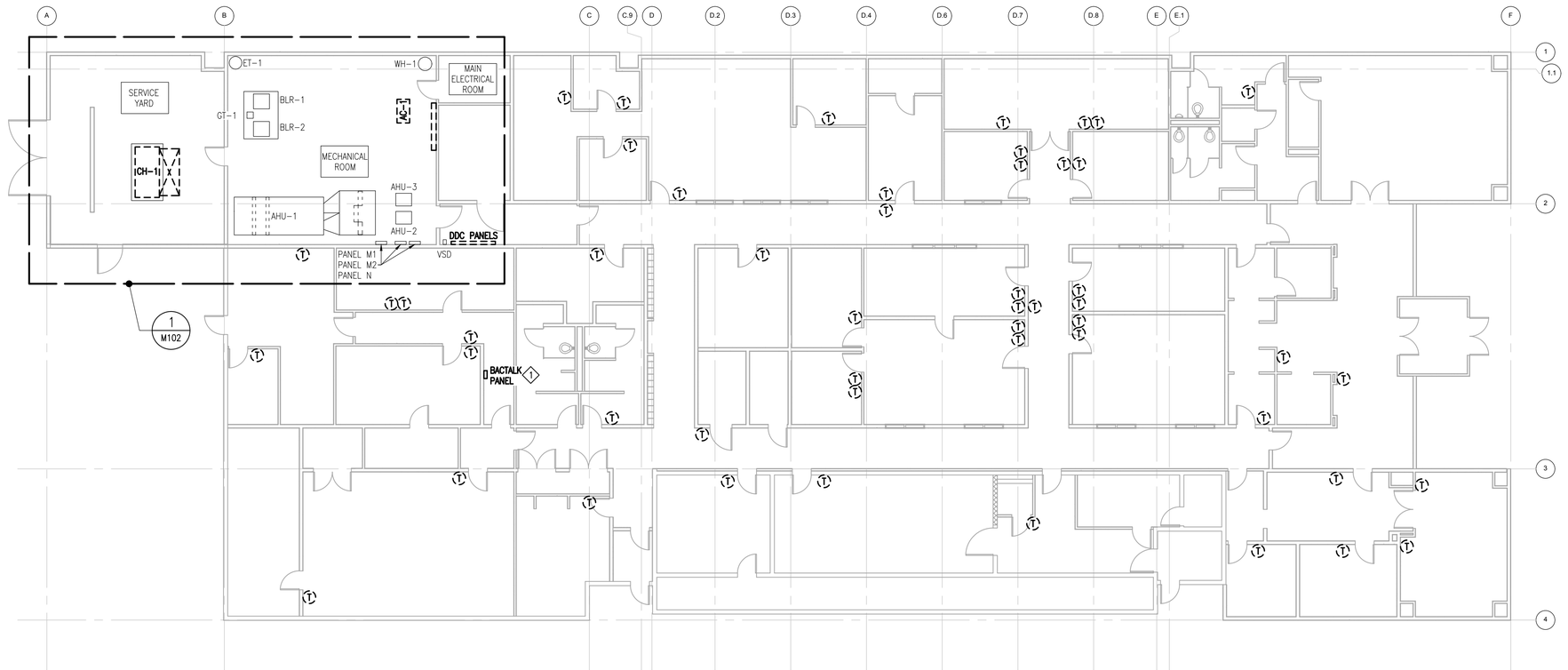
Category	Sheet No.
M	001

GENERAL NOTES

1. EXISTING CONDITIONS ARE BASED ON A LIMITED SITE VISIT AND AS-BUILT DRAWINGS DATED 07/13/1984 AND REMODEL PROJECT DRAWINGS DATED 04/30/2015. CONTRACTOR TO CONDUCT A SITE VISIT PRIOR TO BID SUBMISSION IN ORDER TO BECOME COMPLETELY FAMILIARIZED WITH SCOPE OF WORK. REPORT DISCREPANCIES TO OWNER BEFORE DISTURBING EXISTING CONDITIONS.
2. DEMOLISH PNEUMATIC THERMOSTAT AND PIPING WHERE IT OCCURS IN EACH ROOM. PREPARE THERMOSTAT LOCATION FOR REPLACEMENT THERMOSTAT / TEMPERATURE SENSOR TO CONNECT TO THE BUILDING AUTOMATION SYSTEM.
3. DEMOLISH PNEUMATIC CONTROLS AND DDC CONTROLS FOR APPROXIMATELY 48 VAV BOXES AND SUPPLY AIR VALVES, 9 EXHAUST AIR VALVES, 9 EXHAUST FANS, 1 UNIT HEATER, 4 CABINET UNIT HEATERS, 1 RETURN/RELIEF FAN, 2 RTU'S, 3 SPLIT AIR CONDITIONING UNITS, TO INCLUDE ALL CONTROL DAMPER AND VALVE ACTUATORS. FIELD VERIFY QUANTITIES.
4. COORDINATE LIMITS OF DEMOLITION WITH NEW WORK.

DEMOLITION NOTES

1. DEMOLISH PANEL. PATCH AND REPAIR WALL.



1 DEMOLITION PLAN - MECHANICAL

1 / M101

SCALE: 3/32" = 1'-0"

0 4' 8' 16' 24'

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Revisions		
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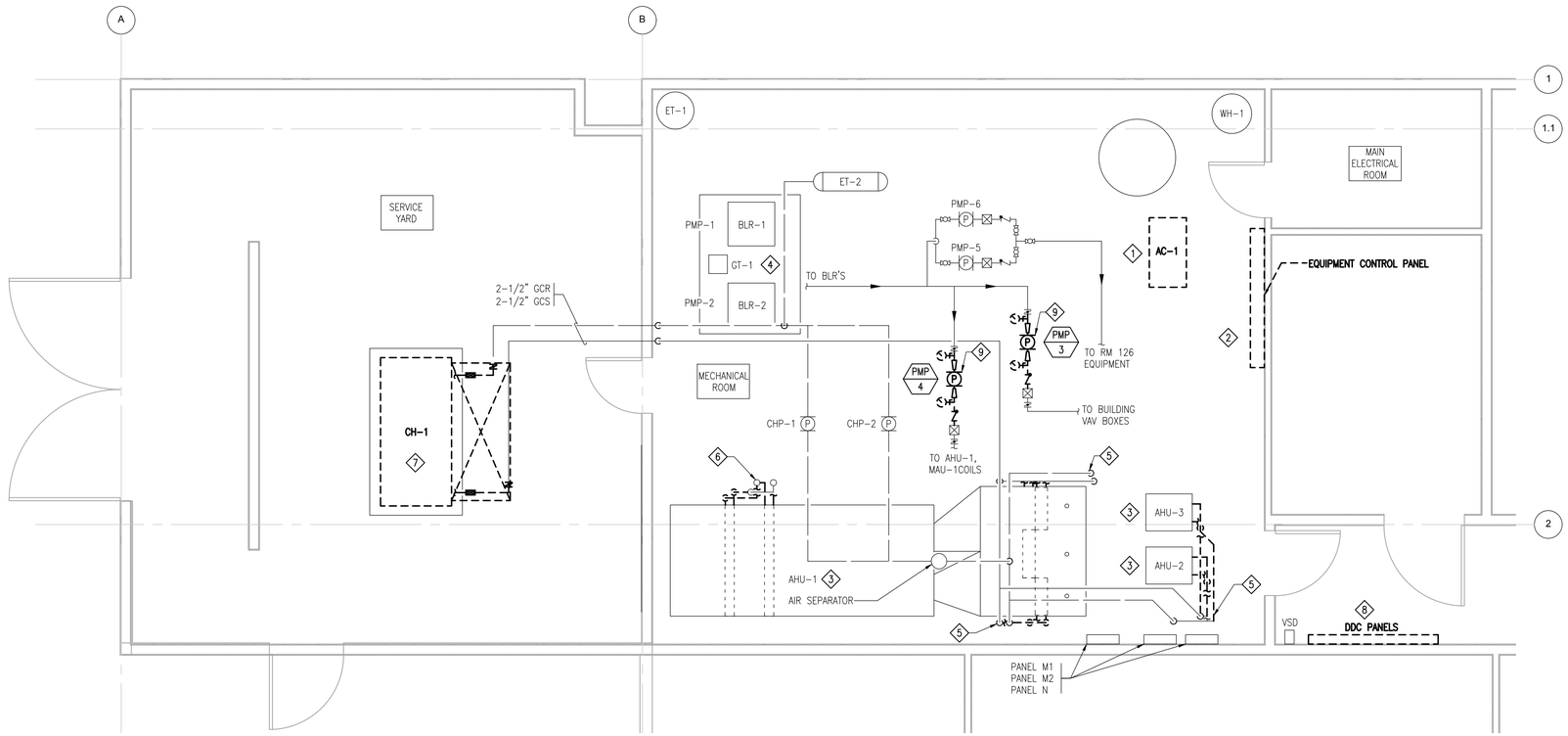
Sheet Contents
DEMOLITION PLAN – MECHANICAL

Category	Sheet No.
M	101

CONSTRUCTION DOCUMENTS



1 M102 **ENLARGED DEMOLITION PLAN - MECHANICAL**

SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. EXISTING CONDITIONS ARE BASED ON A LIMITED SITE VISIT AND AS–BUILT DRAWINGS DATED 07/13/1984 AND REMODEL PROJECT DRAWINGS DATED 04/30/2015. CONTRACTOR TO CONDUCT A SITE VISIT PRIOR TO BID SUBMISSION IN ORDER TO BECOME COMPLETELY FAMILIARIZED WITH SCOPE OF WORK. REPORT DISCREPANCIES TO OWNER BEFORE DISTURBING EXISTING CONDITIONS.
2. DEMOLISH PNEUMATIC THERMOSTAT AND PIPING WHERE IT OCCURS IN EACH ROOM. PREPARE THERMOSTAT LOCATION FOR REPLACEMENT THERMOSTAT / TEMPERATURE SENSOR TO CONNECT TO THE BUILDING AUTOMATION SYSTEM.
3. EXISTING DDC CONTROLS TO BE DEMOLISHED.
4. COORDINATE LIMITS OF DEMOLITION WITH NEW WORK.

DEMOLITION NOTES

1. DEMOLISH AIR COMPRESSOR, APPURTENANCES, AND CONTROL AIR PIPING.
2. DEMOLISH 3 PNEUMATIC CONTROL PANELS AND APPURTENANCES.
3. DEMOLISH PNEUMATIC CONTROLS FOR AIR HANDLING UNIT.
4. DEMOLISH PNEUMATIC CONTROLS FOR BOILERS.
5. DEMOLISH CWS/R COIL PIPING, FITTINGS, AND VALVES DOWNSTREAM OF COIL ISOLATION VALVES. TOTAL OF 5 COILS. SEE DIAGRAM 1/M302.
6. DEMOLISH HWS/R COIL PIPING, FITTINGS, AND VALVES DOWNSTREAM OF COIL ISOLATION VALVES. TOTAL OF 2 COILS. SEE DIAGRAM 1/M301.
7. DEMOLISH CHILLER AND PIPING AS INDICATED. PREPARE REMAINING PIPING FOR RECONNECTION.
8. DEMOLISH OBSOLETE DDC PANELS AND APPERTENANCES.
9. BID ALTERNATE #1: DEMOLISH EXISTING DUPLEX STYLE HEATING PUMP AND FITTINGS AS INDICATED. ISOLATION VALVES TO REMAIN.

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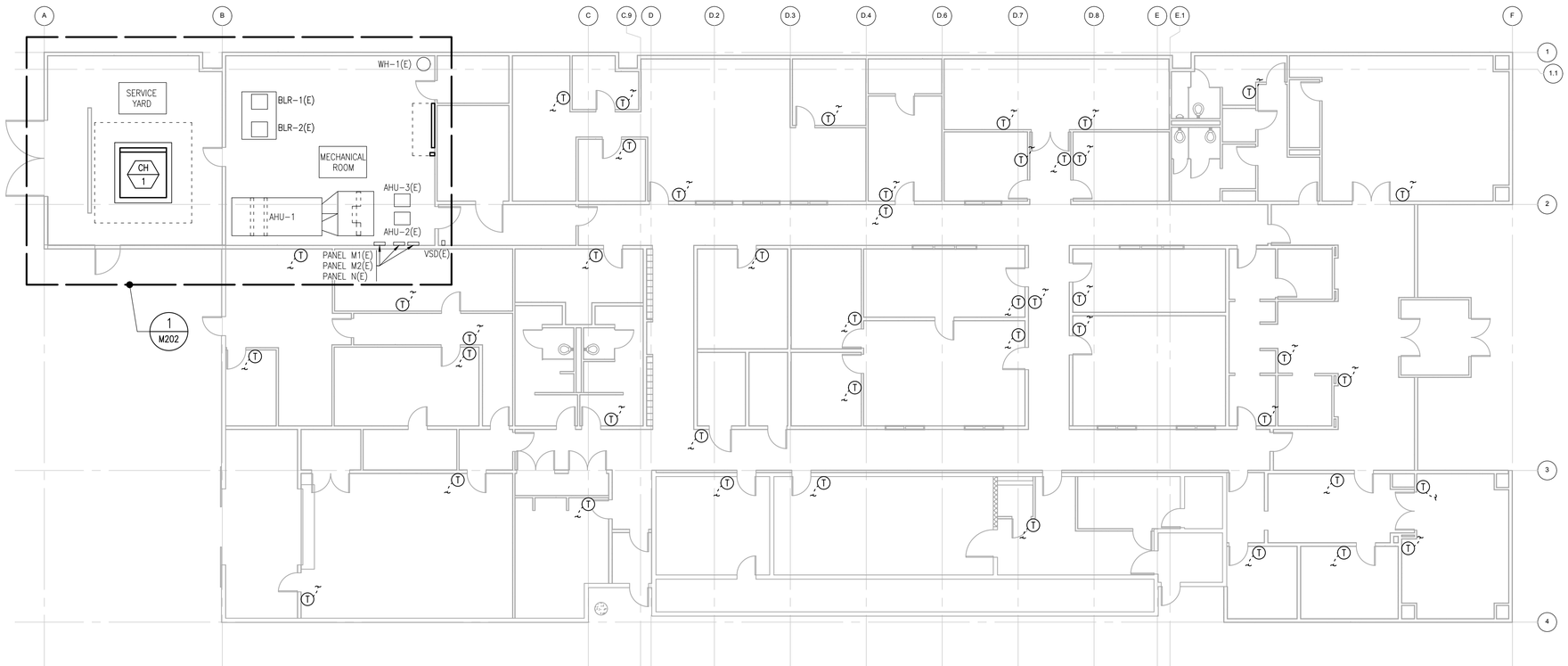
Sheet Contents
ENLARGED DEMOLITION PLAN – MECHANICAL

Category	Sheet No.
M	102

CONSTRUCTION DOCUMENTS

PLOT DATE: 3/14/2023 4:58 PM



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2. PROVIDE REPLACEMENT DIGITAL TEMPERATURE SENSOR IN EACH ROOM HAVING AN EXISTING THERMOSTAT. CONNECT TO BUILDING AUTOMATION SYSTEM.
3. PROVIDE NEW BAS CONTROLS FOR APPROXIMATELY 48 VAV BOXES AND SUPPLY AIR VALVES, 9 EXHAUST AIR VALVES, 9 EXHAUST FANS, 1 UNIT HEATER, 4 CABINET UNIT HEATERS, 1 RETURN/RELIEF FAN, 2 RTU'S, 3 SPLIT AIR CONDITIONING UNITS, TO INCLUDE ALL CONTROL DAMPER AND VALVE ACTUATORS. FIELD VERIFY QUANTITIES.
4. TO ACCOMPLISH CONTROL VALVE CHANGE OUT, DRAIN HEATING SYSTEM. PROVIDE NEW GLYCOL SOLUTION .

1 / M201 **FLOOR PLAN - MECHANICAL**

SCALE: 3/32" = 1'-0"

0 4' 8' 16' 24'

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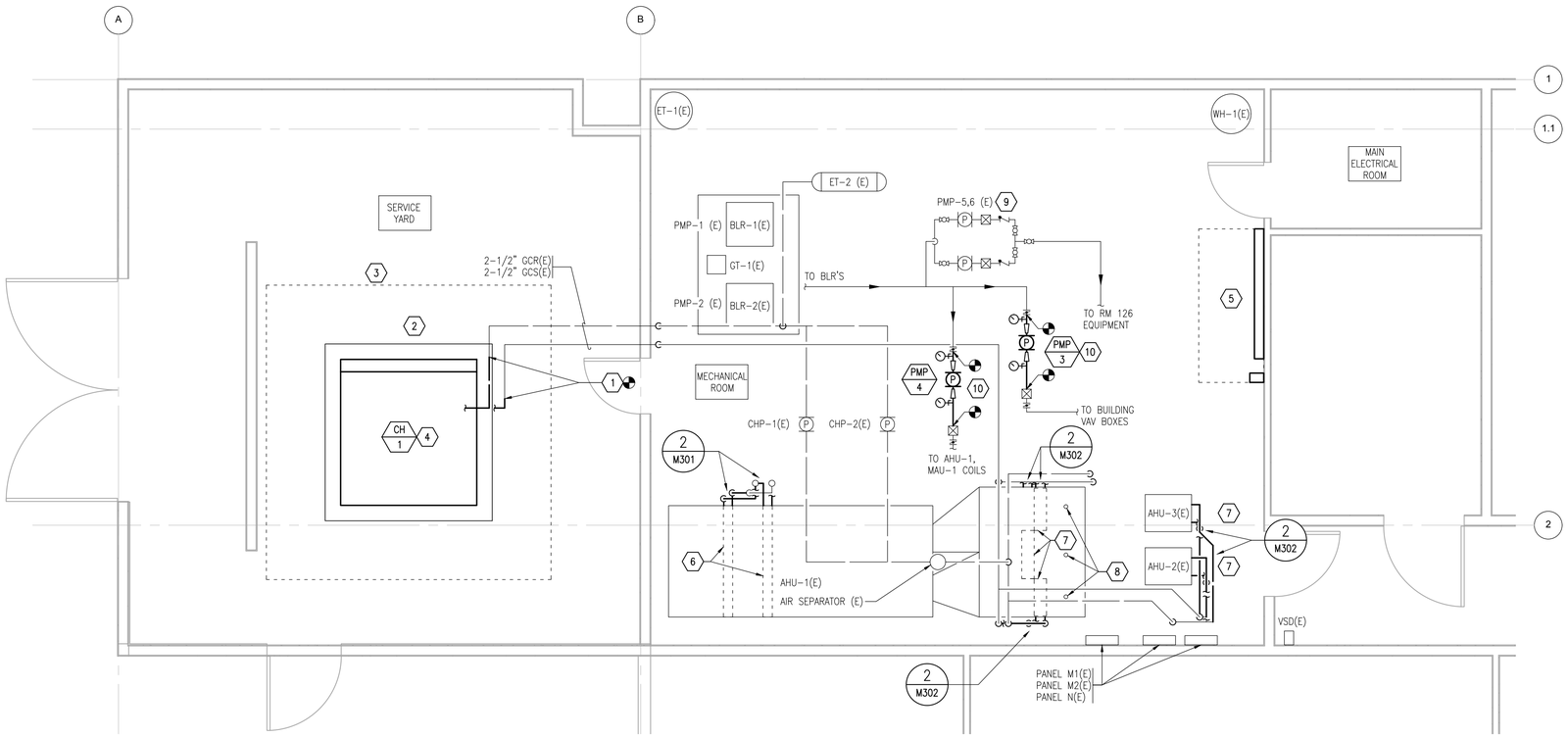
Sheet Contents
FLOOR PLAN – MECHANICAL

Category	Sheet No.
M	201

CONSTRUCTION DOCUMENTS



1 M202 ENLARGED FLOOR PLAN - MECHANICAL

SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'

GENERAL NOTES

1. EXISTING CONDITIONS ARE BASED ON A LIMITED SITE VISIT AND AS-BUILT DRAWINGS DATED 07/13/1984 AND REMODEL PROJECT DRAWINGS DATED 04/30/2015. CONTRACTOR TO CONDUCT A SITE VISIT PRIOR TO BID SUBMISSION IN ORDER TO BECOME COMPLETELY FAMILIARIZED WITH SCOPE OF WORK. REPORT DISCREPANCIES TO OWNER BEFORE DISTURBING EXISTING CONDITIONS.
2. UPON COMPLETION OF PIPING WORK, CLEAN AND FLUSH CHILLED WATER PIPING. FILL SYSTEM WITH GLYCOL PER SPECIFICATIONS.
3. SEE COOLING COIL DIAGRAMS 1/M301 AND 2/M301 FOR EXTENT OF DEMOLITION AND NEW WORK.
4. UPON COMPLETION OF CONTROL VALVE WORK ON THE HEATING SYSTEM, CLEAN AND FLUSH HEATING PIPING. FILL SYSTEM WITH GLYCOL PER SPECIFICATIONS.
5. PROVIDE NEW BAS CONTROLS FOR APPROXIMATELY 8 COOLING AND HEATING COILS, AHU-1, THE HEATING SYSTEM (INTERFACING WITH PACKAGED CONTORLS), THE CHILLED WATER SYSTEM (INTERFACING WITH PACKAGED CONTROLS), 1 RETURN/RELIEF FAN, TO INCLUDE ALL CONTROL DAMPER AND VALVE ACTUATORS. FIELD VERIFY QUANTITIES.

SHEET NOTES (#)

1. CONNECT GCS / GCR PIPING TO EXISTING PIPING. PROVIDE ISOLATION VALVE AND FLEXIBLE CONNECTOR ON EACH PIPE AND A STRAINER ON THE GCR PIPE.
2. ENLARGE EXISTING HOUSEKEEPING PAD TO ACCOMMODATE CH-1. PAD TO BE 10 INCHES LARGER ALL AROUND THAN THE FOOTPRINT OF CH-1.
3. IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS, PROVIDE MINIMUM 4 FEET OF CLEARANCE ALL AROUND CH-1.
4. PROVIDE A BACNET IP CARD FOR CH-1. CONNECT CH-1 TO BUILDING AUTOMATION SYSTEM.
5. LOCATION FOR BUILDING AUTOMATION SYSTEM CONTROL PANELS, WITH 3 FEET OF CLEARANCE IN FRONT OF THE PANELS. LOCATE NEW BAS PANELS ON THIS WALL.
6. CLEANING HEATING COIL.
7. CLEANING COOLING COIL.
8. PROVIDE PLUG FOR COOLING COIL DRAIN PAN.
9. PROVIDE LEAD/LAG CONTROL SEQUENCES FOR EXISTING PUMPS, PMP-5,6.
10. BID ALTERNATE #1 WORK: REPLACE PUMP, PIPE AND FITTINGS AS INDICATED.

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Revisions		
No.	Description	Date

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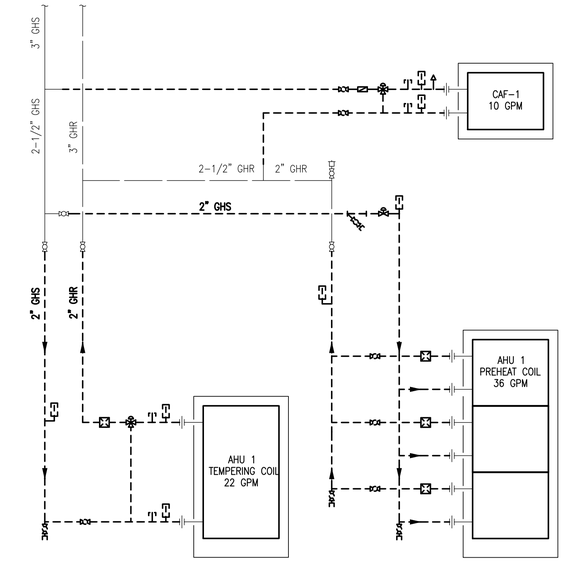
Sheet Contents
ENLARGED FLOOR PLAN – MECHANICAL

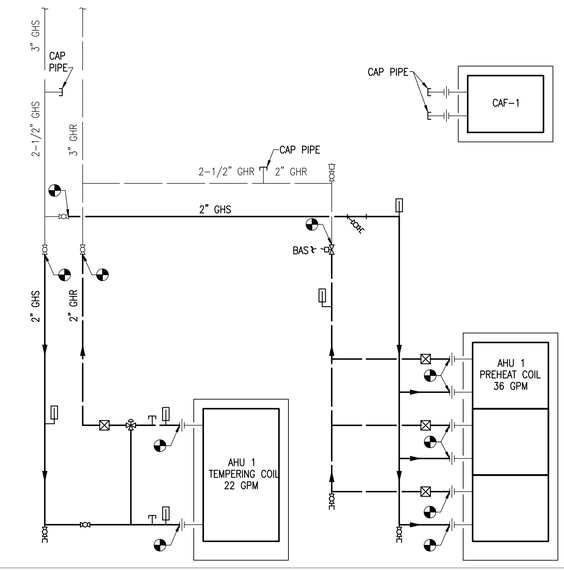
Category	Sheet No.
M	202

CONSTRUCTION DOCUMENTS



1 DIAGRAM - AHU 1 COILS - DEMOLITION

M301 SCALE: NONE



2 DIAGRAM - AHU 1 COILS - REVISED

M301 SCALE: NONE

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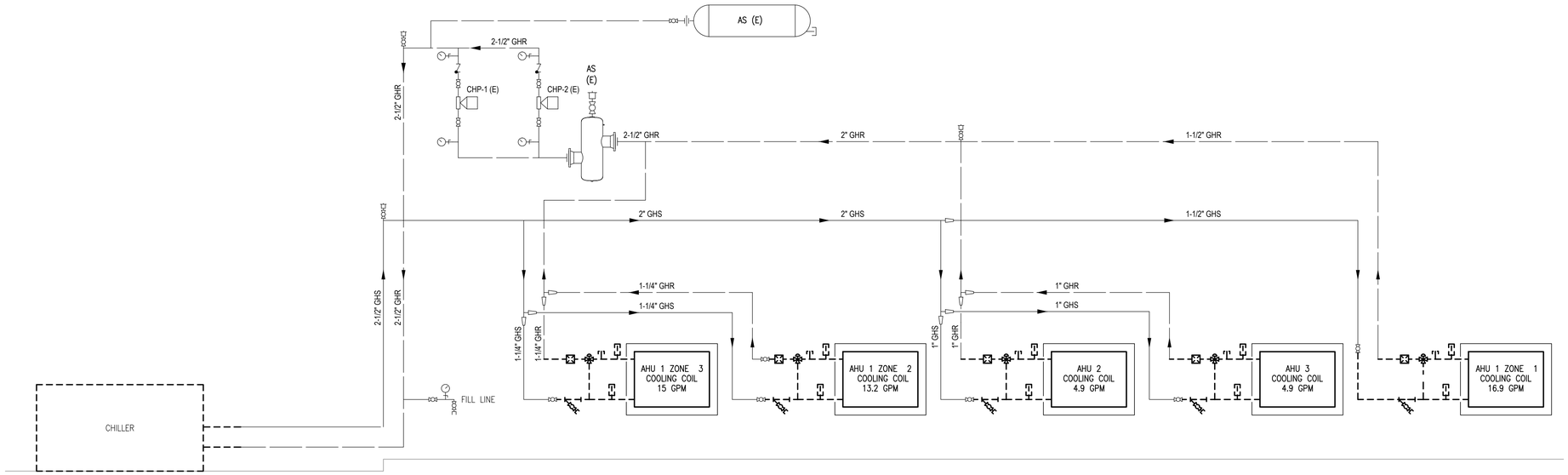
Sheet Contents
DIAGRAMS – AHU 1

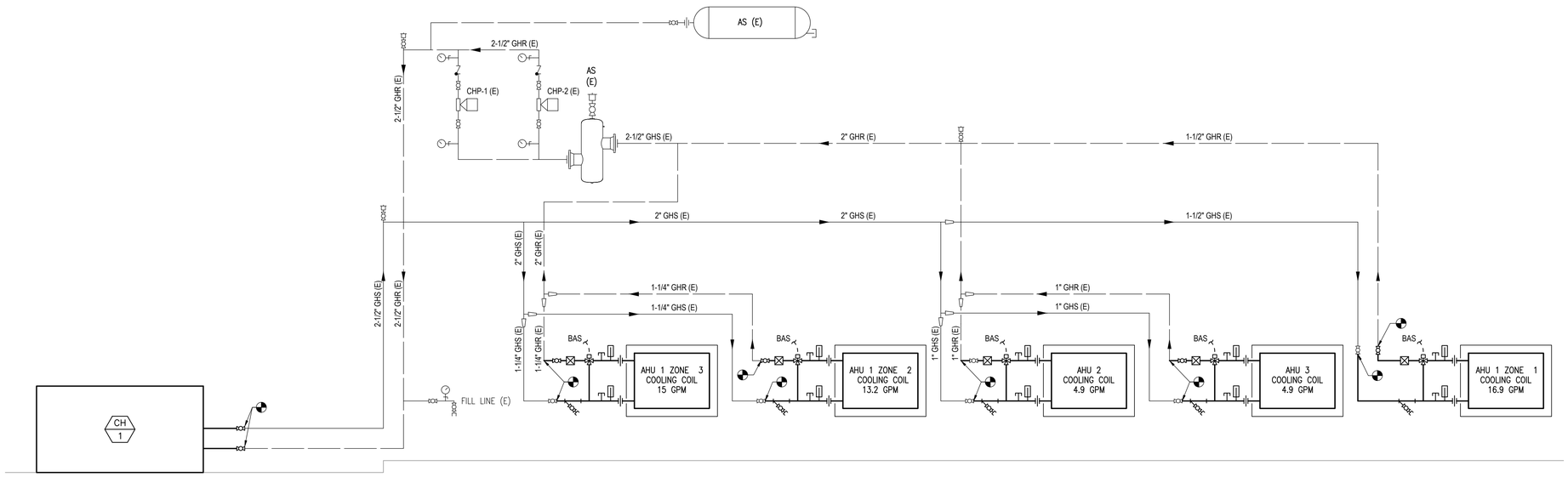
CONSTRUCTION DOCUMENTS

Category	Sheet No.
M	301



1 DIAGRAM - CHILLED WATER SYSTEM - DEMOLITION

M302 SCALE: NONE



2 DIAGRAM - CHILLED WATER SYSTEM - REVISED

M302 SCALE: NONE

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Sheet Contents
DIAGRAMS – CHILLER

Category	Sheet No.
M	302

CONSTRUCTION DOCUMENTS

GENERAL

SYMBOL	DESCRIPTION
1 / 2.	SHEET NOTE CONVENTION: REFERENCED SHEET NOTE GENERAL SHEET NOTE
#	FEEDER IDENTIFICATION TAG FEEDER NUMBER
1 / E0.1	DETAIL REFERENCE DETAIL NUMBER SHEET WHERE DETAIL APPEARS
A / E0.1	SECTION REFERENCE SECTION LETTER SHEET WHERE SECTION APPEARS
	LINE WORK CONVENTION: NEW OR REINSTALLED ITEM ITEM TO BE DEMOLISHED EXISTING ITEM TO REMAIN FUTURE ITEM EXISTING ITEM TO BE RELOCATED
	CONDUIT/FEEDER LINE CONVENTION: CONCEALED UNDERGROUND OR CONCEALED IN FLOOR EXPOSED FLEXIBLE CONDUIT
P–1,3	CIRCUITING CONVENTION CIRCUIT NUMBER(S) PANEL
	BRANCH CIRCUIT HOMERUN TO PANELBOARD NUMBER OF MARKS INDICATE NUMBER OF CONDUCTORS IN RACEWAY, NOT COUNTING GROUNDING CONDUCTORS. (ABSENCE OF MARKS INDICATE TWO CONDUCTORS, PLUS REQUIRED GROUNDS) NUMBER OF ARROWS INDICATE NUMBER OF CIRCUITS UNSWITCHED CONDUCTORS SHOWN ON HOMERUN SIDE OF NEUTRAL NEUTRAL SWITCHED CONDUCTORS SHOWN ON LOAD SIDE OF NEUTRAL

ABBREVIATIONS

ABI	ALASKA BUREAU OF INVESTIGATION
ACS	ACCESS CONTROL SYSTEM
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AL	ALUMINUM
APPROX	APPROXIMATE
AHJ	AUTHORITY HAVING JURISDICTION
BAS	BUILDING AUTOMATION SYSTEM
CKT	CIRCUIT
CCTV	CLOSED CIRCUIT TELEVISION
CMH	COMMUNICATIONS MANHOLE
C.	CONDUIT
C.O.	CONDUIT ONLY
CU	COPPER
(D)	DEMOLISH
DEMO	DEMOLISH
DB	DECIBEL
ECM	ELECTRONICALLY COMMUTATED MOTOR
EL	EMERGENCY LIGHT
ELU	EMERGENCY LIGHTING UNIT
ENL	EMERGENCY NIGHT LIGHT
(E)	EXISTING
(F)	FUTURE
FAA	FIRE ALARM ANNUNCIATOR
FACP	FIRE ALARM CONTROL PANEL
FO	FIBER OPTIC
FOPP	FIBER OPTIC PATCH PANEL
FSD	FIRE/SMOKE DAMPER
HZ	FREQUENCY
HP	HORSEPOWER
IAW	IN ACCORDANCE WITH
K	KELVIN
KVA	KILO VOLT–AMPS
KW	KILOWATT
LCP	LIGHTING CONTROL PANEL
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CONTROL PANEL
MDS	MAIN DISTRIBUTION SWITCHBOARD
MIN	MINIMUM
MM	MULTIMODE FIBER OPTIC CABLE
MTR	MAIN TELECOM ROOM
NEC	NATIONAL ELECTRICAL CODE
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NL	NIGHT LIGHT
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
N/A	NOT APPLICABLE
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
OFC	OPTICAL FIBER CABLE
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
PA	PUBLIC ADDRESS
PDU	POWER DISTRIBUTION UNITS
PH	PHASE (ELECTRICAL)
PLC	PROGRAMMABLE LOGIC CONTROLLER
PMCS	POWER MONITORING CONTROL SYSTEM
SM	SINGLEMODE FIBER OPTIC CABLE
SMR	SURFACE MOUNTED RACEWAY
SPD	SURGE PROTECTIVE DEVICE
TELECOM	TELECOMMUNICATION
TR	TELECOMMUNICATION ROOM
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
VR	VANDAL RESISTANT
VSD	VARIABLE SPEED DRIVE
VAC	VOLTS (ALTERNATING CURRENT)
VDC	VOLTS (DIRECT CURRENT)
V	VOLTS OR VOLTAGE
W	WATT
WP	WEATHERPROOF
WG	WIRE GUARD

POWER

SYMBOL	DESCRIPTION
	RECEPTACLE MOUNTING: RECEPTACLE – WALL MOUNTED (SEE "RECEPTACLE TYPES" BELOW)
	RECEPTACLE TYPES: DUPLEX RECEPTACLE
	GROUND FAULT INTERRUPTER, DUPLEX RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE
	GROUND FAULT INTERRUPTER, DOUBLE DUPLEX RECEPTACLE
	ELECTRICAL DEVICES: SPECIAL PURPOSE RECEPTACLE, NEMA TYPE AS NOTED
	MOTOR
$T	SWITCH – THERMAL TRIP WITH HEATER
	FUSED DISCONNECT
	NON–FUSED DISCONNECT
	COMBINATION STARTER/FUSED DISCONNECT
	STARTER OR CONTACTOR
J	JUNCTION BOX AND/OR CONNECTION TO EQUIPMENT
M	METERING DEVICE
VSD	VARIABLE SPEED DRIVE
PB	PUSHBUTTON – SPECIAL
	PUSHBUTTON (1 BUTTON)
	PUSHBUTTON (2 BUTTON)
	PUSHBUTTON (3 BUTTON)
	PANEL – SURFACE MOUNTED
	PANEL – FLUSH MOUNTED
	TRANSFORMER
R	RELAY
G	GROUND FAULT RELAY

SPECIAL SYSTEMS

SYMBOL	DESCRIPTION
◁2	TELECOMMUNICATION OUTLET – WALL MOUNTED (X DENOTES NUMBER OF PORTS)

NOTE: THIS IS A STANDARD LEGEND. NOT ALL SYMBOLS NECESSARILY APPEAR ON THE DRAWINGS

ELECTRICAL DRAWING INDEX

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Sheet Contents
LEGEND AND SCHEDULES

Category	Sheet No.
E	001

CONSTRUCTION DOCUMENTS

PLOT DATE: 3/14/2023 4:21 PM

M2 (EXISTING PANEL)

LOCATION: MECHANICAL ROOM 146
FED FROM: MDS
MOUNTING: SURFACE
VOLTS: 208/120 Wye
PHASES: 3
WIRES: 4
A.I.C. RATING: 10,000
MAINS TYPE: LUGS
RATING: 225A

CKT#	CIRCUIT DESCRIPTION	AMP	POLE	VA–PHASE A		VA–PHASE B		VA–PHASE C		POLE	AMP	CIRCUIT DESCRIPTION	CKT#
1	SPACE				937					3	20	CHP–1 (2 HP)	2
3	SPACE						937			––	––	––	4
5	SPACE								937	––	––	––	6
7	**PMP–3 (3/4 HP)(NOTE 1,2)**	**20**	**2**	**790**	937					3	20	CHP–2 (2 HP)	8
9	––	––	––			**790**	937			––	––	––	10
11	**SPACE**								937	––	––	––	12
13	**SPACE (NOTE 1)**				937					3	20	CAF–1 (2 HP)	14
15	**SPACE**						937			––	––	––	16
17	**SPACE**								937	––	––	––	18
19	**PMP–4 (3/4 HP)(NOTE 1,2)**	**20**	**2**	**790**									20
21	––	––	––			**790**							22
23	**SPACE**												24
25	**SPACE (NOTE 1)**												26
27	**SPACE**												28
29	**SPACE**												30
31	OUTLET NECROPSY TABLE #1	20	1	180									32
33	DISPOSAL NECROPSY TABLE #1	20	1			1200							34
35	DISPOSAL NECROPSY TABLE #2	20	1					1200					36
37	OUTLET NECROPSY TABLE #2	20	1	180									38
39	SPACE												40
41	SPACE												42

PANEL		PHASE A	PHASE B	PHASE C
	LOAD	**4.8** kVA	**5.6** kVA	**4.0** kVA
	AMPS	**40** A	**47** A	33 A

LOAD TYPE	CONNECTED LOAD	DEMAND FACTOR	TOTAL LOAD WITH NEC FACTORS
CONTINUOUS	0 VA	125%	0
LIGHTING	0 VA	100%	0
MOTOR	**11592** VA	106%	**12294**
NON–CONTINUOUS	0 VA	100%	0
RECEPTACLE	2760 VA	100%	2760
LOAD TYPE	0 VA	55%	0

PANEL TOTALS	
TOTAL CONNECTED LOAD:	**14.4** kVA
TOTAL NEC LOAD:	**15.1** kVA
TOTAL CONNECTED AMPS:	**39.8** A
TOTAL NEC AMPS:	**41.8** A

NOTES:
1. BID ALTERNATE #1: REMOVE EXISTING 20A/3P CIRCUIT BREAKERS.
2. BID ALTERNATE #1: PROVIDE NEW 20A/2P CIRCUIT BREAKER IN SPACE MADE AVAILABLE BY REMOVAL OF CIRCUIT BREAKERS IN NOTE 1 AND CONNECT TO LOAD.
EXISTING LOADS ARE BASED ON AS–BUILT DRAWINGS AND LIMITED FIELD OBSERVATION.
REVISED ITEMS IN BOLD

MDS - NEC 220.87 ELECTRICAL SERVICE CALCULATION

EXISTING ELECTRICAL LOAD IS CALCULATED IN ACCORDANCE WITH NEC 220.87 FOR DETERMINING EXISTING LOADS. NEW LOADS ARE CALCULATED IN ACCORDANCE WITH APPLICABLE PROVISIONS OF THE NEC.

SYSTEM PARAMETERS

VOLTAGE:	208	VOLTS
PHASE:	3	PHASE
CAPACITY (AMPS):	1000	AMPS

EXISTING LOAD

PEAK DEMAND kW:	70.0	kW (FROM UTILITY DEMAND HISTORY)
POWER FACTOR:	0.90	(ESTIMATED)
PEAK DEMAND kVA:	77.7	kVA
NEC kVA:	97.2	NEC kVA (125% PEAK kVA PER 220.87(2))

ITEMIZED DEMOLISHED LOADS

	QUAN	VA PER UNIT	N.E.C. FACTOR	kVA LOAD
EXISTING CHILLER	1	60525	1.25	75.7
EXISTING PMP–3A	1	1581	1.25	2.0
EXISTING PMP–3B	1	1581	1.25	2.0
EXISTING PMP–4B	1	1581	1.25	2.0
EXISTING PMP–4B	1	1581	1.25	2.0
EXISTING AC–1	1	3991	1.25	5.0
TOTAL DEMOLISHED LOAD:				75.7

ITEMIZED NEW LOADS

	QUAN	VA PER UNIT	N.E.C. FACTOR	kVA LOAD
CH–1	1	58723	1.25	73.4
PMP–3	1	1581	1.25	2.0
PMP–4	1	1581	1.25	2.0
TOTAL NEW LOAD:				73.4

CALCULATED TOTAL LOAD

EXISTING LOAD:	97.2	kVA
TOTAL DEMOLISHED LOAD:	–75.7	kVA
TOTAL NEW LOAD:	73.4	kVA
TOTAL LOAD:	94.9	kVA
TOTAL LOAD AMPS:	263	AMPS

SYSTEM SPARE CAPACITY

SYSTEM CAPACITY:	1000	AMPS
CALCULATED TOTAL LOAD:	263	AMPS
SPARE CAPACITY:	73.7%	

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Sheet Contents
SCHEDULES

Category	Sheet No.
E	002

CONSTRUCTION DOCUMENTS

PLOT DATE: 3/14/2023 4:21 PM

GENERAL NOTES

1. EQUIPMENT AND DEVICES ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.

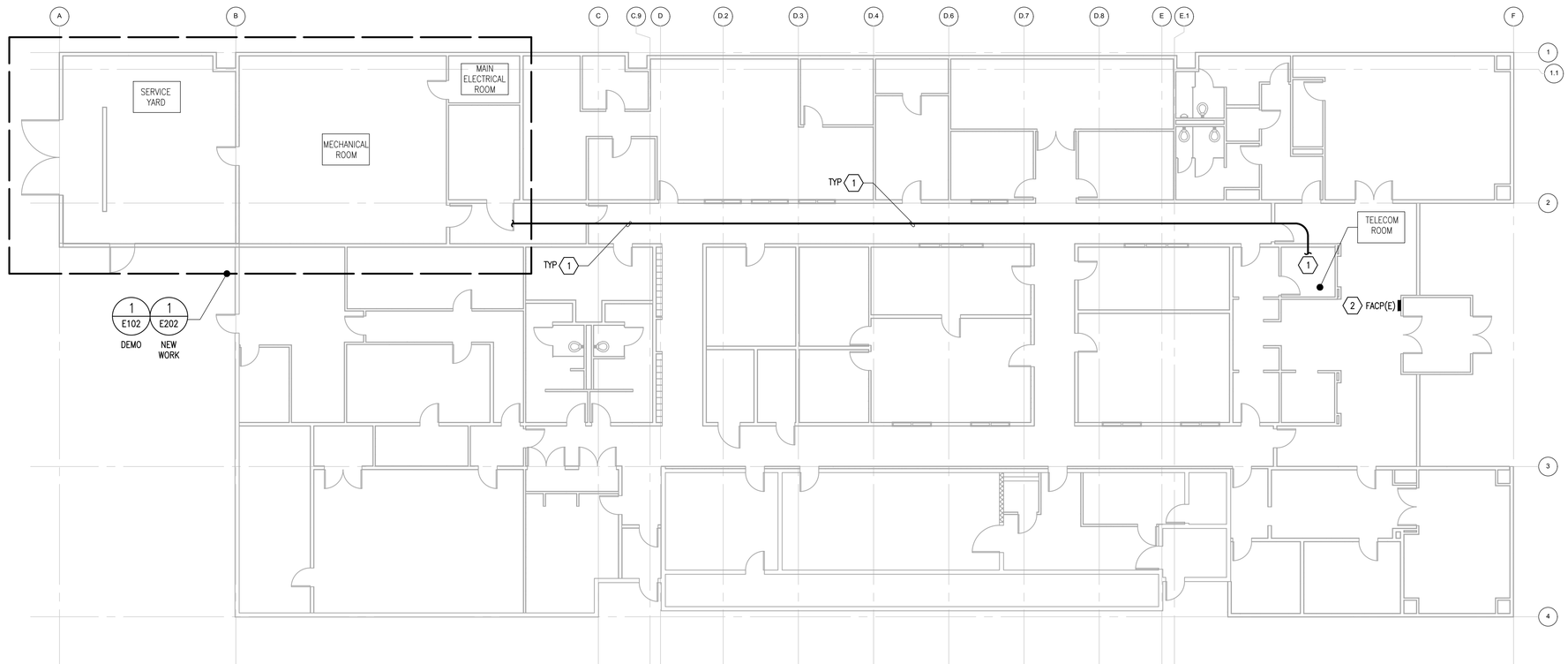
SHEET NOTES (#)

(1) PROVIDE 1 INCH CONDUIT FOR ROUTING OF TELECOM CABLES PROVIDED IAW SHEET NOTE 9 ON SHEET E202. REMOVE EXISTING CEILING TILES AND ROUTE CONDUIT CONCEALED ABOVE SUSPENDED CEILING TO THE BUILDING TELECOM ROOM. TERMINATE CABLES ON EXISTING SPARE TELECOMMUNICATION PATCH PANEL PORTS IN EXISTING TELECOM ROOM AND TEST IN ACCORDANCE WITH ANSI/TIA 586 STANDARDS.

(2) AS PART OF THE BUILDING WIDE PNEUMATIC CONTROL SYSTEM REPLACEMENT WITH A DDC SYSTEM, PROVIDE INPUTS FROM THE EXISTING FIRE ALARM SYSTEM TO THE DDC SYSTEM TO MONITOR:

FIRE ALARM SYSTEM ALARM CONDITION
FIRE ALARM SYSTEM TROUBLE CONDITION

COORDINATE SPECIFIC REQUIREMENTS WITH THE DIVISION 25 CONTRACTOR AND SPECIFICATION SECTIONS 25 50 00 AND 25 90 00.



1 E101 OVERALL PLAN - ELECTRICAL

SCALE: 3/32" = 1'-0"

0 4' 8' 16' 24'

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OVERALL PLAN – ELECTRICAL

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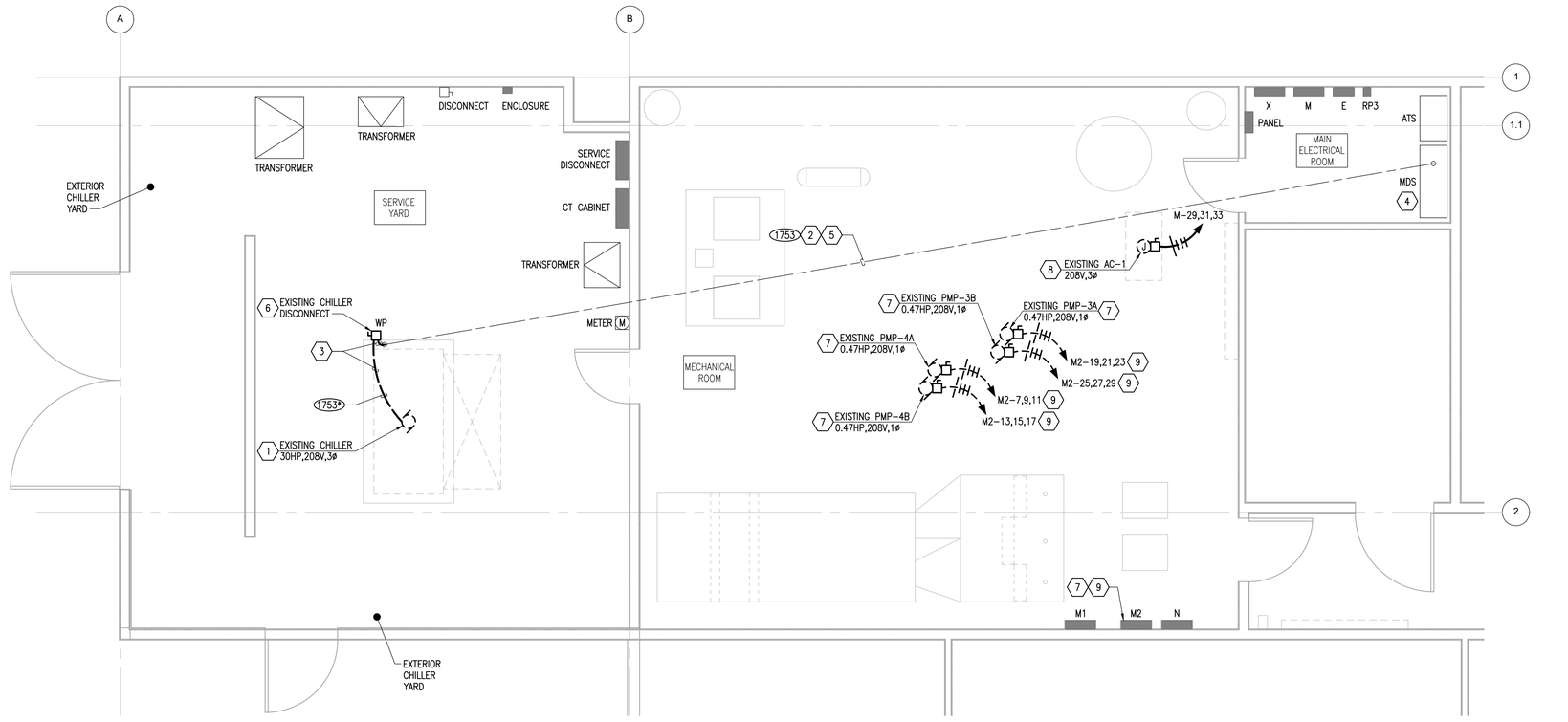
E	101

CONSTRUCTION DOCUMENTS



1 ENLARGED DEMOLITION PLAN - ELECTRICAL

E102 SCALE: 1/4" = 1'-0"

GENERAL NOTES

1. EQUIPMENT AND DEVICES ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
2. PROTECT EXISTING 2" CONDUIT STUB UP REFERRED TO IN SHEET NOTE 2 FOR REUSE IAW SHEET E202.
3. REFER TO SHEET E401 FOR FEEDER SCHEDULE.

SHEET NOTES (#)

1. DEMOLISH EXISTING ELECTRICAL CONNECTION TO EXISTING CHILLER DEMOLISHED UNDER DIVISION 22.
2. EXISTING 2 INCH UNDER SLAB FEEDER CONDUIT BETWEEN EXISTING CHILLER AND EXISTING MDS.
3. DEMOLISH EXISTING FLEXIBLE METAL CONDUIT BETWEEN UNDERSLAB CONDUIT STUB UP AND CHILLER DISCONNECT AND BETWEEN CHILLER DISCONNECT AND CHILLER MOTOR.
4. DEMOLISH EXISTING 150A/3P, MOTOR OPERATED CIRCUIT BREAKER (THERE ARE NO MOTOR OPERATOR CONTROL WIRES) IN EXISTING MDS IN ACCORDANCE WITH THE ONE-LINE DIAGRAM ON SHEET E401.
5. DEMOLISH EXISTING FEEDER CONDUCTORS BETWEEN EXISTING CHILLER CIRCUIT BREAKER IN MDS AND EXISTING CHILLER DISCONNECT.
6. DEMOLISH EXISTING CHILLER DISCONNECT.
7. BID ALTERNATE #1: DEMOLISH EXISTING DUPLEX HEATING WATER CIRCULATION PUMP, DISCONNECT, AND FEEDERS BACK TO PANEL M2 AS SHOWN. DEMOLISH EXISTING 3ø CIRCUIT BREAKER CONNECTED TO 1ø PUMP.
8. DEMOLISH FEEDER FROM COMPRESSOR TO EXISTING PANEL M.
9. 3-#12 AWG CONDUCTORS ARE CONNECTED TO 3-PHASE CIRCUIT BREAKERS IN EXISTING PANEL M2, BUT ONLY TWO (2) LINE VOLTAGE CONDUCTORS ARE USED FOR POWER.

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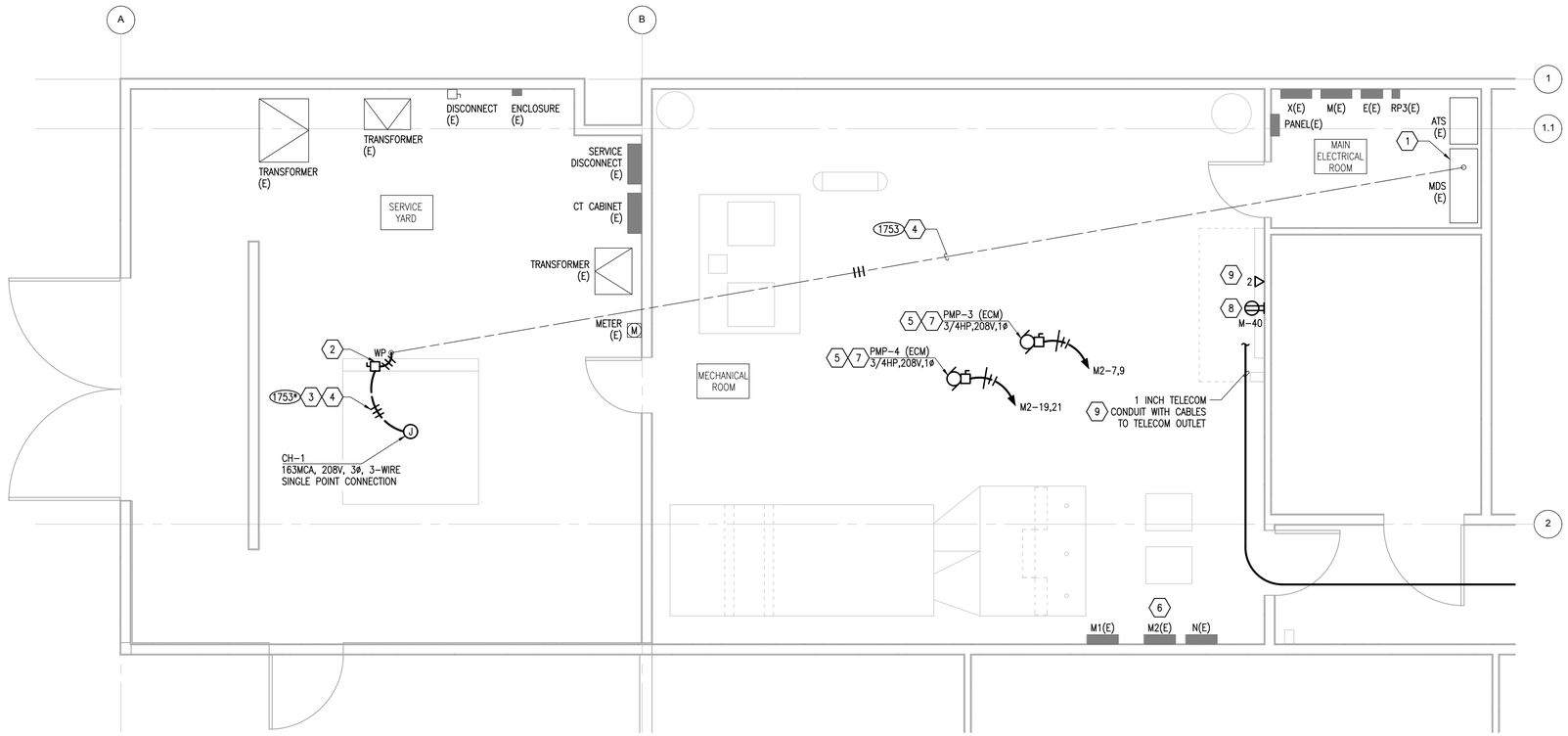
Sheet Contents: ENLARGED DEMOLITION PLAN – ELECTRICAL

Category	Sheet No.
E	102

CONSTRUCTION DOCUMENTS



1 E202 ENLARGED FLOOR PLAN - ELECTRICAL

SCALE: 1/4" = 1'-0"

0 2' 4' 8' 12'

GENERAL NOTES

1. EQUIPMENT AND DEVICES ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.

SHEET NOTES (#)

1. PROVIDE CIRCUIT BREAKER TO FEED NEW CHILLER PROVIDED UNDER DIVISION 22. REFER TO THE ONE-LINE DIAGRAM ON SHEET E401 FOR ADDITIONAL INFORMATION.
2. PROVIDE NEMA 3R DISCONNECT FOR CHILLER PROVIDED UNDER DIVISION 22.
3. PROVIDE COLD TEMPERATURE, LIQUID TIGHT, FLEXIBLE METAL CONDUIT CONNECTION BETWEEN DISCONNECT AND CHILLER PROVIDED UNDER DIVISION 22.
4. PROVIDE FEEDER CONDUCTORS BETWEEN CIRCUIT BREAKER PROVIDED IN ACCORDANCE WITH SHEET NOTE 1, THE CHILLER DISCONNECT PROVIDED IN ACCORDANCE WITH SHEET NOTE 2, AND THE CHILLER ITSELF PROVIDED UNDER DIVISION 22. ROUTE CONDUCTORS VIA EXISTING IN SLAB CONDUIT AND CONDUIT PROVIDED IN ACCORDANCE WITH SHEET NOTE 3.
5. BID ALTERNATE #1: PROVIDE CONNECTIONS TO ECM MOTOR, DISCONNECT, AND FEEDER TO PANEL M2.
6. BID ALTERNATE #1: PROVIDE CIRCUIT BREAKERS IN EXISTING PANEL M2 IAW SHEET NOTE 6 ON SHEET E401.
7. BID ALTERNATE #1: EXISTING DISCONNECTS ARE CURRENTLY MOUNTED HIGH NEAR THE CEILING. FABRICATE UNISTRUT SUPPORT STRUCTURE TO MOUNT NEW DISCONNECT TO SUCH THAT THEY ARE CONVENIENTLY ACCESSIBLE FROM FLOOR LEVEL. SUBMIT SHOP DRAWING FOR APPROVAL PRIOR TO CONSTRUCTION.
8. PROVIDE DUPLEX RECEPTACLE ADJACENT TO BAS CABINET. CONNECT TO CIRCUIT NOTED. PROVIDE SOLA-HD CLARIFY 560 DOUBLE CONVERSION UPS WITH BACKUP BATTERY TO PROVIDE UNINTERRUPTIBLE POWER FOR BAS CONTROL PANEL. COORDINATE SPECIFIC REQUIREMENTS WITH THE BAS SYSTEM CONTRACTOR.
9. PROVIDE TELECOM OUTLET WITH THE NUMBER OF JACKS INDICATED FOR USE BY THE BUILDING AUTOMATIC SYSTEM (BAS). PROVIDE 2 CATEGORY 5E RATED CABLES FROM TELECOM JACKS TO BUILDING TELECOM ROOM VIA 1 INCH CONDUIT. REFER TO SHEET E101 FOR LOCATION OF TELECOM ROOM AND FOR OTHER INFORMATION.

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03/14/2023
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ALASKA STATE TROOPERS
ABI BUILDING CHILLER REPLACEMENT
5500 EAST TUDOR ROAD

Revisions		
No.	Description	Date

Drawn by: MPL	Date: 03/17/23
Checked: KAC	Job No.: 22072.01

Sheet Contents
ENLARGED FLOOR PLAN – ELECTRICAL

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E	202

CONSTRUCTION DOCUMENTS

PLOT DATE: 3/14/2023 4:22 PM

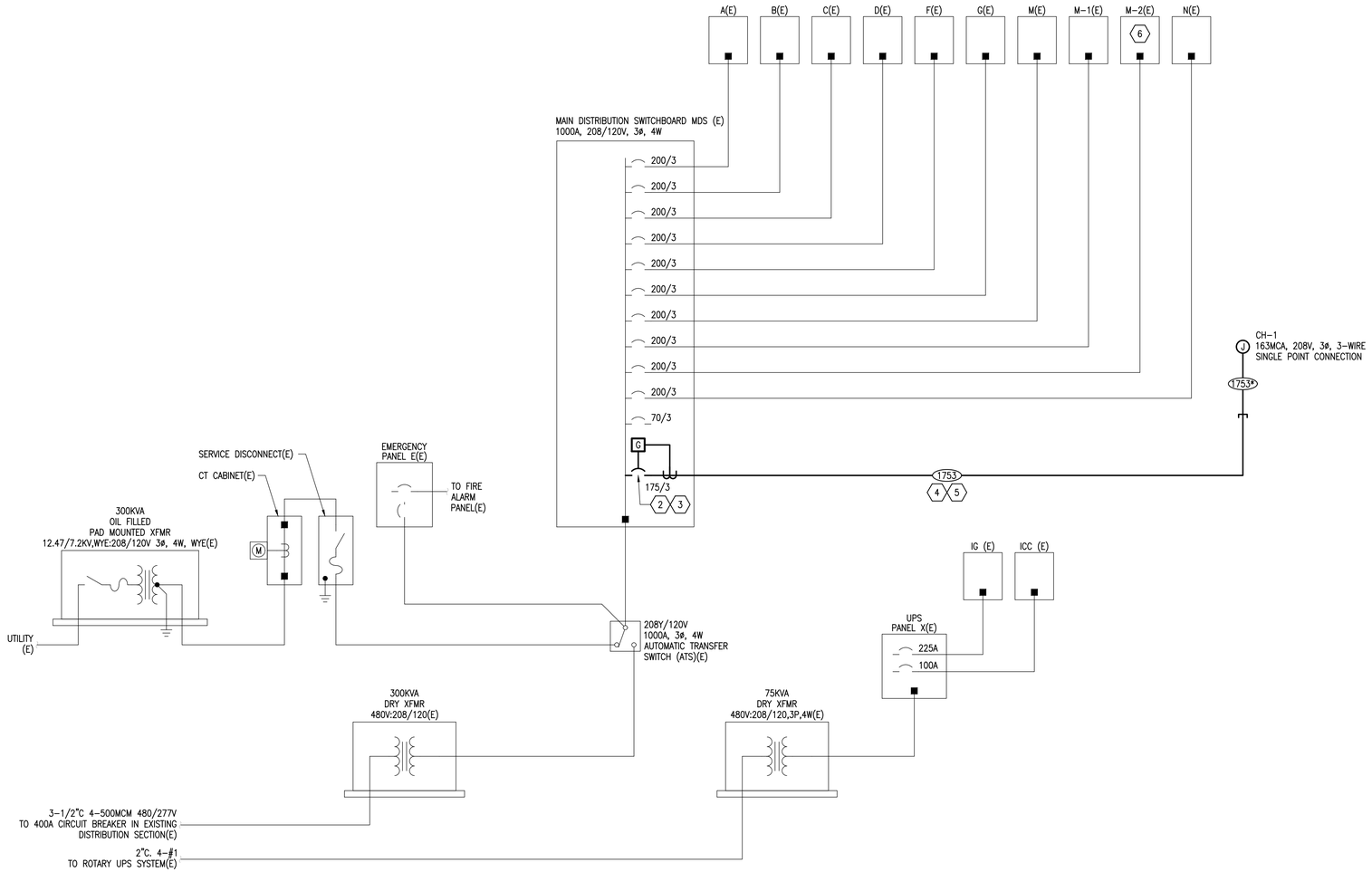
SHEET NOTES

1. DEVICES AND EQUIPMENT ARE EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
2. REMOVE EXISTING 150A/3P, MOTOR OPERATED, CIRCUIT BREAKER FROM MDS TO MAKE ROOM FOR INSTALLATION OF CIRCUIT BREAKER PROVIDED IN ACCORDANCE WITH SHEET NOTE 3.
3. PROVIDE 175A/3P CIRCUIT BREAKER WITH INTEGRAL GROUND FAULT PROTECTION IN ACCORDANCE WITH SPECIFICATION SECTION 26 28 00 IN SPACE MADE AVAILABLE BY REMOVAL OF EXISTING CIRCUIT BREAKER PER SHEET NOTE 2.
4. REMOVE EXISTING 3–#1 AWG XHHW CABLES FROM EXISTING BELOW SLAB CONDUIT FROM MDS TO EXTERIOR CONDUIT PENETRATION IN THE SERVICE YARD.
5. PROVIDE NEW FEEDER CONDUCTORS IN EXISTING BELOW SLAB CONDUIT FROM EXISTING MDS TO WHERE THE CONDUITS DAYLIGHT FROM UNDER SLAB IN THE SERVICE YARD IAW E202.
6. BID ALTERNATE #1: PROVIDE 2–20A/2P CIRCUIT BREAKERS FOR PMP–3 AND PMP–4. CONNECT TO CIRCUITS AS SHOWN ON E202.
7. EXISTING SWITCHBOARD MDS IS A SQUARE D, POWER–STYLE SWITCHBOARD, 1,000 AMP, 208Y/120V, 3–PHASE, 4–WIRE MAIN DISTRIBUTION PANEL. CATALOG NUMBER 47–31873–1.
8. EXISTING BRANCH PANEL M2 IS A SQUARE D, TYPE NQOB, 225 AMP, 208Y/120V, 3–PHASE, 4–WIRE BRANCH CIRCUIT PANEL. CATALOG NUMBER NQOB–42438–2, SERIES E1.

FEEDER SCHEDULE

(1753) 2"C. (E), 3–#2/0 + 1–#6 GRND.

(1753*) 2" COLD TEMP. LIQUID TIGHT C., 3–#2/0 + 1–#6 GRND.



1 E401 DIAGRAM – POWER ONE–LINE

SCALE: NONE

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Sheet Contents: DIAGRAMS

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CONSTRUCTION DOCUMENTS