STATE OF ALASKA
INVITATION TO BID (ITB)

SHELDON JACKSON MUSEUM HVAC UPGRADES

ITB **2526S023**

ISSUED 10/03/2025

THIS INVITATION TO BID (ITB) IS INTENDED TO RESULT IN THE PURCHASE AND DELIVERY OF HVAC EQUIPMENT TO THE SHELDON JACKSON MUSEUM IN SITKA, ALASKA.

IMPORTANT NOTICE: 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 if you desire to receive notification of subsequent amendments to the solicitation.

BIDDER'S NOTICE: By signature on this form, the bidder certifies that they comply with the following:

(1) the bidder has a valid Alaska business license or will obtain one prior to award of any contract resulting from this ITB. If the bidder possesses a valid Alaska business license, the license number must be written below or one the following forms of evidence must be submitted with the bid:
- a canceled check for the business license fee;
- a copy of the business license application with a receipt date stamp from the State's business license office;
- a receipt from the State's business license office for the license fee;
- a copy of the bidder's valid business license;
- a sworn notarized affidavit that the bidder has applied and paid for a business license;

(2) the price(s) submitted was arrived at independently and without collusion, under penalty of perjury, and that the bidder is complying with:
- the laws of the State of Alaska;
- the applicable portion of the Federal Civil Rights Act of 1964;
- the Equal Employment Opportunity Act and the regulations issued thereunder by the state and federal government;
- the Americans with Disabilities Act of 1990 and the regulations issued thereunder by the state and federal government;
- the bid will remain open and valid for at least 90 days;
- all terms and conditions set out in this Invitation to Bid (ITB).

If a bidder does not hold an Alaska Business License (1) at the time designated in the ITB for opening the state will disallow the Alaska Bidder Preference. Bids must also be submitted under the name as appearing on the bidder's current Alaska business license in order to receive the Alaska Bidder Preference. If a bidder fails to comply with (2) of this paragraph, the state may reject the bid, terminate the contract, or consider the contractor in default.

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES	
DIVISION OF STATEWIDE PUBLIC FACILITIES	COMPANY SUBMITTING BID
Signed by: 0EE5FA1D9E024FD...	AUTHORIZED SIGNATURE
PROCUREMENT OFFICER:	
ERIK SHOOK	PRINTED NAME
PHONE: **(907) 465-5852**	
EMAIL: **ERIK.SHOOK@ALASKA.GOV**	DATE

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SECTION 1. INTRODUCTION & INSTRUCTIONS

SEC. 1.01 PURPOSE OF THE ITB

The Department of Transportation and Public Facilities, Division of Statewide Public Facilities, is soliciting bids for HVAC equipment to be delivered to the Sheldon Museum in Sitka, Alaska, to facilitate upgrades to the HVAC system. This ITB is for purchase and delivery only and does not include any labor associated with installation. Delivery must be completed prior to December 31, 2025.

SEC. 1.02 BUDGET

Department of Transportation and Public Facilities, Division of Statewide Public Facilities, estimates a budget of between $60,000 and $99,999 dollars for this contract. Bids priced at more than $99,999 will be considered non-responsive and will be rejected.

SEC. 1.03 DEADLINE FOR RECEIPT OF BIDS

Bids must be received no later than 2:00PM Alaska Time on October 13, 2025, at which time they will be publicly opened. Late bids or amendments will be considered non-responsive and will not be opened or accepted for evaluation.

SEC. 1.04 PRIOR EXPERIENCE

No specific minimums have been set for this ITB.

SEC. 1.05 REQUIRED REVIEW

Bidders shall carefully review this ITB for defects and questionable or objectionable material. Comments concerning defects and questionable or objectionable material in the ITB should be made in writing and received by the procurement officer before the deadline for receipt of bids. This will allow time for an amendment to be issued if one is required. It will also help prevent the opening of a defective bid, upon which award cannot be made, and the resultant exposure of bidders' prices.

SEC. 1.06 QUESTIONS PRIOR TO DEADLINE FOR RECEIPT OF BIDS

All questions must be in writing and directed to the procurement officer. The interested party must confirm telephone conversations in writing. Two types of questions generally arise. One may be answered by directing the questioner to a specific section of the ITB. These questions may be answered over the telephone. Other questions may be more complex and may require a written amendment to the ITB. The procurement officer will make that decision.

SEC. 1.07 RETURN INSTRUCTIONS

Bidders may submit bids electronically or in hard copy. If submitting via hard copy, the bidder must submit one hard copy of their entire bid, in writing, to the procurement officer in a sealed package. The sealed bid package must be addressed as follows:

Department of Transportation & Public Facilities
Division of Statewide Contracting and Procurement
Attention: Erik Shook
Invitation to Bid (ITB) Number: 2526S023
ITB Title: Sheldon Jackson Museum HVAC Upgrades
PO Box 112500
3132 Channel Drive, Room 350
Juneau, Alaska 99811-2500

If using a delivery service, please use the following address:

Department of Transportation & Public Facilities
Division of Statewide Contracting and Procurement
Attention: Erik Shook
Invitation to Bid (ITB) Number: 2526S023
3132 Channel Drive, Room 350
Juneau, Alaska 99801

If submitting your bid via email, the entire bid may be emailed to dotstatewideprocurement@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. Like 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 bids.

It is the bidder's responsibility to contact the issuing agency at 907-465-5852 to confirm that the entire bid has been received. The state is not responsible for unreadable, corrupt, or missing attachments.

SEC. 1.08 ASSISTANCE TO BIDDERS WITH A DISABILITY

The State of Alaska complies with Title II of the Americans with Disabilities Act of 1990. Individuals with disabilities who may need auxiliary aids, services, and/or special modifications to submit a bid should contact the Procurement Officer no later than ten days prior to the closing of the bid to make any necessary arrangements.

SEC. 1.09 AMENDMENTS TO BIDS

Amendments to or withdrawals of bids will only be allowed if acceptable requests are received prior to the deadline that is set for receipt of bids, in accordance with 2 AAC 12.140. No amendments or withdrawals will be accepted after the deadline unless the delay is due to an error of the contracting agency, in accordance with 2 AAC 12.160.

SEC. 1.10 AMENDMENTS TO THE ITB

If an amendment is issued before the deadline for receipt of bids, the amendment will be posted on the State of Alaska Online Public Notice (OPN) website. The link to the posting of the amendment will be provided to all who were notified of the ITB and to those who have registered with the procurement officer after receiving the ITB from the OPN.

SEC. 1.11 ITB SCHEDULE

The ITB schedule below represents the State of Alaska's best estimate of the schedule that will be followed. If a component of this schedule, such as the deadline for receipt of bids, is delayed, the rest of the schedule may be shifted accordingly. All times are Alaska Standard Time (AST).

ACTIVITY	TIME	DATE
Issue Date / ITB Released		October 03, 2025
Deadline for Receipt of Bids / Bid Due Date	2:00 PM AK	October 13, 2025
Bid Evaluations Complete		October 20, 2025
Notice of Intent to Award		October 20, 2025
Contract Issued		October 30, 2025

This ITB does not, by itself, obligate the state. The state's obligation will commence when the contract is approved by the Commissioner of the Department of Transportation & Public Facilities (DOT&PF), or the Commissioner's designee. Upon written notice to the contractor, the state may set a different starting date for the contract. The state will not be responsible for any work done by the contractor, even work done in good faith, if it occurs prior to the contract start date set by the state.

SEC. 1.12 ALTERNATE BIDS

Bidders may only submit one bid for evaluation. In accordance with 2 AAC 12.830 alternate bids (bids that offer something different than what is asked for) will be rejected.

SEC. 1.13 SUPPORTING INFORMATION

Provided a bid meets the requirements for a definite, firm, unqualified, and unconditional offer, the state reserves the right to request supplemental information from the bidder, after the bids have been opened, to ensure that the products or services offered completely meet the ITB requirements. The requirement for such supplemental information will be at the reasonable discretion of the state and may include the requirement that a bidder will provide a sample product(s) so that the state can make a first-hand examination and determination.

A bidder's failure to provide this supplemental information or the product sample(s), within the time set by the state, may cause the state to consider the offer non-responsive and reject the bid.

SEC. 1.14 FIRM, UNQUALIFIED, AND UNCONDITIONAL OFFER

To be responsive a bid must constitute a definite, firm, unqualified and unconditional offer to meet all the material terms of the ITB. Material terms are those that could affect the price, quantity, quality, or delivery. Also included as material terms are those which are clearly identified in the ITB, and which must be complied with at risk of bid rejection for non-responsiveness.

SECTION 2. SCOPE OF WORK AND CONTRACT INFORMATION

SEC. 2.01 SCOPE OF WORK

The Contractor will deliver the listed parts, or state approved equivalents, in the quantities listed in the following table. They will be delivered to 120 Jarvis St, Unit E, Sitka AK 99835.

Qty	Model	Description	Tag
Outdoor Unit			
1	TURYE3843BN41AN	NewR410A R2 Series Outdoor Unit	OU-1
Branch Controller			
1	TCMBM1016KA21N4	BC Controller Main	MCU-1
16	BV38BBSI	Ball Valve 3/8"	
16	BV58BBSI	Ball Vavle 5/8"	
Indoor Units			
1	TPEFYP018MA145A	Ceiling-Concealed (Ducted) Indoor Unit	FCU-1
1	TPLFYP018EM142A	Ceiling-Cassette (Four-Way) Indoor Unit	IU-1
1	TPLFYP024EM142A	Ceiling-Cassette (Four-Way) Indoor Unit	IU-2
1	PAC-LV60AC-1	LEV Kit 60kBTU	DX-1
2	PAC-LV120AC-1	LEV Kit 120kBTU	DX-2,DX-3
1	PAC-LV24AC-1	LEV Kit 24kBTU	DX-4
Controls			
7	TAR-42MAAUB	MA remote controller	
4	PAC-AH001-1	LEV Kit AHU Controller	
Accessories			
2	PAC-PH03EHYU-E1	Panel Heater	
2	SGN-2	Front or Rear Snow/Hail Guard	
1	SGN-4	Side Snow/Hail Guard	
2	SGN-5	Rear Snow/Hail Guard	
4	SHK-1	Snow Hood	
2	CMY-R160-J1	Joint Pipe	OU-1,OU-1
1	CMY-R300NCBK	Twinning Kit	OU-1
2	TLP-41EAEU	Grille with 3D i-see Sensor™	IU-1,IU-2
1	CMY-R304S-G1	Reducer	MCU-1

SEC. 2.02 CONTRACT TERM

The length of the contract will be from the date of award, approximately October 30, 2025. This is a one-time purchase contract. It is fulfilled once the items are delivered.

SEC. 2.03 CONTRACT TYPE

This contract is a Firm-Fixed contract.

SEC. 2.04 PAYMENT FOR STATE PURCHASES

No payment will be made until the contract is approved by the Commissioner of the Department of Transportation & Public Facilities (DOT&PF) or the Commissioner's designee. Under no conditions will the state be liable for the payment of any interest charges associated with the cost of the contract. The state is not responsible for and will not pay local, state, or federal taxes. All costs associated with the contract must be stated in U.S. currency.

Payment for agreements under $500,000 for the undisputed purchase of goods or services provided to a state agency, will be made within 30 days of the receipt of a proper billing or the delivery of the goods or services to the location(s) specified in the agreement, whichever is later. A late payment is subject to 1.5% interest per month on the unpaid balance. Interest will not be paid if there is a dispute or if there is an agreement that establishes a lower interest rate or precludes the charging of interest.

SEC. 2.05 ELECTRONIC PAYMENTS

The State of Alaska prefers vendors receive payment via Electronic Funds Transfer (EFT). Bidders may review information concerning the EFT process and access the Electronic Payment Agreement Form for Vendors at the following link: https://doa.alaska.gov/dof/vendor.html. Method of payment is not a factor in the State's determination for award.

Any single contract payments of $1 million or higher must be accepted by the contractor via Electronic Funds Transfer (EFT).

SEC. 2.06 CONTRACT ADMINISTRATION

The administration of this contract is the responsibility of the procurement officer or person appointed by the Department of Transportation & Public Facilities, Division of Statewide Public Facilities.

SEC. 2.07 CONTRACT PERFORMANCE LOCATION

By signature on their bid, the bidder certifies that all services provided under this contract by the contractor and all subcontractors shall be performed in the United States.

If the bidder cannot certify that all work will be performed in the United States, the bidder must contact the procurement officer in writing to request a waiver at least 10 days prior to the deadline for receipt of bids.

The request must include a detailed description of the portion of work that will be performed outside the United States, where, by whom, and the reason the waiver is necessary.

Failure to comply with these requirements may cause the state to reject the bid as non-responsive or cancel the contract.

SEC. 2.08 THIRD-PARTY FINANCING AGREEMENTS NOT ALLOWED

Third-party financing agreements will not be permitted under the resulting contract.

SEC. 2.09 SUBCONTRACTORS

Subcontractors will not be allowed.

SEC. 2.10 JOINT VENTURES

Joint ventures will not be allowed.

SEC. 2.11 F.O.B. POINT

The F.O.B. point for all items purchased under this contract is the final destination of 120 Jarvis St, Unit E, Sitka AK 99835. Ownership of and title to the ordered items remains with the contractor until the items have been delivered to their final destination and are accepted by the state.

The cost of shipping and delivery is to be included in the bid price.

SEC. 2.12 INSPECTION & MODIFICATION - REIMBURSEMENT FOR UNACCEPTABLE DELIVERABLES

The contractor is responsible for providing all products or the completion of all work set out in the contract. All products or work is subject to inspection, evaluation, and approval by the state. The state may employ all reasonable means to ensure that the work is progressing and being performed in compliance with the contract. The state may instruct the contractor to make corrections or modifications if needed in order to accomplish the contract's intent. The contractor will not unreasonably withhold such changes.

Substantial failure of the contractor to perform the contract may cause the state to terminate the contract. In this event, the state may require the contractor to reimburse monies paid (based on the identified portion of unacceptable products or work received) and may seek associated damages.

SEC. 2.13 EQUIPMENT INSPECTION

Equipment offered (including for lease) may be subject to inspection and approval by the state prior to the award of the ITB. The equipment and attachments must be in good repair and capable of performing the work for which they were designed.

SEC. 2.14 DISCONTINUED ITEMS

In the event an item is discontinued by the manufacturer during the life of the contract, another item may be substituted, provided that the procurement officer makes a written determination that it is equal to or better than the discontinued item and provided that it is sold at the same price or less than the discontinued item.

SEC. 2.15 SHIPPING DAMAGE

The state will not accept or pay for damaged goods. The contractor must file all claims against the carrier(s) for damages incurred to items in transit from the point of origin to the ultimate destination. The state will provide the contractor with written notice when damaged goods are received. The state will deduct the cost of the damaged goods from the invoice prior to payment. The contractor must file all claims against the carrier(s) for reimbursement of the loss.

SEC. 2.16 CONTRACT CHANGES – UNANTICIPATED AMENDMENTS

During the course of this contract, the contractor may be required to perform additional work. That work will be within the general scope of the initial contract. When additional work is required, the state will provide the contractor a written description of the additional work and request the contractor to submit a firm time schedule for accomplishing the additional work and a firm price for the additional work. Cost and pricing data must be provided to justify the cost of such amendments per AS 36.30.400.

The contractor will not commence additional work until the procurement officer has secured required state approvals necessary and issued a written contract amendment.

SEC. 2.17 CONTINUING OBLIGATION OF CONTRACTOR

Notwithstanding the expiration date of a contract resulting from this ITB, the contractor is obligated to fulfill its responsibilities until warranty, guarantee, maintenance, and parts availability requirements have completely expired.

SEC. 2.18 BILLING INSTRUCTIONS

All invoices produced by the contractor must contain the following information at a minimum:

1. One invoice per order.
2. Invoices must clearly identify the Purchase Order, Location, Lot number, item description, quantity, unit price, total extended price and shipping price. Shipping costs must be a separate line item on the invoice and must match the certified copies of, or actual shipping invoice(s).

Invoices must be billed to the ordering agency's address shown on the individual Purchase Order, Contract Award or Delivery Order. The state will make payment after it receives the goods or services and the invoice. Questions concerning payment must be addressed to the ordering agency.

SEC. 2.19 ESTIMATED QUANTITIES

The quantities referenced in this ITB are estimated requirements and may vary more or less from the quantities actually purchased. The State does not guarantee any minimum or maximum purchase. Orders will be issued throughout the contract period on an as-needed basis.

SEC. 2.20 WARRANTY

The contractor warrants every unit purchased against faulty materials and workmanship for a minimum period of at least one year. If, during this period, faults develop with the unit or components of the unit, they will be repaired or replaced without any cost, including any transportation or freight cost, to the state. Bids, which include supplemental warranties, will be accepted, but supplemental warranties that conflict with or diminish the state's rights under this warranty clause will be considered null and void. The state is not responsible for identifying conflicting warranty conditions before issuing a contract award. After award of the contract:

1. if a conflict arises between the supplemental warranty and the warranty in this ITB, the warranty in the ITB will prevail; and

2. if the state's rights are diminished as a result of application of the supplemental warranty, the supplemental warranty will be considered null and void and the ITB warranty will prevail.

By signature on the face page of this ITB the bidder acknowledges this requirement and indicates unconditional acceptance of this warranty clause.

SEC. 2.21 INDEMNIFICATION

The contractor shall indemnify, hold harmless, and defend the contracting agency from and against any claim of, or liability for error, omission or negligent act of the contractor under this agreement. The contractor shall not be required to indemnify the contracting agency for a claim of, or liability for, the independent negligence of the contracting agency. If there is a claim of, or liability for, the joint negligent error or omission of the contractor and the independent negligence of the contracting agency, the indemnification and hold harmless obligation shall be apportioned on a comparative fault basis.

“Contractor” and “contracting agency”, as used within this and the following article, include the employees, agents and other contractors who are directly responsible, respectively, to each. The term “independent negligence” is negligence other than in the contracting agency’s selection, administration, monitoring, or controlling of the contractor and in approving or accepting the contractor’s work.

SEC. 2.22 INSURANCE

Without limiting the contractor's indemnification, it is agreed that the contractor shall purchase at its own expense and maintain in force at all times during the performance of services under this agreement the following policies of insurance. Where specific limits are shown, it is understood that they shall be the minimum acceptable limits. If the contractor's policy contains higher limits, the state shall be entitled to coverage to the extent of such higher limits.

Certificates of Insurance must be furnished to the procurement officer prior to contract approval and must provide for a notice of cancellation, non-renewal, or material change of conditions in accordance with policy provisions. Failure to furnish satisfactory evidence of insurance or lapse of the policy is a material breach of this contract and shall be grounds for termination of the contractor's services. All insurance policies shall comply with and be issued by insurers licensed to transact the business of insurance under AS 21.

Proof of insurance is required for the following:

- Workers' Compensation Insurance: The contractor shall provide and maintain, for all employees engaged in work under this contract, coverage as required by AS 23.30.045, and where applicable, any other statutory obligations including but not limited to Federal U.S.L. & H. and Jones Act requirements. The policy must waive subrogation against the state.

- Commercial General Liability Insurance: covering all business premises and operations used by the contractor in the performance of services under this agreement with minimum coverage limits of $300,000 combined single limit per occurrence.

- Commercial Automobile Liability Insurance: covering all vehicles used by the contractor in the performance of services under this agreement with minimum coverage limits of $300,000 combined single limit per occurrence.

SECTION 3. BID FORMAT AND CONTENT

SEC. 3.01 BID FORMS

Bidders shall use the front page of this ITB, the Bid Submission Cover Sheet, and any other forms identified in this ITB for submitting bids. All bids must be signed by an individual authorized to bind the bidder to the provisions of the ITB.

BIDDER'S CERTIFICATION

By signature on the bid, the bidder certifies that they comply with the following:

A. the laws of the State of Alaska;

B. the applicable portion of the Federal Civil Rights Act of 1964;

C. the Equal Employment Opportunity Act and the regulations issued thereunder by the state and federal government;

D. the Americans with Disabilities Act of 1990 and the regulations issued thereunder by the state and federal government and certifies that programs, services, and activities provided to the general public on behalf of the State under a contract resulting from this solicitation comply with the Americans with Disabilities Act of 1990, 28 CFR, Part 35, Subpart B 35.130;

E. all terms and conditions set out in this ITB;

F. the price(s) submitted was arrived at independently arrived and without collusion, under penalty of perjury; and

G. that the bid will remain open and valid for at least 90 days.

If any bidder fails to comply with [a] through [g] of this paragraph, the state reserves the right to disregard the bid, terminate the contract, or consider the contractor in default.

CONFLICT OF INTEREST

Each bid shall include a statement indicating whether the company or any individuals working on the contract has a possible conflict of interest (e.g., currently employed by the State of Alaska or formerly employed by the State of Alaska within the past two years) and, if so, the nature of that conflict. The procurement officer reserves the right to **consider a bid non-responsive and reject it** or cancel the award if any interest disclosed from any source could either give the appearance of a conflict or cause speculation as to the objectivity of the contract to be performed by the bidder.

SEC. 3.02 PRICES

The bidder shall state prices in the units of issue on this ITB. Prices quoted in bids must be exclusive of federal, state, and local taxes. If the bidder believes that certain taxes are payable by the state, the bidder may list such taxes separately, directly below the bid price for the affected item.

SECTION 4. EVALUATION AND CONTRACTOR SELECTION

SEC. 4.01 EVALUATION OF BIDS

After bid opening, the procurement officer will evaluate the bids for responsiveness. Bids deemed non-responsive will be eliminated from further consideration. An evaluation may not be based on discrimination due the race, religion, color, national origin, sex, age, marital status, pregnancy, parenthood, disability, or political affiliation of the bidder.

SEC. 4.02 APPLICATION OF PREFERENCES

Certain preferences apply to all state contracts, regardless of their dollar value. The Alaska Bidder and Alaska Veteran preferences are the most common preferences involved in the ITB process. Additional preferences that may apply to this procurement are listed below. Guides that contain excerpts from the relevant statutes and codes, explain when the preferences apply and provide examples of how to calculate the preferences are available at the following website:

https://oppm.doa.alaska.gov/policy-oversight/policy-resources/user-guide-matrixes/

- Alaska Military Skills Program Preference – AS 36.30.321(l)
- Alaska Products Preference - AS 36.30.332
- Recycled Products Preference - AS 36.30.337
- Local Agriculture and Fisheries Products Preference - AS 36.15.050
- Employment Program Preference - AS 36.30.321(b)
- Alaskans with Disabilities Preference - AS 36.30.321(d)

The Division of Vocational Rehabilitation in the Department of Labor and Workforce Development keeps a list of qualified employment programs and individuals who qualify as persons with a disability. As evidence of a business' or an individual's right to the Employment Program or Alaskans with Disabilities preferences, the Division of Vocational Rehabilitation will issue a certification letter. To take advantage of these preferences, a business or individual must be on the appropriate Division of Vocational Rehabilitation list prior to the time designated for receipt of proposals. Bidders must attach a copy of their certification letter to the proposal. **A bidder's failure to provide this certification letter with their proposal will cause the state to disallow the preference**.

SEC. 4.03 ALASKA BIDDER PREFERENCE

An Alaska Bidder Preference of 5% will be applied to the total bid price. The preference will be given to a bidder who:

1) holds a current Alaska business license prior to the deadline for receipt of bids;
2) submits a bid for goods or services under the name appearing on the bidder's current Alaska business license;
3) 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;
4) 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 (LLC) organized under AS 10.50 and all members are residents of the state, or is a partnership under AS 32.06 or AS 32.11 and all partners are residents of the state; and
5) if a joint venture, is composed entirely of ventures that qualify under (1)-(4) of this subsection.

Alaska Bidder Preference Certification Form

To receive the Alaska Bidder Preference, the bid must include the Alaska Bidder Preference Certification Form attached to this ITB. A bidder does not need to complete the Alaska Veteran Preference questions on the form if not claiming the Alaska Veteran Preference. A bidder's failure to provide this completed form with their bid will cause the state to disallow the preference.

SEC. 4.04 ALASKA VETERAN PREFERENCE

An Alaska Veteran Preference of 5%, not to exceed $5,000, will be applied to the total bid price. The preference will be given to a bidder who qualifies under AS 36.30.990(2) as an Alaska Bidder and is 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.

In accordance with AS 36.30.321(i), the bidder must also add value by actually performing, controlling, managing, and supervising the services provided, or for supplies, the bidder must have sold supplies of the general nature solicited to other state agencies, other government, or the general public.

Alaska Veteran Preference Certification

To receive the Alaska Veteran Preference, the bid must include the Alaska Bidder Preference Certification Form attached to this ITB. A bidder's failure to provide this completed form with their bid will cause the state to disallow the preference.

SEC. 4.05 ALASKA MILITARY SKILLS PROGRAM PREFERENCE

An Alaska Military Skills Program Preference of 2%, not to exceed $5,000, will be applied to the price in the proposal. The preference will be given to an offeror who qualifies under AS 36.30.990(2) as an Alaska bidder and:

a) Employs at least one person who is currently enrolled in, or within the previous two years graduated from, a United States Department of Defense SkillBridge or United States Army career skills program for service members or spouses of service members that offers civilian work experience through specific industry training, pre-apprenticeships, registered apprenticeships, or internships during the last 180 days before a service member separates or retires from the service; or
b) has an active partnership with an entity that employs an apprentice through a program described above.

In accordance with AS 36.30.321(i), the bidder must also add value by actually performing, controlling, managing, and supervising the services provided, or for supplies, the bidder must have sold supplies of the general nature solicited to other state agencies, other government, or the general public.

Alaska Military Skills Program Preference Certification

In order to receive the Alaska Military Skills Program Preference, the bid must include the Alaska Bidder Preference Certification Form attached to this ITB. A bidder's failure to provide this completed form with their bid will cause the state to disallow the preference.

In addition, proof of graduation of the qualifying employee from an eligible program as described in AS 36.30.321(l) must be provided to the Procurement Officer at time of bid submission. Bidders must provide clarification or additional information requested by the Procurement Officer related to the preference not later than 5:00 PM Alaska Time one (1) business day following the date of the request. Failure to provide sufficient documentation will result in the bidder not receiving the Military Skills Program Preference.

SEC. 4.06 ALASKA PRODUCT PREFERENCE

A bidder that designates the use of an Alaska Product which meets the requirements of the ITB specifications and is designated as a Class I, Class II, or Class III Alaska Product by the Department of Community & Economic Development (DCCED) may receive a preference in the bid evaluation in accordance with AS 36.30.332 and 3 AAC 92.010.

To qualify for the preference, the product must have received certification from DCCED, be listed in the current published edition of the Alaska Products Preference List, and the bidder must provide the qualified product on a 100% basis. There are no provisions under Alaska Statutes or Regulations that allow for a product exchanges/substitutions or permit the product to be co-mingled with other products. Rather, AS 36.30.330 provides for a penalty for failing to use the designated Alaska products.

Products are classified in one of three categories:

- Class I products receive a 3% preference.
- Class II products receive a 5% preference.
- Class III products receive a 7% preference.

When the bids are evaluated, the preference percentage will be deducted from the product price. If a bidder fails to specify the brand being offered, no preference will be given. For more information on the Alaska Product Preference and to see the list of products currently on the Alaska Product Preference List, use the following web link:

https://www.commerce.alaska.gov/web/dcra/AlaskaProductPreferenceProgram.aspx

Brand Offered
If offering a product that qualifies for the Alaska Product Preference, the bidder must indicate the brand of product they intent to provide. If a bidder is not offering a product that qualifies for the Alaska Product Preference, the bidder does not need to indicate a product brand.

Brand of Product Changes
During the course of the contract including all renewal options, a contractor that offered a product that qualified for the Alaska Product Preference wishes to change the product brand, the contractor must first provide a written request, along with evidence that the replacement brand also qualifies for the Alaska Product Preference, for approval by the procurement officer. A contract amendment must be issued by the procurement officer to authorize the change.

If a bidder offers a product brand in the original bid that does not qualify for the Alaska Product Preference, a change in the product brand may be made at any time during the course of the contract, including all renewals, as long as the product band continues to meet the required specifications. A contract amendment is not required if the product brand originally offered did not qualify for the Alaska Product Preference.

SEC. 4.07 EMPLOYMENT PROGRAM PREFERENCE

If a bidder qualifies for the Alaska Bidder Preference and is offering goods or services through an employment program as defined under AS 36.30.990(12), an Employment Program Preference of 15% will be applied to the total bid price.

In accordance with AS 36.30.321(i), the bidder must also add value by actually performing, controlling, managing, and supervising the services provided, or for supplies, the bidder must have sold supplies of the general nature solicited to other state agencies, other government, or the general public.

SEC. 4.08 ALASKANS WITH DISABILITIES PREFERENCE

If a bidder qualifies for the Alaska Bidder Preference and is a qualifying entity as defined in AS 36.30.321(d), an Alaskans with Disabilities Preference of 10% will be applied to the total bid price.

In accordance with AS 36.30.321(i), the bidder must also add value by actually performing, controlling, managing, and supervising the services provided, or for supplies, the bidder must have sold supplies of the general nature solicited to other state agencies, other government, or the general public.

SEC. 4.09 PREFERENCE QUALIFICATION LETTER

Regarding the Employment Program Preference and the Alaskans with Disabilities Preference, the Division of Vocational Rehabilitation in the Department of Labor and Workforce Development maintains lists companies who qualify for those preferences. As evidence of a company's right to the preferences, the Division of Vocational Rehabilitation will issue a certification letter. To take advantage of the preferences, a bidder must be on the appropriate Division of Vocational Rehabilitation list at the time the bid is opened and must attach a copy of their certification letter to their bid. The bidder's failure to provide this certification letter with their bid will cause the state to disallow the preference.

SEC. 4.10 EXTENSION OF PRICES

In case of error in the extension of prices in the bid, the unit prices will govern; in a lot bid, the lot prices will govern.

SEC. 4.11 METHOD OF AWARD

Award will be made to the lowest responsive and responsible bidder. To be considered responsive, bidders must bid on all items.

SEC. 4.12 NOTICE OF INTENT TO AWARD

After the responses to this ITB have been opened and evaluated, a tabulation of the bids will be prepared. This tabulation, called a Notice of Intent to Award, serves two purposes. It lists the name of each company or person that offered a bid and the price they bid. It also provides notice of the state's intent to award a contract(s) to the bidder(s) indicated. A copy of the Notice of Intent will be sent to each company or person who responded to the ITB. Bidders identified as the apparent low responsive bidders are instructed not to proceed until a Purchase Order, Contract Award, Lease, or some other form of written notice is given by the procurement officer. A company or person who proceeds prior to receiving a Purchase Order, Contract Award, Lease, or some other form of written notice from the procurement officer does so without a contract and at their own risk.

SECTION 5. GENERAL PROCESS AND LEGAL INFORMATION

SEC. 5.01 ALASKA BUSINESS LICENSE AND OTHER REQUIRED LICENSES

Prior to the award of a contract, a bidder must hold a valid Alaska business license. However, to receive the Alaska Bidder Preference and other related preferences, such as the Alaska Veteran Preference and Alaskans with Disabilities Preference, a bidder must hold a valid Alaska business license prior to the deadline for receipt of bids. Bidders should contact the **Department of Commerce, Community and Economic Development, Division of Corporations, Business, and Professional Licensing, PO Box 110806, Juneau, Alaska 99811-0806**, for information on these licenses. Acceptable evidence that the bidder possesses a valid Alaska business license may consist of any one of the following:

- copy of an Alaska business license,
- certification on the bid that the bidder has a valid Alaska business license and has included the license number in the bid,
- a canceled check for the Alaska business license fee,
- a copy of the Alaska business license application with a receipt stamp from the state's occupational licensing office, or
- a sworn and notarized statement that the bidder has applied and paid for the Alaska business license.

You are not required to hold a valid Alaska business license at the time bids are opened if you possess one of the following licenses and are offering services or supplies under that specific line of business:

- fisheries business licenses issued by Alaska Department of Revenue or Alaska Department of Fish and Game,
- liquor licenses issued by Alaska Department of Revenue for alcohol sales only,
- insurance licenses issued by Alaska Department of Commerce, Community and Economic Development, Division of Insurance, or
- Mining licenses issued by Alaska Department of Revenue.

Prior the deadline for receipt of bids, all bidders must hold any other necessary applicable professional licenses required by Alaska Statute.

SEC. 5.02 AUTHORITY

This ITB is written in accordance with AS 36.30 and 2 AAC 12.

SEC. 5.03 COMPLIANCE

In the performance of a contract that results from this ITB, the contractor must comply with all applicable federal, state, and borough regulations, codes, and laws; be liable for all required insurance, licenses, permits and bonds; and pay all applicable federal, state, and borough taxes.

SEC. 5.04 SUITABLE MATERIALS, ETC.

Unless otherwise specified in this ITB, all materials, supplies or equipment offered by a bidder shall be new, unused, and of the latest edition, version, model, or crop and of recent manufacture.

SEC. 5.05 SPECIFICATIONS

Unless otherwise specified in this ITB, product brand names or model numbers specified in this ITB are examples of the type and quality of product required and are not statements of preference. If the specifications describing an item conflict with a brand name or model number describing the item, the specifications govern. Reference to brand name or number does not preclude an offer of a comparable or better product, if full specifications and descriptive literature are provided for the product. Failure to provide such specifications and descriptive literature may be cause for rejection of the offer.

SEC. 5.06 ORDER DOCUMENTS

Except as specifically allowed under this ITB, an ordering agency will not sign any vendor contract. The state is not bound by a vendor contract signed by a person who is not specifically authorized to sign for the state under this ITB. Unless otherwise specified in this ITB, the State of Alaska Purchase Order, Contract Award and Delivery Order are the only order documents that may be used to place orders against the contract(s) resulting from this ITB.

SEC. 5.07 HUMAN TRAFFICKING

By signature on their bid, the bidder certifies that the bidder is not established and headquartered or incorporated and headquartered in a country recognized as Tier 3 in the most recent United States Department of State's Trafficking in Persons Report.

The most recent United States Department of State's Trafficking in Persons Report can be found at the following website: http://www.state.gov/j/tip/

Failure to comply with this requirement will cause the state to reject the bid as non-responsive or cancel the contract.

SEC. 5.08 RIGHT OF REJECTION

Bidders must comply with all the terms of the ITB, the State Procurement Code (AS 36.30), and all applicable local, state, and federal laws, codes, and regulations. The procurement officer may reject any bid that does not comply with all the material and substantial terms, conditions, and performance requirements of the ITB.

Bidders may not qualify the bid nor restrict the rights of the state. If a bidder does so, the procurement officer may determine the bid to be a non-responsive counteroffer and the bid may be rejected.

Minor informalities that:

- do not affect responsiveness,
- are merely a matter of form or format,

- do not change the relative standing or otherwise prejudice other bidders,
- do not change the meaning or scope of the ITB,
- are trivial, negligible, or immaterial in nature,
- do not reflect a material change in the work, or
- do not constitute a substantial reservation against a requirement or provision,

may be waived by the procurement officer.

The state reserves the right to refrain from making an award if it is determined to be in the state's best interest. **A bid from a debarred or suspended bidder shall be rejected.**

SEC. 5.09 STATE NOT RESPONSIBLE FOR PREPARATION COSTS

The state will not pay any cost associated with the preparation, submittal, presentation, or evaluation of any bid.

SEC. 5.10 DISCLOSURE OF BID CONTENTS

This section governs the ownership, return, and disclosure of any offer or other record a bidder submits in response to this invitation to bid. (Herein, any reference to "Record" includes all such records and the offer; any reference to "Law" includes any federal or State of Alaska (State) law, including any court or administrative order or rule.)

1. All Records belong to the State.
2. The State has sole discretion regarding whether to return any Record. In exercising this discretion, the State will comply with all Laws.
3. Unless a notice of intent to award is issued, the State will, to the extent permitted by Law, consider all Records confidential and not subject to the Alaska Public Records Act (APRA).
4. If, and when a notice of intent to award is issued, the State will consider nonconfidential any Record unless, at the time of submission, the bidder undertook the following protective measures:
    a. marked information confidential;
    b. for any information marked confidential, identified the authority that makes that specific information confidential; and
    c. committed, in writing, to explain in detail, including with affidavits and briefs, why each authority applies in any court or administrative proceeding in which any nondisclosure is challenged.
5. If the bidder did not undertake each protective measure, the State will not consider any information in a Record confidential: the State will disclose the entire Record without any redaction in response to an APRA or other request or, if it chooses, in the absence of a request and the State will disclose the entire Record without notifying the bidder.
6. If the bidder undertook each protective measure, the State will withhold the information marked confidential to the following extent:

a. the State agrees that the Law protects the information; and

b. if the nondisclosure is challenged, the bidder fulfills its commitment to explain, including with affidavits and briefs, how each authority applies to the information marked confidential.

7. The State will only notify a bidder of a request for the Record and of a planned release if the bidder undertook each protective measure, but the State disagrees that the marked information is protected. If there is such a disagreement, then before releasing the Record, the State will, to the extent permitted by Law and practicable, notify the bidder that it will disclose the information unless the bidder convinces the State not to or obtains an order prohibiting disclosure.

SEC. 5.11 ASSIGNMENTS

Per 2 AAC 12.480, the contractor may not transfer or assign any portion of the contract without prior written approval from the procurement officer. Bids that are conditioned upon the state's approval of an assignment will be rejected as non-responsive.

SEC. 5.12 FORCE MAJEURE (IMPOSSIBILITY TO PERFORM)

The parties to a contract resulting from this ITB are not liable for the consequences of any failure to perform, or default in performing, any of its obligations under the contract, if that failure or default is caused by any unforeseeable Force Majeure, beyond the control of, and without the fault or negligence of, the respective party.

For the purposes of this ITB, Force Majeure will mean war (whether declared or not); revolution; invasion; insurrection; riot; civil commotion; sabotage; military or usurped power; lightning; explosion; fire; storm; drought; flood; earthquake; epidemic; quarantine; strikes; acts or restraints of governmental authorities affecting the project or directly or indirectly prohibiting or restricting the furnishing or use of materials or labor required; inability to secure materials, machinery, equipment or labor because of priority, allocation or other regulations of any governmental authorities.

SEC. 5.13 DEFAULT

In case of default by the contractor, for any reason whatsoever, the state may procure the goods or services from another source and hold the contractor responsible for any resulting excess cost and may seek other remedies under law or equity.

SEC. 5.14 DISPUTES

If the contractor has a claim arising in connection with the contract that it cannot resolve with the state by mutual agreement, it shall pursue the claim, if at all, in accordance with the provisions of AS 36.30.620 – AS 36.30.632.

SEC. 5.15 SEVERABILITY

If any provision of the contract or agreement is found to be invalid or declared by a court to be illegal or in conflict with any law, the validity of the remaining terms and provisions will not be affected; and the rights and obligations of the parties will be construed and enforced as if the contract did not contain the particular provision held to be invalid.

SEC. 5.16 CONTRACT CANCELLATION

1) The state reserves the right to cancel the contract at its convenience upon thirty calendar days written notice to the contractor. The state is only liable for payment in accordance with the payment provisions of this contract for supplies or services provide before the effective date termination.

2) By signature on their bid, the bidder certifies that they will not support or participate in a boycott of the State of Israel. Failure to comply with this requirement may cause the state to reject the bid as non-responsive or cancel the contract.

SEC. 5.17 GOVERNING LAW; FORUM SELECTION

A contract resulting from this ITB is governed by the laws of the State of Alaska. To the extent not otherwise governed by Section 5.15 of this ITB, any claim concerning the contract shall be brought only in the Superior Court of the State of Alaska and not elsewhere.

SEC. 5.18 QUALIFIED BIDDERS

Per 2 AAC 12.875, unless provided for otherwise in the ITB, to qualify as a bidder for award of a contract issued under AS 36.30, the bidder must:

1) Add value in the contract by actually performing, controlling, managing, or supervising the services to be provided; or

2) Be in the business of selling and have actually sold on a regular basis the supplies that are the subject of the ITB.

If the bidder leases services or supplies or acts as a broker or agency in providing the services or supplies to meet these requirements, the procurement officer may not accept the bidder as a qualified bidder under AS 36.30.

SEC. 5.19 FEDERALLY IMPOSED TARIFFS

Changes in price (increase or decrease) resulting directly from a new or updated federal tariff, excise tax, or duty, imposed after contract award may be adjusted during the contract period or before delivery into the United States via contract amendment.

- **Notification of Changes:** The contractor must promptly notify the procurement officer in writing of any new, increased, or decreased federal excise tax or duty that may result in either an increase or decrease in the contact price and shall take appropriate action as directed by the procurement officer.

- **After-imposed or Increased Taxes and Duties:** Any federal excise tax or duty for goods or services covered by this contract that was exempted or excluded on the contract award date but later imposed on the contractor during the contract period, as the result of legislative, judicial, or administrative action may result in a price increase provided:

    a) The tax or duty takes effect after the contract award date and isn't otherwise addressed by the contract.

b) The contractor warrants, in writing, that no amount of the newly imposed federal excise tax or duty or rate increase was included in the contract price, as a contingency or otherwise.

- **After-relieved or Decreased Taxes and Duties:** The contract price shall be decreased by the amount of any decrease in federal excise tax or duty for goods or services under the contract, except social security or other employment taxes, that the contractor is required to pay or bear, or does not obtain a refund of, through the contractor's fault, negligence, or failure to follow instructions of the procurement officer.

- **State's Ability to Make Changes:** The state reserves the right to request verification of federal excise tax or duty amounts on goods or services covered by this contract and increase or decrease the contract price accordingly.

- **Price Change Threshold:** No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $250.

SEC. 5.20 PROTEST

AS 36.30.560 provides that an interested party may protest the content of the ITB.

An interested party is defined in 2 AAC 12.990(a) (7) as "an actual or prospective bidder or bidder whose economic interest might be affected substantially and directly by the issuance of a contract solicitation, the award of a contract, or the failure to award a contract."

If an interested party wishes to protest the content of a solicitation, the protest must be received, in writing, by the procurement officer at least ten days prior to the deadline for receipt of bids.

AS 36.30.560 also provides that an interested party may protest the award of a contract or the proposed award of a contract.

If a bidder wishes to protest the award of a contract or the proposed award of a contract, the protest must be received, in writing, by the procurement officer within ten days after the date the Notice of Intent to Award the contract is issued.

A protester must have submitted a bid to have sufficient standing to protest the proposed award of a contract. Protests must include the following information:

- the name, address, and telephone number of the protester,
- the signature of the protester or the protester's representative,
- identification of the contracting agency and the solicitation or contract at issue,
- a detailed statement of the legal and factual grounds of the protest including copies of relevant documents, and
- the form of relief requested.

Protests filed by telex or telegram are not acceptable because they do not contain a signature. Fax copies containing a signature are acceptable.

The procurement officer will issue a written response to the protest. The response will set out the procurement officer's decision and contain the basis of the decision within the statutory time limit in AS 36.30.580. A copy of the decision will be furnished to the protester by certified mail, fax or another method that provides evidence of receipt.

All bidders will be notified of any protest. The review of protests, decisions of the procurement officer, appeals, and hearings, will be conducted in accordance with the State Procurement Code (AS 36.30), Article 8 "Legal and Contractual Remedies."

SECTION 6. ATTACHMENTS

SEC. 6.01 ATTACHMENTS

Attachments:

1) Bid Schedule
2) ITB 2526S023 Bid Submission Cover Sheet
3) Alaska Bidders Preference Certification
4) Appendix B1 Indemnity and Insurance
5) HVAC Replacement Plans
6) HVAC Replacement Select Specs
7) HVAC Replacement Technical Specs

DOCUMENTS REQUIRED AT TIME OF BID OPENING:

A) Completed ITB – Page 1 of this solicitation
B) Bid Schedule – Page 28 of this solicitation
C) Bid Submission Cover Sheet – Attachment 2 of this solicitation
D) Alaska Bidder Preference Certification Form Attachment 3 of this solicitation

DOCUMENTS REQUIRED PRIOR TO AWARD:

A) Current Certificate of Insurance per Section 2.20 of this solicitation
B) Current Alaska Business License per Section 5.01 of this solicitation

ATTACHMENT 1
Bid Submission Cover Sheet

BID SCHEDULE

LOT 1: Sheldon Jackson Museum HVAC Upgrades Parts List
F.O.B. Final Destination: 120 Jarvis St, Unit E, Sitka Alaska 99835

Item No.	Quantity	Unit	Part Number/Name	Unit Price	Shipping Cost By Unit	Extended Price
1)	1	EA	TURYE3843BN41AN/ New R410A R2 Series Outdoor Unit			
2)	1	EA	TCMBM1016KA21N4/ BC Controller Main			
3)	16	EA	BV38BBSI/ Ball Valve 3/8"			
4)	16	EA	BV58BBSI/ Ball Valve 5/8"			
5)	1	EA	TPEFYP018MA145A/ Ceiling-Concealed (Ducted) Indoor Unit			
6)	1	EA	TPLFYP018EM142A/ Ceiling-Cassette (Four-Way) Indoor Unit			
7)	1	EA	TPLFYP024EM142A/ Ceiling-Cassette (Four-Way) Indoor Unit			
8)	1	EA	PAC-LV60AC-1/ LEV Kit 60kBTU			
9)	2	EA	PAC-LV120AC-1/ LEV Kit 120kBTU			
10)	1	EA	PAC-LV24AC-1/ LEV Kit 24kBTU			
11)	7	EA	TAR-42MAAUB/ MA remote controller			
12)	4	EA	PAC-AH001-1/ LEV Kit AHU Controller			
13)	2	EA	PAC-PH03EHYU-E1/ Panel Heater			
14)	2	EA	SGN-2/ Front or Rear Snow/Hail Guard			
15)	1	EA	SGN-4/ Side Snow/Hail Guard			
16)	2	EA	SGN-5/ Rear Snow/Hail Guard			
17)	4	EA	SHK-1/ Snow Hood			

18)	2	EA	CMY-R160-J1/ Joint Pipe			
19)	1	EA	CMY-R300NCBK/ Twinning Kit			
20)	2	EA	TLP-41EAEU/ Grille with 3D i-see Sensor™			
21)	1	EA	CMY-R304S-G1/ Reducer			

Total Price for Lot-1: $_____

Guaranteed Delivery Date _____

Delivery dates of December 31st, 2025 or later will be found non-responsive and rejected.

ATTACHMENT 2
Bid Submission Cover Sheet

PROJECT INFORMATION

ITB NUMBER: 2526S023
PROJECT NAME: ITB 2526S023 Sheldon Jackson Museum HVAC Upgrades

BIDDER INFORMATION

Company Name: _____
Address: _____
Tax ID: _____
Alaska Business License #: _____

CONTACT INFORMATION

Provide contact information for the individual that can be contacted for clarification regarding this bid:

Name _____
Title _____
Address _____
Email _____
Telephone _____

ADDENDA ACKNOWLEDGEMENT

The bidder acknowledges receipt of the following amendments and has incorporated the requirements of such amendments into their bid. Failure to identify and sign for all amendments may subject the bidder to disqualification. The bidder must list all amendments (by number), then initial and date to confirm that you have received and incorporated them into your bid (add more rows as necessary).

Number	Initials & Date

Number	Initials & Date

Number	Initials & Date

CERTIFICATIONS

No	Criteria	Response*
1	The bidder is presently engaged in the business of providing the products and/or services required in this ITB.	☐ YES ☐ NO
2	The bidder confirms that it has the financial strength to provide and/or perform and maintain the services required under this ITB.	☐ YES ☐ NO
3	The bidder accepts the terms and conditions set out in the ITB and agrees not to restrict the rights of the state.	☐ YES ☐ NO
4	The bidder confirms that they can obtain and maintain all necessary insurance as required on this project.	☐ YES ☐ NO
5	The bidder certifies that all services provided under this contract by the contractor and all subcontractors shall be performed in the United States.	☐ YES ☐ NO
6	The bidder is not established and headquartered or incorporated and headquartered, in a country recognized as Tier 3 in the most recent United States Department of State's Trafficking in Persons Report.	☐ YES ☐ NO
7	The bidder complies with the American with Disabilities Act of 1990 and the regulations issued thereunder by the federal government.	☐ YES ☐ NO
8	The bidder complies with the Equal Employment Opportunity Act and the regulations issued thereunder by the federal government.	☐ YES ☐ NO
9	The bidder complies with the applicable portion of the Federal Civil Rights Act of 1964.	☐ YES ☐ NO
10	The bidder can provide (if requested) financial records for the organization for the past three years.	☐ YES ☐ NO
11	The bidder has not had any contracts terminated by the State of Alaska (within the past five years).	☐ YES ☐ NO
12	The bidder certifies that it is not currently debarred, suspended, proposed for debarment, or declared ineligible for award by any public or federal entity.	☐ YES ☐ NO
13	The offeror certifies that they will not support or participate in a boycott of Israel. Failure to comply with this requirement may cause the state to reject the proposal as non-responsive or cancel the contract.	☐ YES ☐ NO
14	The bidder certifies that they do not have any governmental or regulatory action against their organization that might have a bearing on their ability to provide products and/or services to the State.	☐ YES ☐ NO
15	The bidder certifies, within the last five years, they have not been convicted or had judgment rendered against them for: fraud, embezzlement, theft, forgery, bribery, falsification or destruction of records, false statements, or tax evasion.	☐ YES ☐ NO
16	The bidder does not have any judgments, claims, arbitrations or suits pending/outstanding against your company in which an adverse outcome would be material to the company.	☐ YES ☐ NO

17	The bidder is not (now or in the past) been involved in bankruptcy or reorganized proceeding.	☐ YES ☐ NO
18	The bidder certifies they comply with the laws of the State of Alaska.	☐ YES ☐ NO
19	The bidder confirms their bid will remain valid and open for at least 90 days.	☐ YES ☐ NO

** Failure to answer or answering "False" may be grounds for disqualification. For any "False" responses, provide clarification (up to 250 word maximum for each "False" clarification) below* **(add rows as necessary)**.

Number	Clarification

CONFLICT OF INTEREST STATEMENT

Indicate below whether or not the firm or any individuals that will work on the contract has a possible conflict of interest (e.g., currently employed by the State of Alaska or formerly employed by the State of Alaska within the past two years) and, if so, the nature of that conflict. The procurement officer reserves the right to consider a bid non-responsive and reject it or cancel the award if any interest disclosed from any source could either give the appearance of a conflict or cause speculation as to the objectivity services to be provided by the bidder.

Does the bidder, or any individuals that will work on this contract, have a possible conflict of interest? ** Failure to answer may be grounds for disqualification.*	☐ YES ☐ NO

If "Yes", please provide additional information regarding the nature of that conflict:

FEDERAL REQUIREMENTS

Indicate below all known federal requirements that apply to the bid, it's evaluation, or the resulting contract:

ALASKA PREFERENCES

If you wish to claim any Alaska Preferences, please complete the Alaska Bidder Preference Certification Form that follows the below signature section.

SIGNATURE

This bid must be signed by a company officer empowered to bind the company.

Printed Name _____

Title _____

Date _____

Signature _____

ATTACHMENT 3

ALASKA BIDDER PREFERENCE CERTIFICATION FORM
AS 36.30.321 (A) / AS 36.30.990 (2)

Solicitation Number	**ITB 2526S023**
Project Description	**Sheldon Jackson Museum HVAC Upgrades**
Business Name	
Alaska Business License Number	

A signed copy of this form must be included with your bid or proposal no later than the deadline set for receipt of bids or proposals.

If you are submitting a bid or proposal as a **JOINT VENTURE**, all members of the joint venture must complete and submit this form before the deadline set for receipt of bids or proposals. AS 36.30.990(2)(E)

If the procuring agency is unable to verify a response, the preference may not be applied. Knowingly or intentionally making false or misleading statements on this form, whether it succeeds in deceiving or misleading, constitutes misrepresentation per AS 36.30.687 and may result in criminal penalties.

SIGNATURE

By signature below, I certify under penalty of law that I am an authorized representative of the above entity and all information on this form is true and correct to the best of my knowledge.

Printed Name:	
Title:	
Date:	
Signature:	

Alaska Bidder Preference: Do you believe your firm qualifies for the Alaska Bidder Preference?	□ Yes □ No
Alaska Veterans Preference: Do you believe your firm qualifies for the Alaska Veteran Preference?	□ Yes □ No
Alaska Military Skills Program Preference: Do you believe your firm qualifies for the Alaska Military Skills Program Preference?	□ Yes □ No

To qualify for and claim the **Alaska Bidder Preference** you must answer **YES** to all questions in the Alaska Bidder Preference Question section below:

Alaska Bidder Preference Questions

1	Does your business hold a current Alaska business license per AS 36.30.990(2)(A)?	□ Yes □ No
2	Is your business submitting a bid or proposal under the name appearing on the Alaska Business license identified above? Per AS36.30.990 (2)(B)?	□ Yes □ No
3	Has your business maintained a place of business within the state staffed by the bidder or offeror or an employee of the bidder or offeror for a period of six months immediately preceding the date of the bid or proposal per AS 36.30.990 (2)(C)?	□ Yes □ No

If the answer to question 3 is YES, complete the following:

Physical Place of Business Address	
City	
Zip Code	

"**Place of business**" is defined as a location at which normal business activities are conducted, services are rendered, or goods are made, stored, or processed; a post office box, mail drop, telephone, or answering service does not, by itself, constitute a place of business per 2 AAC 12.990(b)(3).

Do you certify the Place of Business identified above meets this definition?	□ Yes □ No

Per AS 16.05.415(a) per 2AAC 12.990(b)(7), the bidder or offeror, or at least one employee of the bidder or offeror must be a resident of the state?

1	Do you certify the bidder or offeror, or, at least one employee of the bidder or offeror is physically present in the state with the intent to remain in Alaska indefinitely and to make a home in the state per AS 16.05.415(a)(2)?	□ Yes □ No
2	Do you certify the resident(s) used to meet this requirement has maintained a domicile in Alaska for the 12 months immediately preceding the deadline set for receipt of bids or proposals per AS 16.05.415(a)(2)?	□ Yes □ No
3	Do you certify the resident(s) used to meet this requirement is only claiming residency in Alaska per AS 16.05.415(a)(3)?	□ Yes □ No
4	Do you certify the resident used to meet this requirement is not obtaining benefits under a claim of residency in another state, territory, or country per As 16.05.415 (a)(4)?	□ Yes □ No

Per AS 36.30.990(2)(D), is your business:

1	Incorporated or qualified to do business under the laws of the state?	□ Yes □ No
If yes, enter the current Alaska Corporate Entity Number:		

Indicate below how your business is organized:

1	Is your business a Sole Proprietorship and the Proprietor is a resident of the state?	□ Yes □ No
2	Is your business a Limited Liability Corporation organized under AS 10.50 and **ALL** members are residents of the state?	□ Yes □ No
If the answer to question 2 above is YES, please identify each member by name:		
3	Is your business a partnership under former AS32.05, AS32.06, or AS32.11 and all partners are residents of the state?	□ Yes □ No
If the answer to question 3 above is YES, please identify each partner by name:		

Alaska Veterans Preference Questions:

To qualify for and claim the Alaska Veteran Preference, you must answer **YES** to the below questions as well as answer **YES** to all the questions in the Alaska Veteran Preference section above.

Per AS36.30.321(F), is your business:

1	A sole proprietorship owned by an Alaska veteran?	□ Yes □ No
2	A partnership under AS32.06 or AS32.11 and a majority of the members are Alaska veterans?	□ Yes □ No
3	A limited liability company organized under AS10.50 and a majority of the members are Alaska veterans?	□ Yes □ No
4	A corporation that is wholly owned by individuals, and a majority of the individuals are Alaska veterans?	□ Yes □ No

Per AS36.30.321(F)(3), an "Alaska veteran" is defined as an individual who:

A. Served in the:
   a. Armed forces of the United States, including a reserve unit of the United States armed forces ; or
   b. Alaska Territorial Guard, The Alaska Army National Guard, the Alaska Air Nations Guards, or the Alaska Naval Militia; and,

B. Was separated from services under a condition that was not dishonorable.

4	Do you certify the individual(s) indicated in items 1-4 above meet this definition and can provide documentation of their service and discharge in necessary?	□ Yes □ No

Alaska Military Skills Program Preference Questions

To qualify for and claim the Alaska Military Skills Program Preference, you must answer **YES** to the below questions as well as answer **YES** to all the questions in the Alaska Bidder Preference section above.

Per 36.30.321(l), does your business:

1	Employ at least one person who is enrolled in, or within the past two years, graduated from, a United States Department of Defense SkillBridge or United States Army career skills program that offers civilian work experience through specific industry training, pre-apprenticeships, registered apprenticeships, or internships during the last 180 days before a service member separates or retires from the service; or during the last 180 days before a the person separates or retires from the service?	□ Yes □ No
2	Have an active partnership with an entity that employs an apprentice through a program described in item 1 above?	□ Yes □ No
3	Have proof of an employee's graduation or enrollment in a qualified program as described in 1. above?	□ Yes □ No

ATTACHMENT #4
APPENDIX B[1]
INDEMNITY AND INSURANCE

Article 1. Indemnification

The contractor shall indemnify, hold harmless, and defend the contracting agency from and against any claim of, or liability for error, omission or negligent act of the contractor under this agreement. The contractor shall not be required to indemnify the contracting agency for a claim of, or liability for, the independent negligence of the contracting agency. If there is a claim of, or liability for, the joint negligent error or omission of the contractor and the independent negligence of the contracting agency, the indemnification and hold harmless obligation shall be apportioned on a comparative fault basis. "Contractor" and "contracting agency", as used within this and the following article, include the employees, agents and other contractors who are directly responsible, respectively, to each. The term "independent negligence" is negligence other than in the contracting agency's selection, administration, monitoring, or controlling of the contractor and in approving or accepting the contractor's work.

Article 2. Insurance

Without limiting contractor's indemnification, it is agreed that contractor shall purchase at its own expense and maintain in force at all times during the performance of services under this agreement the following policies of insurance. Where specific limits are shown, it is understood that they shall be the minimum acceptable limits. If the contractor's policy contains higher limits, the state shall be entitled to coverage to the extent of such higher limits. Certificates of Insurance must be furnished to the contracting officer prior to beginning work and must provide for a notice of cancellation, non-renewal, or material change of conditions in accordance with policy provisions. Failure to furnish satisfactory evidence of insurance or lapse of the policy is a material breach of this contract and shall be grounds for termination of the contractor's services. All insurance policies shall comply with and be issued by insurers licensed to transact the business of insurance under AS 21.

2.1 Workers' Compensation Insurance: The Contractor shall provide and maintain, for all employees engaged in work under this contract, coverage as required by AS 23.30.045, and; where applicable, any other statutory obligations including but not limited to Federal U.S.L. & H. and Jones Act requirements. The policy must waive subrogation against the State.

2.2 Commercial General Liability Insurance: covering all business premises and operations used by the Contractor in the performance of services under this agreement with minimum coverage limits of $300,000 combined single limit per claim.

2.3 Commercial Automobile Liability Insurance: covering all vehicles used by the Contractor in the performance of services under this agreement with minimum coverage limits of $300,000 combined single limit per claim.

ATTACHMENT #5

100% BID DOCUMENTS

SHELDON JACKSON MUSEUM
HVAC UPGRADES - 25C0544708

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
STATEWIDE PUBLIC FACILITIES
2200 EAST 42ND AVE
ANCHORAGE, ALASKA 99508

OWNER: DEPARTMENT OF EDUCATION AND EARLY DEVELOPMENT
ADDRESS: 104 COLLEGE DRIVE
SITKA, ALASKA 99835

7.23.25

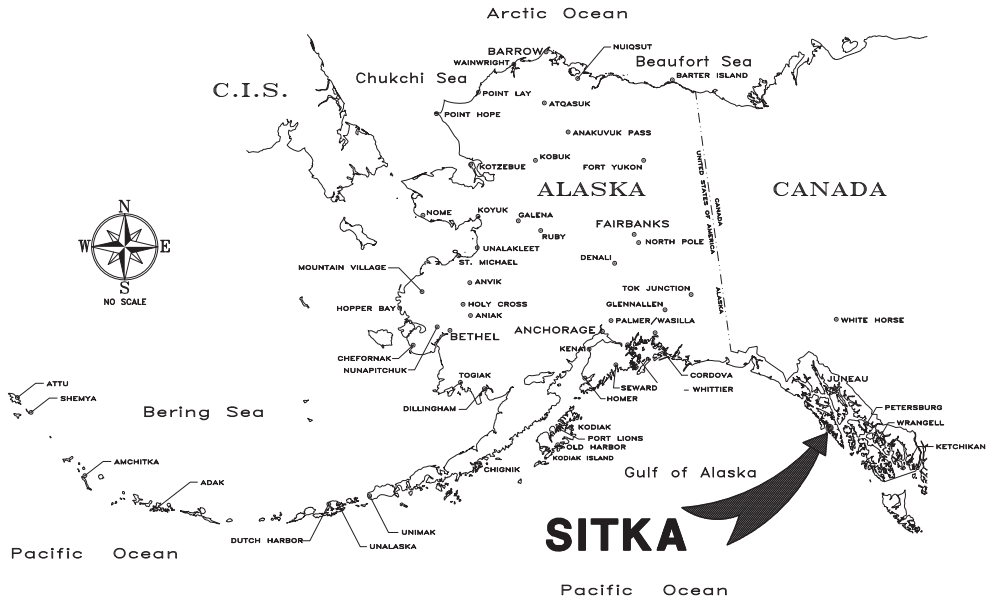
DRAWING INDEX:

ARCHITECTURAL
A101 FLOOR PLAN – LEVEL 1
A102 REFLECTED CEILING PLAN – LEVEL 1
A501 DETAILS

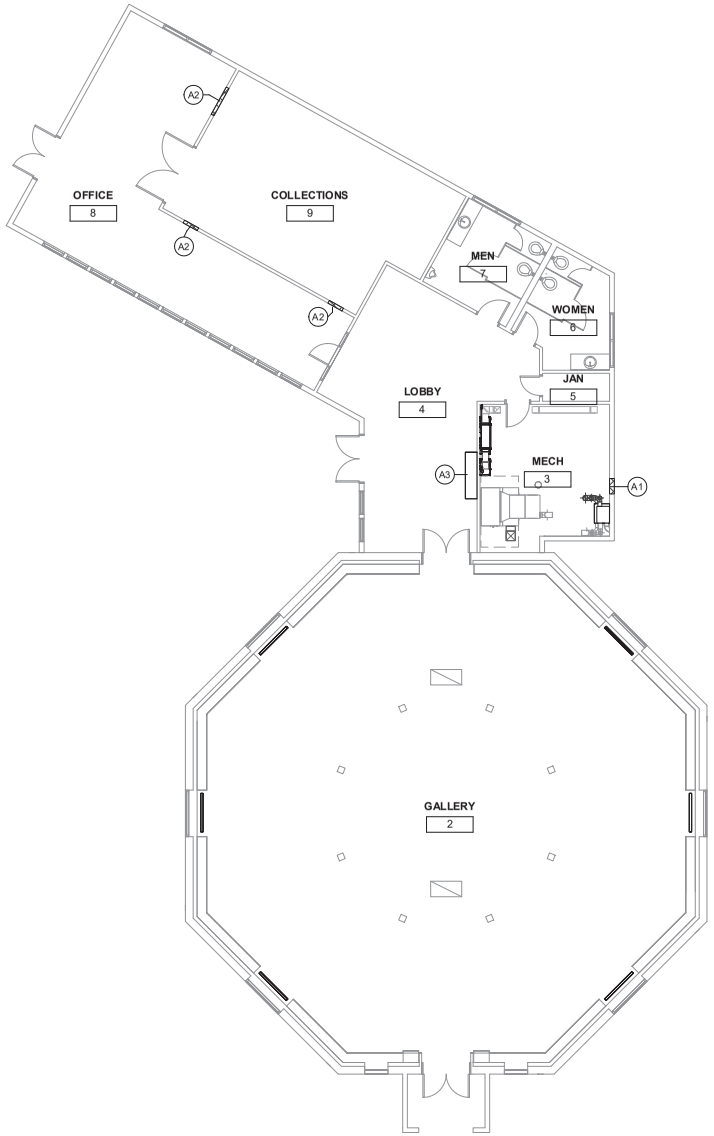
STRUCTURAL/CIVIL
S101 CONCRETE PAD & CHAIN LINK FENCE PLAN VIEW AND DETAILS

MECHANICAL
M001 MECHANICAL LEGEND, ABBREVIATIONS, AND GENERAL NOTES
M002 MECHANICAL SCHEDULES
M003 SEQUENCE OF OPERATION
M101 MECHANICAL SITE AND ROOF DEMOLITION & REMODEL
M102 FIRST FLOOR MECHANICAL DEMOLITION
M103 MECHANICAL ROOM HVAC DEMOLITION
M201 UNDERFLOOR HVAC REMODEL
M202 FIRST FLOOR HVAC REMODEL
M301 MECHANICAL ROOM HVAC REMODEL
M302 FIRST FLOOR REFRIGERATION PIPING ENLARGED PLAN
M401 MECHANICAL SECTIONS
M501 MECHANICAL DETAILS
M601 MECHANICAL SCHEMATICS

ELECTRICAL
E001 ELECTRICAL LEGEND, SCHEDULES, AND LOAD CALCULATION
E002 ELECTRICAL SITE PLANS
E101 ELECTRICAL DEMOLITION PLANS
E201 ELECTRICAL REMODEL PLANS



PROJECT LOCATION



1 A101 FLOOR PLAN - LEVEL 1

1/8" = 1'-0"

GENERAL NOTES

1) THE INFORMATION SHOWN IN THIS DRAWING IS TAKEN FROM AS-BUILT DRAWINGS AND WALK-THRU OF THE EXISTING FACILITY. THERE IS NO WARRANTY OR GUARANTEE AS OF THE ACCURACY OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL ITEMS, AREAS, AND ASSEMBLIES SHOWN FOR DEMOLITION PRIOR TO START OF WORK

2) DIMENSIONS ARE BASED ON AS-BUILT DRAWINGS AND VARIOUS SITE VISITS. ACCURACY OF CRITICAL DIMENSIONS SHOULD BE VERIFIED BY THE CONTRACTOR

3) REFER TO MECHANICAL AND ELECTRICAL FOR RELATED ADDITIONAL INFORMATION

KEYNOTES

A1 CUT OPENING IN EXISTING EXTERIOR WALL CONSTRUCTION FOR INSTALLATION OF MECHANICAL LOUVER; REFER TO DETAIL 1/A501

A2 INFILL WOOD FRAMED PARTITION WALL WHERE MECH GRILLE IS REMOVED; REFINISH WALL BOTH SIDES TO MATCH ADJACENT

A3 REMOVE, SALVAGE AND REINSTALL CASEWORK ENCLOSURE FOR UNIT HEATER TO BE DEMOLISHED UNDER MECHANICAL SCOPE

A4 INFILL CEILING AND REFINISH WHERE MECHANICAL DIFFUSERS ARE REMOVED; REFER TO DETAIL 3/A501

MCG Explore Design
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explorecdesign.com

STATE OF ALASKA
AGTH
GARRETT PAUL BURTNER
No. A-12683
REGISTERED PROFESSIONAL ARCHITECT
7-24-2025

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

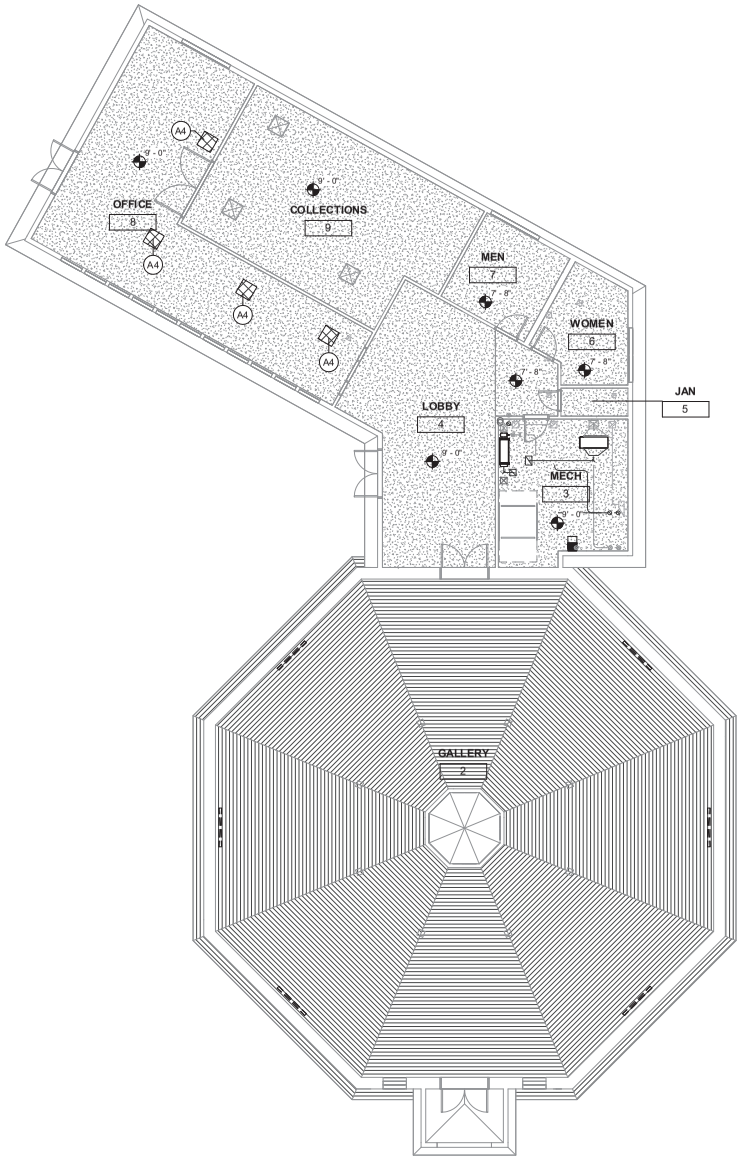
104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

JOB NO.	2024008
DATE:	07.23.25
PROJ. MGR.:	GPB
DRAWN BY:	GPB
REVIEWED BY:	JW
REVISIONS:	

FLOOR PLAN - LEVEL 1

SHEET NO.
A101



1 A102 REFLECTED CEILING PLAN - LEVEL 1

1/8" = 1'-0"

GENERAL NOTES

1) THE INFORMATION SHOWN IN THIS DRAWING IS TAKEN FROM AS-BUILT DRAWINGS AND WALK-THRU OF THE EXISTING FACILITY. THERE IS NO WARRANTY OR GUARANTEE AS OF THE ACCURACY OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL FIELD VERIFY ALL ITEMS, AREAS, AND ASSEMBLIES SHOWN FOR DEMOLITION PRIOR TO START OF WORK

2) DIMENSIONS ARE BASED ON AS-BUILT DRAWINGS AND VARIOUS SITE VISITS. ACCURACY OF CRITICAL DIMENSIONS SHOULD BE VERIFIED BY THE CONTRACTOR

3) REFER TO MECHANICAL AND ELECTRICAL FOR RELATED ADDITIONAL INFORMATION

KEYNOTES

A1 CUT OPENING IN EXISTING EXTERIOR WALL CONSTRUCTION FOR INSTALLATION OF MECHANICAL LOUVER; REFER TO DETAIL 1/A501

A2 INFILL WOOD FRAMED PARTITION WALL WHERE MECH GRILLE IS REMOVED; REFINISH WALL BOTH SIDES TO MATCH ADJACENT

A3 REMOVE, SALVAGE AND REINSTALL CASEWORK ENCLOSURE FOR UNIT HEATER TO BE DEMOLISHED UNDER MECHANICAL SCOPE

A4 INFILL CEILING AND REFINISH WHERE MECHANICAL DIFFUSERS ARE REMOVED; REFER TO DETAIL 3/A501

MCG Explore Design
421 W 1st Ave. Suite 300
Anchorage, AK 99517
907.563.8474
exploredesign.com

STATE OF ALASKA
AGRM
GARRETT PAUL BURTNER
No. A-12683
REGISTERED PROFESSIONAL ARCHITECT
7-24-2025

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

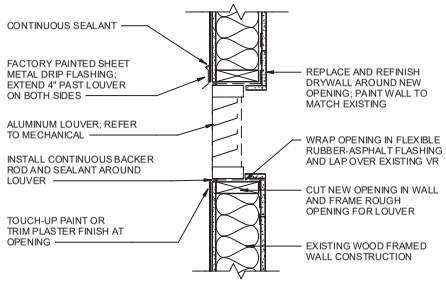
104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

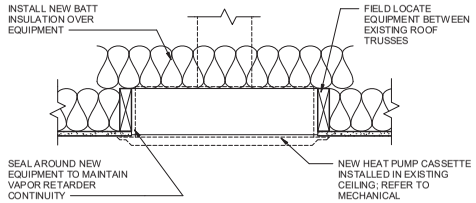
JOB NO.	2024008
DATE:	07.23.25
PROJ. MGR.:	GPB
DRAWN BY:	GPB
REVIEWED BY:	JW
REVISIONS:	

REFLECTED CEILING PLAN - LEVEL 1

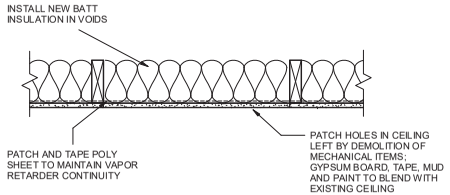
SHEET NO.
A102



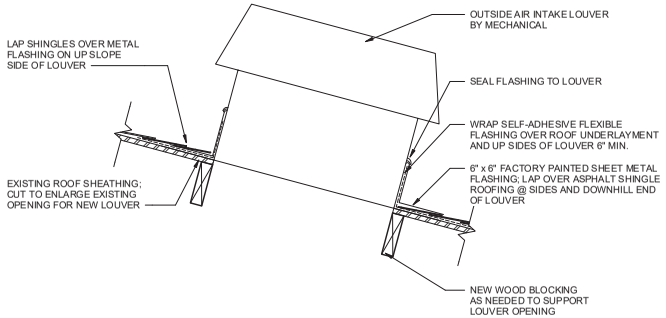
1 EXTERIOR WALL LOUVER
A501 — 1 1/2" = 1'-0"



2 CEILING CASSETTE
A501 — 1 1/2" = 1'-0"



3 CEILING INFILL - TYPICAL
A501 — 1 1/2" = 1'-0"



4 ROOF INTAKE HOOD
A501 — 1 1/2" = 1'-0"

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STATE OF ALASKA — 49TH — GARRETT PAUL BURTNER — No. A-12683 — REGISTERED PROFESSIONAL ARCHITECT
7-24-2025

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

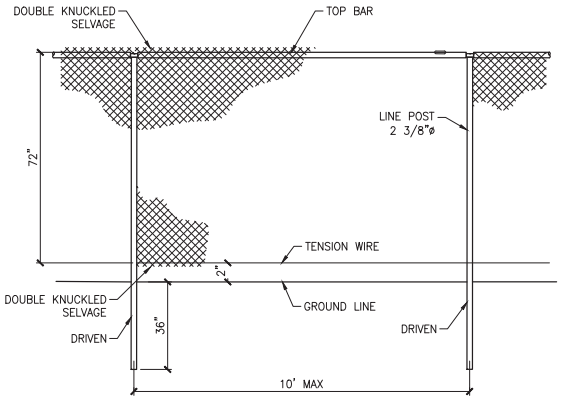
104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

JOB NO.	2024008
DATE:	07.23.25
PROJ. MGR.:	GPB
DRAWN BY:	GPB
REVIEWED BY:	JW
REVISIONS:	

DETAILS

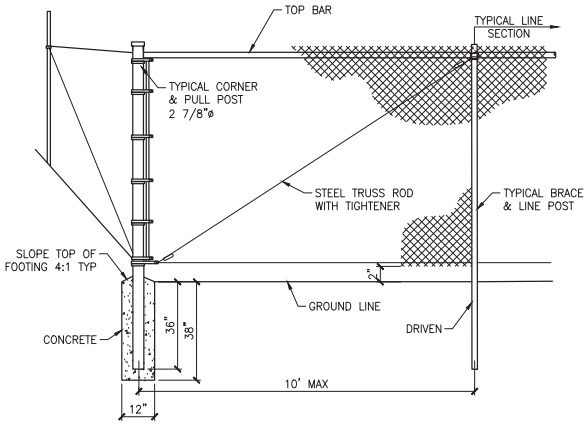
SHEET NO.
A501



NOTE:
PROVIDE DOUBLE KNUCKLED SELVAGE TOP AND BOTTOM OF ALL FENCE FABRIC

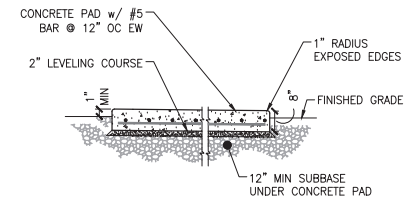
1 S101 TYPICAL LINE SECTION

NTS



2 S101 TYPICAL CORNER TERMINAL

NTS

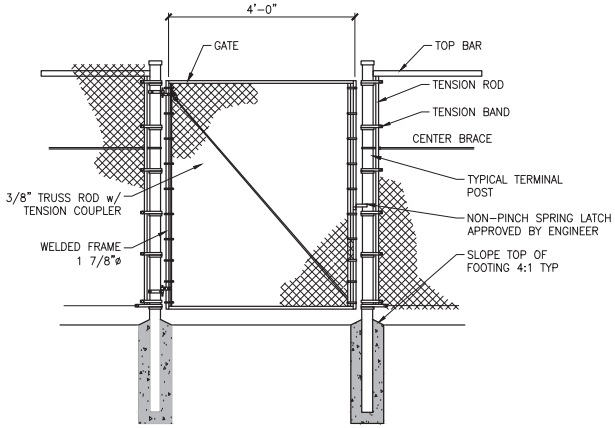


PAD USE	SIZE	CONTROL JOINT SPACING
OUTSIDE UTIL	8" THICK, SEE PLAN	MID POINT

NOTES:
1. COORDINATE ALL SIZES AND LOCATIONS WITH ELECTRICAL AND MECHANICAL.
2. PROVIDE A MINIMUM SLOPE OF 1% TO SLAB TO PROVIDE DRAINAGE.

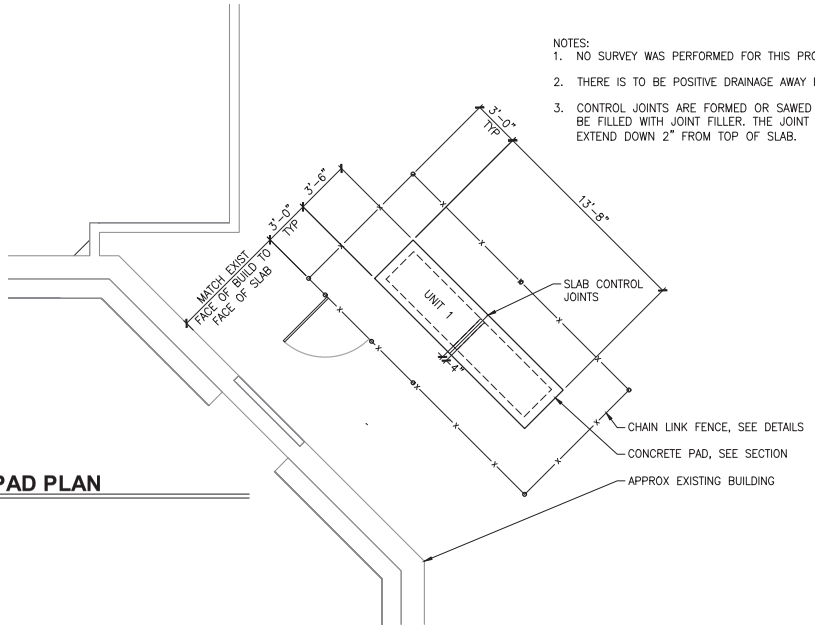
3 S101 CONCRETE PAD SECTION

NTS



5 S101 GATE

NTS



NOTES:
1. NO SURVEY WAS PERFORMED FOR THIS PROJECT.
2. THERE IS TO BE POSITIVE DRAINAGE AWAY FROM SLAB.
3. CONTROL JOINTS ARE FORMED OR SAWED JOINT TO BE FILLED WITH JOINT FILLER. THE JOINT SHALL EXTEND DOWN 2" FROM TOP OF SLAB.

6 S101 CONCRETE PAD PLAN

NTS

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

JOB NO.	241101
DATE:	7.23.25
PROJ. MGR.:	DNB
DRAWN BY:	WAY
REVIEWED BY:	DNB
REVISIONS:	

PLANS DEVELOPED BY PND ENGINEERS, INC AK. LIC# AECC250

STATE OF ALASKA 49 TH David N. Berntt CE 13838 07.23.25 REGISTERED PROFESSIONAL ENGINEER

CONCRETE PAD & CHAIN LINK FENCE PLAN VIEW AND DETAILS

SHEET NO.

S101

PIPING LEGEND

- WASTE
- VENT PIPING
- COLD WATER
- HOT WATER
- HOT WATER RECIRCULATED
- XXX — SEE ABBREVIATIONS FOR MEDIA
- PIPE UP
- PIPE DOWN
- TEE UP
- TEE DOWN
- CAP
- UNION
- DIRECTION OF FLOW
- BALL VALVE
- FLOOR DRAIN

LOGIC

- POINT OF CONNECTION
- X — DETAIL NUMBER; XX — SHEET LOCATED ON
- DIRECTION OF VIEW
- X — SECTION NUMBER; XX — SHEET LOCATED ON
- X — SHEET NOTES
- X — CONNECTION; NECK SIZE; CFM; DIFFUSER OR GRILLE TYPE

DUCTWORK LEGEND

- T — THERMOSTAT
- S — SENSOR
- SP — DUCT STATIC PRESSURE SENSOR
- SUPPLY AIR UP & DOWN
- RETURN AIR UP & DOWN
- EXHAUST AIR UP & DOWN
- VOLUME DAMPER
- M — MOTORIZED CONTROL DAMPER
- SOUND LINED DUCTWORK
- 12/24 — DUCT SIZE - EXTERIOR INSULATED (1ST FIGURE-SIDE SHOWN) (2ND FIGURE-SIDE NOT SHOWN)
- EXTERNALLY INSULATED DUCTWORK
- TURNING VANES
- FLEXIBLE DUCT
- FD — FIRE DAMPER

ABBREVIATIONS

AAV	AUTOMATIC AIR VENT	DN	DOWN	IN	INCHES	RA/A	REACTIVATION AIR
ABV	ABOVE	DT-X	DISPERSION TUBE DESIGNATOR	IU-X	VRF INDOOR UNIT DESIGNATOR	RL	RAINLEADER
AC-X	AIR CONDITIONING UNIT DESIGNATOR	DWG	DRAWING	L-X	LOUVER DESIGNATOR	S/A	SUPPLY AIR
AD	ACCESS DOOR	DX-X	DIRECT EXPANSION COIL DESIGNATOR	LAT	LEAVING AIR TEMPERATURE	SCFM	STANDARD CUBIC FEET PER MINUTE
AF	AIR FOIL			LAV	LAVATORY	SMACNA	SHEET METAL AND AIR CONDITIONING NATIONAL ASSOCIATION
AFF	ABOVE FINISHED FLOOR	(E)	EXISTING EQUIPMENT DESIGNATOR	LF	LINEAL FEET		
AFG	ABOVE FINISHED GRADE	E/A	EXHAUST AIR	MAX	MAXIMUM	SP	STATIC PRESSURE
AHAP	AS HIGH AS POSSIBLE	EAT	ENTERING AIR TEMPERATURE	MBH	THOUSAND BTUH	SQ	SQUARE
AHU-X	AIR HANDLING UNIT DESIGNATOR	ECUH-X	ELECTRIC CABINET UNIT HEATER DESIGNATOR	MCA	MINIMUM CIRCUIT AMPACITY	SS	STAINLESS STEEL
AL	ALUMINUM			MFGR	MANUFACTURER	T/A	TRANSFER AIR
AMPS	AMPERES	EFF	EFFICIENCY	MIN/MIN.	MINIMUM	TEMP	TEMPERATURE
APD	AIR PRESSURE DROP	ENT	ENTERING	MOD	MOTOR OPERATED DAMPER	TOD	TOP OF DUCT
ARCH	ARCHITECTURAL	ERV-X	ENERGY RECOVER VENTILATOR DESIGNATOR	MTD	MOUNTED	TSP	TOTAL STATIC PRESSURE
BDD	BACKDRAFT DAMPER			NAT.	NATURAL	T'STAT	THERMOSTAT
BLDG	BUILDING	ESP	EXTERNAL STATIC PRESSURE	NC	NOISE CRITERIA	TTL	TOTAL
BOD	BOTTOM OF DUCT	EUH-X	ELECTRIC UNIT HEATER DESIGNATOR	N.C.	NORMALLY CLOSED	TYP/TYP.	TYPICAL
BS-X	BRANCH SELECTOR DESIGNATOR	F	FAHRENHEIT	NO.	NUMBER	UPC	UNIFORM PLUMBING CODE
BTUH	BRITISH THERMAL UNIT/HOUR	FC	FORWARD CURVE	N.O.	NORMALLY OPEN	V	VENT
CAP	CAPACITY	FCU-X	FAN COIL UNIT DESIGNATOR	NTS	NOT TO SCALE	VAC	VOLT-AC
CFM	CUBIC FEET PER MINUTE	FLA	FULL LOAD AMPS	O/A	OUTSIDE AIR	VEL	VELOCITY
CLG	CEILING	FLR	FLOOR	O.D.	OUTSIDE DIAMETER	VDC	VOLT-DC
CONT	CONTINUED	FPM	FEET PER MINUTE	O/C	ON CENTER	VRF	VARIABLE REFRIGERANT FLOW
CONN	CONNECTION	FT	FEET	OU-X	VRF OUTDOOR UNIT DESIGNATOR	VTR	VENT THRU ROOF
CUH-X	CABINET UNIT HEATER DESIGNATOR	GA	GAUGE	P/A/S	PROCESS AIR SUPPLY	V/L	REFRIGERANT VAPOR/LIQUID
CU	COPPER	GAL	GALLONS	P/A/R	PROCESS AIR RETURN	W	WASTE
dB	DECIBELS	GALV	GALVANIZED	PD	PRESSURE DROP	W/	WITH
DEG	DEGREE	H-X	HUMIDIFIER DESIGNATOR	PH	PHASE	W.C.	WATER COLUMN
DH-X	DEHUMIDIFIER DESIGNATOR	HOA	HAND-OFF-AUTO	PSI	POUNDS PER SQUARE INCH	WCO	WALL CLEAN OUT
DIA	DIAMETER	HP	HORSEPOWER	PSIG	POUNDS PER SQUARE INCH GAUGE	WG	WATER GAUGE
DIM	DIMENSION	IBC	INTERNATIONAL BUILDING CODE	R/A	RETURN AIR		

GENERAL DEMOLITION NOTES:

A. THE INFORMATION SHOWN ON DEMOLITION DRAWINGS IS TAKEN FROM RECORD DRAWINGS AND A NON-DESTRUCTIVE WALKTHROUGH OF THE FACILITY. THERE IS NO WARRANTY OR GUARANTEE AS TO THE ACCURACY OF THE INFORMATION SHOWN HERE-IN. THE CONTRACTOR SHALL FIELD VERFIY EXISTING CONDITIONS, LOCATIONS, AND SIZES PRIOR TO START OF WORK.

B. PRESENT ALL REMOVED AND SALVAGED EQUIPMENT TO THE BUILDING OWNER. IF NOT DESIRED TO BE KEPT BY OWNER, CONTRACTOR SHALL HAUL OFF AND PROPERLY DISPOSE OF REMOVED EQUIPMENT.

C. DASHED BOLD LINES INDICATE ITEMS TO BE DEMOLISHED. PIPING, DUCTWORK, AND EQUIPMENT SHOWN LIGHT IS EXISTING, INSTALLED UNDER PREVIOUS PROJECTS.

D. PROTECT ALL MECHANICAL EQUIPMENT, CONTROL WIRING, PIPING AND DUCTWORK THAT IS TO REMAIN FROM DAMAGE DURING DEMOLITION.

E. VENTILATION SYSTEM TO BE PROTECTED DURING DEMOLITION PER SMACNA.

F. BUILDING COMPONENTS DAMAGED BY DEMOLITION WORK SHALL BE PATCHED AND REPAIRED TO MATCH EXISTING. COORDINATE WITH ARCHITECTURAL.

G. ALL PLUMBING FIXTURES, EQUIPMENT, PIPING, AND ASSOCIATED APPURTENANCES SHALL REMAIN.

GENERAL REMODEL NOTES:

A. THE INFORMATION SHOWN ON DRAWINGS IS TAKEN FROM RECORD DRAWINGS AND A NON-DESTRUCTIVE WALKTHROUGH OF THE FACILITY. THERE IS NO WARRANTY OR GUARANTEE AS TO THE ACCURACY OF THE INFORMATION SHOWN HERE-IN. THE CONTRACTOR SHALL FIELD VERFIY EXISTING CONDITIONS, LOCATIONS, AND SIZES PRIOR TO START OF WORK.

B. PROVIDE ACCESS DOORS OF APPROPRIATE SIZE AS REQUIRED TO ALL EQUIPMENT AND VALVES LOCATED ABOVE HARD LID CEILINGS OR WITHIN WALLS.

C. INSTALL SENSORS ON WALLS AT APPROXIMATE LOCATIONS INDICATED AFTER INSTALLATION OF FURNISHINGS. COORDINATE FINAL LOCATION AS REQUIRED SO THAT FURNISHINGS DO NOT COVER OR BLOCK ACCESS TO SENSORS. DO NOT INSTALL ANY THERMOSTATS BEHIND DOORS.

D. BRANCH DUCTWORK TO INDIVIDUAL DIFFUSER SHALL EQUAL THE DIFFUSER NECK SIZE UNLESS OTHERWISE INDICATED.

D. COORDINATE DUCT ROUTING WITH ALL NEW AND EXISTING LIGHTING, STRUCTURAL, AND PIPING TO AVOID CONFLICTS.

E. VENTILATION SYSTEM TO BE PROTECTED DURING CONSTRUCTION PER SMACNA.

F. COORDINATE FINAL GRILLE AND DIFFUSER LOCATIONS WITH THE ARCHITECTURAL REFLECTED CEILING PLAN AND LIGHTING.

G. CLEAN ALL DIFFUSERS AND GRILLES AFTER REMODEL WORK IS COMPLETED.

I. VOLUME DAMPERS LOCATED ABOVE HARD LID CEILING SHALL BE PROVIDED WITH REMOTE OPERATORS.

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

JOB NO.	M4087
DATE:	7.23.25
PROJ. MGR.:	EMM
DRAWN BY:	NSK
REVIEWED BY:	EMM
REVISIONS:	

PLANS DEVELOPED BY:
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE,
SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542

STATE OF ALASKA — EVAN MATHERS — MECHANICAL — REGISTERED PROFESSIONAL ENGINEER

MECHANICAL LEGEND, ABBREVIATIONS, AND GENERAL NOTES

SHEET NO.

M001

VRF MODE CONTROL UNIT SCHEDULE

SYMBOL	MFGR	MODEL	# OF PORTS	REFRIGERANT	DIMENSIONS			POWER DATA			WEIGHT LBS	REMARKS
					WIDTH	HEIGHT	LENGTH	MCA	VOLTS	PH		
MCU-1	SAMSUNG*	MCU-S4NEK3UN	4	R-410A	18.5"	8"	29"	2 A	208	1	54	MODE CONTROL UNIT SERVING DX-2 AND DX-3.
MCU-2	SAMSUNG*	MCU-S6NEK2UN	6	R-410A	18.5"	8"	29"	2 A	208	1	54	MODE CONTROL UNIT SERVING DX-4, FCU-1, IU-1, AND IU-2.

VRF HEAT PUMP SCHEDULE - OUTDOOR UNITS

SYMBOL	MFGR	MODEL	COOLING CAPACITY	HEATING CAPACITY	WEIGHT LBS	ELECTRICAL DATA (EACH MODULE)				REFRIGERANT TYPE	REMARKS
						MCCB	MCA	VOLTS	PH		
OU-1	SAMSUNG*	AM408BXVGFR/AA	388 MBH	438 MBH	1778	70/80	60/64	208	3	410-A	PROVIDE W/ MFGR WIND/HAIL GUARD WHG-T3, CONSISTS OF TWO SEPARATE MODULES PER MANUFACTURER. TWO SEPARATE CONNECTIONS, COORDINATE W/ ELECTRICAL.

VRF HEAT PUMP SCHEDULE - INDOOR UNITS

SYMBOL	MFGR	MODEL	UNIT TYPE	UNIT LOCATION	OUTDOOR UNIT	COOLING CAPACITY MBH	HEATING CAPACITY MBH	DIMENSIONS			WEIGHT	SOUND LEVEL dB(A)	MCA	VOLTS	PH	REMARKS
								HEIGHT	WIDTH	DEPTH						
FCU-1	SAMSUNG*	AM018CNLDCH/AA	FAN COIL UNIT	ABOVE CEILING	OU-1	18.0	20.0	8IN	43IN	17IN	48.5LBS	34	0.98	208	1	PROVIDE WITH INTEGRAL CONDENSATE PUMP.
IU-1	SAMSUNG*	AM018BN4PCH/AA	CASSETTE	CEILING	OU-1	18.0	20.0	10IN	33IN	33IN	39.7LBS	35.5	0.51	208	1	PROVIDE WITH INTEGRAL CONDENSATE PUMP.
IU-2	SAMSUNG*	AM024BN4PCH/AA	CASSETTE	CEILING	OU-1	24.0	27.0	10IN	33IN	33IN	39.7LBS	36	0.58	208	1	PROVIDE WITH INTEGRAL CONDENSATE PUMP.

DX COOLING COIL SCHEDULE

SYMBOL	MFGR	MODEL	CFM	WPD FT HD	EAT DB DEG F	EAT WB DEG F	LAT DB DEG F	LAT WB DEG F	COOLING CAPACITY MBH	REMARKS
DX-1	SAMSUNG*	SJM1	3,875	0.29 FT	75 °F	62 °F	62 °F	56 °F	57.3	COOLING COIL WITHIN AND SERVING INTEGRAL TO AHU-1.

DX HEATING COIL SCHEDULE

SYMBOL	MFGR	MODEL	CFM	WPD FT HD	EAT DB DEG F	LAT DB DEG F	HEATING CAPACITY MBH	REMARKS
DX-2	SAMSUNG*	SJM1-RH	3,875	6.73 FT	55 °F	105 °F	105	HEATING COIL WITHIN AND SERVING INTEGRAL TO AHU-1.
DX-3	SAMSUNG*	SJM1-RH	3,875	6.73 FT	55 °F	105 °F	105	HEATING COIL WITHIN AND SERVING INTEGRAL TO AHU-1.
DX-4	SAMSUNG*	ERV-1	500	13.65 FT	42 °F	82 °F	21.4	HEATING COIL SERVING ERV-1.

ELECTRIC HEATER SCHEDULE

SYMBOL	MFGR	MODEL	CFM	KW OUTPUT	ELECTRICAL				REMARKS
					AMPS	VOLTS	Hz	PH	
ECUH-1	QMARK*	CWH3404F	100	3.0	14.5	208	60	1	ELECTRIC CABINET UNIT HEATER, INTEGRAL THERMOSTAT, AND INTEGRAL DISCONNECT.
ECUH-2	QMARK*	CWH3504F	100	3.6	17.3	208	60	1	ELECTRIC CABINET UNIT HEATER, INTEGRAL THERMOSTAT, AND INTEGRAL DISCONNECT.
ECUH-3	QMARK*	CWH1202DSFPQ	65	0.75	3.6	208	60	1	ELECTRIC UNIT HEATER, WALL RECESSED MOUNTED, 4" MOUNTING DEPTH, INTEGRAL THERMOSTAT, WIRE TO OPERATE AT HALF MAX WATTAGE OUTPUT PER MFGR INSTALLATION INSTRUCTIONS.
EUH-1	QMARK*	MWUH5004	1800	3.75	18.0	208	60	1	ELECTRIC UNIT HEATER, INTEGRAL THERMOSTAT.

DEHUMIDIFIER SCHEDULE

SYMBOL	MANUFACTURER	MODEL	CAPACITY	INPUT		POWER			REMARKS
			LBS/HR	KW	FLA	VOLTS	HZ	PH	
DH-1	MUNTERS*	HC-300	9.7	6	19.0	208	60	3	DEHUMIDIFIER SERVING GALLERY.
DH-2	MUNTERS*	HC-150	4.8	1.5	15.5	115	60	1	DEHUMIDIFIER SERVING COLLECTIONS.
DH-3	MUNTERS*	HC-150	4.8	1.5	15.5	115	60	1	DEHUMIDIFIER SERVING OFFICES - ADD ALT #1.

HUMIDIFIER SCHEDULE

SYMBOL	MANUFACTURER	MODEL	CAPACITY	POWER					REMARKS
			LBS/HR	KW	FLA	VOLTS	HZ	PH	
DT-1	DRISTEEM*	PER MANUFACTURER	30.7	--	--	--	--	--	DISPERSION TUBE SERVING GALLERY.
DT-2	DRISTEEM*	PER MANUFACTURER	5.0	--	--	--	--	--	DISPERSION TUBE SERVING COLLECTIONS.
DT-3	DRISTEEM*	PER MANUFACTURER	3.2	--	--	--	--	--	DISPERSION TUBE SERVING OFFICES - ADD ALT #1.
H-1	DRISTEEM*	RX-36-1	36	12	33.3	208	60	3	STEAM CANISTER HUMIDIFIER SERVING GALLERY, 1 CONTACTOR. PROVIDE WITH INTEGRAL AUTOMATIC DRAIN TEMPERING.
H-2	DRISTEEM*	RX-12-1	12	4	16.7	208	60	3	STEAM CANISTER HUMIDIFIER SERVING COLLECTIONS, 1 CONTACTOR. PROVIDE WITH INTEGRAL AUTOMATIC DRAIN TEMPERING.
H-3	DRISTEEM*	RX-12-1	12	4	16.7	208	60	3	STEAM CANISTER HUMIDIFIER OFFICES, 1 CONTACTOR - ADD ALT #1. PROVIDE WITH INTEGRAL AUTOMATIC DRAIN TEMPERING.

AIR INLET/OUTLET SCHEDULE

SYMBOL	MFGR	MODEL	TYPE	MATERIAL	FINISH	CFM	FACE SIZE (IN)	NC	THROW	REMARKS
A	TITUS*	TMSA-AA	SURFACE	ALUMINUM	PER ARCH	PER PLANS	PER PLANS	<25	4-WAY	SURFACE MOUNT DIFFUSER.
B	TITUS*	45F	SURFACE	ALUMINUM	PER ARCH	PER PLANS	PER PLANS	<25	--	SURFACE MOUNT GRILLE.
C	TITUS*	CT-PP-0	SURFACE	ALUMINUM	PER ARCH	PER PLANS	PER PLANS	<25	1-WAY	PROVIDE WITH INTEGRAL SURFACE MOUNT DIFFUSER AG-35 OPPOSED BLADE DAMPER ACCESSORY.

LOUVER SCHEDULE

SYMBOL	MFGR	MODEL	SERVICE	MATERIAL	FINISH	SIZE	REMARKS
L-1	RUSKIN*	ELF6375DX	ERV-1 E/A	ALUMINUM	PER ARCH	12/24	HORIZONTAL DRAINABLE BLADES AT 37.5 DEG, 3/4" BIRDSCREEN, COLOR SELECTED BY ARCHITECT.

AIR HANDLER SCHEDULE

SYMBOL	MFGR	Model	COIL TAG	SUPPLY FAN			ESP IN. W.C.	TSP IN. W.C.	MOTOR DATA				MCA	FILTER RATING	O/A %	REMARKS
				SIZE	TYPE	CFM			# MOTORS	HP	VOLTS	PH				
AHU-1	VTS*	AVS040V	DX-1	450MM	PLUG	3,875	0.75	2.05	1	3.0	208	1	11.3	MERV 13	30	VERTICAL ORIENTATION, VFD BY CONTROL CONTRACTOR, WITH DUAL TEMPERATURE DX COIL

ERV UNIT SCHEDULE

SYMBOL	MFGR	MODEL	RECOVERY EFFICIENCY		AIRFLOW (CFM)	APD IN. W.C.	DIMENSIONS			WEIGHT LBS	VOLTAGE	PHASE	WATTS	REMARKS
			SENSIBLE	LATENT			HEIGHT	WIDTH	LENGTH					
ERV-1	RENEWAIRE*	HE07INH	70%	70%	500	1.0	49.5"	16"	49.5"	310	208 V	1	850	PROVIDE WITH ENTHALPY CONTROLS, MERV 8 FILTERS

*OR APPROVED EQUAL

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MECHANICAL SCHEDULES

SHEET NO.

M002

SEQUENCE OF OPERATION

EXISTING SIEMENS CONTROL SYSTEM SHALL BE RECONFIGURED AS NECESSARY. RECONFIGURED SYSTEM TO BE SIEMENS, NO SUBSTITUTIONS.

ALL CONTROL FUNCTIONS SHALL BE THROUGH A DDC SYSTEM. SYSTEM SHALL BE PROVIDED WITH RELEVANT SYSTEM GRAPHICS AND USER INTERFACE TO CONTROL AND MONITOR INDIVIDUAL SYSTEMS. EQUIPMENT WITH INTEGRAL CONTROLS SHALL BE MONITORED BY THE DDC SYSTEM. THE CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, POWER, WIRING, CONDUIT, ACTUATORS, CONTROLLERS, SENSORS AND ASSOCIATED ACCESSORIES AS REQUIRED FOR A COMPLETE AND OPERATIONAL SYSTEM.

OCCUPIED SCHEDULES
SYSTEM SHALL BE PROVIDED WITH AN ADJUSTABLE USER DEFINED SCHEDULE FOR OCCUPIED, UNOCCUPIED, AND WARM UP MODES. SYSTEM SHALL BE PROVIDED WITH A MANUAL OVERRIDE (WITH TIMER) FOR OCCUPIED MODE.

OCCUPIED MODE SHALL INITIALLY BE SET FOR MONDAY THRU FRIDAY BETWEEN 8AM AND 5PM.

WARM UP SHALL START BEFORE OCCUPIED MODE. START TIME SHALL BE DETERMINED BY DDC BASED ON BUILDING TRENDING.

UNOCCUPIED MODE SHALL BE ALL OTHER TIMES AND HOLIDAYS. PROVIDE USER ADJUSTABLE HOLIDAY SCHEDULE.

OVERRIDE MODE SHALL SWITCH THE SYSTEMS TO OCCUPIED MODE FOR A SET DURATION - PROVIDE USER ADJUSTABLE TIMER WITH MAX TIME SETTING 12 HOURS.

HUMIDIFIERS/STEAM DISPERSION UNITS (H-1, H-2, H-3, DU-1, DU-2, AND DU-3) - NOTE H-3 AND DU-3 ARE ADDITIVE ALTERNATES

A. ALARMS:
   1. UNIT FAILURE (EACH UNIT)
   2. LOW HUMIDITY (<20%, ADJUSTABLE)
   3. HIGH HUMIDITY (>80%, ADJUSTABLE)
B. DIGITAL CONTROL AND MONITORING:
   1. UNIT STATUS (EACH UNIT)
   2. HUMIDITY SETPOINT
   3. HUMIDITY INDICATION
C. AUTOMATED CONTROL:
   1. WHEN SPACE HUMIDITY DROPS BELOW 43% RH, STEAM GENERATOR(S) AND ASSOCIATED STEAM DISPERSION UNIT(S) SERVING SPACE SHALL OPERATE IN SEQUENCE TO MAINTAIN ROOM SETPOINT (ADJUSTABLE, INITIALLY SET TO 45% RH)
      1.1. IF CALL FOR HUMIDITY OCCURS DURING UNOCCUPIED HOURS, DDC SHALL ENABLE ERV-1 SYSTEM IN OCCUPIED MODE FOR THE DURATION OF THE CALL FOR HUMIDITY AND 20 MINS AFTER THE CALL FOR HUMIDITY HAS BEEN SATISFIED.
   2. AT HUMIDITY LEVELS ABOVE SETPOINT UNIT(S) SHALL BE DISABLED.
   3. WHEN MULTIPLE SENSORS SERVE ONE SPACE, THE AVERAGE OF HUMIDITY READINGS SHALL BE USED.
   4. IT IS THE INTENT THAT THE HUMIDIFICATION AND DEHUMIDIFICATION UNITS IN A SPECIFIC ZONE WILL NEVER RUN SIMULTANEOUSLY. A 5% RH DEADBAND HAS BEEN ESTABLISHED AROUND THE DESIRED SETPOINT TO AID IN THIS INTENT. IF THE SETPOINT CHANGES A SIMILAR DEADBAND MUST BE ENSURED. PROVIDE PLACARD DETAILING INTENT ADJACENT TO UNIT.

DEHUMIDIFICATION UNITS (DH-1, DH-2, AND DH-3) - NOTE DH-3 IS AN ADDITIVE ALTERNATE

A. ALARMS:
   1. UNIT FAILURE
   2. LOW HUMIDITY (<20%, ADJUSTABLE)
   3. HIGH HUMIDITY (>80%, ADJUSTABLE)
B. DIGITAL CONTROL AND MONITORING:
   1. UNIT STATUS (EACH UNIT)
   2. HUMIDITY SETPOINT
   3. HUMIDITY INDICATION
C. AUTOMATED CONTROL:
   1. WHEN SPACE HUMIDITY SERVING SPACE RISES ABOVE 48% RH INTEGRAL CONTROLS SHALL SEQUENCE TO DEHUMIDIFY SPACE DOWN TO MAINTAIN ROOM SETPOINT (ADJUSTABLE, INITIALLY SET TO 45% RH)
   2. AT HUMIDITY LEVELS BELOW SETPOINT UNIT SHALL BE DISABLED.
   3. IT IS THE INTENT THAT THE HUMIDIFICATION AND DEHUMIDIFICATION UNITS IN A SPECIFIC ZONE WILL NEVER RUN SIMULTANEOUSLY. A 5% RH DEADBAND HAS BEEN ESTABLISHED AROUND THE DESIRED SETPOINT TO AID IN THIS INTENT. IF THE SETPOINT CHANGES A SIMILAR DEADBAND MUST BE ENSURED. PROVIDE PLACARD DETAILING INTENT ADJACENT TO UNIT.

COOLING AND HEATING SYSTEM (CU-1, IU-1'S (2), AND IU-2)

A. ALARMS:
   1. UNIT FAILURE (EACH INDOOR UNIT)
   2. CONDENSING UNIT FAILURE
   3. LOW TEMPERATURE (10°F BELOW SETPOINT, ADJUSTABLE)
   4. HIGH TEMPERATURE (10°F ABOVE SETPOINT, ADJUSTABLE)
B. DIGITAL CONTROL AND MONITORING:
   1. UNIT STATUS (EACH UNIT)
   2. TEMPERATURE SETPOINT - COOLING TEMPERATURE SETPOINT SHALL ALWAYS BE 5°F ABOVE HEATING TEMPERATURE SETPOINT TO ALLOW FOR DEADBAND.
   3. TEMPERATURE INDICATION
C. AUTOMATED CONTROL:
   1. DDC SHALL MONITOR COOLING/HEATING SYSTEM THROUGH BACNET GATEWAY. NO DIRECT DDC CONTROL.
   2. ON CALL FOR COOLING OR HEATING FROM ZONE SENSOR, INTEGRAL CONTROLS SHALL SEQUENCE UNIT(S) AS NECESSARY TO PROVIDE COOLING OR HEATING. ROOM SETPOINT(S) SHALL INITIALLY BE SET TO 70°F - OFFICES/LOBBY, AND 60°F - COLLECTIONS (ADJUSTABLE).
   3. COOLING SHALL BEGIN ON ROOM TEMPERATURE RISE 5°F (INITIAL SETTING, ADJUSTABLE) ABOVE SETPOINT. HEATING SHALL BEGIN ON ROOM TEMPERATURE DROP 3°F (INITIAL SETTING, ADJUSTABLE) BELOW SETPOINT.
   4. INTEGRAL CONTROLS SHALL CYCLE CONDENSING UNIT AS REQUIRED TO REJECT/GAIN HEAT TO/FROM THE EXTERIOR OF THE BUILDING.
   5. DX COILS AND FAN COIL UNIT SHALL INTERFACE WITH CONDENSING UNIT AND VRF SYSTEM AS NEEDED. SEE ASSOCIATED SECTIONS FOR SEQUENCE.

ENERGY RECOVERY VENTILATOR (ERV-1, DX-4)

A. ALARMS:
   1. FREEZE ALARM - AIRSIDE
   2. FAN FAILURE (EACH FAN)
B. DIGITAL CONTROL AND MONITORING:
   1. S/A TEMPERATURE INDICATION
   2. S/A TEMPERATURE SETPOINT
   3. FAN STATUS (EACH FAN)
   4. E/A DAMPER POSITION
   5. O/A DAMPER POSITION
   6. H-O-A CONTROL (ERV)
   7. OCCUPIED MODE INDICATION
   8. OUTSIDE AIR TEMPERATURE
C. AUTOMATED CONTROL:
   1. UNOCCUPIED MODE:
      1.1. ERV-1 SHALL BE DISABLED. O/A AND E/A DAMPERS SHALL BE CLOSED.
   2. WARM-UP MODE:
      2.1. SYSTEM SHALL RUN IN OCCUPIED MODE.
   3. OCCUPIED MODE:
      3.1. O/A AND E/A DAMPERS SHALL BE OPEN. ERV-1 SHALL BE ENABLED. DX-4 SHALL STAGE IN HEATING OR COOLING MODE AS REQUIRED TO MAINTAIN A S/A TEMPERATURE OF 70°F (ADJUSTABLE).
   4. FREEZE ALARM SEQUENCE SHALL ONLY BE ENABLED WHILE O/A TEMPERATURES ARE 50°F AND LESS.
      4.1. IF S/A TEMPERATURE INDICATION IS BELOW 35°F (ADJUSTABLE) FREEZE ALARM SHALL TRIGGER AND ERV SHALL BE DISABLED, O/A AND E/A DAMPERS SHALL BE CLOSED AND DX-4 SHALL BE IN FULL HEATING MODE FOR A RESET PERIOD OF TEN MINUTES. AFTER RESET PERIOD PREVIOUS OPERATION MODE SHALL COMMENCE, PROVIDE AUTOMATIC RESET. IF FREEZE ALARM TRIGGERS MORE THEN 4 TIMES IN A 24 HOUR PERIOD REQUIRE MANUAL RESET.
      4.2. FREEZE ALARM SEQUENCE SHALL RUN REGARDLESS OF THE OCCUPIED/UNOCCUPIED MODE THE BUILDING IS IN.

AIR HANDLING UNIT (AHU-1, DX-1, DX-2, DX-3)

A. ALARMS:
   1. LOW SPACE TEMPERATURE
   2. HIGH SPACE TEMPERATURE
   3. FREEZE ALARM
   4. SUPPLY FAN FAILURE
   5. SMOKE DETECTION
B. DIGITAL CONTROL AND MONITORING:
   1. H-O-A CONTROL
   2. SUPPLY AIR INDICATION
   3. SUPPLY AIR SETPOINT
   4. RETURN AIR INDICATION
   5. MIXED AIR TEMPERATURE INDICATION
   6. O/A DAMPER POSITION
   7. R/A DAMPER POSITION
   8. RELIEF DAMPER POSITION
   9. OUTSIDE AIR MINIMUM POSITION ADJUSTMENT
   10. OUTSIDE AIR TEMPERATURE INDICATION
   11. SMOKE DETECTOR INDICATION
C. AUTOMATED CONTROL:
   1. OCCUPIED MODE:
      1.1 THE OUTSIDE AIR DAMPER SHALL MAINTAIN MINIMUM 30% O/A.
      1.2. THE RELIEF AIR DAMPER SHALL MODULATE AS REQUIRED TO MAINTAIN POSITIVE BUILDING PRESSURE WITHIN THE GALLERY, INITIALLY SET TO 0.02 IN W.C. (ADJUSTABLE)
      1.3 GALLERY SETPOINT TO BE INITIALLY SET TO 68°F. ON FALL IN ROOM TEMPERATURE TO 65°F DX-2 AND DX-3 SHALL STAGE TOGEATHER IN SEQUENCE TO PROVIDE HEAT TO THE SPACE.
      1.4 ON RISE IN ROOM TEMPERATURE TO 70°F DX-1 SHALL STAGE TO PROVIDE COOLING TO THE SPACE.
      1.5 HEATING AND COOLING DX COILS SHALL NOT RUN AT THE SAME TIME.
      1.6 PROVIDE MINIMUM 5 MIN BREAK BETWEEN RUNNING HEATING AND COOLING DX COIL(S)
      1.7. ON SUPPLY AIR FREEZE ALARM (38°F, ADJUSTABLE) THE FAN SHALL STOP, O/A DAMPERS SHALL FULLY CLOSE, R/A DAMPERS SHALL FULLY OPEN. PROVIDE AUTOMATIC RESET. IF THE FREEZE STAT IS TRIPPED 5 OR MORE TIMES IN A 24 HOUR PERIOD A MANUAL RESET SHALL BE REQUIRED.
   2. UNOCCUPIED MODE:
      2.1. O/A DAMPER NEAR ROOF AND O/A DAMPER INTEGRAL TO UNIT SHALL BE CLOSED, R/A DAMPER SHALL BE OPEN.
      2.2 GALLERY SETPOINT TO BE INITIALLY SET TO 68°F. ON FALL IN ROOM TEMPERATURE TO 65°F DX-2 AND DX-3 SHALL STAGE TOGEATHER IN SEQUENCE TO PROVIDE HEAT TO THE SPACE.
      2.3 ON RISE IN ROOM TEMPERATURE TO 70°F DX-1 SHALL STAGE TO PROVIDE COOLING TO THE SPACE.
      2.4 HEATING AND COOLING DX COILS SHALL NOT RUN AT THE SAME TIME.
   3. WARM UP MODE:
      3.1. O/A DAMPER NEAR ROOF AND O/A INTEGRAL TO UNIT SHALL BE CLOSED, R/A DAMPER SHALL BE OPEN. UNIT SHALL RUN UNTIL THE R/A TEMPERATURE RISES TO 68°F.
      3.2. THEN UNIT SHALL SWITCH TO OCCUPIED MODE.
   4. FIRE ALARM: IF THE FIRE ALARM SYSTEM IS ACTIVATED, THE FAN SHALL STOP, INTEGRAL AND NEAR ROOF O/A DAMPERS SHALL FULLY CLOSE, AND R/A DAMPERS SHALL OPEN.
   5. SMOKE DETECTOR: AIR HANDLING UNIT SHALL BE EQUIPPED WITH A SMOKE DETECTOR, TO BE PROVIDED BY CONTROLS CONTRACTOR, TO STOP THE AHU IN THE EVENT OF ACTIVATION. COORDINATE WITH DIV 28 AND INTERLOCK WITH FIRE ALARM SYSTEM

FAN COIL UNIT (FCU-1)

A. ALARMS:
   1. LOW SPACE TEMPERATURE
   2. HIGH SPACE TEMPERATURE
   3. FAN FAILURE
B. DIGITAL CONTROL AND MONITORING:
   1. SPACE TEMPERATURE SETPOINT
   2. SPACE TEMPERATURE INDICATION
C. AUTOMATED CONTROL:
   1. COLLECTIONS SPACE TEMPERATURE SETPOINT TO BE SET INITIALLY FOR 60°F (ADJUTABLE).
   2. FAN AND DX COIL SHALL CYCLE IN SEQUENCE TO PROVIDE HEATING OR COOLING TO SPACE AS REQUIRED.
   3. IF DU-2 OR H-2 AND DT-2 IS ENABLED, FAN SHALL BE ENABLED TO PROVIDE FLOW TO CONTROL MOVE AIR THROUGH THE DEHUMIDIFIER OR HUMIDIFIER AS REQUIRED.
   4. COORDINATE SEQUENCE WITH CONDENSING UNIT AND OTHER VRF COMPONENETS AS REQUIRED.

UNIT HEATER (EUH-1)

A. ALARMS:
   1. LOW SPACE TEMPERATURE
   2. HIGH SPACE TEMPERATURE
B. DIGITAL CONTROL AND MONITORING:
   1. UNIT HEATER STATUS
   2. SPACE TEMPERATURE SETPOINT
   3. SPACE TEMPERATURE INDICATION
C. AUTOMATED CONTROL:
   1. ON CALL FOR HEAT FROM SPACE TEMPERATURE SENSOR, FAN SHALL RUN AND ELECTRIC COIL SHALL CYCLE IN SEQUENCE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

CABINET UNIT HEATER (ECUH-1, ECUH-2, ECUH-3)

A. ALARMS:
   1. LOW SPACE TEMPERATURE
   2. HIGH SPACE TEMPERATURE
B. DIGITAL CONTROL AND MONITORING:
   1. CABINET UNIT HEATER STATUS
   2. SPACE TEMPERATURE SETPOINT
   3. SPACE TEMPERATURE INDICATION
C. AUTOMATED CONTROL:
   1. ON CALL FOR HEAT FROM SPACE TEMPERATURE SENSOR, FAN SHALL RUN AND ELECTRIC COIL SHALL CYCLE IN SEQUENCE TO MAINTAIN SPACE TEMPERATURE SETPOINT.

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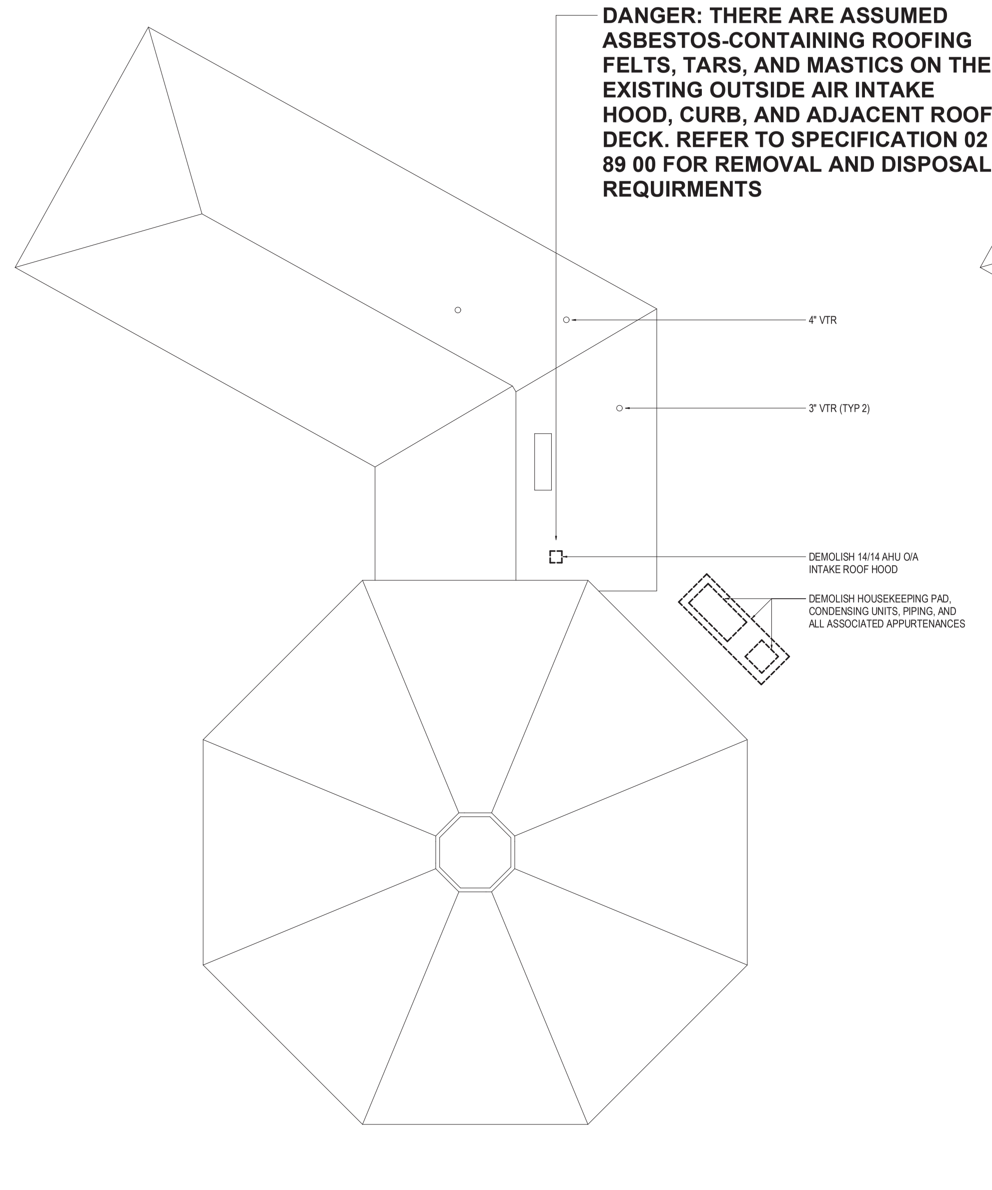
STATE OF ALASKA 49TH EVAN MATHERS ME-167480 REGISTERED PROFESSIONAL ENGINEER

SEQUENCE OF OPERATION

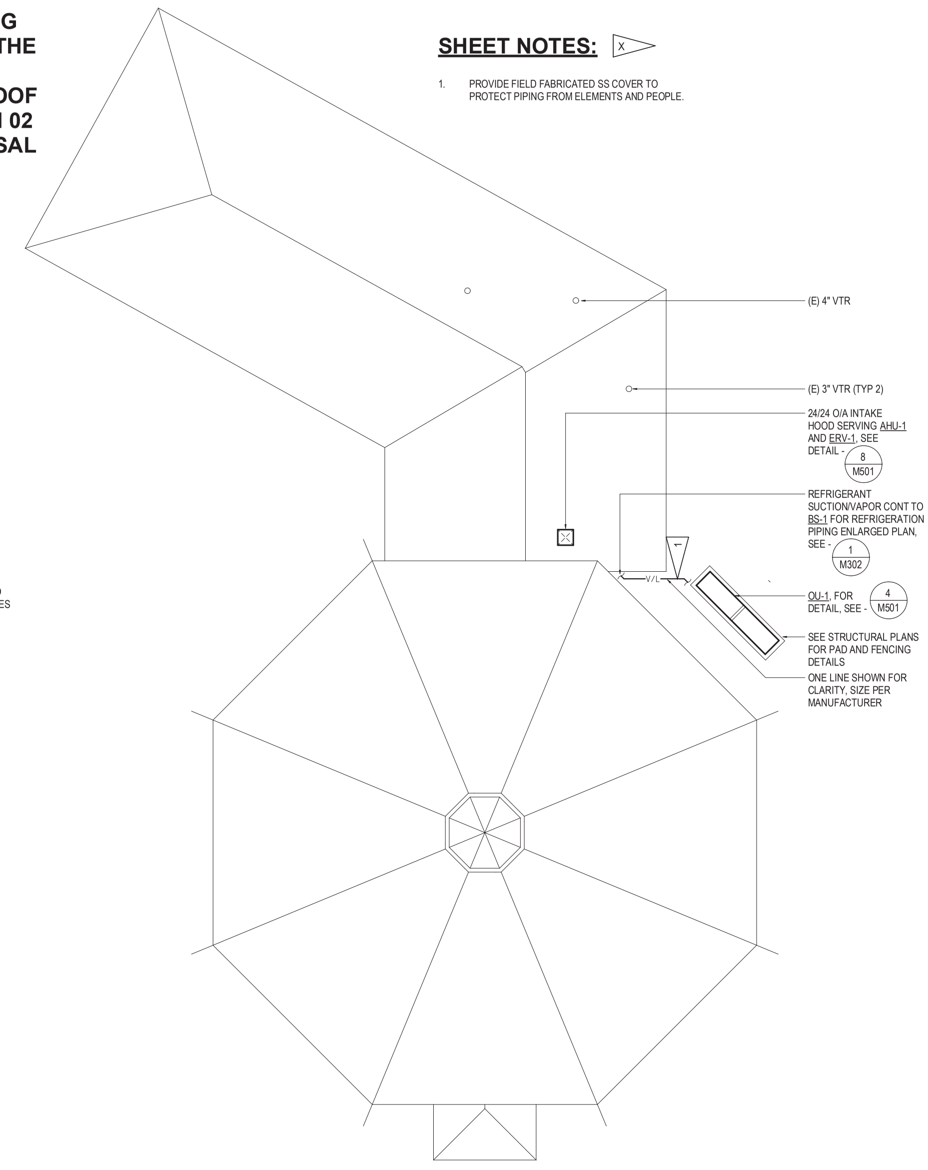
SHEET NO.
M003



1 SITE AND ROOF MECHANICAL DEMOLITION PLAN
1/8" = 1'-0"

SHEET NOTES:

1. PROVIDE FIELD FABRICATED SS COVER TO PROTECT PIPING FROM ELEMENTS AND PEOPLE.



2 SITE AND ROOF MECHANICAL REMODEL PLAN
1/8" = 1'-0"

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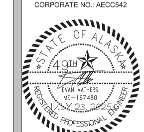
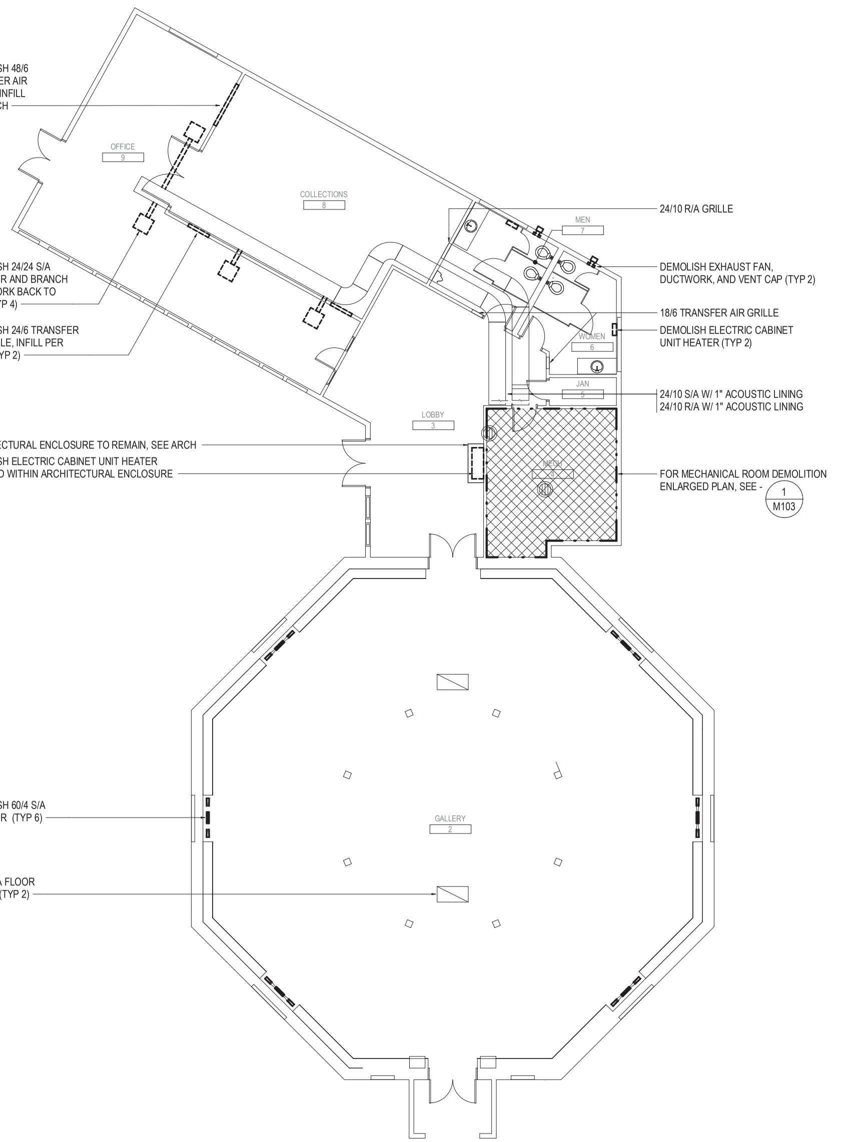
DATE:	7.23.25
PROJ. MGR.:	EMM
DRAWN BY:	NSK
REVIEWED BY:	EMM
REVISIONS:	

PLANS DEVELOPED BY:
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542



MECHANICAL SITE AND ROOF DEMOLITION & REMODEL

SHEET NO.
M101



1 FIRST FLOOR MECHANICAL DEMOLITION PLAN

1/8" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

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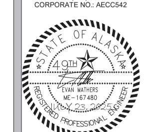


FIRST FLOOR MECHANICAL DEMOLITION

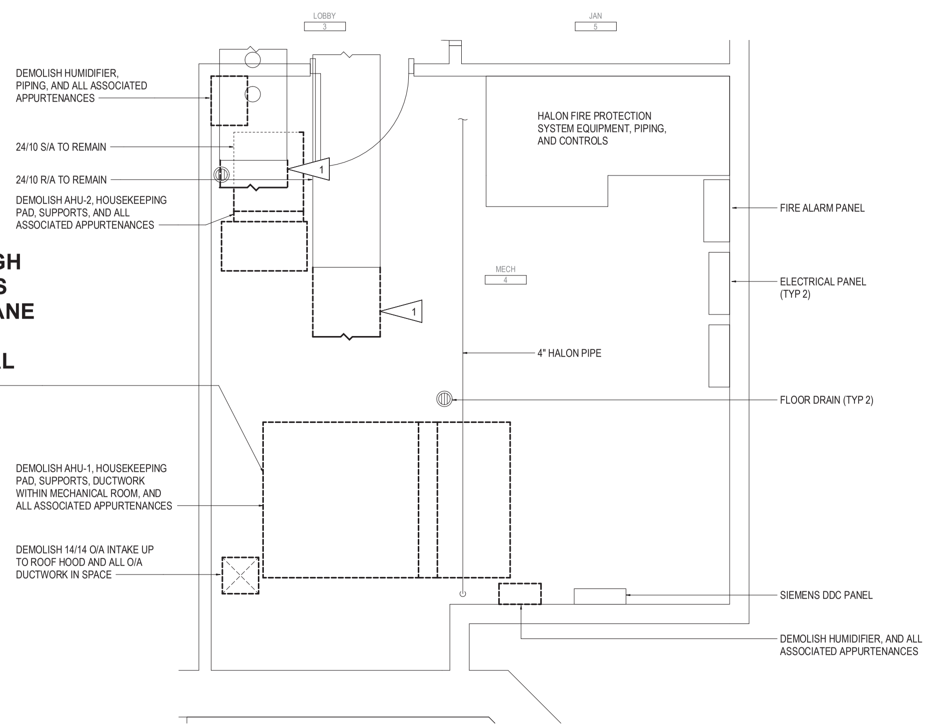
SHEET NO.

M102

SHEET NOTES:

1. DEMOLISH AHU-2 DUCTWORK WITHIN MECHANICAL ROOM. DEMOLISH ABOVE CEILING 24/10 S/A AND 24/10 R/A DUCTWORK UP TO APPROXIMATE EXTENTS INDICATED AND CAP OPEN ENDS. COORDINATE DEMOLITION EXTENTS WITH DUCT CONNECTIONS IN REMODEL WORK.

DANGER: ASBESTOS-CONTAINING HIGH TEMPERATURE WIRING INSULATION IS PRESENT INSIDE OF THE LARGER TRANE AIR HANDLING UNIT. REFER TO SPECIFICATION 02 89 00 FOR REMOVAL AND DISPOSAL REQUIRMENTS



1 MECHANICAL ROOM HVAC DEMOLITION ENLARGED PLAN
1/2" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

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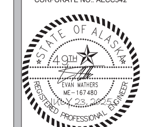
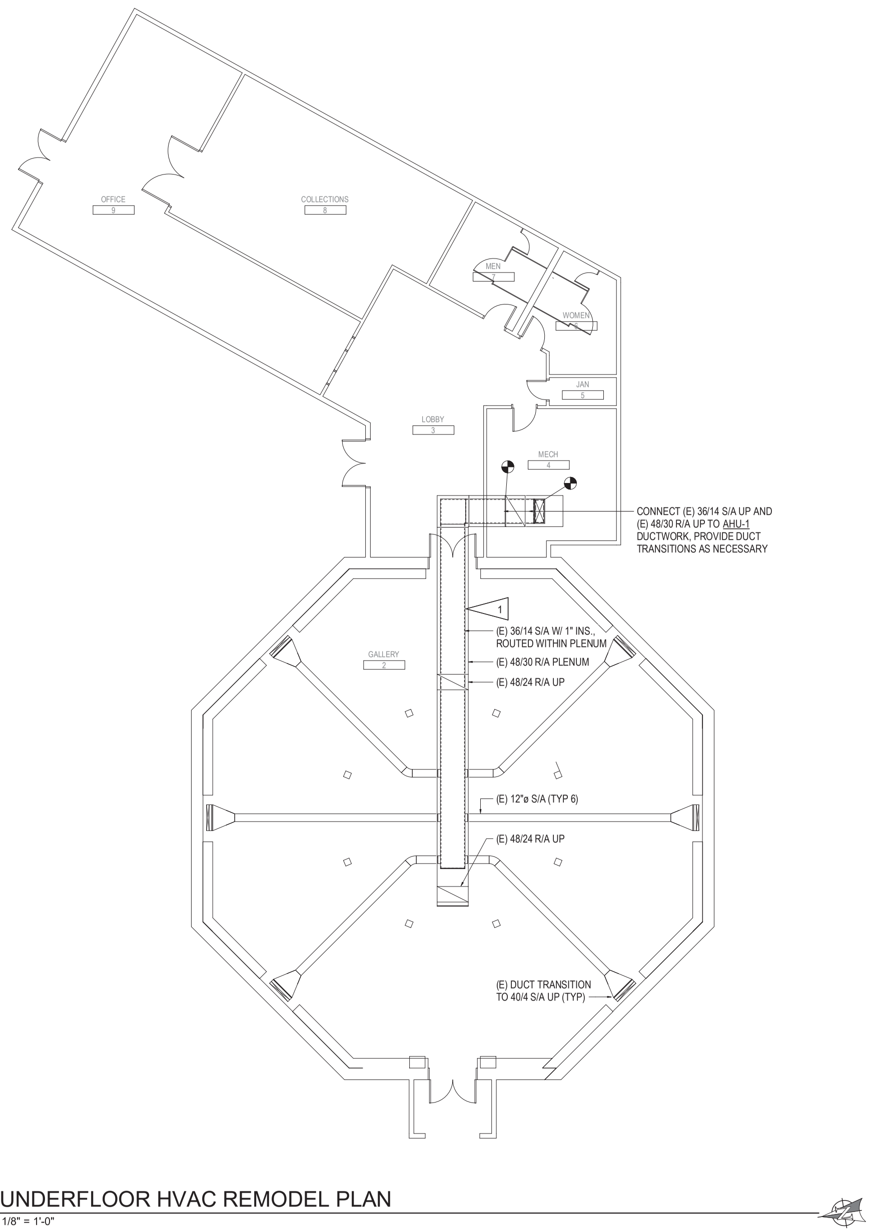


MECHANICAL ROOM HVAC DEMOLITION

SHEET NO.
M103



1 UNDERFLOOR HVAC REMODEL PLAN
1/8" = 1'-0"

SHEET NOTES:

1. BASE BID: NO WORK
ADD ALT #2: CLEAN EXISTING S/A DUCT AND RETURN AIR PLENUM.

ALASKA
DEPARTMENT OF
TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

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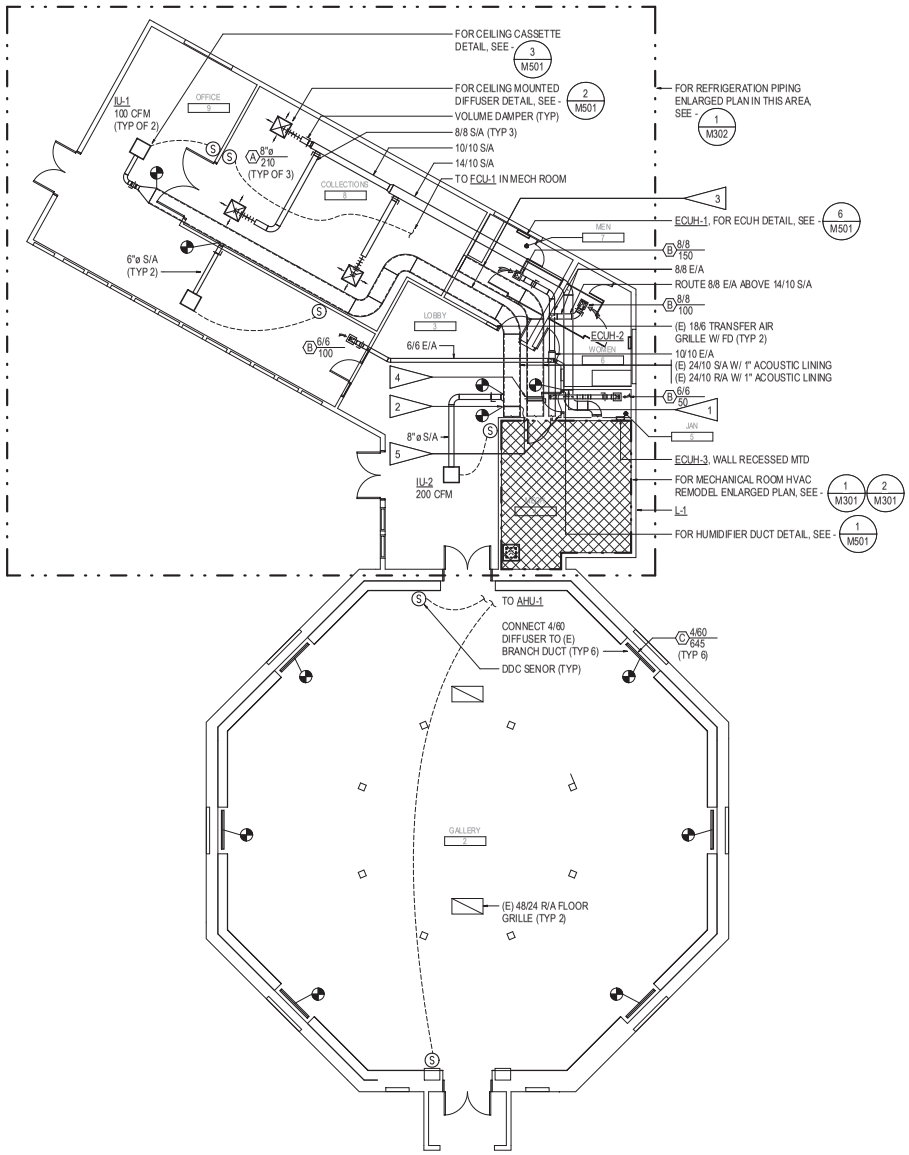
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE,
SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542

STATE OF ALASKA
49TH
EVAN MATHERS
ME-167480
REGISTERED PROFESSIONAL ENGINEER

UNDERFLOOR HVAC REMODEL

SHEET NO.
M201



1 FIRST FLOOR HVAC REMODEL PLAN
1/8" = 1'-0"

SHEET NOTES:

1. PROVIDE DT-2 AND STAINLESS STEEL LINER IN DUCTWORK 12IN UPSTREAM AND 36IN DOWNSTREAM OF DT-2. ROUTE 1.5" STEAM LINES AND 1.5" DRAIN BACK TO MECHANICAL ROOM FLOOR DRAIN WITH 1" AIR GAP.
2. BASE BID: NO WORK
   ADD ALT #1: PROVIDE DT-3 AND STAINLESS STEEL LINER IN DUCTWORK 12IN UPSTREAM AND 36IN DOWNSTREAM OF DT-3. ROUTE 1.5" STEAM LINES AND 1.5" DRAIN BACK TO MECHANICAL ROOM FLOOR DRAIN WITH 1" AIR GAP.
3. BASE BID: NO WORK
   ADD ALT #2: CLEAN EXISTING S/A AND R/A DUCTWORK.
4. PROVIDE VOLUME DAMPER WITHIN EXISTING 24/10 R/A DUCT AND BALANCE TO 630 CFM.
5. ROUTE DISPERSION TUBE CONDENSATE SLOPED AT MIN 1/8" PER FOOT TO NEAREST MECHANICAL ROOM FLOOR DRAIN.

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

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REVISIONS:	

PLANS DEVELOPED BY:
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542

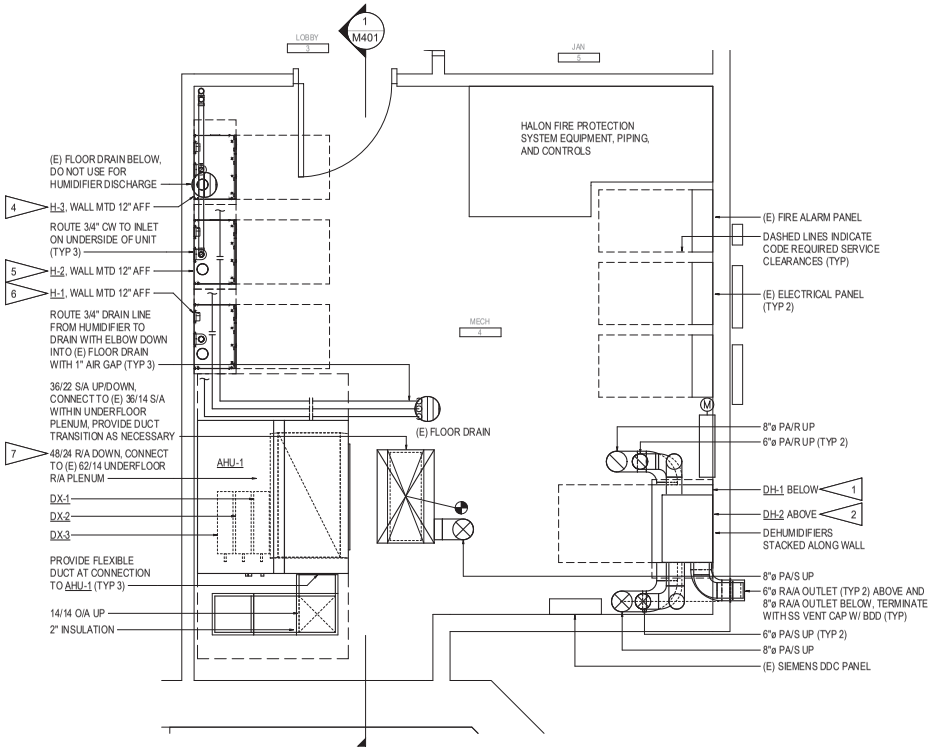
STATE OF ALASKA 49TH REGISTERED PROFESSIONAL ENGINEER

FIRST FLOOR HVAC REMODEL

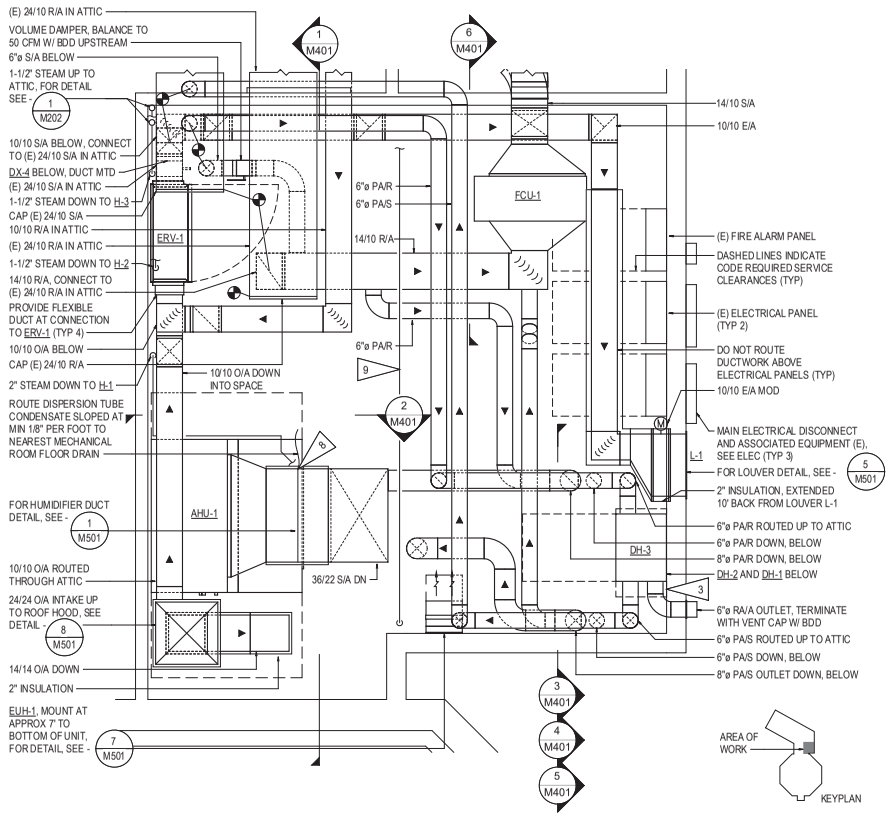
SHEET NO.
M202

SHEET NOTES: <#>

1. ROUTE 8"ø PA/S AND 8"ø PA/R FROM DH-1 TO TIE INTO AHU-1 SUPPLY AIR DUCTWORK. ROUTE 6"ø STAINLESS STEEL INSULATED RA/A OUTLET DUCTWORK OUT SIDEWALL AND TERMINATE WITH VENT CAP W/ BDD.
2. ROUTE 6"ø PA/S AND 6"ø PA/R FROM DH-2 TO TIE INTO FCU-1 RETURN AIR DUCTWORK. ROUTE 4"ø STAINLESS STEEL INSULATED RA/A OUTLET DUCTWORK OUT SIDEWALL AND TERMINATE WITH VENT CAP W/ BDD.
3. BASE BID: NO WORK
   ADD ALT #1: ROUTE 6"ø S/A AND 6"ø R/A FROM DH-3 TO TIE INTO ERV-1 SUPPLY AIR DUCTWORK DOWNSTREAM FROM FCU-1 S/A BRANCH DUCTWORK. ROUTE 4"ø STAINLESS STEEL INSULATED RA/A OUTLET DUCTWORK OUT SIDEWALL AND TERMINATE WITH VENT CAP W/ BDD.
4. BASE BID: NO WORK
   ADD ALT #1: ROUTE 1-1/2" COPPER TUBE FROM TOP SIDE OF H-3 UP TO DT-3 ABOVE LOBBY CEILING. SEE FIRST FLOOR HVAC PLAN FOR APPROXIMATE DT-3 LOCATION.
5. ROUTE 2" COPPER TUBE FROM TOP SIDE OF H-2 UP TO DT-2 ABOVE JANITOR CLOSET CEILING. SEE FIRST FLOOR HVAC PLAN FOR APPROXIMATE DT-2 LOCATION.
6. ROUTE 1-1/2" COPPER TUBE FROM TOP SIDE OF H-1 TO DT-1 IN AHU-1 S/A DUCTWORK. SEE UPPER LEVEL MECHANICAL ROOM HVAC PLAN FOR APPROXIMATE DT-1 LOCATION.
7. CONTRACTOR TO FIELD VERIFY R/A CONNECTION TO EXISTING UNDERFLOOR R/A PLENUM.
8. PROVIDE DT-1 AND STAINLESS STEEL LINER IN DUCTWORK 12IN UPSTREAM AND 36IN DOWNSTREAM OF DT-1. ROUTE STEAM LINES TO H-1 AS SHOWN AND DRAIN TO MECHANICAL ROOM FLOOR DRAIN WITH 1" AIR GAP.
9. COORDINATE DUCT INSTALLATION AND ROUTING WITH EXISTING HALON SYSTEM PIPING.



1 MECHANICAL ROOM HVAC REMODEL ENLARGED PLAN - LOWER LEVEL 6'-
1/2" = 1'-0"



2 MECHANICAL ROOM HVAC REMODEL ENLARGED PLAN - UPPER LEVEL 6'+
1/2" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

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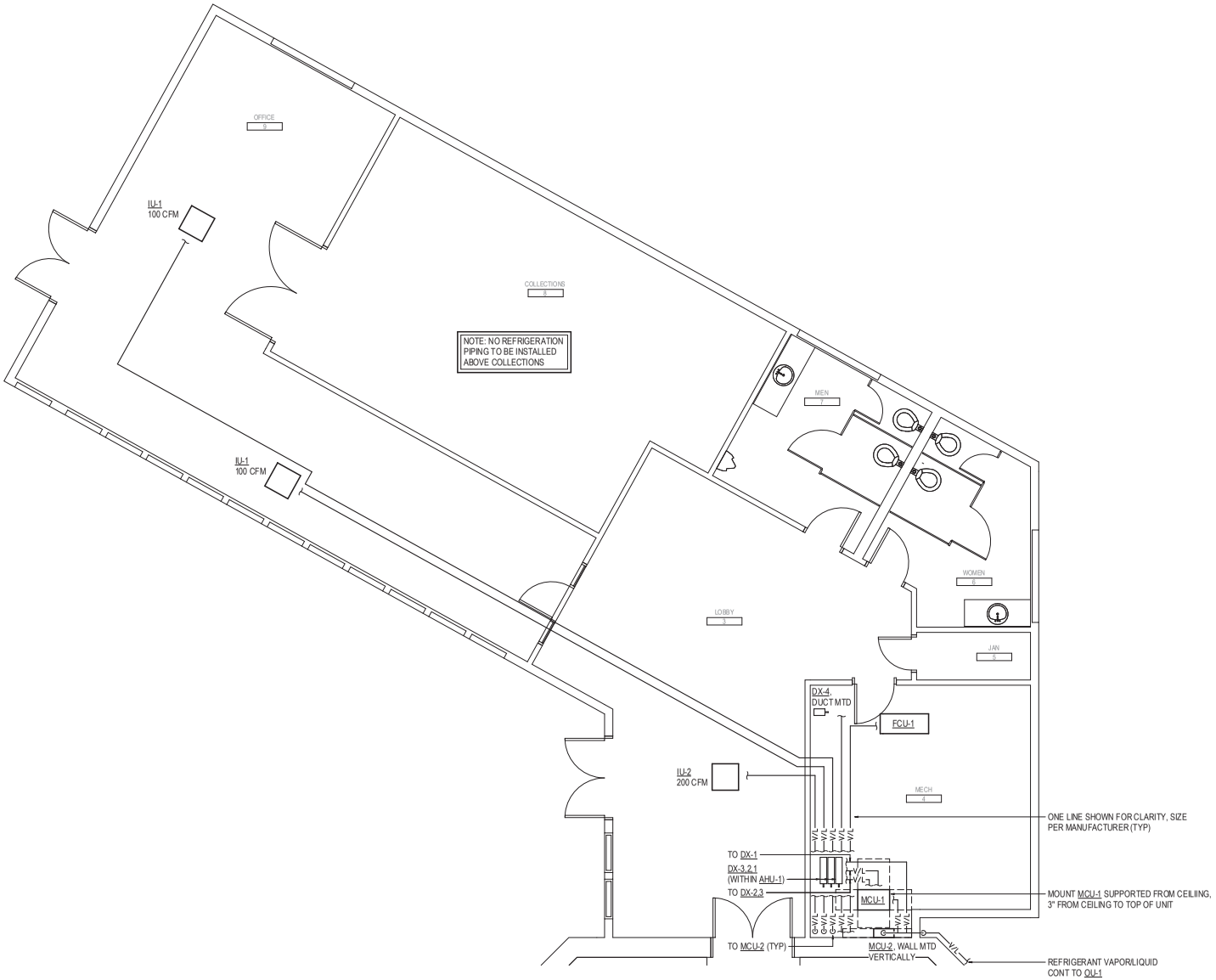
PLANS DEVELOPED BY:
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: ABCC542

STATE OF ALASKA — REGISTERED PROFESSIONAL ENGINEER — EVAN MATHERS — ME-17480

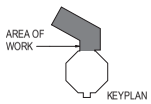
MECHANICAL ROOM HVAC REMODEL

SHEET NO.
M301



1 FIRST FLOOR REFRIGERATION PIPING ENLARGED PLAN

1/4" = 1'-0"



ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

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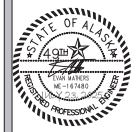
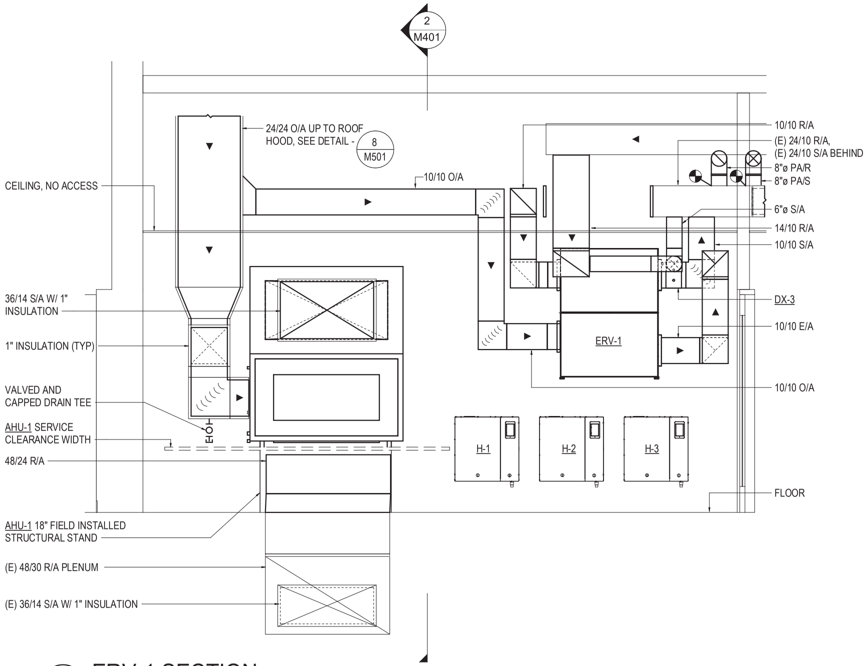
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542



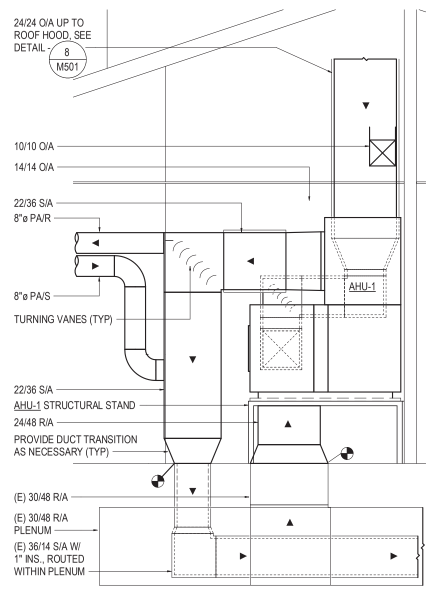
FIRST FLOOR REFRIGERATION PIPING ENLARGED PLAN

SHEET NO.

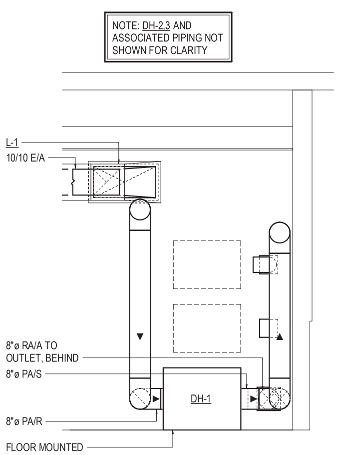
M302



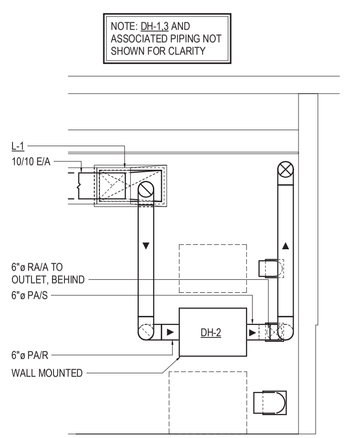
1 ERV-1 SECTION
1/2" = 1'-0"



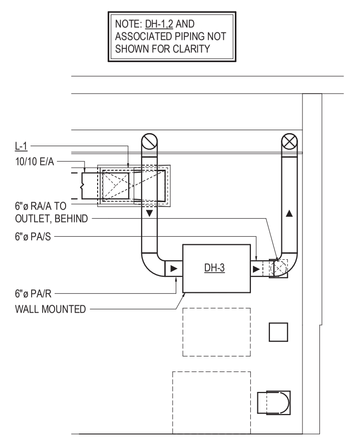
2 AHU-1 SECTION
1/2" = 1'-0"



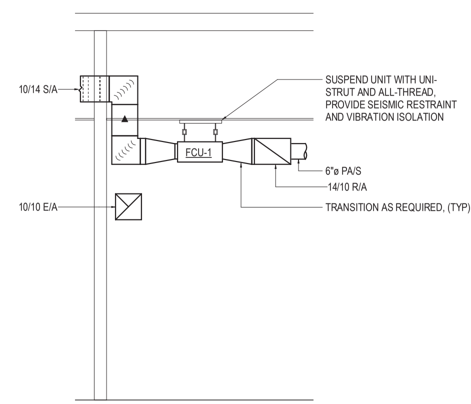
3 DH-1 SECTION
1/2" = 1'-0"



4 DH-2 SECTION
1/2" = 1'-0"



5 DH-3 SECTION
1/2" = 1'-0"



6 FCU-1 SECTION
1/2" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

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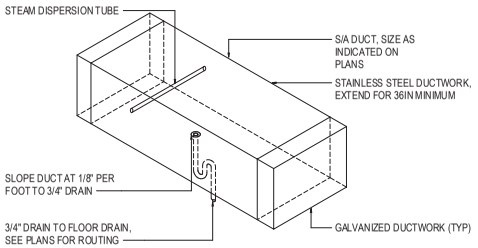
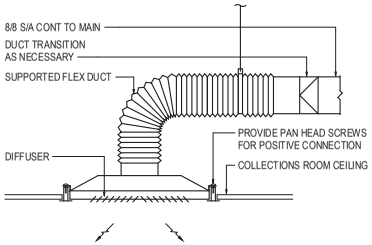
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542

MECHANICAL SECTIONS

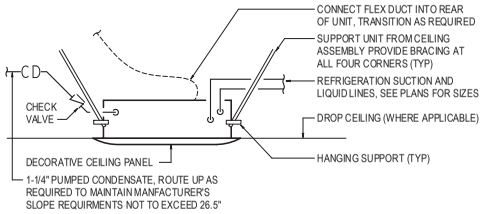
SHEET NO.
M401



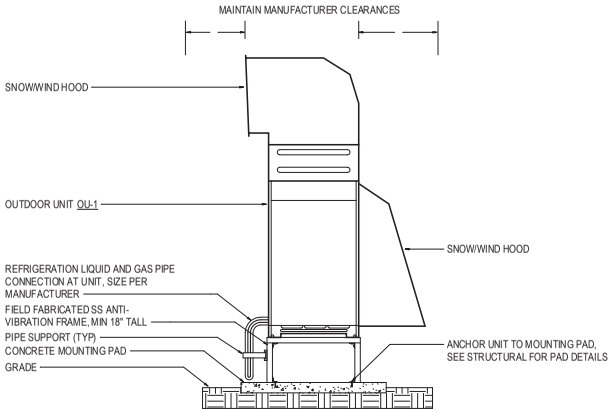
1 HUMIDIFIER DUCT DETAIL
NOT TO SCALE



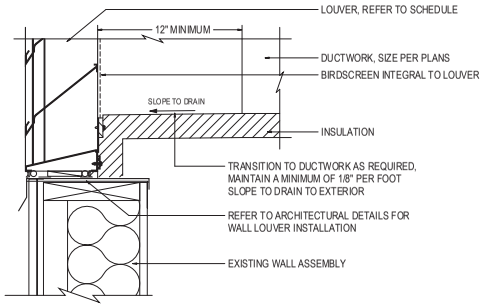
2 CEILING MOUNTED DIFFUSER DETAIL
NOT TO SCALE



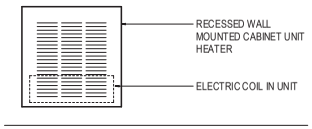
3 CEILING CASSETTE DETAIL
NOT TO SCALE



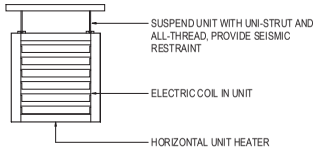
4 OUTDOOR UNIT DETAIL
NOT TO SCALE



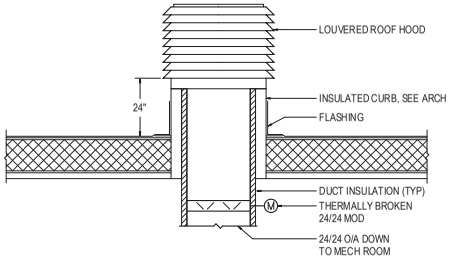
5 LOUVER DETAIL
NOT TO SCALE



6 ELECTRIC CABINET UNIT HEATER DETAIL
NOT TO SCALE



7 ELECTRIC UNIT HEATER DETAIL
NOT TO SCALE



8 ROOF HOOD DETAIL
NOT TO SCALE

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

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670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
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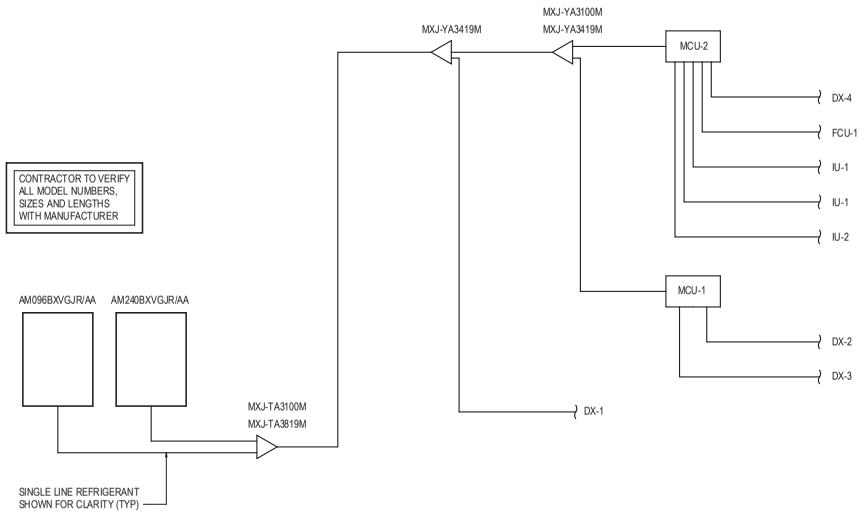
MECHANICAL DETAILS

SHEET NO.
M501



1 REFRIGERATION PIPING DETAIL

NOT TO SCALE

ALASKA
DEPARTMENT OF
TRANSPORTATION

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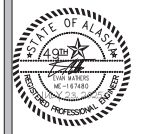


MECHANICAL SCHEMATICS

SHEET NO.

M601

SHEET NOTES: <#>

1. THE CONTRACTOR SHALL IDENTIFY AND TRACE OUT EXISTING UNKNOWN CIRCUITS AND PROVIDE AN UPDATED CIRCUIT DIRECTORY WITH CLEAR, UNIQUELY DESCRIPTIVE LABELS IN ACCORDANCE WITH THE NEC.

PANEL 'B'

MFR/MODEL: SQUARE 'D' TYPE NQ | VOLTS: 120/208V,3PH,4W | ENCLOSURE: NEMA 1 | 600 A

						VOLT-AMPS			MTG: SURFACE					
NOTE	CIRC	POLE	AMPS	SERVICE	TYPE	A	B	C	TYPE	SERVICE	AMPS	POLE	CIRC	NOTE
a,c	1	3	150	PANEL 'A'	FEDR	- ⋮ 425			MOTR	ERV-1	15	2	2	
a,c	3	3	150	^^	FEDR		- ⋮ 425		MOTR	^^	15	2	4	
a,c	5	3	150	^^	FEDR			- ⋮ 1508	HEAT	ECUH-1	20	2	6	
	7	3	20	AHU-1	MOTR	1081 ⋮ 1508			HEAT	^^	20	2	8	
	9	3	20	^^	MOTR		1081 ⋮ 1799		HEAT	ECUH-2	25	2	10	
	11	3	20	^^	MOTR			1081 ⋮ 1799	HEAT	^^	25	2	12	
	13	3	80	OU-1 SEC 2	MOTR	7686 ⋮ 374			HEAT	ECUH-3	15	2	14	
	15	3	80	^^	MOTR		7686 ⋮ 374		HEAT	^^	15	2	16	
	17	3	80	^^	MOTR			7686 ⋮ 2282	MISC	DH-1	25	3	18	
	19	3	70	OU-1 SEC 1	MOTR	7205 ⋮ 2282			MISC	^^	25	3	20	
	21	3	70	^^	MOTR		7205 ⋮ 2282		MISC	^^	25	3	22	
	23	3	70	^^	MOTR			7205 ⋮ 1860	MISC	DH-2	20	1	24	
	25	2	15	I2/IU-1, IU-2	MOTR	166 ⋮ 1860			MISC	DH-3	20	1	26	b
	27	2	15	^^	MOTR		166 ⋮ 3999		MOTR	H-1	50	3	28	
	29	2	15	MCU-1, MCU-2, FCU-1	MISC			518 ⋮ 3999	MOTR	^^	50	3	30	
	31	2	15	^^	MISC	518 ⋮ 3999			MOTR	^^	50	3	32	
	33	3	25	H-2	MOTR		2005 ⋮ 1872		HEAT	EUH-1	25	2	34	
	35	3	25	^^	MOTR			2005 ⋮ 1872	HEAT	^^	25	2	36	
	37	3	25	^^	MOTR	2005 ⋮ -			MISC	SURGE PROTECTOR	20	3	38	a
b	39	3	25	H-3	MOTR		2005 ⋮ -		MISC	^^	20	3	40	a
b	41	3	25	^^	MOTR			2005 ⋮ -	MISC	^^	20	3	42	a
b	43	3	25	^^	MOTR	2005 ⋮ 180			RECP	RECP - OU-1	20	1	44	
	45	1	20	SPARE			⋮			SPARE	20	1	46	
	47	1	20	SPARE				⋮		SPARE	20	1	48	
	49	1	-	SPACE		⋮				SPACE	-	1	50	
	51	1	-	SPACE			⋮			SPACE	-	1	52	
	53	1	-	SPACE				⋮		SPACE	-	1	54	

CALCULATED AIC RATING: 15,352, MINIMUM RECOMMENDED A.I.C. RATING: 22,000

PANEL NOTES:
a EXISTING LOAD TO REMAIN
b LOAD PART OF ADD ALT #1. PROVIDE AS SPARE UNDER BASE BID.
c EXISTING LOAD FED FROM SUB-FEED BREAKER.

PANEL OPTIONS:
MAIN LUGS ONLY

1 PANEL 'A'

MFR/MODEL: SQUARE 'D' TYPE NQ | VOLTS: 120/208V,3PH,4W | ENCLOSURE: NEMA 1 | 225 A

						VOLT-AMPS			MTG: SURFACE					
NOTE	CIRC	POLE	AMPS	SERVICE	TYPE	A	B	C	TYPE	SERVICE	AMPS	POLE	CIRC	NOTE
a	1	1	20	LTG - INTERIOR		⋮				LTG - MUSEUM CKT #1	20	1	2	a
a	3	2	20	LTG - LOBBY TRACKLIGHT			⋮			LTG - MUSEUM CKT #2	20	1	4	a
a	5	2	20	^^				⋮		LTG - MUSEUM CKT #3	20	1	6	a
a	7	1	20	WATER HEATER		⋮				RECP - MECHANICAL	20	1	8	a
a,b	9	1	20	HALON PNL & SECURITY PNL			⋮			RECP - MUSEUM CKT #1	20	1	10	a
a	11	1	20	LTG - MECH, LOBBY, BATHROOMS				⋮		RECP - MUSEUM CKT #2	20	1	12	a
a	13	3	40	TRACKLIGHT VIA DIMMER RACK		⋮				RECP - MUSEUM CKT #3	20	1	14	a
a	15	3	40	^^			⋮			RECP - MUSEUM CKT #4	20	1	16	a
a	17	3	40	^^				⋮		RECP - STORAGE, OFFICE BRK TBL	20	1	18	a
a	19	1	20	UNKNOWN		⋮				LTG - STORAGE CKT #1	20	1	20	a
a	21	1	20	UNKNOWN			⋮			LTG - STORAGE CKT #2	20	1	22	a
a	23	1	20	UNKNOWN				⋮		UNKNOWN	20	1	24	a
a	25	1	20	UNKNOWN		⋮				COLL./OFFICE - EMERGENCY LAMP	20	1	26	a
a	27	1	20	RECP - UNDER SEC.			⋮			UNKNOWN	20	1	28	a
a	29	1	20	SECURITY PANEL				⋮		UNKNOWN	20	1	30	a
a	31	1	20	DATABOARD RECP, MECH RM		⋮				UNKNOWN	20	1	32	a
a	33	1	20	UNKNOWN			⋮			SPARE	20	1	34	
	35	1	-	SPACE				⋮		SPACE	-	1	36	
	37	1	-	SPACE		⋮				SPACE	-	1	38	
	39	1	-	SPACE			⋮			SPACE	-	1	40	
	41	1	-	SPACE				⋮		SPACE	-	1	42	

CALCULATED AIC RATING: 13,427, MINIMUM RECOMMENDED A.I.C. RATING: 22,000

PANEL NOTES:
a EXISTING LOAD TO REMAIN
b PROVIDE A RED HANDLE BREAKER CAPABLE OF BEING LOCKED IN THE 'ON' POSITION.

PANEL OPTIONS:
MAIN LUGS ONLY

ELECTRICAL LEGEND

	CONDUIT, CONCEALED		DUCT TYPE PHOTOELECTRIC SMOKE DETECTOR
#10	NUMBER AND SIZE OF WIRES (NO MARKS = 3 #12)		DUPLEX RECEPTACLE TO BE REMOVED (DASHED OR DOTTED LINES INDICATE ITEMS TO BE REMOVED TYPICAL)
A-2	HOMERUN TO PANEL (PANEL AND CIRCUIT No.)	1	NOTE TAG (No. INDICATES NOTE)
	PANEL	C	CONDUIT
J	JUNCTION BOX	E	DENOTES EXISTING ITEM
	MOTOR (SIZED AS SHOWN)	GFCI	GROUND FAULT CIRCUIT INTERRUPTER
$_F$	FRACTIONAL HORSEPOWER MOTOR STARTER	NEC	NATIONAL ELECTRICAL CODE
	DISCONNECT SWITCH	R	DENOTES EXISTING ITEM THAT HAS BEEN RELOCATED
VFD	VARIABLE FREQUENCY DRIVE WITH INTEGRAL DISCONNECT	TYP	TYPICAL
FCP	FIRE ALARM CONTROL PANEL	WP	WEATHERPROOF

ELECTRICAL LOAD CALCULATION

PANEL 'B' & SERVICE SIZE:		**500 A, 208 V, 3 PH**
PEAK KW DEMAND - 01/09/2023:		75.2 KW
ASSUMED POWER FACTOR:		0.85 PF
EXISTING PEAK DEMAND (IN KVA):		88.47 KVA
125% OF PEAK LOAD (NEC 220.87)		110.59 KVA
EXISTING PEAK DEMAND (IN AMPS):		**307 A**
EXISTING SPARE CAPACITY:		193 A
EXISTING LOADS REMOVED (IN KVA):		
AHU-1	45.00 KVA	
AHU-2	13.00 KVA	
CU-1	18.36 KVA	
CU-2	2.70 KVA	
CUH-1	15.0 KVA	
WALL HEATER MEN	3.00 KVA	
WALL HEATER WOMEN	3.00 KVA	
WALL FAN MEN	0.12 KVA	
WALL FAN WOMEN	0.12 KVA	
PH-1	10.36 KVA	
PH-2	10.36 KVA	
SUBTOTAL:	121.02 KVA	
TOTAL LOADS REMOVED:		-121.02 KVA
TOTAL LOADS REMOVED (IN AMPS):		**-336 A**
NEW LOADS ADDED (IN KVA)		
AHU-1	3.24 KVA	
ERV-1	0.85 KVA	
MCU-1	0.33 KVA	
MCU-2	0.33 KVA	
OU-1 SECTION 1	23.06 KVA	
OU-1 SECTION 2	21.62 KVA	
FCU-1	0.20 KVA	
2 IU-1	0.21 KVA	
IU-2	0.12 KVA	
ECUH-1	3.02 KVA	
ECUH-2	3.60 KVA	
ECUH-3	0.75 KVA	
EUH-1	3.74 KVA	
DH-1	6.85 KVA	
DH-2	1.86 KVA	
* DH-3	1.86 KVA	
H-1	12.00 KVA	
H-2	6.02 KVA	
* H-3	6.02 KVA	
RECEPTACLE	0.18 KVA	
25% OF LARGEST MOTOR (OU-1)	5.76 KVA	
SUBTOTAL:	101.61 KVA	
TOTAL LOADS ADDED:		101.61 KVA
TOTAL LOADS ADDED (IN AMPS):		**282 A**
NET LOAD CHANGE:		-19.41 KVA
NET LOAD CHANGE (IN AMPS):		-54 A
NEW TOTAL NEC DEMAND LOAD:		91.18 KVA
NEW TOTAL NEC DEMAND LOAD:		**253 A**
SPARE CAPACITY:		247 A

RESULT: OVERALL REDUCTION OF LOAD ON EXISTING DISTRIBUTION SYSTEM.

* ADDITIVE ALTERNATE #1

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

100% BID DOCUMENTS

JOB NO.	M4087
DATE:	7.23.25
PROJ. MGR.:	PCC
DRAWN BY:	CSZ,NVF
REVIEWED BY:	PCC,FWS
REVISIONS:	

PLANS DEVELOPED BY:
RSA ENGINEERING, INC.
670 WEST FIREWEED LANE, SUITE 200
PHONE: (907) 276-0521
CORPORATE NO.: AECC542

STATE OF ALASKA — PATRICK C. COLLINS — EC-13321 — REGISTERED PROFESSIONAL ENGINEER

ELECTRICAL LEGEND, SCHEDULES AND LOAD CALCULATION

SHEET NO.
E001

GENERAL NOTES:

A. THE INFORMATION SHOWN ON THIS DRAWING IS TAKEN FROM AS-BUILT DRAWINGS AND A NON-DESTRUCTIVE WALK THROUGH OF THE FACILITY. THERE IS NO WARRANTY OR GUARANTEE AS TO THE ACCURACY OF THE INFORMATION SHOWN HERE-IN. THE CONTRACTOR SHALL FIELD VERIFY ALL ITEMS SCHEDULED FOR DEMOLITION PRIOR TO START OF WORK

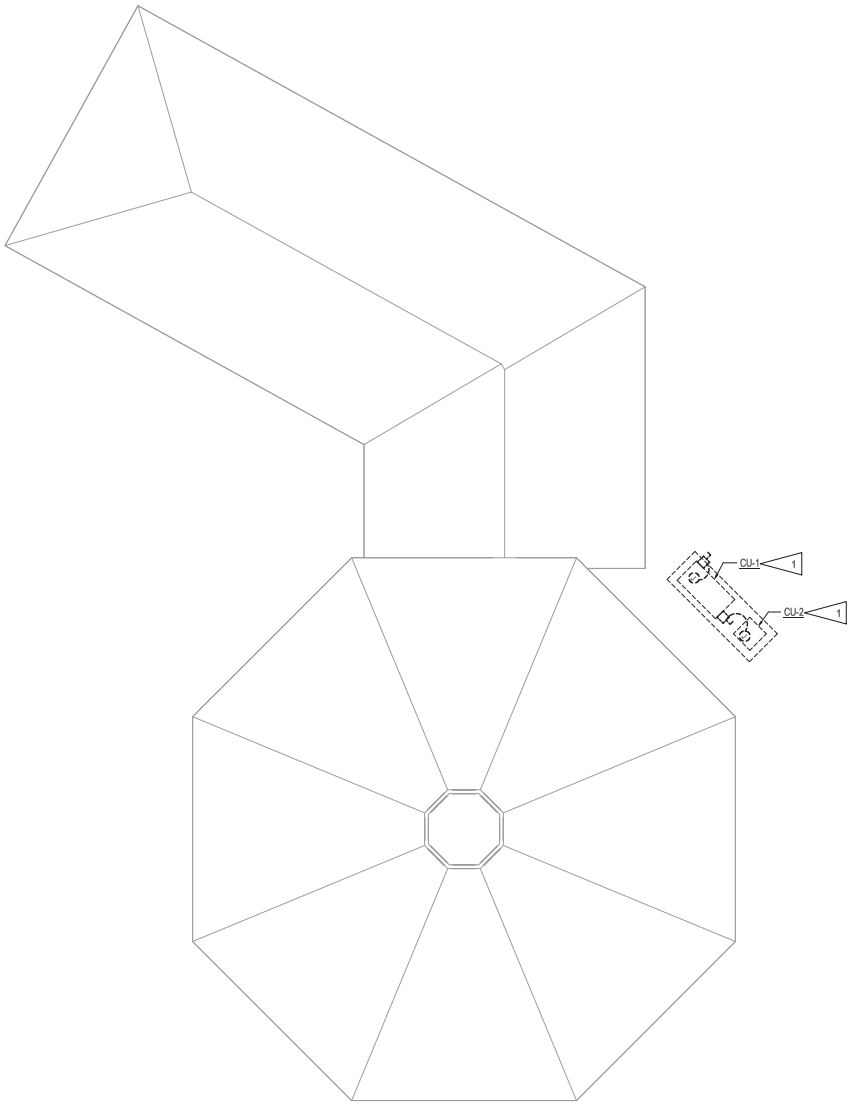
B. THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL ON ALL SALVAGEABLE MATERIALS. THE CONTRACTOR SHALL DELIVER SALVAGED MATERIALS AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL DISPOSE OF, OFF SITE, ALL UNWANTED MATERIALS.

C. DASHED OR DOTTED LINES INDICATE ITEMS TO BE REMOVED. SOLID LINES INDICATE EXISTING ITEMS TO REMAIN.

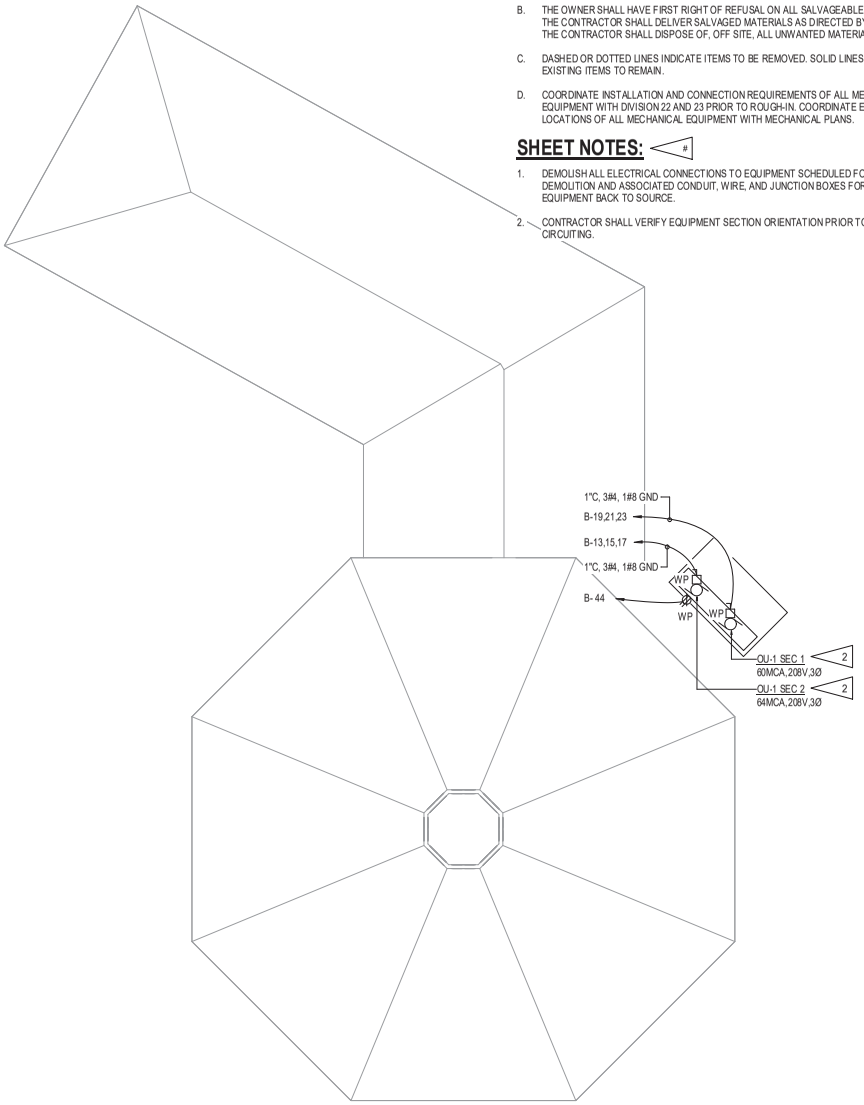
D. COORDINATE INSTALLATION AND CONNECTION REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH DIVISION 22 AND 23 PRIOR TO ROUGH-IN. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL PLANS.

SHEET NOTES: <#>

1. DEMOLISH ALL ELECTRICAL CONNECTIONS TO EQUIPMENT SCHEDULED FOR DEMOLITION AND ASSOCIATED CONDUIT, WIRE, AND JUNCTION BOXES FOR EQUIPMENT BACK TO SOURCE.
2. CONTRACTOR SHALL VERIFY EQUIPMENT SECTION ORIENTATION PRIOR TO CIRCUITING.



1 ELECTRICAL SITE PLAN - DEMOLITION
1/8" = 1'-0"



2 ELECTRICAL SITE PLAN - REMODEL
1/8" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

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STATE OF ALASKA
PATRICK C. COLLINS
EE-13321
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ELECTRICAL SITE PLANS

SHEET NO.
E002

GENERAL NOTES:

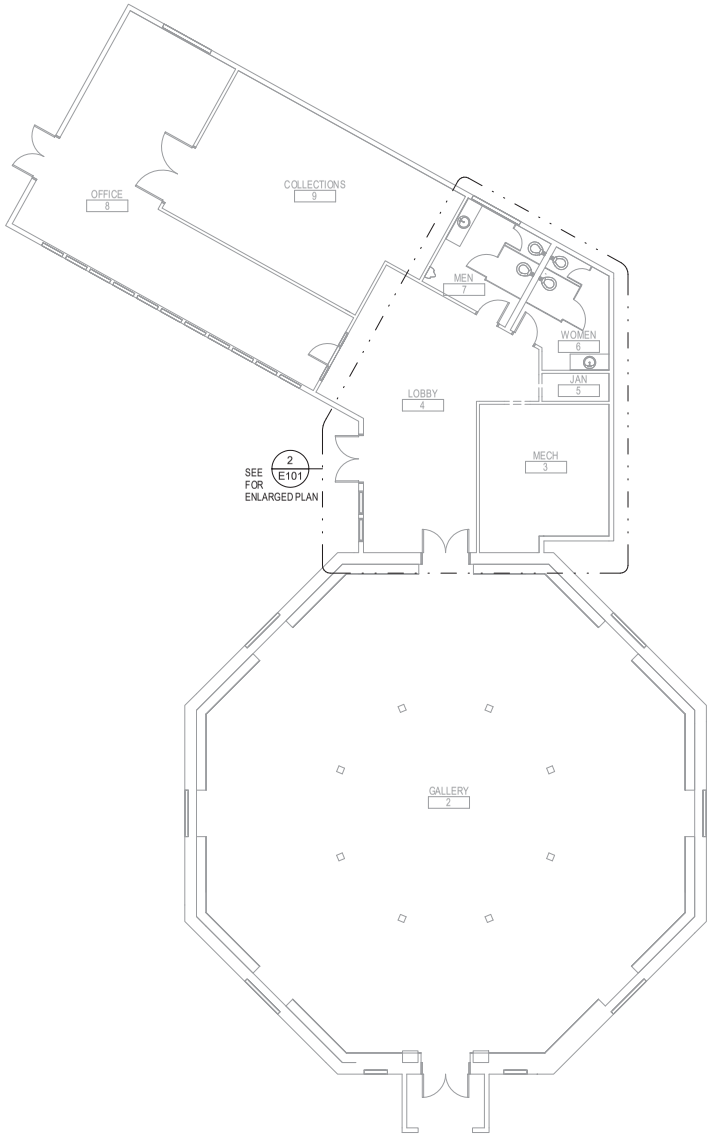
A. SEE SHEET E002 FOR GENERAL NOTES.

B. PRIOR TO DEMOLITION OF FIRE ALARM DEVICES, CONTRACTOR SHALL REVIEW THE STATUS OF THE FIRE ALARM CONTROL PANEL AND PROVIDE IN WRITING ANY TROUBLES OR ALARMS PRESENT IN THE SYSTEM TO THE DEPARTMENT.

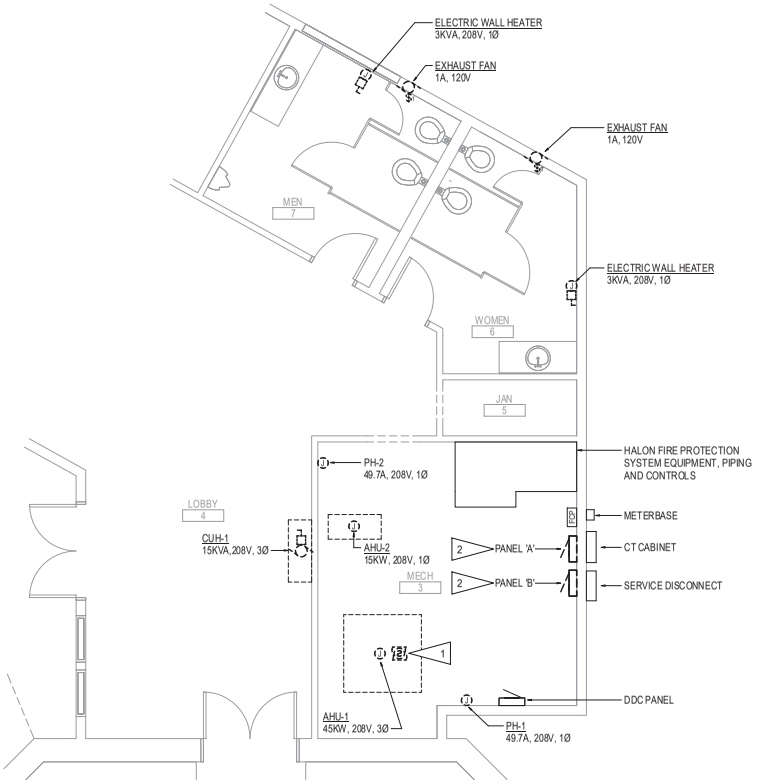
SHEET NOTES: <#>

1. DEMOLISH AIR HANDLING UNIT DUCT DETECTOR. SALVAGE CONDUIT, JUNCTION BOXES AND WIRING FOR CONNECTION TO NEW DUCT DETECTOR IN REMODEL. SEE 1/E201.

2. EXISTING PANEL TO BE REPLACED. SALVAGE FEEDER AND BRANCH CIRCUITS FOR RECONNECTION TO NEW PANELBOARD IN EXISTING LOCATION.



1 FIRST FLOOR ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"



2 ENLARGED ELECTRICAL DEMOLITION PLAN
1/4" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

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49TH
PATRICK C. COLLINS
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ELECTRICAL DEMOLITION PLANS

SHEET NO.
E101

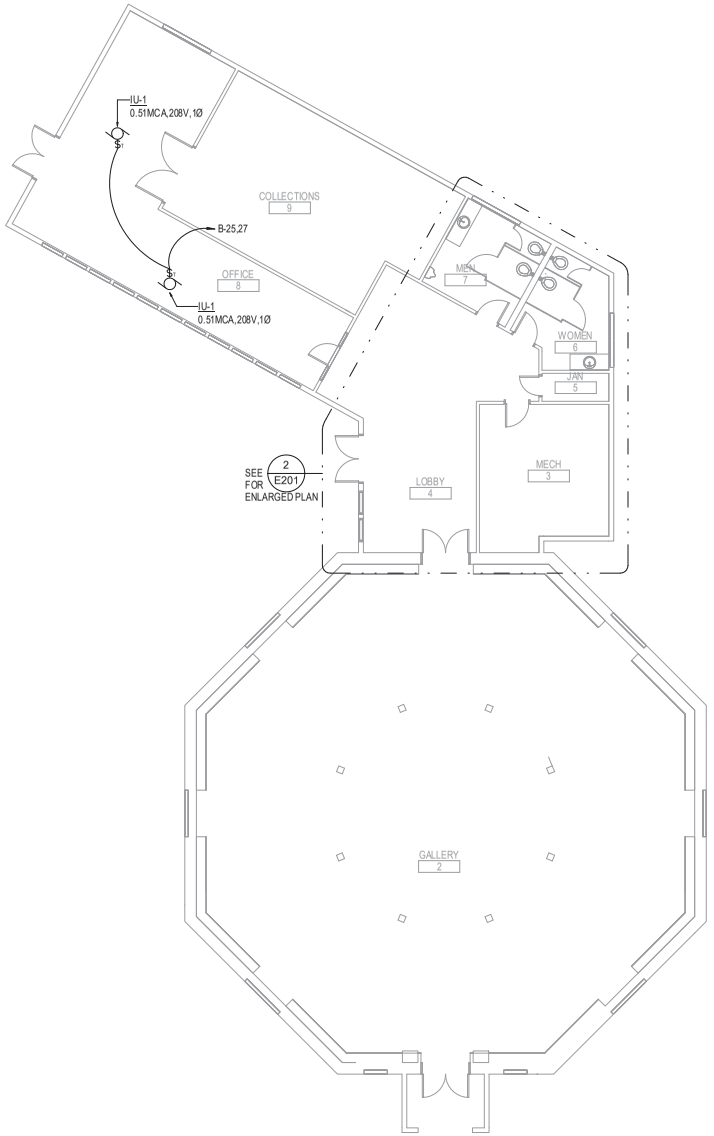
GENERAL NOTES:

A. COORDINATE INSTALLATION AND CONNECTION REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH DIVISION 22 AND 23 PRIOR TO ROUGH-IN. COORDINATE EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL PLANS.

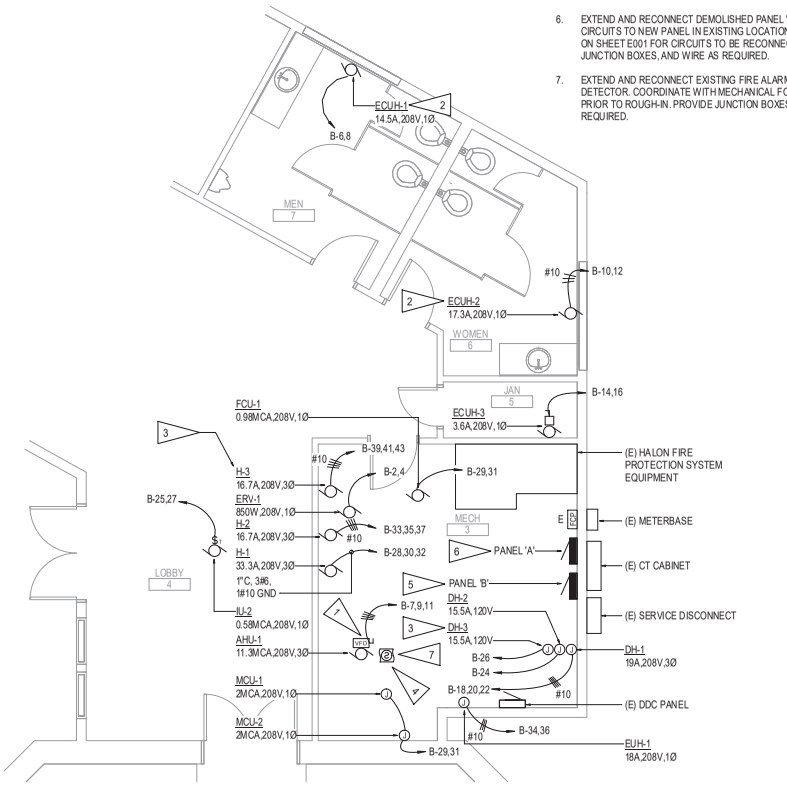
B. CONTRACTOR TO PROVIDE TEMPORARY CONNECTIONS AS REQUIRED TO MINIMIZE TOTAL BUILDING OUTAGES AND PROVIDE PARTIAL BUILDING OPERATIONS.

SHEET NOTES: <#>

1. VFD FURNISHED BY MECHANICAL, INSTALLED BY ELECTRICAL.
2. EQUIPMENT PROVIDED WITH INTEGRAL DISCONNECT.
3. BASE BID: NO WORK.
   ADD ALT #1: PROVIDE CONNECTION TO NEW EQUIPMENT AS INDICATED.
4. NEW NFPA 72 CERTIFIED ADDRESSABLE, PHOTOELECTRIC TYPE DUCT DETECTOR WITH AUXILIARY SPDT RELAY CONTACT, DUCT SAMPLING TUBES EXTENDING THE WIDTH OF THE DUCT, AND VISUAL INDICATION OF DETECTOR ACTIVATION IN DUCT-MOUNTED HOUSING PROVIDE WITH REMOTE VISUAL INDICATOR, TEST, AND RESET STATION. NEW DETECTOR SHALL BE COMPATIBLE FOR OPERATION ON THE EXISTING SIMPLEX CONTROL PANEL POWER SUPPLELY AND SIGNALING LINE CIRCUIT.
5. EXTEND AND RECONNECT DEMOLISHED PANEL 'B' FEEDER TO NEW PANEL IN EXISTING LOCATION. EXTEND AND RECONNECT BRANCH CIRCUITS TO NEW PANEL. SEE PANEL SCHEDULE ON SHEET E001 FOR CIRCUITS TO BE RECONNECTED. PROVIDE CONDUIT, JUNCTION BOXES, AND WIRE AS REQUIRED.
6. EXTEND AND RECONNECT DEMOLISHED PANEL 'A' FEEDER AND BRANCH CIRCUITS TO NEW PANEL IN EXISTING LOCATION. SEE PANEL SCHEDULE ON SHEET E001 FOR CIRCUITS TO BE RECONNECTED. PROVIDE CONDUIT, JUNCTION BOXES, AND WIRE AS REQUIRED.
7. EXTEND AND RECONNECT EXISTING FIRE ALARM CIRCUIT TO NEW DUCT DETECTOR. COORDINATE WITH MECHANICAL FOR EXACT LOCATION PRIOR TO ROUGH-IN. PROVIDE JUNCTION BOXES, CONDUIT, AND WIRE AS REQUIRED.



1 FIRST FLOOR ELECTRICAL REMODEL PLAN
1/8" = 1'-0"



2 ENLARGED ELECTRICAL REMODEL PLAN
1/4" = 1'-0"

ALASKA DEPARTMENT OF TRANSPORTATION

SHELDON JACKSON MUSEUM HVAC UPGRADES - 25C0544708

104 COLLEGE DRIVE SITKA, AK 99835

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REGISTERED PROFESSIONAL ENGINEER

ELECTRICAL REMODEL PLANS

SHEET NO.
E201

SECTION 23 63 00 - REFRIGERANT CONDENSERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Condensing Unit Package.

B. Internal Piping and Accessories.

C. Controls.

D. Charge of Refrigerant and Oil.

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 09 23 - Direct Digital Control System for HVAC.

C. Section 23 23 00 - Refrigerant Piping.

D. Section 23 23 16 - Refrigerant Piping Specialties.

E. Section 23 73 00 - Indoor Central Air-Handling Units.

F. Section 26 05 83 - Wiring Connections.

1.3 QUALITY ASSURANCE

A. Conform to requirements of UL and applicable codes.

B. Test and rate cooling system to ARI Standard 210.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Submit with shop drawings, schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

C. Submit complete pipe sizing data.

D. Submit manufacturer's installation instructions under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Samsung

B. Or approved equal.

2.2 CONDENSING UNITS

A. Provide packaged, factory assembled, prewired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, wind and snow deflector, screens.

2.3 MATERIALS

A. Use corrosion resistant materials for parts in contact with refrigerant.

B. Provide timer circuits to prevent rapid loading and unloading of compressor.

2.4 CABINET

A. Galvanized steel with baked enamel finish, and removable access doors or panels with quick fasteners.

2.5 COMPRESSOR

A. Provide hermetically sealed, 1750 rpm, resiliently mounted compressor with positive lubrication, crankcase heater, cylinder unloaders for capacity modulation, motor overload protection, service valves, and filter drier.

2.6 CONDENSER

A. Coil: Seamless copper tubing with aluminum fins.

B. Fans: Vertical discharge, direct drive axial fans, resiliently mounted with guard and motor.

C. Motors: Permanently lubricated ball bearing motors with built-in current and overload protection.

2.7 CONTROLS

A. Provide factory wired and mounted control panel containing fan motor contactors, compressor interlock, and control transformer.

B. Provide high and low pressure cutouts for compressor, oil pressure control, non-recycling pump-down, and reset relay.

C. Provide controls to permit operation down to 10ºF ambient temperature at minimum compressor load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

B. Furnish charge of refrigerant and oil.

3.2 ADJUSTING

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period. Supply to DEPARTMENT, one complete charge of lubricating oil in addition to that placed in the system.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Inspect and test for refrigerant leaks every six months during first year of operation.

END OF SECTION

SECTION 23 73 00 - INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Indoor Central-Station Air-Handling Units.

B. Energy Recovery Ventilators (ERVs)

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 09 23 - Direct Digital Control System for HVAC.

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Section 23 33 00 - Air Duct Accessories.

1.3 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.

F. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

G. ANSI/AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

H. ANSI/UL 900 - Test Performance of Air Filter Units.

I. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

J. ARI 430 - Standard for Central-Station Air-Handling Units.

K. ARI 435 - Standard for Application of Central-Station Air- Handling Units.

L. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

M. SMACNA - Low Pressure Duct Construction Standards.

1.4 QUALITY ASSURANCE

A. Fan Performance Ratings: Conform to AMCA 210

B. Sound Ratings: AMCA 301; tested to AMCA 300

C. Fabrication: Conform to AMCA

D. Filter Media: ANSI/UL 900 listed, Class I or Class II, approved by local authorities.

E. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

F. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

C. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.

D. Provide fan curves with specified operating point clearly plotted.

E. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

F. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

G. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

H. Submit two samples of replacement filter media with frame, under provisions of Division 01.

I. Submit manufacturer's installation instructions under provisions of Division 01.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Division 01.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.9 EXTRA STOCK

A. Provide one set of disposable panel filters under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – AIR HANDLING UNITS

A. VTS

B. Or approved equal.

2.2 GENERAL

A. Fabricate blow-through type air handling units suitable for low pressure operation.

B. Fabricate units with fan or fan and coil section plus accessories, including split heating DX coil, cooling DX coil, mixing box section, and filter section.

C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified.

D. Base performance on sea level conditions.

E. Model AVS040V manufactured by VTS.

2.3 ACCEPTABLE MANUFACTURERS – ERVS

A. Renewaire

B. Or approved equal.

2.4 GENERAL

A. Energy Recovery type air handling units suitable for low pressure operation.

B. Unit shall provide sensible and latent energy recovery as indicated on schedules.

C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install unit on vibration isolators.

END OF SECTION

SECTION 23 81 13 - PACKAGED TERMINAL AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged VRF Terminal Air Conditioning Units.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 26 05 83 - Wiring Connections: Installation of thermostats and other control components.

1.3 RELATED SECTIONS

A. Section 26 05 83 - Wiring Connections: Electrical supply to units.

1.4 REFERENCES

A. ARI 210 - Unitary Air-Conditioning Equipment.

B. ARI 240 - Air Source Unitary Heat Pump Equipment.

C. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

D. MIL-H-22547B - Heat Pump, Heating and Cooling (Unitary).

1.5 MOCKUP

A. Provide mockup of installation of one unit under provisions of Division 01.

B. Approved mockup may remain as part of the Work.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Submit shop drawings and product data for manufactured products and assemblies required for this project.

C. Indicate water, drain, and electrical rough-in connections on shop drawings or product data.

D. Submit samples under provisions of Division 01.

E. Submit manufacturer's installation instructions under provisions of Division 01.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.9 QUALIFICATIONS

A. Installer with a minimum of five years of documented experience installing VRF systems and a minimum of 4 completed projects with verified completion by the DEPARTMENT and VRF manufacturer.

1.10 WARRANTY

A. Provide five year warranty under provisions of Division 01.

B. Warranty: Include coverage of refrigeration compressors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Samsung

B. Or approved equal.

2.2 CABINET

A. Cabinet: Ceiling mounted of 18 gauge galvanized steel with removable front panel with concealed latches.

B. Discharge Grill and Access Door: 4-way fascia plate.

C. Fan coil unit may provide pass through discharge as indicated on plans.

2.3 CONTROLS

A. Control Module: Remote mounted adjustable thermostat with heat anticipator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers' instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

C. Supply units fully charged with refrigerant and filled with oil.

D. Scheduled performance is based on ARI 210 test conditions. Scheduled sound rating is based on ARI 270.

END OF SECTION

SECTION 02 41 19 - SELECTIVE BUILDING DEMOLITION

PART 1 - GENERAL

1.1 RELATED SECTIONS

1.2 DEFINITION

A. Demolition - Demolish: Completely detach from existing construction, tear down, remove and legally dispose of off-site.

B. Salvage: Remove without damage for reuse.

1.3 APPLICABLE PUBLICATIONS

A. International Building Code (IBC) Section 3302 – Construction Safeguards: Exit Maintenance and Fire Safety.

1.4 SUBMITTALS

A. Record of contractor demolition experience.

B. Description of demolition and removal procedures including dust and noise control.

C. Schedule: Submit schedule indicating proposed methods and sequence of operations for demolition work to the DEPARTMENT for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.
   1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of the DEPARTMENT'S on-site operations.
   2. Coordinate with the DEPARTMENT'S continuing occupation of portions of existing building.

D. Maintain and submit record drawings of underground active utilities to remain.

E. Submit photos of existing surrounding conditions prior to demolition.

1.5 QUALITY ASSURANCE

A. Demolition firm qualifications: Company with at least 5 successful completed demolition work projects similar to this project.

B. Regulatory requirements: Comply with governing authorities before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PREDEMOLITION MEETING

A. Meet with DEPARTMENT representative to review proposed schedule and sequence of work prior to start of work.

1.7 EXISTING CONDITIONS

A. Conduct demolition to minimize interference with adjacent building and property areas. Maintain protected egress and access at all times.

B. Provide, erect, and maintain temporary barriers and security devices.

C. Notify DEPARTMENT and AUTHORITIES owning or controlling affected services before starting operations and disconnecting services.

D. Differing Conditions: Should materials, systems, or conditions be encountered that differ from those indicated, immediately notify DEPARTMENT and do not proceed without approval.

E. If Contractor encounters hazardous materials, or suspected hazardous materials notify DEPARTMENT immediately and do not disturb.

F. Hazardous Materials are anticipated. Refer to DEPARTMENTS separate report and follow approved removal and disposal procedures.

1.8 CONDITION OF STRUCTURES

A. The DEPARTMENT assumes no responsibility for actual condition of items or structures to be demolished.

B. A copy of existing construction drawings is available for review at the DEPARTMENT'S offices. Accuracy and completeness of these construction drawings is not guaranteed.

1.9 OWNER OCCUPANCY

A. The DEPARTMENT will be continuously occupying areas of the building immediately adjacent to areas of demolition. Conduct demolition work in manner that will minimize need for disruption of the DEPARTMENT'S normal operations.

B. Provide minimum of 72 hours advance notice to the DEPARTMENT of demolition activities, which will cause severe impact.

1.10 SALVAGE

A. Items indicated to be demolished or removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

B. Storage or sale of removed items on site will not be permitted.

C. Historic artifacts, including cornerstones and their contents, commemorative plaques and tablets, antiques, and other articles of historic significance remain the property of the DEPARTMENT. Notify the DEPARTMENT if such items are encountered and obtain acceptance regarding method of removal and salvage.

D. Items indicated to be salvaged for DEPARTMENT'S reuse remain the DEPARTMENT'S property.

1.11 DAMAGES

A. Promptly repair damages caused to adjacent facilities by demolition work at no cost to the DEPARTMENT.

1.12 TRAFFIC

A. Conduct demolition operations and debris removal in a manner to ensure minimum interference with streets, walks and other adjacent facilities.

B. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

1.13 ENVIRONMENTAL CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
   1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding and pollution.

PART 2 - PRODUCTS

2.1 BARRIER PARTITIONS

A. Provide barrier between demolition and occupied building areas.

B. Fabricate barriers from two layers of 6-mil thread reinforced plastic sheet, with lapped, stapled and taped seams, or other approved low permeability material.

C. Framing for barriers may be of wood or metal free from rough or sharp projections and edges, with sufficient strength to maintain integrity of dust controlling membrane.

2.2 PROTECTION

A. Provide protection from demolition and exterior weather as necessary to prevent damage to existing finishes and equipment to remain.

B. Provide protection to allow safe passage of DEPARTMENT’s personnel to occupied portions of existing building.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions at adjacent structure surfaces, equipment or to surrounding properties, which could be damaged resulting from demolition work.
   1. Provide minimum 4 by 5 inch digital images showing complete record of existing building interior and exterior demolition areas and adjacent properties.
   2. Submit to DEPARTMENT prior to starting work.

3.2 PREPARATION

A. Erect and maintain temporary barrier partitions to prevent spread of dust, fumes, noise, and smoke. Provide temporary barricades and other forms of protection as required to protect the DEPARTMENT'S personnel and general public from injury due to demolition work.
   1. Provide protective measures as required to provide free and safe passage of the DEPARTMENT'S personnel and general public to and from occupied portions of building.
   2. Protect from damage existing finish work that is to remain in place and that becomes exposed during demolition operations.
   3. Provide temporary weather protection to insure that no water leakage or freeze damage occurs to structure or interior areas of existing building.
   4. Remove protections at completion of work.

B. Protect existing items and site paving which are not indicated to be altered with plywood, tarps, and similar shielding.

C. Remove and store in protected area items noted to be removed and reinstalled or salvaged.

D. Mark locations, disconnect, remove, and cap designated utility services within demolition areas. Maintain and protect existing utilities indicated to remain. Provide 72 hours advance notice to DEPARTMENT if shut-down is necessary.

E. Mark location of disconnected utilities. Identify and indicate capping locations on Project Record Documents.

3.3 DEMOLITION

A. Demolish and remove building items indicated including foundations below ground. Fill in below grade areas and voids using existing soils to avoid steep banks, ponded water and slope to natural soil angles of repose.

B. Except where noted otherwise, immediately remove demolished materials from site as work progresses.

C. Erect and maintain temporary partitions and closures to separate areas where noisy or dusty demolition operations are performed to prevent spread of excessive noise, dust or fumes to occupied portions of the building and to protect interior of building from weather.
   1. Construct temporary barrier partitions of minimum 3-1/2 inch steel studs, 5/8-inch Gypsum board painted white on occupied side, 5/8-inch gypsum exterior sheathing on demolition or weather side, and fill stud cavities with fiberglass insulation.
   2. Use water misting to limit dust and dirt rising and scattering in air. Do not create hazardous or objectionable ice, flooding or pollution when using water.

D. Perform demolition work in a systematic orderly manner. Use such methods as required to complete work indicated on drawings in accordance with approved demolition schedule and governing regulations.
   1. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.
   2. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

3. For slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or walls. Use power saw where possible.

E. Where demolition methods include flame cutting or grinding, provide separate personnel for fire watch during and for four-hours after flame cutting and grinding with appropriate hand held fire extinguishers.

F. If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to the DEPARTMENT in written, accurate detail. Pending receipt of directive from the DEPARTMENT rearrange selective demolition schedule as necessary to continue overall job progress without delay.

G. Do not use explosives.

H. Do not burn or bury materials on site.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish and other materials resulting from demolition operations from building site. Transport and legally dispose of materials off site as work progresses.
1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution. Remove asbestos containing building materials as specified in separate Specification Section.

3.5 CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections.

B. Leave interior areas to remain broom clean and free of demolition dust.

C. Leave exterior site area free from demolished building remains.

D. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02 89 00 - MINOR HAZARDOUS MATERIALS RELATED WORK

PART 1 - GENERAL

1.1. NOTIFICATIONS

A. Notification of Potential Hazards: Asbestos, lead and other potentially hazardous materials are present in the building that may impact the work of all trades. Regulated air contaminants, including asbestos and lead, are also present in settled and concealed dust in and on architectural, structural, mechanical and electrical components or systems throughout the building. All trades shall coordinate with other trades and conduct their work to prevent worker exposure or site contamination. Refer to Specification Divisions 0, 1 and 2 for specific information concerning disturbing, removing and disposing of these materials and the installation of new materials or components. This notification is provided in accordance with EPA and OSHA requirements.

1.2. SECTION INCLUDES

A. This section applies to work involving the removal, disturbance, transportation, and disposal of minor or incidental quantities of asbestos-containing materials, lead-containing materials (including those related to lead-based paint activities as defined and regulated by 40 CFR 745), mercury-containing materials, PCB-containing light ballasts and associated contamination, equipment with ozone depleting substances, items with radioactive components, and heat transfer fluids in building heating and cooling systems.

B. This section does not apply to or address requirements related to the removal, disturbance, transportation, and disposal of larger quantities of asbestos-containing materials, lead-containing materials (including those related to lead-based paint activities as defined and regulated by 40 CFR 745), mercury-containing materials, PCB-containing materials, equipment with ozone depleting substances, items with radioactive components, and heat transfer fluids in building heating and cooling systems such as would be found in a renovation or demolition.

C. This section does not apply to or address requirements related to any other health, safety, or environmental concerns related to other types of materials or conditions which may be present at this site; other PCB-containing materials or contamination not related to light ballasts; stored materials or other materials which are not installed building materials or components; contractor supplied or produced wastes; or any other wastes not specifically described as included.

1.3. CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and other Division 00, 01, and 02 specifications, apply to the work of this section. The contract documents show or describe the work to be done under the contract including related requirements and conditions impacting the project. Related requirements and conditions include, but are not limited to, applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, security of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work, among others. In the event the Contractor discovers a conflict in the contract documents and/or requirements, the conflict must be brought to the immediate attention of the Owner for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without authorization from the Owner shall become the sole risk and responsibility of the Contractor. All costs incurred due to such action are also the responsibility of the Contractor.

1.4. RELATED WORK

A. None.

1.5. REFERENCE STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. All work under this contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards and codes governing miscellaneous hazardous materials removal work, and any other trade work done in conjunction with the project. All applicable codes, regulations, and standards are adopted into this specification and will have the same force and effect as this specification.

C. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.

D. All related regulations, statutes, public laws, registers, and regulatory guidance are incorporated by reference.

E. Alaska Administrative Code (AAC)

1. 8 AAC 61 Occupational Safety and Health Division
2. 8 AAC 61.600-790 Asbestos Abatement Certification
3. 8 AAC 61.1010-1190 Occupational Safety and Health Standards
4. 17 AAC 25 Operations, Wheeled Vehicles
5. 18 AAC 60 Solid Waste Management
6. 18 AAC 60.450 Asbestos Disposal Regulations
7. 18 AAC 62 Hazardous Waste
8. 18 AAC 70 Water Quality Standards
9. 18 AAC 72 Wastewater Treatment and Disposal
10. 18 AAC 75 Oil and Other Hazardous Substances Pollution Control
11. 18 AAC 85 Radiation Protection

F. Alaska Statutes (AS)

1. AS Section 18.31 Asbestos
2. AS Section 18.60 Safety
3. AS Section 18.62 Certificates of Fitness
4. AS Section 23.05 Department of Labor and Workforce Development

G. American National Standards Institute (ANSI)

1. ANSI Z535 Series Safety Alerting Standards

H. American Society of Safety Professionals (ASSP)

1. ASSP Z9.2 Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

I. ASTM International (ASTM)

1. ASTM C732 Aging Effects of Artificial Weathering on Latex Sealants

2. ASTM D522/D522M Mandrel Bend Test of Attached Organic Coatings

3. ASTM D2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

4. ASTM D4397 Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

5. ASTM D4801 Standard Specification for Polyethylene Sheeting in Thickness of 0.25 mm (0.010 in.) and Greater

6. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

7. ASTM E96/E96M Standard Test Methods for Water Vapor Transmission of Materials

8. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials

9. ASTM E736/E736M Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

10. ASTM E1368 Visual Inspection of Asbestos Abatement Projects

11. ASTM F2412 Standard Test Methods for Foot Protection

12. ASTM F2413 Standard Specification for Performance Requirements for Protective (Safety) Toe Cap Footwear

J. Compressed Gas Association (CGA)

1. CGA G-7 Compressed Air for Human Respiration; 6th Edition

K. Institute of Environmental Sciences and Technology (IEST)

1. IEST-Recommended Practices-Contaminant Control (IEST-RP-CC-xxxx) Series

L. International Air Transport Association (IATA)

1. IATA DGR Dangerous Goods Regulations

M. International Organization for Standardization (ISO)

1. ISO 13.340 Protective Equipment Series Standards

N. International Safety Equipment Association (ISEA)

1. ANSI/ISEA 101 Limited-Use and Disposable Coveralls—Size and Labeling Requirements

2. ANSI/ISEA 105 Hand Protection Classification

3. ANSI/ISEA Z87.1 Occupational and Educational Personal Eye and Face Protection Devices

4. ANSI/ISEA Z88 Series Respiratory Protection Standards

O. National Fire Protection Association (NFPA)

1. NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

2. NFPA 1990 Standard for Protective Ensembles for Hazardous Materials and CBRN Operations

P. National Institute for Occupational Safety and Health (NIOSH)

1. NIOSH Manual of Analytical Methods

Q. Nuclear Regulatory Commission

1. 10 CFR Chapter I Nuclear Regulatory Commission

2. 10 CFR 20 Standards for Protecting Against Radiation

R. Underwriters Laboratories (UL)

1. UL 586 Standard for Safety High-Efficiency Particulate, Air Filter Units

S. United States Army Corps of Engineers (USACE)

1. Engineer Manual EM 385-1-1 Safety and Health Requirements

T. United States Department of Transportation

1. 49 CFR Subchapter C Hazardous Materials Regulations

2. 49 CFR 107 Hazardous Materials Program Procedures

3. 49 CFR 171 General Information, Regulations, and Definitions

4. 49 CFR 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements

5. 49 CFR 173 Shippers - General Requirements for Shipments and Packagings

6. 49 CFR 178 Specifications for Packagings

7. 49 CFR 179 Specifications for Tank Cars

U. United States Environmental Protection Agency (EPA)

1. EPA 340/1-90/018 Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance

2. 40 CFR 61 National Emission Standards for Hazardous Air Pollutants

3. 40 CFR 61-Subpart A General Provisions

4. 40 CFR 61-Subpart M National Emission Standard for Asbestos

5. 40 CFR 82 Protection of Stratospheric Ozone

6. 40 CFR 124 Procedures for Decisionmaking

7. 40 CFR Subchapter I Solid Wastes

8. 40 CFR 260 Hazardous Waste Management System: General

9. 40 CFR 261 Identification and Listing of Hazardous Waste

10. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste

11. 40 CFR 263 Standards Applicable to Transporters of Hazardous Waste

12. 40 CFR 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

13. 40 CFR 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

14. 40 CFR 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

15. 40 CFR 267 Standards for Owners and Operators of Hazardous Waste Facilities Operating Under a Standardized Permit

16. 40 CFR 268 Land Disposal Restrictions

17. 40 CFR 270 EPA Administered Permit Programs: The Hazardous Waste Permit Program

18. 40 CFR 271 Requirements for Authorization of State Hazardous Waste Programs

19. 40 CFR 272 Approved State Hazardous Waste Management Programs

20. 40 CFR 273 Standards for Universal Waste Management

21. 40 CFR 300 National Oil and Hazardous Substances Pollution Contingency Plan

22. 40 CFR 302 Designation, Reportable Quantities, and Notification

23. 40 CFR 745 Lead-Based Paint Poisoning Prevention in Certain Residential Structures

24. 40 CFR 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions

25. 40 CFR 763 Asbestos

V. United States Military Standards

1. MIL-STD-282 Filter Units, Protective Clothing, Gas-Mask Components and Related Products: Performance Test Methods

W. United States Occupational Safety and Health Administration (OSHA)

1. 29 CFR 1910.120 Appendix B General Description and Discussion of the Levels of Protection and Protective Gear.

2. 29 CFR 1910 Subpart I Appendix A Nonmandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection

3. 29 CFR 1910.134 Respiratory Protection

4. 29 CFR 1926 Safety and Health Regulations for Construction

5. 29 CFR 1926.21 Safety Training and Education

6. 29 CFR 1926.28 Personal Protective Equipment

7. 29 CFR 1926.32 Definitions

8. 29 CFR 1926.51 Sanitation

9. 29 CFR 1926.53 Ionizing Radiation

10. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists

11. 29 CFR 1926.59 Hazard Communication

12. 29 CFR 1926.62 Lead in Construction

13. 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

14. 29 CFR 1926 Subpart E (Parts 95-107) Personal Protective and Life Saving Equipment

15. 29 CFR 1926.95 Criteria for Personal Protective Equipment

16. 29 CFR 1926.103 Respiratory Protection

17. 29 CFR 1926.200 Accident Prevention Signs and Tags

18. 29 CFR 1926.1101 Asbestos

19. OSHA Publication 3071 Job Hazard Analysis

1.6. DEFINITIONS

A. Definitions used in this section include those used in Divisions 00, 01, and 02; those defined by the Reference Standards listed above; and the following:

B. Auxiliary Work

1. Auxiliary Work is intended to include all work that is not defined as a Major Element by this section. An example of Auxiliary Work includes work such as routing of new mechanical or electrical systems within the Main Work Areas and to areas outside of the Main Work Area(s).

C. Contractor's Professional Industrial Hygienist (CPIH)

1. The Contractor's Professional Industrial Hygienist (CPIH) is responsible for all monitoring, inspections, sampling, and testing which is not work required to be performed by the IIHT. The CPIH and CPIH's employer must have no employee or employer relationship which could constitute a conflict of interest.

D. General Contractor (GC)

1. General Contractor (GC) means the entity the Owner has entered into agreement with to serve as the overall authority of the construction-related aspects of the contract.

E. Hazardous Materials

1. As used in this section, hazardous materials means: asbestos-containing, lead-containing materials, mercury-containing materials, PCB-containing light ballasts and associated contamination, equipment with ozone depleting substances, items with radioactive components, and heat transfer fluids in building heating and cooling systems.

F. Hazardous Materials Assessment (HMA)

1. Hazardous Materials Assessment (HMA) means any reports or other existing information related to asbestos-containing materials or other potentially hazardous materials present at the site which is provided prior to the award of the contract.

G. Hazards Removal Contractor (HRC)

1. Hazards Removal Contractor (HRC) means the GC or other subcontractor(s) responsible for conducting the work required by this section.

H. Independent Industrial Hygiene Technician (IIHT)

1. The Independent Industrial Hygiene Technician IIHT is responsible for conducting all final visual inspections and clearance monitoring required by this section. The IIHT and IIHT's employer must have no employee or employer relationship which could constitute a conflict of interest.

I. Main Work Area

1. Main Work Area is intended to include area(s) which have defined boundaries where the majority of work is located.

J. Major Element

1. Major Element is intended to include the elements of work which are located within the Main Work Area(s), whose scope is not subject to variations in means or methods, and can generally be identified solely by graphical representation or notation on the contract drawings.

K. Refrigerant Recovery Technician (RRT)

1. Refrigerant Recovery Technician (RRT) means the specialty subcontractor responsible for the removal, recovery, and recharging of ODS from equipment located onsite.

L. Transportation and Disposal Coordinator (TDC)

1. Transportation and Disposal Coordinator (TDC) means the person selected by the GC who is responsible for ensuring compliance with all applicable rules and regulations pertaining to the wastes generated by the work covered by this section.

1.7. QUALITY ASSURANCE

A. General

1. Administrative and supervisory personnel shall, at a minimum, consist of the HRC's Competent Person, the CPIH, and the IIHT. These employees are the GC's representatives responsible for compliance with this section. Non-supervisory personnel must consist of an adequate number of qualified personnel to meet the performance requirements of the project. All personnel must meet required qualifications.

2. Comply with the specific requirements of this contract, and other applicable laws, ordinances, rules, and regulations of federal, state, and local authorities having jurisdiction regarding removing, handling, storing, transporting, and disposal of the hazardous materials covered by this section. Notify the Owner and request resolution of conflicts between regulations and specified requirements before starting work.

B. Responsibilities

1. Owner Responsibilities Prior to Commencement of Work

a. The Owner will notify occupants adjacent to the work areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions if required to complete the work. The Owner will coordinate utilities use, locations, and other conditions of use with the GC.

2. HRC and GC Responsibility

a. The HRC shall assume primary responsibility and liability for compliance with all applicable federal, state, and local regulations related to all aspects of the hazardous materials removal work. The GC shall assume secondary responsibility and liability for their own and their other subcontractor's compliance with all applicable federal, state, and local regulations as it relates to potential hazards associated with the hazardous materials present in the work areas. The HRC and GC are responsible for providing and maintaining required documentation including, but not limited to, training, accreditations, medical exams, medical records, personal protective equipment (PPE), respiratory protection, and

respirator fit testing, as required by applicable federal, state, and local regulations and this section. The HRC and GC must hold the Owner harmless for any Contractor failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental regulations or contract requirements on the part of themself, their employees, or their subcontractors.

3. TDC Responsibility

   a. The GC must designate, by position and title, one person to act as the TDC who is responsible for ensuring compliance with all applicable federal, state, and local regulations related to the transportation and disposal hazardous materials waste generated by the work covered by this section. The TDC's responsibilities include, but are not limited to, accurate identification and classification of the hazardous materials wastes; determination of proper shipping names; identification of marking, labeling, packaging, and placarding requirements; completion of waste profiles, hazardous waste manifests, PCB manifests, bill of ladings, exception and discrepancy reports; and all other transportation and disposal documentation required by this section.

C. Site Conditions

1. The condition of the hazardous materials at the site are described in the HMA, and those conditions were accurate as of the dates of inspection cited in that HMA. Prior to starting work in any area, the HRC and GC must verify the accuracy of the conditions that are presented in the HMA, the hazards abatement design drawings and specifications, and the HRC's approved Hazards Abatement Plan (HAP).

2. The building may be occupied and in use during the work. The HRC and GC must coordinate the timing of work with the Owner and other trades to ensure there are no adverse effects to building functions or occupants, and that other performance requirements of the contract are met.

D. Security

1. The HRC and GC are jointly responsible for and must control access to the areas where hazardous materials removal work is being performed and areas where hazardous materials are being stored. Access must be restricted to properly trained and protected persons authorized to be in those areas. Entry into these areas by unauthorized persons must be reported immediately to the Competent Person by anyone observing the entry. The Competent Person must immediately require any unauthorized person to leave the regulated area and then notify the Owner and the GC.

E. Variations in Quantity

1. The estimated quantities of hazardous materials to be removed and/or disturbed are shown in paragraph 1.8 below. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents. Refer to the HMA for detailed information on the hazardous materials known or assumed to be present at this site.

2. No quantities are provided for the removal and disturbance of lead-containing materials which are incidental to the demolition work (i.e. demolition or surface preparation of walls or other components painted with lead-containing paints). Quantities are provided for metallic lead found in components which can generally be removed intact (e.g. batteries,

VTR flashings, sheet lead, etc.). Metallic lead quantities do not include lead-containing solders or lead-containing sealants.

3. The estimated quantities are to be considered a baseline for bidding purposes only and are based on limited assessments of materials located within the project work areas which were made accessible to the designer for use in preparing the hazards abatement specifications. The HRC and GC must satisfy themselves of the actual quantities to be removed and disposed of and to conduct that work in accordance with applicable laws of the authorities having jurisdiction. The HRC and GC must document the locations and quantities of hazardous materials removed each day from each work area. Quantities of hazardous materials must match the units used in the hazards abatement specifications. Where, in the opinion of the HRC or GC, the use of alternative units is necessary, those alternative units may be used with preapproval from the Owner. Minor variations (+/- 10 percent) in the quantities of hazardous materials shown in the hazards abatement specifications are considered as having no impact on contract price or the performance requirements of this contract. The HRC and GC must submit unit pricing within their bid for each hazardous materials identified in the specifications in case additional quantities of material in excess of the minor variation stated above are required to be removed or disturbed and disposed of in order to accommodate the work. The unit prices submitted by the HRC and GC are to be used as the cost basis for additional work required under the contract.

F. Preconstruction Conference

1. After the Preconstruction Submittals have been reviewed and approved, a preconstruction meeting must be held with the following parties in attendance at a minimum: the HRC and their Competent Person, the GC, other interested subcontractors, the CPIH, the IIHT, and the Owner. The goals of the preconstruction meeting are to discuss the planned scope, phasing, and overall coordination and execution of the hazardous materials work; to verify that the approved Preconstruction Submittals are still valid; to identify any potential issues with the project scope, timing, or planning as it relates to the hazardous materials scope of work, and to ensure agreement among the parties prior to commencing work. The preconstruction meeting minutes and sign in sheet must be submitted to the Owner within 5 days after the completion of the preconstruction meeting.

G. Stop Work Order

1. If the Owner or representative of a regulatory authority having jurisdiction presents a verbal Stop Work Order, the HRC and GC must immediately stop all hazardous materials removal work and must maintain all work area protections. If a verbal Stop Work Order is issued, the Owner or a representative of a regulatory authority having jurisdiction will follow-up with a written order to the HRC and GC as soon as it is practicable. The HRC and GC must not resume any hazardous materials removal activity until authorized to do so in writing by the Owner or a representative of a regulatory authority having jurisdiction. A Stop Work Order may be issued at any time the Owner or a representative of a regulatory authority having jurisdiction determines hazardous materials removal work conditions/activities are not being performed within the requirements of this specification, the HRC's approved HAP, regulatory requirements, or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the Owner or the representative of a regulatory authority having jurisdiction. Standby time and costs for corrective actions will be borne by the HRC or GC, including any applicable time or expense incurred by any of the personnel categories stated in the beginning of this paragraph, as a result of the Stop Work Order. The occurrence of any of the following events must be reported immediately by the HRC's Competent Person to the Owner and GC using the most expeditious means (e.g.,

verbal or telephonic), followed up with written notification to the Owner as soon as practicable. The HRC and GC must immediately stop hazardous materials removal removal/disturbance activities and initiate corrective actions if:

a. Airborne PCM analysis results outside of the asbestos regulated work area exceeds 0.01 fibers per cubic centimeter or background whichever is higher.
b. Mercury vapor concentrations exceed 600 ng/m^3 outside of the regulated work area.
c. Breach or break in regulated area containment barrier(s).
d. Pressure within a Negative Pressure Enclosure falls below -0.02 inch WCG.
e. Serious injury/death at the site.
f. Fire/safety emergency at the site.
g. Respiratory protection system failure.
h. Power failure or loss or inadequate use of wetting agent.
i. Any visible emissions observed outside the regulated area.
j. Failure to follow project specification requirements.

H. Protection of Existing Work to Remain

1. The HRC and GC must not damage or cause contamination to existing finishes or other existing elements or areas scheduled to remain at the site. Where such elements or areas are damaged or contaminated as verified by the Owner using visual inspection and/or sample analysis, the HRC and GC must stop work and restore those elements or areas to their original undamaged and uncontaminated condition at no additional cost to the Owner. Once the elements or areas have been restored to the satisfaction of the Owner, the work may proceed.

I. Monitoring, Inspections, Sampling, and Testing

1. All sampling required by this section must be performed by qualified persons meeting the minimum requirements of this section.

2. The CPIH is responsible for conducting all non-clearance monitoring, inspections, sampling, and testing required by this section.

3. All final visual inspections and clearance air monitoring required by this section must be performed by the IIHT.

4. All costs related to the monitoring, inspections, sampling, and testing required by this section are to be borne by the HRC and/or GC.

5. All costs related to additional monitoring, inspections, sampling, and testing exceeding the minimum requirements of this section, including those costs for any failed final visual inspections or clearance air monitoring, must come at no additional cost to the Owner.

6. The Owner or the representative of a regulatory authority having jurisdiction may observe any monitoring, inspections, sampling, and testing performed under this contract at any time or location at their discretion.

7. The Owner or the representative of a regulatory authority having jurisdiction may perform additional monitoring, inspections, sampling, and testing at any time or location at their discretion.

J. Onsite Documentation

1. The HRC and GC must ensure employees have access to complete copies of the contract documents, the submittal items and other elements required by this section, and to all applicable standards, regulations, codes, and other documents. Electronic format is acceptable except where the contract documents, the submittal items and other elements required by this section, or applicable standards, regulations, codes, or other documents specifically require physical copies to be maintained. Access must be made available at the jobsite at no cost to the employee during normal working hours or at all times work covered by this section is being performed.

1.8. REQUIREMENTS

A. Description of Work

1. The hazardous materials work of this project is anticipated to be minor in nature and incidental to the proposed Sheldon Jackson Museum HVAC Upgrades project. The following is a description of the anticipated hazardous materials scope of work to be performed:

   a. Demolition of the existing outside air intake curb and enlargement of the adjacent roof deck to accommodate the new outside air intake. This work will require the removal and disturbance of no more than 10 square feet of assumed asbestos-containing roof felts, tars, and mastics on both the curb and roof deck. Based on photography of the curb and prevailing conditions of the roof deck taken during the 2020 Roof Replacement project, it is anticipated that the work may be performed “intact” as an unclassified asbestos abatement operation. This is based on the work being able to remove the felts intact from the side of the wooden curb and/or by cutting the roof deck out around the curb and removing the entire curb with adjacent roof deck as an assembly. Should it not be possible to perform the work “intact”, it is anticipated that the work would be performed as a Class III asbestos abatement operation unless larger quantities are removed which would change the classification to a Class II asbestos abatement operation.
   b. Demolition of the existing asbestos-containing high temperature wiring insulation inside of the larger Trane air handling unit to accommodate the demolition of the entire unit. This work will require the removal and disturbance of no more than 20 linear feet of asbestos-containing high temperature wiring insulation. This work is anticipated to be performed “intact” as an unclassified asbestos abatement operation.
   c. Disturbance of lead-containing paints as necessary to accommodate the project, such as for penetrations thru walls, ceilings, cabinetry, or other painted surfaces, or for painting and patching activities. This work may be regulated by 29 CFR 1926.62, however, it is the responsibility of the Contractor to determine the applicability of the regulation to their work and to ensure complete compliance with the requirements of that regulation.
   d. Removal, recovery, and disposal of ozone depleting substances from the existing exterior condensing units and all associated piping and appurtenances. The existing ozone depleting substance in use is believed to be R22 based on labels found on the equipment, however, this was not confirmed and it is the responsibility of the removal contractor to verify the type of ozone depleting substance used to the extent necessary to meet regulatory requirements. Additional disposal considerations regarding the equipment using ozone depleting substances include any oils or other circulating media that may be present that may be regulated for disposal.

2. The work includes all related submittals, monitoring, inspections, sampling, testing, removal, disturbance, transportation, disposal, recordkeeping, documentation, and other elements as specified herein.

1.9. LISTING OF REQUIRED SUBMITTALS

A. Preconstruction Submittals

1. Hazard Abatement Plan (HAP).
2. Employee training documentation.
3. Competent Person documentation.
4. Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation.
5. License and insurance for the HRC.
6. CPIH documentation.
7. Testing laboratory documentation.
8. Documentation of notifications.
9. TDC documentation.
10. Waste transporter documentation.
11. Waste disposal site documentation.

B. Periodic Submittals

1. Sampling results.
2. Project logs.
3. Sampling and analysis plan.
4. Updates to any of the preconstruction submittals.

C. Closeout Submittals

1. Waste transport records.
2. Disposal site receipts.
3. Updates to any previously submitted submittals.

1.10. DETAILS OF REQUIRED PRECONSTRUCTION SUBMITTALS

A. Hazard Abatement Plan (HAP)

1. The Hazard Abatement Plan (HAP) must not be combined with other hazard abatement plans and must be prepared and signed by a State-accredited EPA Project Designer for asbestos work and by the HRC and/or GC and their Competent Person for all other work.

Provide shop drawings for each affected area and a table of contents for each submittal item, which follows the sequence of requirements in the contract. The plan, at a minimum, must include the proposed means, methods, materials, equipment, and other procedures to be used by the HRC which must include, but not be limited to, the following elements for each of the hazardous material to be removed:

a. Procedures for notification of other employers and their employees performing work at the site under this contract, building occupants, and other interested parties or as directed by the Owner.
b. A description of each hazardous material to be removed.
c. Estimated quantities of each hazardous material to be removed.
d. A pre-work sampling plan describing the procedures to be used to identify, sample, and quantify any additional hazardous materials found that will require disturbance.
e. Procedures used to identify, execute, and document potential pre-cleaning activities.
f. Procedures to ensure the protection of existing work to remain.
g. Isolation and protection of existing systems.
h. A detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used during the removal, disturbance, or demolition of each hazardous material to be removed.
i. Work area setup to be used for each type of hazardous material to be removed.
j. A description of the minimum training requirements for employees for each type of hazardous material to be removed.
k. Personal protective equipment to be used for each type of hazardous material to be removed.
l. Procedures for the decontamination of personnel for each type of hazardous material to be removed.
m. Removal procedures for each type of hazardous material to be removed.
n. Procedures to be used for the decontamination of existing building components for each type of hazardous material to be removed.
o. Expendable materials to be used during the removal of hazardous materials for each type of hazardous material to be removed.
p. Procedures to be used in the event hazardous materials are spilled, leaked, damaged, or otherwise released in a manner resulting in contamination of existing building components.
q. Procedures to ensure negative air pressure is maintained within Negative Pressure Enclosures and corrective actions to be taken in the event of equipment failure or other events which may lead to inadequate negative pressure.
r. Procedures for supplying, controlling, treating, and discharging water and wastewater.
s. Monitoring and sampling to be used for each type of hazardous material to be removed.
t. Waste packaging, storage, loadout, decontamination, manifesting, transport, and disposal procedures.
u. Procedures to follow in the event additional quantities of hazardous materials are encountered after the start of work.
v. Current copies of accreditations relevant to the hazardous materials being removed of the person who prepared the MHRP and their Competent Person.

2. At a minimum, shop drawings must show the following elements:

a. The locations and extents of each regulated work area.
b. Locations of critical barriers.
c. Locations of existing systems within and/or adjacent to the regulated work area boundaries to be isolated during the hazardous materials removal activities.

d. Location of decontamination area(s).
e. Location(s) of negative pressure exhaust routing.
f. Location of make-up air entrance(s) into each regulated work area.
g. Locations of water supplies and wastewater treatment and discharge area(s).
h. Locations of monitoring and sampling equipment.
i. Location(s) of first aid materials.
j. Location(s) of fire extinguishers.
k. Emergency egress routes.
l. Waste loadout route(s).
m. Location of temporary storage area(s).
n. The location of copies of all applicable codes, standards, regulations, notices, SDSs, air monitoring results, the HRC's and/or GC's approved work plan, and other pertinent documents.

3. Shop drawings are required only if:

a. Poured polyurethane gym flooring classified as a hazardous waste for mercury is being removed.
b. The hazardous materials being removed are required to be performed within a regulated area.
c. Monitoring and sampling is required due to the type of hazardous material being removed.

B. Employee Training

1. All persons involved in asbestos work must have received training required by 29 CFR 1926.1101, 40 CFR 763, 8 AAC 61, and any other applicable state or local regulations.

2. Persons performing, designing, directly supervising, or monitoring asbestos abatement work must have a current State of Alaska Asbestos Abatement Certificate of Fitness in accordance with 8 AAC 61.600.

3. Submit proof of current accreditation for persons who received training under 40 CFR 763 and submit copies of current State of Alaska Asbestos Abatement Certificates of Fitness. Organize certificates by individual worker, not grouped by type of certification.

4. Due to the potential to contact asbestos-containing materials in project areas throughout this site, all personnel performing work at this site are required to have a minimum of "two-hour asbestos awareness training" in accordance with 29 CFR 1926.1101 and 40 CFR 763. Proof of this training must be maintained onsite for the duration of the project but is not required to be submitted by this section. Only personnel who are trained and State-accredited as an EPA Worker or EPA Contractor/Supervisor are permitted to disturb asbestos-containing materials.

5. All persons involved in the removal of the following hazardous materials must have received training required by 29 CFR 1926.21; 29 CFR 1926.62, 8 AAC 61; 40 CFR 273.16; and any other state or local regulations applicable to the specific hazardous material:

a. Removal of intact universal waste mercury-containing lamps, mercury-containing thermostats, or mercury-containing equipment.
b. Removal of intact universal waste batteries.
c. Removal of intact PCB-containing light ballasts.
d. Removal of heat transfer fluids other than those classified as a hazardous waste.
e. Removal of intact components with radioactive materials.

f. Removal of intact equipment containing ozone depleting substances.
g. Removal of lead-containing materials other than those classified as a hazardous waste.

6. In addition to the training required above, all persons involved in the removal and/or cleanup of the following hazardous materials must have received training equivalent to the training in 29 CFR 1926.65(e):

   a. Poured polyurethane gym flooring classified as a hazardous waste for mercury.
   b. Non-intact mercury-containing lamps, mercury-containing thermostats, or mercury-containing equipment.
   c. Non-intact universal waste batteries.
   d. Heat transfer fluids classified as a hazardous waste.
   e. Non-intact PCB-containing light ballasts.
   f. Removal of lead-containing materials classified as a hazardous waste.

7. All persons involved in the removal of non-intact components with radioactive materials or cleanup and removal of components contaminated by radioactive materials must have received training equivalent to the training in 10 CFR 20; 29 CFR 1926.53; and any other applicable state or local regulations.

8. All persons involved in the recovery of ozone depleting substances from equipment must have received training required by 40 CFR 82.161 and any other applicable state or local regulations.

9. All persons who perform the functions of a Hazmat Employee as defined by 49 CFR 171.8 must be trained in accordance with 49 CFR 172 Subpart H.

10. Submit proof of current accreditation for persons who received training required by this section. Organize certificates by individual worker, not grouped by type of certification.

11. Additional training related to health, safety, and environmental issues may be required, and it is the responsibility of the HRC, the HRC's Competent Person, the GC, and the CPIH to identify those additional issues and to recommend training as necessary to ensure compliance with applicable regulations.

C. Competent Person

1. All asbestos work must be performed under the supervision of a Competent Person as defined by 29 CFR 1926.1101 who additionally has documented experience and training including, but not limited to, the administration and supervision of asbestos abatement projects including exposure assessments and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination unit installation and maintenance requirements, site safety and health requirements, and notification of other employees onsite.

2. All hazardous materials removal work must be performed under the supervision of a Competent Person as defined by 29 CFR 1926.32 and 29 CFR 1926.62 and who additionally meets the employee training requirements of this section.

3. Certify in writing that the proposed Competent Person meets the minimum requirements of this section and submit evidence to support such certification. Examples of acceptable documentation include, but are not limited to, resumes, training documentation, or

descriptions of prior experience supervising or performing hazardous materials removal work.

D. Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation

1. Provide a written statement certifying that the following records are current and available on request for all persons engaged in hazardous materials work:

a. Evidence of training on the contents of 29 CFR 1926.21; 29 CFR 1926.62; 29 CFR 1926.1101; 40 CFR 763, 8 AAC 61, and other related training required by this section and federal, state, or local agencies.
b. Evidence of training on the contents of the HRC's written Respiratory Protection Program and the requirements of 29 CFR 1910.134 and its appendices.
c. Documentation of medical evaluations and determinations, respirator fit tests, and associated recordkeeping required by 29 CFR 1926.103, 29 CFR 1926.62, 29 CFR 1926.1101, and other regulations required by this section and federal, state, or local agencies.

E. HRC License and Insurance

1. Submit a copy of the HRC's license issued by the State of Alaska and a copy of their insurance policy, including exclusions, with a letter from their agent stating in plain language the coverage provided and the fact that hazardous materials removal activities are covered by the policy.

F. Contractor's Professional Industrial Hygienist (CPIH)

1. Submit the following information for the Contractor's Professional Industrial Hygienist (CPIH):

a. The name, address, and telephone number of the CPIH.
b. Evidence of current training and accreditation as a Building Inspector and Contractor/Supervisor Abatement Worker as described by 40 CFR 763.
c. Current State of Alaska Asbestos Abatement Certificate of Fitness in accordance with 8 AAC 61.600.
d. Evidence of successful completion of the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent.
e. If performing onsite analysis of Phase Contrast Microscopy air samples, the CPIH must be currently registered as an Asbestos Analyst and affiliated with a Registered Organization under the American Industrial Hygiene Association (AIHA) Asbestos Analyst Registry (AAR).
f. Alternatively, onsite analysis of Phase Contrast Microscopy air samples may be permitted if the CPIH participates as an asbestos analyst in their laboratory's Industrial Hygiene Proficiency Analytical Testing (IHPAT) program and evidence showing their satisfactory performance in the last four rounds of the program is submitted.
g. Evidence that the CPIH meets the employee training requirements of this section for each hazardous material affected by the project.
h. The CPIH and the HRC and GC must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest.

G. Testing Laboratory

1. The minimum analytical capabilities required for the hazardous materials work under this contract include:

   a. National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods (NMAM) Method 7400: Asbestos and Other Fibers by Phase Contrast Microscopy.
   b. National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods (NMAM) Method 7402: Asbestos by Transmission Electron Microscopy.
   c. United States Environmental Protection Agency Method 600, R93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy.
   d. United States Environmental Protection Agency "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Non-Mandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR 763, Subpart E, Appendix A.
   e. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 1110A – Corrosivity towards steel.
   f. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 1311 – Toxicity Characteristic Leaching Procedure.
   g. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 6010D – Inductively Coupled Plasma-Atomic Emission Spectrometry.
   h. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 6020B – Inductively Coupled Plasma-Mass Spectrometry.
   i. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 7000B – Flame Atomic Absorption Spectrophotometry.
   j. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 7010 – Graphite Furnace Atomic Absorption Spectrophotometry.
   k. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 7040A – Mercury in Liquid Waste (Manual Cold-Vapor Technique).
   l. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 7471B – Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique).
   m. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA publication SW-846, Method 9040C – pH Electrometric Measurement.
   n. NIOSH NMAM 5503 – Polychlorobiphenyls.
   o. NIOSH NMAM Method 6009 – Mercury, modified to achieve a limit of quantification less than 60 ng/m^3.

2. Submit the following information for each testing laboratory:

   a. The name, address, and telephone number of the testing laboratory.
   b. The testing laboratory's current American Industrial Hygiene Association Laboratory Accreditation Programs (AIHA LAP) certificate of accreditation; scope of accreditation; and the most recent Proficiency Testing Performance Report for the Industrial Hygiene Proficiency Analytical Testing (IHPAT) program showing the testing laboratory as "Proficient" for the "Asbestos Analyte Class" in the "Overall Performance Summary".
   c. A listing of the testing laboratory's microscopists showing evidence of successful completion of the National Institute of Occupational Safety and Health (NIOSH)

582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent; participation in and satisfactory performance under the IHPAT program; and Asbestos Analyst Testing (AAT) Performance Results Report for AAR participants.

d. The testing laboratory's current certificate of accreditation and scope of accreditation issued under the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for analysis of asbestos in bulk samples and for analysis of asbestos by Transmission Electron Microscopy in accordance with 40 CFR 763, Subpart E, Appendix A.

e. The testing laboratory's current American Industrial Hygiene Association Laboratory Accreditation Programs (AIHA LAP) certificate of accreditation; scope of accreditation; and the most recent Proficiency Testing Performance Report for the Industrial Hygiene Proficiency Analytical Testing (IHPAT) program showing the testing laboratory as "Proficient" for the "Metals Analyte Class" in the "Overall Performance Summary".

f. For laboratories performing TCLP using Method 1311, submit current copies of their certificate of accreditation issued by an accrediting body listed on the National Environmental Laboratory Accreditation Management System maintained by the National Environmental Laboratory Accreditation Program (NELAP).

g. The testing laboratory's current American Industrial Hygiene Association Laboratory Accreditation Programs (AIHA LAP) certificate of accreditation; scope of accreditation; and the most recent Proficiency Testing Performance Report for the Environmental Lead Proficiency Analytical Testing (ELPAT) program showing the testing laboratory as "Proficient" for the "Paint Analyte Class", "Soil Analyte Class", and "Dust Analyte Class" in the "Overall Performance Summary".

h. The testing laboratory must be independent of the HRC and GC and must have no employee or employer relationship which could constitute a conflict of interest.

H. Notifications

1. Submit copies of notifications to the Alaska Department of Labor required by 8 AAC 61.620 showing approval by the department.

2. Submit copies of notifications to the regional EPA authority required by 40 CFR 61 Subpart M. Note this may include more than one notification and may include trades other than the HRC.

3. Submit the EPA identification number for the site. If the site was not already assigned an EPA identification number, the TDC must assist the Owner in obtaining an EPA identification number for the site under the following conditions:

   a. If the work covered by this section will by itself generate hazardous wastes in excess of the those allowed for a very small quantity generator as defined by 40 CFR 260.10.

   b. If other hazardous wastes are being generated at the site, and the work covered by this section will generate additional hazardous wastes which when added together is in excess of the those allowed for a very small quantity generator as defined by 40 CFR 260.10.

   c. If the work covered by this section cannot be performed in accordance with the conditions for exemption for a very small quantity generator defined in 40 CFR 262.14.

   d. If using the alternative standards for episodic generation found in 40 CFR 262 Subpart L.

   e. If the work covered by this section will by itself generate universal wastes in excess of the those allowed for a small quantity handler of universal waste as defined by 40 CFR 273.9.

f. If other universal wastes are being generated at the site, and the work covered by this section will generate additional universal wastes which when added together is in excess of the those allowed for a small quantity handler of universal waste as defined by 40 CFR 273.9.
g. If otherwise required by 40 CFR Subchapter I.

4. Submit copies of notifications to the regional EPA authority:

a. As required by 40 CFR 262.232 for episodic generation as defined by 40 CFR 262.231.
b. As required by 40 CFR 273.32 for large quantity handlers of universal waste as defined by 40 CFR 273.9.
c. If otherwise required by 40 CFR Subchapter I.

5. If wastes will cross international boundaries, submit notifications as required by 40 CFR 262 Subpart H and any additional notifications required by the country through which the wastes will be transported.

I. TDC Documentation

1. Certify in writing that the proposed TDC meets the minimum requirements of this section and submit evidence to support such certification. Examples of acceptable documentation include, but are not limited to, resumes, training documentation, or descriptions of prior experience supervising or performing hazardous materials removal work.

2. Submit evidence that the TDC meets the employee training requirements of this section for each hazardous material affected by the project.

3. The TDC and the GC and/or their subcontractors must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest.

J. Waste Transporter

1. Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as and all other state and local regulatory agency requirements.

2. Submit the EPA identification number for each transporter who will transport wastes generated by the work covered by this section which are classified as:

a. Hazardous wastes, hazardous materials, or hazardous substances as defined by 40 CFR 261.3 and 49 CFR 171.8.
b. PCB wastes as defined by 40 CFR 761.3.

3. Submit written evidence that the transporter is approved to transport universal wastes in accordance with the requirements of 40 CFR 263 Subpart D.

4. Submit written evidence that each transporter who transports hazardous wastes, hazardous materials, or hazardous substances as defined by 40 CFR 261.3 and 49 CFR 171.8 is registered in accordance with 49 CFR 107 Subpart G, if required by 49 CFR 107.601.

5. Submit written evidence that each transporter who transports hazardous wastes, hazardous materials, or hazardous substances as defined by 40 CFR 261.3 and 49 CFR 171.8 has received training in accordance with 49 CFR 172 Subpart H.

K. Waste Disposal Site

1. Submit written evidence that the landfill is approved for asbestos disposal by the regional EPA authority and local regulatory agencies along with a certification that the Contractor has consulted with the proposed landfill to determine any specific requirements which may be more stringent than those found within this specification, including if pre-authorization is required.

2. If the proposed landfill requires pre-authorization to dispose of asbestos wastes, submit copies of those authorizations as evidence of compliance with the landfill's requirements.

3. Submit the following for each facility which will receive, handle, treat, store, accumulate, dispose of, recycle, or reclaim any of the hazardous wastes generated by the work covered by this section:

   a. The name, address, and telephone number of the facility.
   b. The EPA identification number.

4. Submit the following for each facility which will receive, handle, treat, store, accumulate, dispose of, recycle, or reclaim universal wastes generated by the work covered by this section:

   a. Certification of the facility's universal waste handler status as a small quantity handler of universal waste, a large quantity handler of universal waste, or a destination facility as defined by 40 CFR 273.9.

5. Submit the following for each facility which will receive, handle, treat, store, accumulate, dispose of, recycle, or reclaim hazardous wastes generated by the work covered by this section which meet the definition of hazardous wastes, hazardous materials, or hazardous substances as defined by 40 CFR 261.3 and 49 CFR 171.8; universal wastes as defined by 40 CFR 273.9; and PCB wastes as defined by 40 CFR 761.3:

   a. Evidence the facility is permitted to receive and manage the types of wastes being disposed of in accordance with 40 CFR 124, 40 CFR 270, and RCRA Subtitle C.
   b. For PCB wastes, evidence the facility is approved to receive and manage PCB wastes in accordance with TSCA and 40 CFR 761.
   c. Written approval from the facility stating that they will accept the types of wastes being transported to their facility.

6. Submit evidence that each facility which will handle, treat, store, accumulate, dispose of, recycle, or reclaim equipment with radioactive components being disposed of as part of the work covered by this section:

   a. Is a specific licensee authorized by the NRC to accept such wastes in accordance with 10 CFR Chapter I and their Radioactive Materials License number.

1.11. DETAILS OF REQUIRED PERIODIC SUBMITTALS

A. Sampling Results.

1. Submit the flowing information for all sampling events, regardless of the type of sampling:

    a. The printed name and signature of the individual who conducted the sampling and their certification names, numbers, and expiration date relevant to the type of sampling performed.
    b. The date the samples were collected.
    c. The requested analytical method.
    d. The sample prefixes, numbers, descriptions, and other unique identifying information.
    e. Field logs associated with the sampling.
    f. Drawings showing the locations of all sampling locations.
    g. Chain of custody documentation for the samples.
    h. A finalized report from the testing laboratory showing the name and location of the testing laboratory, the dates of analysis, the name of the analysts, the analytical method used, and the results of the analysis for all samples. The finalized report must be signed by the analyst.

2. Submit the flowing additional information for all air sampling events, regardless of the type of sampling:

    a. Purpose/type of air sample (e.g. personnel, inside or outside work area, baseline, clearance, etc.).
    b. For personnel monitoring, the name of the person being monitored, their work activities, and the type of PPE being worn.
    c. The type of sampling cassette or media used.
    d. The locations of samples and activities being performed during the sampling period.
    e. Sampling pump manufacturer, model number, and serial number.
    f. Beginning flow rate, end flow rate, and average flow rate (L/min).
    g. Equipment and equipment identifier (serial number, etc.) used to calibrate flow rates.
    h. Sample period start time, stop time, and elapsed time (in minutes).
    i. Total air volume sampled (liters).

3. Submit the following additional information for all wipe sampling events, regardless of the type of sampling:

    a. Purpose/type of wipe sample (e.g. inside or outside work area, baseline, clearance, etc.).
    b. The type of sampling wipes, templates, sample containers, or other media used.
    c. Lot number and expiration date of wipes used.
    d. The total area sampled in square feet, square centimeter, or other unit which is capable of being converted to square feet or square centimeter.

4. Submit the flowing additional information for all clearance monitoring events:

    a. Signed and completed final visual inspection forms.

5. Submit the flowing additional information for clearance monitoring events conducted after the complete removal of poured polyurethane gym flooring classified as a hazardous waste for mercury:

    a. Temperature and relative humidity logs collected during the sampling period.

6. Documentation for all sampling events must be submitted to the Owner within 24 hours of receiving the finalized laboratory results.

B. Work area inspections and clearances.

1. Documentation of final visual inspections must:

    a. Include the time and date of the inspection.
    b. The name, signature, and the State of Alaska Asbestos Abatement Certificate of Fitness number and expiration date of the IIHT conducting the inspection.
    c. The name and signature of the IIHT conducting the inspection for non-asbestos-related work.
    d. The IIHT's client which authorized the inspection.
    e. The name of the GC, the HRC, and the HRC's Competent Person.
    f. A written description of the location the inspection is being performed.
    g. A sketch or drawing of the location the inspection is being performed.
    h. Indicate whether the work area was satisfactorily cleaned or indicate that the work area was not satisfactorily cleaned.
    i. If the work area was satisfactorily cleaned, include a statement that the work area is ready for clearance air monitoring.
    j. If the work area was not satisfactorily cleaned, indicate the deficiencies noted and the recommended corrective actions to be taken.
    k. If encapsulants are used, and if those encapsulants were tinted, indicate the color which was used to tint the encapsulant and/or what color the encapsulant appears after drying.
    l. Be uniquely labeled or titled so that it can be referenced by other documentation.

2. Clearance monitoring documentation must:

    a. Indicate the unique label or title of the satisfactory final visual inspection for the work area.
    b. Indicate whether encapsulant was used, and if so, indicate whether the encapsulant has tried to the touch.
    c. Include a statement that the clearance air samples were collected using aggressive means.
    d. Include all other sampling documentation required by this section.

3. Documentation for all work area inspections and clearance events must be submitted to the Owner within 24 hours of receiving the finalized laboratory results.

C. Project Logs.

1. Submit all project logs no later than 24 hours after the end of shift.

2. The HRC's written daily log must include:

    a. The date and time the work took place.
    b. The name and signature of the Competent Person.

c. The name of the CPIH and a description of the type(s) of sampling and inspections performed by the CPIH.
d. A description of the work being performed.
e. A sketch or drawing showing the location of the work being performed.
f. The types and quantities of hazardous materials removed.

3. Regulated area sign-in sheets must include:

a. The date and time the work took place.
b. The name and signature of the Competent Person.
c. A description of where the work is being performed, and if more than one regulated area is present, which regulated area the sign-in sheet applies to.
d. The name and signature of each person entering and exiting the regulated work area.
e. The State of Alaska Asbestos Abatement Certificate of Fitness number for each person entering and exiting the regulated work area.

4. Pressure differential recordings for Negative Pressure Enclosures.

D. Sampling and analysis plan.

1. A sampling and analysis plan in accordance with EPA recommendations and industry standards. The sampling and analysis plan must include the following general elements:

a. The location of the sampling activities.
b. Existing waste characterization data for the materials to be sampled, if any.
c. Sampling rationale and objectives.
d. The material to be sampled and constituents of concern.
e. Sample selection and collection procedures.
f. Sample documentation and shipment.
g. Analytical methods to be used and each method's limits of detection, limits of quantification, and reporting units.
h. The selected analytical laboratory.

E. Submit updates to the preconstruction submittals generated during the work.

1.12. DETAILS OF REQUIRED CLOSEOUT SUBMITTALS

A. Completed disposal records:

1. All information described in 40 CFR 61.150(d).

2. For asbestos, disposal site receipts must include:

a. The name, address, and telephone number of the disposal site.
b. The date and time the asbestos wastes were received by the disposal site operator.
c. The name and signature of the disposal site operator's personnel who received the asbestos wastes.
d. A unique identifying number which can be traced to a waste shipment record.

3. The transportation and disposal of any materials classified as a hazardous waste by 40 CFR 261.3 must be documented using EPA Form 8700-22 "Uniform Hazardous Waste Manifest" (including, if necessary, EPA Form 8700-22A), or electronic manifest.

4. The transportation and disposal of any materials classified as a PCB waste by 40 CFR 761.3 must be documented using EPA Form 8700-22 “Uniform Hazardous Waste Manifest” (including, if necessary, EPA Form 8700-22A), or electronic manifest, a certificate of disposal in accordance with 40 CFR 761.218, and any additional information if required by of 40 CFR 761 Subpart K.

5. If wastes crossed international boundaries, submit additional waste transport and disposal documentation as required by 40 CFR 262 Subpart H and as required by the country through which the wastes were transported.

6. Documentation for the disposal of each type of universal waste must include the following:

    a. The generator name, address, and phone number.
    b. The transporter name, address, and phone number.
    c. The name, address, and phone number of the universal waste transfer facility and/or universal waste handler.
    d. The name, address, and phone number of the destination facility.
    e. The EPA identification number for each generator, handler, transporter, and destination facility.
    f. The type of universal waste.
    g. The date the universal wastes were first removed.
    h. The quantity of universal waste.
    i. The date the universal wastes were transferred to another universal waste handler, transporter, transfer facility, or destination facility.

7. Documentation for the recycling of heat transfer fluids other than those classified as a hazardous waste must include the following:

    a. The name, address, and phone number of the site where the heat transfer fluids were removed.
    b. The transporter name, address, and phone number.
    c. The name, address, and phone number of the transfer facility and/or recycling facility.
    d. The type of heat transfer fluids.
    e. The date the heat transfer fluids were first removed.
    f. The quantity of heat transfer fluids.
    g. The date the heat transfer fluids were transferred to another transporter, transfer facility, or final recycling facility.

8. Documentation for the disposal of items with radioactive components waste must include the following:

    a. The name, address, and phone number of the site where the items with radioactive components were removed.
    b. The transporter name, address, and phone number.
    c. The name, address, and phone number of the final destination facility.
    d. The manufacturer name, model number, serial number, manufacture date, life rating, and date of removal for each item with radioactive components.
    e. Copies of notifications to the NRC and State Director.

9. Documentation for the disposal of ozone depleting substances must include the following:

    a. The name, address, and phone number of the site where the ozone depleting substances were removed.

b. The transporter name, address, and phone number.
c. The name, address, and phone number of the transfer facility and/or final recycling or destruction facility.
d. The types of ozone depleting substances removed, to include information on any other substances or contaminants which were present in the ODS that would affect how the ODS is regulated, such as those described in 40 CFR 82 Subpart F Appendix A.
e. The date the ozone depleting substances were first removed.
f. The quantity of ozone depleting substances.
g. The date the ozone depleting substances were transferred to another transporter, transfer facility, and/or final recycling or destruction facility.

10. Documentation for the recycling of metallic lead materials must include the following:

a. The name, address, and phone number of the site where the metallic lead materials were removed.
b. The transporter name, address, and phone number.
c. The name, address, and phone number of the transfer facility and/or recycling facility.
d. The type of metallic lead materials.
e. The date the metallic lead materials were first removed.
f. The quantity of metallic lead materials.
g. The date the metallic lead materials were transferred to another transporter, transfer facility, or final recycling facility.

11. If more than one form is used to document the transportation and disposal of any hazardous material, each form must contain a unique identifying number, page number, and total page count.

B. In addition to these submittals, the closeout submittals must include all updates to previously submitted information as necessary to ensure the documentation requirements of this section are fulfilled.

1.13. PERFORMANCE REQUIREMENTS FOR SUBMITTALS

A. All types of submittals must be submitted as a “submittal package” with all required documentation for the type of submittal, must be reasonably organized, and must not contain duplicate information or other information not required by this section. Piecemeal submittals, incomplete submittals, disorganized submittals, or submittals containing duplicative or unnecessary information will be rejected without review and returned to the HRC for revision.

B. The HRC must provide the initial Preconstruction Submittal package required by this section to the Owner no less than 14 days prior to the planned start of work.

C. Periodic Submittals must be provided to the Owner within the timeframes specified for each submittal item. Where no timeframe is provided, the Periodic Submittals must be provided at least weekly.

D. The HRC must provide the initial Closeout Submittal package required by this section to the Owner no later than 14 days after demobilization from the site by the HRC.

E. The performance requirements for submittals apply to each construction season and phase separately.

F. The Owner will provide written acceptance or rejection of all submittals no later than 10 days after receiving the submittals.

G. Failure to deliver submittals in accordance with these performance requirements and/or failure to submit any documentation required by this section may result in the withholding of payment until such time a resolution has been reached to the satisfaction of the Owner.

PART 2 - PRODUCTS

2.1. GENERAL

A. The HRC and GC must provide and maintain a sufficient quantity of materials and equipment required to complete the work of the project. This may include, but is not limited to, HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length, fall protection devices, water hoses, airless spray equipment, and any other tools, materials or equipment required to conduct the hazardous materials removal work.

B. All products used during the work must be used in strict accordance with the manufacturer's instructions.

C. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination.

D. Flammable and combustible materials must not be stored inside of any structure, and if stored elsewhere onsite, must be stored in a container specifically designed for the storage of such materials.

E. Provide Ground-Fault Circuit Interrupters (GFCI) for all electrical equipment.

F. All electrical-related work must be performed by a licensed electrician.

2.2. BACKUP ELECTRICAL SOURCES

A. Provide at least one backup electrical source, such as a standby or backup generator, independent of the building’s electrical systems and any other primary electrical systems established by the GC, which has sufficient capacity and rating to supply the maximum expected electrical demand of all electrical devices required to run continuously during the abatement work, including, but not limited to negative air machines, pressure differential monitoring devices, and other critical systems.

2.3. CHEMICALS

A. Maintain Safety Data Sheets (SDS) at the jobsite for all hazardous chemicals under OSHA 29 CFR 1926.59 - Hazard Communication and 8 AAC 61.1110 - Additional Hazard Communication Standards.

B. Solvent must be compatible with replacement materials, must be nonflammable, and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than 140 degrees F.

C. Chlorinated compounds shall not be used with any product.

D. Water used for asbestos abatement must be amended using wetting agents or surfactants specifically designed for such use.

E. All types of encapsulant (bridging, penetrating, lock-down, high-temperature, removal, etc.) must be specifically designed for use in asbestos encapsulation applications, non-flammable, non-combustible, non-toxic, and must be compatible with all replacement products.

F. Chemical paint strippers must be bio-degradable, capable of removing existing paint layers in one application, be formulated to prevent stain, discoloration, or raising of the substrate materials, and must be acceptable to the Owner.

G. Neutralizers for paint strippers must be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

2.4. DANGER SIGNS AND TAPE

A. Use danger signs and tape which comply with 29 CFR 1926.62(m); 29 CFR 1926.200; 29 CFR 1926.1101(k)(7); and ANSI Z535 series standards.

2.5. DECONTAMINATION AREA

A. Provide decontamination areas in accordance with 29 CFR 1926.1101(j).

2.6. DISPOSAL CONTAINERS

A. All disposal containers for asbestos wastes must:

1. Be leak-tight.

2. Use a minimum of 6-mil polyethylene.

3. Be labeled in accordance with 29 CFR 1926.1101(k)(8); 40 CFR 61.149(d)(1) and 40 CFR 61.149(e)(1); 40 CFR 61.150(a)(1); 40 CFR Appendix D to Subpart E of Part 763; and 49 CFR 172.101.

4. Be weatherproof and must be preprinted on the disposal container or affixed directly to the disposal container.

5. Meet any additional requirements of the disposal site operator.

2.7. DUCT TAPE

A. Use commercial grade duct tape which is compatible with existing substrates and materials being used; capable of withstanding the forces encountered during the work, such as for air movement, the weight of weight of water, equipment, personnel, and materials, from punctures, and other expected forces; and that is capable of maintaining bonding strength in wet or dry conditions throughout the temperature extremes expected to be encountered during the work.

2.8. GLOVEBAGS AND GLOVEBOXES

A. All glovebags must meet or exceed the following minimum specifications:

1. Must not be larger than 60” x 60”.

2. Must have glove-like appendages through which materials and tools may be handled.

3. Must be a minimum of 6-mil thick.

4. Must be seamless at the bottom.

5. Must be used without modification.

B. All gloveboxes must meet or exceed the following minimum specifications:

1. Must have rigid sides and made from metal or other material which can withstand the weight of the materials, tools, and water used during removal.

2. Must use a minimum of 6-mil thick polyethylene sheeting.

3. Must have a negative pressure generator capable of maintaining negative pressure in the system.

4. Must have an air filtration unit attached to the glovebox.

5. Must be fitted with gloved apertures.

6. Must have an aperture at the base of the box of adequate size to serve as a bagging outlet for waste asbestos and water.

2.9. HEPA FILTERS

A. Use only HEPA filters certified as capable of capturing particulates of 0.3 microns with 99.97% efficiency when tested in accordance with UL 586, IEST-RP-CC series, or MIL-STD-282. HEPA filters must be labeled with the certifying organization.

B. All equipment using HEPA filters must be designed so that all the air drawn into the equipment is expelled through one or more HEPA filters with none of the air leaking past any portion of the equipment prior to passing through the HEPA filters.

2.10. LABELS

A. Provide labels for each hazardous material waste covered by this section which conform to the requirements of 29 CFR 1926.200; 29 CFR 1926.1101(k)(8); 40 CFR 262.31; 40 CFR 763.95; 49 CFR 172.101; 49 CFR 172 Subpart E, and ANSI Z535 series standards.

2.11. LOCAL EXHAUST VENTILATION

A. Use HEPA-filtered local exhaust ventilation meeting or exceeding the performance requirements of ASSP Z9.2.

B. In addition to the above specifications, local exhaust ventilation used for any work involving mercury dust or vapor must be designed specifically for that purpose, have an activated charcoal filter, and at least one HEPA or ULPA filtration stage.

2.12. MARKINGS

A. Provide markings for each hazardous material waste covered by this section which conform to the requirements of 40 CFR 262.32 and 49 CFR 172 Subpart D.

2.13. NEGATIVE AIR MACHINES

A. Use HEPA-filtered negative air machines which are capable of meeting or exceeding the performance requirements for Negative Pressure Enclosure in 29 CFR 1926.1101(g)(5)(i).

B. In addition to the above specifications, negative air machines used for any work involving mercury dust or vapor must be designed specifically for that purpose, have an activated charcoal filter, and at least one HEPA or ULPA filtration stage.

2.14. PACKAGING

A. Provide packaging for each hazardous material waste covered by this section which conform to the requirements of 40 CFR 262.30, 40 CFR 761 Subpart D, 49 CFR 173, 49 CFR 178, and 49 CFR 179.

2.15. PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. General

1. Provide and maintain a sufficient quantity of Personal Protective Equipment (PPE) designed to protect the ears, eyes, face, head, body, lungs, and extremities to all employees engaged in hazardous material removal work in accordance with the requirements of 29 CFR 1926.28, 29 CFR 1926.62, 29 CFR 1926.1101, 29 CFR 1926 Subpart E, 29 CFR 1926.95, and other sections of 29 CFR Part 1926 as applicable.

2. Required PPE for persons engaged in hazardous material removal work is anticipated to include, but not be limited to, respiratory protective devices, protective clothing, gloves, protective footwear, eye and face protections, hearing protection, fall protection, protective shields, and barriers. Additional PPE must be provided to persons engaged in hazardous material removal work as necessary to protect those employees due to situations such as: other conditions which may be present at the site, conditions caused as a result of the HRC's choice of means and methods to complete the work, or due to hazards which are incidental to the hazardous material removal work. The HRC must perform an assessment of the potential hazards present for each work task being performed and must provide PPE as necessary to protect employees and others from those hazards. The assessments must be documented in writing and maintained at the work site. The elements of the assessment may include, but are not limited to, those elements described in Appendix B to 29 CFR 1910.120; Appendix B to Subpart I of 29 CFR 1910; OSHA Publication 3071 for Job Hazard Analysis; or in USACE EM 385-1-1.

3. PPE must be of commercial quality, bear the manufacturer's name, and certified to meet or exceed any performance and labeling requirements specified by applicable regulations. Examples which demonstrate compliance with this requirement include, but are not limited to:

   a. Respirators which are approved for use by NIOSH in accordance with 42 CFR 82 and meet the requirements of ANSI/ISEA Z88 series standards.
   b. Protective ensembles which are certified by NFPA 1990.
   c. Protective clothing meeting the requirements of ANSI/ISEA 101.
   d. Foot protection meeting the requirements of ASTM F2412 and ASTM F2413.
   e. Hand protection meeting the requirements of ANSI/ISEA 105.
   f. Eye and face protection meeting the requirements of ANSI/ISEA Z87.1.
   g. Head protection meeting the requirements of ANSI/ISEA Z89.1.
   h. Protective equipment meeting the requirements of ISO 13.340.

B. Provide the Owner or representative of an authority having jurisdiction with at least two complete sets of personal protective equipment as required for entry into and inspection of all areas of the regulated work area.

C. Select and use respiratory protective devices in accordance with 29 CFR 1910.134(d) and 1926.1101(h)(3).

D. Breathing air quality and use must meet the requirements of 29 CFR 1910.134(i).

2.16. PLACARDS

A. Provide placards for each hazardous material waste covered by this section which conform to the requirements of 40 CFR 262.33 and 49 CFR 172 Subpart F.

2.17. POLYETHYLENE SHEETING

A. All polyethylene sheeting used for hazardous material work including, but not limited to, the containment of regulated work areas, construction of decontamination areas, isolation of HVAC systems, as a drop cloth, glovebags, disposal containers and liners, etc. must meet the following minimum requirements:

1. Be 6-mil thick or greater.

2. Must be impermeable.

3. Meet the performance requirements of ASTM E84, ASTM D4397 or ASTM D4801, and NFPA 701.

2.18. PRESSURE DIFFERENTIAL MONITORING DEVICE

A. Provide a pressure differential monitoring device for hazardous material work conducted in Negative Pressure Enclosures. The device must:

1. Be capable of continuous operation.

2. Be capable of measuring pressure differential in a minimum range of +0.25” to -0.25” of water column.

3. Have a continuous data logging feature which can store measurements in electronic format, record measurements on physical printouts, or both.

4. Be capable of setting alarm setpoints.

5. Have audible and visual alarm or be able to signal these alarms.

2.19. SANITATION SYSTEMS

A. Provide potable water; nonpotable water; toilets; food handling; temporary sleeping quarters; washing facilities; eating and drinking areas; vermin control; and change rooms in accordance with 29 CFR 1926.51, 29 CFR 1926.62. and 29 CFR 1926.1101(j).

2.20. SPILL RESPONSE MATERIALS

A. Provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials must be available at all times when hazardous materials are being handled or transported. Spill response materials must be compatible with the type of material being handled.

2.21. VACUUMS

A. Use vacuums which have been designed with a HEPA filter as the last filtration stage for general hazardous materials work. The vacuum cleaner must be designed so that all the air drawn into the machine is expelled through the HEPA filter with none of the air leaking past it.

B. Vacuums used for any work involving mercury dust or vapor must be designed specifically for that purpose, have an activated charcoal filter, and at least one HEPA or ULPA filtration stage.

C. All vacuums must be operated and maintained in accordance with the manufacturer's instructions.

2.22. WARNING SIGNS AND TAPE

A. Use warning signs and tape which comply with 29 CFR 1926.200; 29 CFR 1926.1101(k)(7); and ANSI Z535 series standards.

PART 3 - EXECUTION

3.1. GENERAL

A. No work covered by this section may commence until all required Preconstruction Submittals have been approved, a preconstruction meeting held, the pre-work inspections have been completed, and a written authorization to proceed with the work is provided by the Owner.

B. All hazardous materials removal work covered by this section must be performed in accordance with the occupational health and safety regulations of 29 CFR Part 1926, 8 AAC 61, and any other applicable occupational health and safety standards. In addition to these requirements, the following requirements apply to specific hazardous materials:

1. All work involving asbestos must be performed in accordance with 29 CFR 1926.1101, 40 CFR 61 Subpart M, 40 CFR 763, 49 CFR 172 Subpart C, and 18 AAC 60.

2. All work involving universal wastes must be performed in accordance with 40 CFR 273, 18 AAC 60, and 18 AAC 62.

3. All work involving PCB-containing light ballasts must be performed in accordance with 40 CFR 761 and 18 AAC 60.

4. All work involving heat transfer fluids which are not classified as hazardous waste as defined by 40 CFR 261.3 must be performed in accordance with 40 CFR Subchapter I, 18 AAC 60, 18 AAC 72, and 18 AAC 75.

5. All work involving equipment with radioactive components must be performed in accordance with 10 CFR Chapter I, 18 AAC 60 and 18 AAC 85.

6. All work involving ozone depleting substances must be performed in accordance with 40 CFR 82.

7. All work involving hazardous wastes as defined by 40 CFR 261.3 must be performed in accordance with 40 CFR Subchapter I and 18 AAC 62.

8. All work involving lead-containing materials must be performed in accordance with 29 CFR 1926.62 and 18 AAC 60.

C. All hazardous materials transportation work covered by this section must be performed in accordance with the transportation regulations of 49 CFR Subchapter C and 17 AAC 25.

D. The disposal of hazardous materials covered by this section must be performed in accordance with the regulations of 10 CFR Chapter I, 40 CFR 82, 40 CFR Subchapter I, 40 CFR 761, 49 CFR Subchapter C, and 17 AAC 25.

E. Comply with applicable codes and requirements related to fire protection and prevention, emergency egress, first aid, and other similarly related elements.

3.2. PRE-WORK ACTIVITIES

A. The Contractor must perform the following pre-work inspections and preparations prior to starting any work covered by this section:

1. With the assistance of the Owner, determine if there are any special or unique conditions within the work area, such as controls or equipment which may require access during the hazardous materials removal work by non-contractor personnel, that may necessitate modification or revision of the Contractor's approved HAP.

2. Determine the extents of each individual work area and the work to be performed within those areas, and confirm that the conditions, work areas, and work to take place is in accordance with the Contractor's approved HAP. If materials are identified that may be contacted or disturbed by the work that are not classified as asbestos-containing or non-asbestos-containing in the Hazardous Materials Assessment, the CPIH must collect bulk samples of those materials in accordance with this section.

3. If the HAP or other submittal elements required by this section require modification or revision due to discoveries made during the pre-work inspections and preparations, the Contractor must submit those modifications and/or revisions to the Owner for review and approval prior to starting work.

3.3. PRE-WORK NOTIFICATIONS AND AUTHORIZATIONS

A. The Contractor must submit a "Notification of Demolition and Renovation" to the EPA Region 10 NESHAP coordinator at least 10 working days prior to starting the work if required by 40 CFR 61.145. The notification must be updated periodically if the amount of asbestos affected changes by at least 20 percent, if the start or end dates change, or as otherwise required by 40 CFR 61.145(b).

B. The Contractor must submit notification to, and receive approval from, the Alaska Department of Labor (DOL) in accordance with 8 AAC 61.620(b).

C. If required by the disposal site, obtain written authorization to dispose of asbestos wastes.

3.4. PRE-CLEANING AND WORK AREA PREPARATION ACTIVITIES

A. There is no requirement to remove all pre-existing dusts, debris, or components contaminated by the hazardous materials from the site unless noted otherwise and elsewhere in this section or the contract documents, or if it is necessary to complete the work in accordance with this section, or because the HRC or GC determines it to be a more cost-effective means of completing the work.

B. Work involving the removal of hazardous materials which are intact and not contaminated by other hazardous materials are not required by this section to be cleaned and may be performed

with moveable objects in place so long as those moveable objects are protected by at least one layer of 6-mil polyethylene sheeting.

C. Moveable objects remaining in the work area which the Owner chooses to leave in place must be removed prior to establishing the regulated area unless those objects are contaminated by any hazardous material covered by the work of this section. Contaminated moveable objects which are cleanable and can be decontaminated may be cleaned and removed prior to establishing the regulated area. Noncleanable moveable objects must remain in the regulated area and be removed and disposed of after the regulated area has been established.

D. Non-moveable objects, fixed objects, and remaining exposed surfaces in the work area which are cleanable must be cleaned using industry standard protocols for the type of hazardous material present prior to establishing the regulated area. Non-moveable objects, fixed objects, or remaining surfaces which cannot be cleaned using industry standard protocols for the type of hazardous material present must be decontaminated or removed and disposed of after the regulated area has been established.

E. Objects and surfaces remaining in the work area after the precleaning activities have been completed must be covered and protected using a minimum of 2 layers of polyethylene sheeting and sealed using duct tape, spray adhesive, or other approved method.

3.5. SPECIFIC REQUIREMENTS OF THIS SECTION

A. All work covered by this section that is performed indoors must be performed within a regulated area using critical barriers as a minimum.

1. Exceptions to this requirement:

   a. Class IV asbestos work.
   b. Intact removal of asbestos-containing material.
   c. Buildings scheduled for complete demolition which will not be reoccupied after abatement and prior to demolition.
   d. Work classified as small-scale short-duration.
   e. Isolated glovebag or glovebox work.

B. Work which includes the removal or disturbance of asbestos-containing roof coatings, cements, and mastics is required by this section to be performed as a Class II asbestos operation.

C. Reliance on OSHA's "Flooring Settlement Agreement" as justification to reduce the minimum work area protections required by this section is prohibited.

D. The following materials are classified by this section as a Regulated Asbestos-Containing Material:

1. Asbestos-containing sheet vinyl and its associated mastics and leveling compounds, or any materials contaminated by these items.

2. Loose fill vermiculite insulation.

E. Negative air machines and local exhaust ventilation must not use any building HVAC systems as a means of transporting air into or out of the regulated areas; must exhaust to the exterior of the building, no less than 30 feet away from building HVAC intakes, and must be exhausted to an area with the least amount of personnel traffic to the greatest extent practicable.

F. Work conducted adjacent to occupied areas must be obscured from those occupants to the greatest extent practicable.

G. The HRC must document all work covered by this section they perform on a written daily log.

H. All regulated work areas must maintain a sign-in sheet to record all persons entering and exiting the regulated work area.

I. All asbestos-containing wastes removed from the site, including those classified as Category I Non-Friable ACM, Category II Non-Friable ACM, RACM, and materials containing asbestos at a concentration of less than or equal to 1% asbestos must have a waste shipment record and a disposal receipt indicating receipt by the disposal site operator.

J. Where encapsulants are used, and when the area or components where they are used will not be visible to normal building occupants after the completion of construction, the encapsulant must be tinted with a unique color in a manner which does not obscure underlying substrates.

K. All hazardous materials covered by this section which are defined as a universal waste by 40 CFR 763.9 must be managed as universal wastes by this project in accordance with 40 CFR 273. “Green-tip” or “eco” fluorescent lamps are required by this section to be managed as a universal waste, regardless of mercury content.

L. Onsite treatment as defined by 40 CFR 260.10 of any wastes covered by this section is prohibited.

M. All heat transfer fluids which are removed and will not be reused must be sent to an offsite facility for recycling.

N. Removal of poured polyurethane gym flooring classified as a hazardous waste for mercury must be performed within a Negative Pressure Enclosure (NPE) which meets or exceeds the specifications for an NPE as defined by 29 CFR 1926.1101(g)(5)(i).

1. Exceptions to this requirement:

    a. Buildings scheduled for complete demolition which will not be reoccupied after abatement and prior to demolition.
    b. Isolated removal which can be contained using a glovebag or glovebox.

2. The HRC must maintain a sign-in sheet to record all persons entering and exiting the NPE.

O. The disturbance of lead-containing materials is subject to regulation by 29 CFR 1926.62, and it is the Contractor's responsibility to review the “trigger tasks” and other requirements of 29 CFR 1926.62 to determine which portions apply, if any, to each unique work task required by this project. The Contractor may elect to have the CPIH collect bulk samples of each affected material to determine if “detectable levels of lead” are present in the material. Any results which indicate lead above the limits of detection must be considered as having “detectable levels of lead” and therefore subject to both the monitoring and testing requirements of this contract. The maximum allowable limit of detection is 60 ppm for the purposes of determining if "detectable levels of lead" are present.

P. Hazardous materials must not be stored onsite for more than 90 days and must be received by the destination facility within 180 days of being shipped off site.

3.6. MATERIALS TESTING REQUIREMENTS

A. Any asbestos materials requiring bulk sampling by this section must meet the following minimum bulk sampling requirements for each homogeneous area:

1. Surfacing materials:

   a. At least three (3) bulk samples shall be collected from each homogeneous area that is 1,000 square feet or less.
   b. At least five (5) bulk samples shall be collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
   c. At least seven (7) bulk samples shall be collected from each homogeneous area that is greater than 5,000 square feet.
   d. At least one (1) additional bulk sample for every additional 1,000 square feet of material.

2. Thermal System Insulation (TSI):

   a. At least three (3) bulk samples shall be collected from each homogeneous area of TSI.
   b. At least one (1) bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
   c. In a manner sufficient to determine, which must include at least two (2) bulk samples, from each insulated mechanical system where cement or plaster is used on fittings such as tees, elbows, or valves.
   d. Bulk samples are not required to be collected from any homogeneous area where the accredited inspector has determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM.

3. Miscellaneous materials:

   a. At least two (2) bulk samples shall be collected from each homogeneous area that is less than 500 square feet.
   b. At least three (3) bulk samples shall be collected from each homogeneous area that is greater than or equal to 500 square feet but less than 1,000 square feet.
   c. At least five (5) bulk samples shall be collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
   d. At least seven (7) bulk samples shall be collected from each homogeneous area that is greater than 5,000 square feet.
   e. At least one (1) additional bulk sample for every additional 1,000 square feet of material.

B. All lead-containing waste streams must be TCLP tested in accordance with 40 CFR 261 to determine disposal requirements. Other hazardous materials which are managed in accordance with this section do not require additional testing.

C. Testing of the hazardous materials may become required for reasons encountered during the work, including, but not limited to:

1. Additional miscellaneous hazardous materials covered by this section are generated which have not had a hazardous waste determination or been otherwise characterized prior to their generation.

2. If miscellaneous hazardous materials generated by the work covered by this section cannot be managed as specified herein.

3. There is reason to believe that additional potentially hazardous constituents are present in the miscellaneous hazardous materials covered by this section which have not been previously identified and where the presence of those other constituents would affect the Contractor's ability to properly execute any of the worker protection, packaging, labeling, transportation, disposal, documentation, or other requirements of this section.

D. The Owner must be notified immediately, and prior to, any miscellaneous hazardous materials testing being performed on the wastes covered by this section. Such notification must include the following information:

1. The reason why the miscellaneous hazardous materials cannot be managed as specified herein or otherwise require testing.

2. A sampling and analysis plan.

3.7. MONITORING

A. Asbestos

1. General

a. For all work covered by this section which requires the establishment of a regulated area, air monitoring must be performed.
b. Air monitoring must be performed at all times work covered by this section is being conducted for the duration of the project.
c. Air monitoring must be performed by the CPIH.
d. The CPIH must submit lab blanks and field blanks in accordance with the requirements of the analytical method being used.
e. The quantities and types of air monitoring required by this section are the minimum requirements and apply to each regulated area and each shift separately.
f. A reduction of monitoring may be permitted at the discretion of the Owner upon written request from the CPIH. Modifications to any air monitoring procedures required by this section are prohibited unless the Owner issues a written authorization stating their acceptance of the proposed modifications. No modifications are allowed prior to receiving such authorization.
g. The minimum air monitoring requirements of this section apply to each regulated area and each shift separately.
h. Air monitoring is not required by this section for intact removal of asbestos-containing materials.
i. Air samples collected for analysis by NIOSH 7400 must have a sufficient volume of air drawn through the filter media to establish a minimum level of detection of less than 0.01 f/cc.

2. Air monitoring for the purpose of establishing background levels of airborne asbestos concentrations by NIOSH 7400 is not required by this section but may be performed at the discretion of the Contractor.

3. Monitoring of personnel:

a. Monitoring of personnel must be performed in accordance with 29 CFR 1926.1101.

4. For all interior work, and for exterior work which cannot be performed using non-aggressive means, air monitoring during the work must include:

a. A minimum of three (3) air samples from within the regulated area boundaries.

b. A minimum of three (3) air samples from areas outside of but adjacent to the regulated area boundaries.
c. One (1) air sample at the entrance to the regulated area.
d. One (1) air sample at the waste loadout area during waste loadout operations.
e. One (1) air sample at the approximate location of HEPA exhaust discharge.

5. For exterior work performed using non-aggressive means, air monitoring during the work must include:

a. A minimum of two (2) air samples from within the regulated area boundaries.
b. A minimum of two (2) air samples from areas outside of but adjacent to the regulated area boundaries.

6. For work classified as small-scale short-duration and where the employer has not completed a Negative Exposure Assessment for the work operation in accordance with 29 CFR 1926.1101(f)(2), air monitoring during the work must include:

a. A minimum of one (1) air sample taken from each of the employee's breathing zone.
b. A minimum of two (2) air samples collected directly adjacent to where the removal work is taking place.

B. Non-Asbestos-Containing Materials

1. There are no specific monitoring requirements for work involving the removal of intact and otherwise uncontaminated miscellaneous hazardous materials covered by the work of this section unless noted otherwise. However, monitoring may be performed at the Contractor's discretion for any reason. Such optional monitoring must come at no additional cost to the Owner.

2. Work involving the removal of non-intact or otherwise contaminated miscellaneous hazardous materials covered by the work of this section must include:

a. Monitoring of personnel performed in accordance with 10 CFR 20, 29 CFR 1926.55, and 8 AAC 61.

3. Work involving removal of the poured polyurethane gym flooring classified as a hazardous waste for mercury must include:

a. Monitoring of personnel performed in accordance with 29 CFR 1926.55 and 8 AAC 61.
b. Pre-work sampling to determine ambient mercury vapor concentrations. A minimum of two (2) mercury vapor samples exterior to the building and two (2) samples within the area of removal. The direct reading instrument or sampling and analytical method used must be capable of reporting mercury vapor concentrations below 60 ng/m^3. Pre-work sampling must be performed in conditions similar to those typically encountered during normal operations of the facility (e.g. normal ventilation and temperature).
c. Monitoring of mercury vapor concentrations using a direct reading instrument at the entrance to the regulated area, waste loadout area during waste loadout operations, and at the approximate location of NPE exhaust discharge. Instruments must be set to alarm at 600 ng/m^3. If mercury vapor concentrations exceed the alarm threshold, work must be immediately stopped, and corrective actions must be taken to reduce the concentrations below alarm threshold.

4. Work involving removal of lead-containing materials subject to regulation by 29 CFR 1926.62 must include:

    a. Monitoring of personnel performed in accordance with 29 CFR 1926.62 and 8 AAC 61.
    b. Pre-work sampling to determine existing lead in dust concentrations. A minimum of two (2) wipe samples collected within the area of removal and a minimum of two (2) wipe samples collected outside of the area of removal.

5. Where work is being conducted in a facility that meets the definition of a “child occupied facility” as defined by 40 CFR 745.223 but is otherwise not subject to regulation by 40 CFR 745, and the work involves removal of the lead-containing materials subject to regulation by 29 CFR 1926.62, the following monitoring must be performed in addition to other lead-related monitoring requirements of this section:

    a. Pre-work sampling to determine existing lead in dust concentrations. A minimum of five (5) wipe samples collected within the area of removal and a minimum of five (5) wipe samples collected outside of the area of removal.

6. Wipe samples must be collected from undisturbed surfaces and must be collected from an area typically occupied during normal operations of the facility. Wipe samples must not be collected from the same location as a previous wipe sample.

7. Wipe samples must be of sufficient area to achieve a limit of detection of <10 µg/ft^2.

8. When required, monitoring must be performed at all times work covered by this section is being conducted for the duration of the work which requires monitoring.

9. Monitoring must be performed by the CPIH.

10. The CPIH must submit lab blanks and field blanks in accordance with the requirements of the analytical method being used.

11. The quantities and types of monitoring required by this section are the minimum requirements and apply to each regulated area and each shift separately.

12. A reduction of monitoring may be permitted at the discretion of the Owner upon written request from the CPIH. Modifications to any monitoring procedures required by this section are prohibited unless the Owner issues a written authorization stating their acceptance of the proposed modifications. No modifications are allowed prior to receiving such authorization.

3.8. WORK AREA INSPECTIONS AND CLEARANCES

A. Asbestos

1. General:

    a. All clearance air monitoring and final visual inspections must be performed by the IIHT.
    b. Final visual inspections must be performed at the completion of all asbestos removal activities, including for intact removal, exterior removal, work classified as small-scale short-duration, and any other work which disturbs and removes any quantity of asbestos from any location of the site.

c. The final visual inspection must be thorough and performed in accordance with the protocols found in ASTM E1368 and 40 CFR 763.
d. All final visual inspections and clearance air monitoring must be documented in writing.
e. Clearance air monitoring is required for all work conducted inside of regulated areas unless noted otherwise by this section.
f. If the work area requires the use and application of encapsulants of any type, clearance air monitoring may not begin until the applied encapsulant is dry to the touch.
g. All clearance air monitoring must be performed using aggressive methods as described in Appendix A to 40 CFR 763 Subpart E.
h. The IIHT must submit lab blanks and field blanks in accordance with the requirements of the analytical method being used.
i. The quantities and types of air monitoring required by this section are the minimum requirements and apply to each regulated area separately.
j. Onsite analysis of clearance air samples is prohibited.
k. Clearance air monitoring is not required by this section for intact removal of asbestos-containing materials or for exterior asbestos removal activities.
l. If any of the clearance air samples fails clearance criteria, the work area must be recleaned, receive an additional final visual inspection, and clearance air monitoring repeated.
m. All regulated work areas must retain their status as a regulated work area until the Owner provides written notice that the work area may be deregulated.

2. TEM clearance air monitoring:

a. Must be performed in accordance with the United States Environmental Protection Agency “Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Non-Mandatory-and Mandatory Section to Determine Completion of Response Actions” as found in 40 CFR 763, Subpart E, Appendix A.
b. Is required for all Class I asbestos work requiring the removal of greater than 25 linear feet or 10 square feet of asbestos-containing material.
c. Is required for all work requiring the removal of greater than 10 square feet of asbestos-containing resilient floor coverings and their associated mastics and leveling compounds, or for the removal of any materials contaminated by these items.
d. Is required for all other interior work requiring the removal of greater than 160 linear feet or 260 square feet of asbestos-containing material.
e. Must include a minimum of five (5) clearance air samples from within the regulated area boundaries.
f. Each TEM clearance air sample collected must meet the pass/fail criteria in 40 CFR 763.90(i)(4). Averaging of the analytical results to achieve passing criteria is prohibited by this section.

3. PCM clearance air monitoring:

a. Must be performed in accordance with the National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods (NMAM) Method 7400: Asbestos and Other Fibers by Phase Contrast Microscopy.
b. May be performed for all other interior work which is not required to have TEM clearance air monitoring.
c. Must include a minimum of five (5) clearance air samples from within the regulated area boundaries.
d. Each PCM clearance air sample collected must meet the pass/fail criteria in 40 CFR 763.90(i)(5). Reanalysis of failed PCM clearance air samples using NIOSH

NMAM TEM Method 7402 for the purposes of determining if passing clearance criteria has been achieved is prohibited by this section.

B. Non-Asbestos-Containing Materials

1. All clearance monitoring and final visual inspections must be performed by the IIHT.

2. Final visual inspections must be performed at the completion of all miscellaneous hazardous materials removal activities, including for intact removal, exterior removal, and any other work which disturbs and removes any quantity of miscellaneous hazardous material from any location of the site.

3. All final visual inspections and clearance monitoring must be documented in writing.

4. Clearance monitoring is only required for work involving the complete removal of poured polyurethane gym flooring classified as a hazardous waste for mercury unless noted otherwise. There are no clearance monitoring requirements for work involving the partial removal of poured polyurethane gym flooring classified as a hazardous waste for mercury or for the removal of any other miscellaneous hazardous material covered by this section when the work is performed in accordance with the requirements of this section.

5. The IIHT must submit lab blanks and field blanks in accordance with the requirements of the analytical method being used.

6. The quantities and types of clearance monitoring required by this section are the minimum requirements and apply to each regulated area separately.

7. Onsite analysis of clearance samples is prohibited.

8. If any of the clearance samples fails clearance criteria, the work area must be recleaned, receive an additional final visual inspection, and clearance monitoring repeated.

9. All regulated work areas must retain their status as a regulated work area until the Owner provides written notice that the work area may be deregulated.

C. Work involving complete removal of poured polyurethane gym flooring classified as a hazardous waste for mercury.

1. Clearance monitoring:

   a. After satisfactory completion of a final visual inspection, the work area must be sealed and ventilation shut off for a period of at least 24 hours prior to starting clearance monitoring.
   b. Temperatures inside of the removal boundaries must be maintained at a minimum of 70 degrees Fahrenheit or the maximum space design temperature, whichever is greater, for the duration of the sampling period.
   c. Ventilation of the space within the removal boundaries during the sampling period is prohibited.
   d. All clearance monitoring samples must be collected simultaneously and in one sampling period.
   e. All samples must be collected from within a space located 30”-40” above the floor surface.
   f. A minimum of five (5) mercury vapor samples must be collected from within the removal boundaries for work involving removal of <1,000 square feet. Collect at

least one (1) additional sample for each additional 400 square feet of material removed.

g. A minimum of two (2) mercury vapor samples must be collected from spaces typically occupied during normal use of the facility near, but outside of, the removal boundaries.

h. A minimum of two (2) mercury vapor samples must be collected from the exterior of the building.

i. To achieve satisfactory clearance criteria, mercury vapor concentrations for each sample must be less than 60 ng/m^3. If ambient exterior mercury vapor concentrations are greater than 60 ng/m^3, then satisfactory clearance criteria is achieved when each sample is no greater than 110% of the ambient exterior mercury vapor concentrations.

D. Work involving removal of lead-containing materials subject to regulation by 29 CFR 1926.62.

1. At the completion of the lead removal activities, a minimum of two (2) wipe samples collected within the area of removal and a minimum of two (2) wipe samples collected outside of the area of removal. To achieve satisfactory clearance criteria, each of the samples collected must be <200 µg/ft^2 or less than the existing lead in dust concentrations reported by the pre-work samples, whichever is lower.

2. At the completion of the entire project, a minimum of three (3) wipe samples collected within the area of work for the entire project and a minimum of three (3) wipe samples collected outside of the area of work for the entire project in areas used by workers walking to and from the work area, as a contractor staging area, or other areas which were used by the Contractor during the work. To achieve satisfactory clearance criteria, each of the samples collected must be <10 µg/ft^2.

E. Where work is being conducted in a facility that meets the definition of a “child occupied facility” as defined by 40 CFR 745.83 but is otherwise not subject to regulation by 40 CFR 745, and the work involves removal of the lead-containing materials subject to regulation by 29 CFR 1926.62.

1. At the completion of the lead removal activities, a minimum of two (2) wipe samples collected within the area of removal and a minimum of two (2) wipe samples collected outside of the area of removal. To achieve satisfactory clearance criteria, each of the samples collected must be <200 µg/ft^2.

2. At the completion of the entire project, clearance monitoring must be performed using the procedures described in 40 CFR 745.227(e)(8). To achieve satisfactory clearance criteria, each of the samples collected must be less than the published Lead Dust Hazard Standards criteria current at the time of completion of the work.

F. Where work is being conducted in a facility that meets the definition of a “child occupied facility” as defined by 40 CFR 745.83 and is subject to regulation by 40 CFR 745 due to the quantities of lead-based paints being removed.

1. At the completion of the lead removal activities, a minimum of two (2) wipe samples collected within the area of removal and a minimum of two (2) wipe samples collected outside of the area of removal. To achieve satisfactory clearance criteria, each of the samples collected must be <200 µg/ft^2.

2. At the completion of the entire project, clearance monitoring must be performed using the procedures described in 40 CFR 745.227(e)(8). To achieve satisfactory clearance criteria, each of the samples collected must be less than the published Lead Dust Hazard Standards criteria current at the time of completion of the work.

3.9. POST-WORK ACTIVITIES

A. The HRC must visually inspect areas impacted by their work activities for potential dust, debris, or contamination resulting from their miscellaneous hazardous materials work that may have been concealed after all regulated area protections, equipment, supplies, and other objects within their possession have been removed from those areas. If any dust, debris, or contamination resulting from their miscellaneous hazardous materials work is noted, the HRC must promptly clean up the dust or debris and record those actions on their daily report.

B. The GC, HRC, and Owner must perform a final walk-thru of the work areas to inspect for any damage that may have occurred as a result of the HRC's activities at the site.

C. The HRC must submit all documentation required by this section for Owner review and approval.

D. After the HRC has demobilized from the site and all required submittals approved, then the requirements of this section will have been satisfied and final payment can be made.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

G. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

H. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

I. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

K. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.

M. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

N. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2023.

P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Q. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

R. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

S. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.

T. ASTM D2103 - Standard Specification for Polyethylene Film; 2023a.

1.2 SUBMITTALS

A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

B. Design Mixtures: For each concrete mixture.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

D. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.3 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-306 when concreting during cold weather.

C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities.

D. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

PART 2 - PRODUCTS

2.1 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.

1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.

2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.2 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).

1. Type: Deformed billet-steel bars.

2. Finish: Unfinished, unless otherwise indicated.

B. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

G. Accelerating Admixture: ASTM C494/C494M Type C.

H. Retarding Admixture: ASTM C494/C494M Type B.

I. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5 CURING MATERIALS

A. Moisture-Retaining Sheet: ASTM C171.

B. Polyethylene Film: ASTM D2103, 6 mil, 0.006 inch (0.152 mm) thick, clear.

C. Water: Potable, not detrimental to concrete.

2.6 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, as specified in ACI SPEC-301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,500 pounds per square inch (31.0 MPa).

2. Water-Cement Ratio: Maximum 45 percent by weight.

3. Total Air Content: 6 percent, plus or minus 1 percent determined in accordance with ASTM C173/C173M.

4. Maximum Slump: 4 inches (100 mm).

5. Maximum Aggregate Size: 1 inch (25.4 mm).

PART 3 - EXECUTION

3.1 PREPARATION

A. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.

3.2 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

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

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

3.4 CONCRETE FINISHING

A. Repair surface defects, immediately after removing formwork.

B. Concrete Slabs: Finish to requirements of ACI PRC-302.1.

1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.5 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.6 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

3.7 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 07 21 10 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 63 10 –Flashing and Trim

B. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications may be referenced in the text by basic designation only. In case of conflict, the most stringent shall govern:
   1. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE) “Handbook of Fundamentals”.
   2. Underwriter’s Laboratories (UL) “Building Materials Directory”.
   3. ASTM C177 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties utilizing the Guarded Hot-Plate Apparatus.
   4. ASTM C423 – Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   5. ASTM C518 - Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties utilizing the Heat Flow Meter Apparatus.
   6. ASTM C553 - Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications.
   7. ASTM C1104 – Test Method for Determining the Water Vapor Sorbtion of Unfaced Mineral Fiber Insulation.
   8. ASTM C1338- Test Method for Deforming Fungi Resistance of Insulation Materials and Facings.
   9. ASTM E84 - Tests for Surface Burning Characteristics of Building Materials.
   10. ASTM E96 – Test Methods for Water Vapor Transmission of Materials.
   11. ASTM E119 - Fire Tests of Building Construction and Materials.
   12. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

1.3 SUBMITTALS

A. Manufacturer’s literature including material, composition, fire hazard ratings, and application instructions.

1.4 PRODUCT LABELING

A. Insulation, or factory sealed packages of the insulation shall be marked by the insulation manufacturers as having the thermal resistance, fire hazard characteristics, water absorption, and compressive strength specified.

1.5 PROTECTION

A. Store and protect insulation from moisture until permanently enclosed.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not apply insulation to surfaces, which are frosty, damp, or dirty.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Fire Hazard Classification: Insulation materials, including integral facing covers and vapor retarders, shall meet the following ratings when tested per ASTM E-84 (tunnel test). Not required for rigid insulation installed under concrete or earth.
   a. Fuel contributed: 50.
   b. Maximum installed flame spread: 25.
   c. Maximum smoke developed: 450 (50 for insulation left exposed).
   d. Self-extinguishing.

B. No added asbestos.

C. No added formaldehyde.

D. Blanket fibrous glass insulation: Green Guard Certified.

2.2 BLANKET (BATT) INSULATION

A. Type I: Unfaced fibrous blanket of mineral wool or fibrous glass per ASTM C553 or C665 suitable for friction fit between framing or furring members.

2.3 SPRAY FOAM INSULATION

A. Spray Applied Polyurethane Insulation.

B. 1.5 to 3 pounds minimum density. Low-rising, low-pressure semi-rigid.

C. Apply following the manufacturer's written instructions.

D. Cover any foam exposed to the interior of the building with gypsum board, sheet metal, or IBC-approved thermal barrier coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and verify field conditions to receive insulation for defects that will adversely affect the completed installation, and for deviation beyond allowable tolerances.

B. Installation shall be done only after other trade work in the area is sufficiently complete to prevent subsequent disturbance of insulation.

C. Beginning of installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 PREPARATION

A. Verify substrates are clean and dry. Remove loose or foreign matter.

3.3 INSTALLATION

A. Install in accordance with approved submittals and manufacturer's written instructions

using necessary primers and accessories.

B. Install continuously where indicated without voids. Fill spaces completely. Trim and fit closely around structure, door rough openings and frames, conduit, piping, obstructions, and penetrations following the manufacturer's written instructions. Install clearance baffles around heat-producing lights and heat-producing appliances under the appliance manufacturer's instructions.

C. Where pipe or conduit is in space to be insulated, place a portion of insulation batt between the pipe or conduit and the building exterior. Compress insulation only slightly to keep it in place.

END OF SECTION

SECTION 07 62 10 - FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants

1.2 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referenced in the text by basic reference only. In case of conflict, the most stringent shall govern.
   1. American Society for Testing Materials (ASTM) specific references as noted.
   2. ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   3. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
   4. ASTM B209 - Specification for Aluminum and Aluminum-Alloy, Sheet, and Plate.
   5. ASTM C920 - Specification for Elastomeric Joint Sealant.
   6. Sheet Metal and Air Condition Contractor's National Association (SMACNA) "Architectural Sheet Metal Manual".
   7. Society for Protective Coatings (SSPC) Systems and Specifications.
   8. International Building Code (IBC).
   9. American Architectural Manufacturers Association (AAMA) 621 – Voluntary Specifications for High-Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized and Zinc-Aluminum Coated Steel Substrates.

1.3 SUBMITTALS

A. Shop Drawings and Manufacturer's Literature: Including dimensions, materials, joints, fasteners, anchorage, installation recommendations, details, and location in complete work if the work proposed differs from Contract DRAWINGS.

PART 2 - PRODUCTS

2.1 GALVANNEALED STEEL SHEET

A. American Society for Testing and Materials ASTM A653 cold rolled steel sheet, lock-forming quality. Hot-dip Galvannealed zinc coating on both sides of at least 0.90 ounces per square foot total. (G90).

B. Minimum thickness 24-gauge except for unbacked spans over 12-inches 20-gauge unless indicated otherwise. Special thickness per DRAWING details. Anchor clips and hook strips 20-gauge.

2.2 FLEXIBLE RUBBER-ASPHALT FLASHING

A. Pre-manufactured, elastomeric, self-adhering, self-sealing sheet membrane waterproofing composed of high-strength polyethylene sheet plastic bonded to rubberized asphalt per ASTM D1970 recommended by the manufacturer for application as concealed flashing meeting the following requirements.
   1. Total thickness: 40 mil minimum.
   2. Maximum load at break: 25 pounds per inch per ASTM D1970.
   3. Elongation at break, asphalt: 10 percent minimum per ASTM D1970.

4. Low-Temperature Flexibility: 180-degree bend over 1-inch mandrel at minus 20 degrees F without cracking per ASTM D1970.
5. Overall adhesion between Plywood and adjacent membrane at 40 degrees F: 3.0 pound per inch width minimum per ASTM D1970.
6. Sealability around nail: pass per ASTM D1970.
7. Removable release paper.
8. Primer: as recommended by the underlayment manufacturer for conditions of use.

B. Approved manufacturer subject to meeting specified criteria:
1. W.R. Grace “Bituthene Ice and Water Shield” roof flashing or “Perm–A-Barrier wall flashing” by W. R. Grace, www.wrgrace.com,
2. “CCW-705 TWF” - www.carlisleccw.com
3. Hohman & Barnard “Flex-Flash” by, www-h-b.com,
4. Fortifiber Building Systems “Moistop Next” by, https://henry.com/residential-and-light-commercial/

C. Substitutions per Section 01 60 00 - Product Requirements.

2.3 FASTENERS

A. Number 14 (1/4-inch) stainless steel or corrosion and abrasion-resistant coated carbon steel resistant to 1000 hours salt spray per ASTM B117 or 15 cycles per ASTM G87 – Kesternich Cabinet Testing; testing with 15 percent maximum red rust, and no coating blistering or cracking on head or shank.

B. Exposed fasteners: Number 14 (1/4-inch) diameter screws preassembled with a 3/4-inch diameter 18-gauge tapered lip stainless steel washer bonded to an EPDM sealing gasket washer. Factory-painted heads to match the adjacent metal color.

C. Use round or pan head Phillips screws for concealed work.

D. Nails and pop rivets are not permitted.

E. Screws shall penetrate metal substrate ½-inch or penetrate wood substrate 1-1/2-inches.

2.4 ACCESSORIES-ATTACHMENTS

A. Primers, clips, hook strips, angles, cover plates, inserts, and other accessories, as necessary for secure attachment shall be the same material as flashing and under SMACNA and NRCA recommendations. Fabricate anchor clips and hook strips one gauge thicker than the attached flashing.

2.5 SEALANTS

A. Single component silicone or urethane per ASTM C920.
1. Tape sealant may be used for straight lap joints: 50 percent butyl, 1/4-to-1/2-inch width, and thickness.

B. Color: Standard color nearest match to flashing finish color for exposed sealants.

2.6 METAL FABRICATION

A. Fabricate per approved submittals and the best commercial practice of SMACNA and NRCA. Form sections square, true, and accurate to size, free from distortion and to fit substrate.

B. Fabricate sheets or panels in the longest lengths practical, true to details, and free of dents, scratches, and tool marks. Make allowances for thermal expansion-contraction at joints.

C. Cross break as necessary to prevent “oil canning”. Form lines and edges straight and neat. Form bent-metal corners to the smallest radius possible without causing grain separation. Roll exposed edges back on the underside to form a folded, hemmed edge, 1/2-inch minimum (3/4-inch minimum to engage hold down). Slope exposed vertical bottom edges 45 degrees to form a drip.

D. Welding shall be per AWS for the type of weld and material. Grind exposed welds smooth and flush. Coat welds and bare metal abrasions in galvannealed steel with SSPC 20 zinc-rich epoxy primer paint.

E. Joints shall be weathertight and have provisions for expansion and contraction. Lap joints and corners are watertight. Lap in the direction of water flow. Provide slotted holes at exposed gasketed screws.

2.7 PAINTING

A. Clean metal before painting by “solvent cleaning” SP-1, followed by an acid etch and “hand cleaning” SP-2 per SSPC.

B. Shop paint 1 primer coat and 2 finish coats per finish paint manufacturer’s instructions.

C. Factory Coil paints PVDR coating per AAMA 621 is acceptable in place of shop paint.

PART 3 - EXECUTION

2.8 EXAMINATION

A. Examine the DRAWING details and field conditions to receive the work for defects that will adversely affect the completed work and for deviations beyond allowable tolerances.

B. Beginning of installation shall mean acceptance of existing conditions as capable of producing an acceptable job.

2.9 DISSIMILAR MATERIALS

A. Steel contacting aluminum, concrete, masonry, or treated wood shall have contact surfaces separated by a heavy coat of bituminous paint, 40 mils self-adhering rubber sheet, or by non-absorptive tape.

B. Separation materials shall be trimmed to not be visible in exposed completed work.

2.10 INSTALLATION

A. Install all flashings under the best commercial practice of SMACNA, and NRCA, and following approved submittals, plumb, level, or to alignment shown on the DRAWINGS.

B. Joints shall be weathertight and have provisions for expansion and contraction. Lap to shed water flow outside.
   1. Lap flashing over door and window head and sill.
   2. Lap metal flashing 4-inch minimum with sealant tape to shed water.

C. Cut components neatly to fit against the adjacent member.

D. Field cut members exposed in the completed work so that the finish is not damaged. Leave no exposed sharp edges.

E. Length of screws shall be sufficient to fully penetrate metal or plywood, or 1 1/2-inch minimum into solid backing.

F. Cutting or drilling of building structural components shall not be permitted unless approved by ARCHITECT in writing.

G. Touch-up steel with paint primer and finish coat equal to adjacent panel finish coating at bare metal abrasions.

2.11 ANCHORAGE AND ATTACHMENT

A. Spacing and quantity of anchor fasteners as indicated and required to develop permanent weather-tight joints on exterior work.

B. Maximum spacing of exposed fasteners shall be 12-inches evenly spaced within 1-1/2-inches of panel edges unless closer spacing is indicated.

2.12 SEALANT APPLICATION

A. As recommended by sealant manufacturer-approved submittals, to provide permanent, weathertight joints. Set lapped seams in sealant bed or sealant tape.

B. Joints shall be sealed continuously against the weather and have provisions for expansion and contraction.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED SECTIONS

A. Section 07 62 10 – Flashing and Trim

B. Division 21, 22, 23 – Plumbing

C. Division 23 – Heating

D. Division 26, 27, 28 – Electrical

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this Specification. The publications are referred to in the text by the basic designation only. In case of conflict only the most stringent shall govern.
   1. ASTM C510 - Test Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
   2. ASTM C717 - Terminology of Building Seals and Sealants.
   3. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
   4. ASTM C834 - Specifications for Latex Sealants.
   5. ASTM C919 - Practice for Use of Sealants in Acoustical Applications.
   6. ASTM C920 - Specification for Elastomeric Joint Sealants.
   7. ASTM C1193 - Guide for Use of Joint Sealants.
   8. ASTM C1330 – Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants
   9. ASTM D1667 - Specification for Flexible Cellular Materials Poly Vinyl Chloride Polymers and Copolymers Foam (Closed-Cell).

1.3 SUBMITTALS

A. Sealants including colors, backing, and bond breaker: Manufacturer’s Literature: Including recommendations for cleaning substrate, application temperatures, and compatibility with adjoining surfaces and application.
   1. Verify Sealant adhesion, primer, and staining requirements.

B. Product Labeling: Each sealant material container shall bear the manufacturer’s label and name, type, color, and applicable standards.

1.4 QUALITY ASSURANCE

A. Applicator shall be responsible for verifying sealants used are compatible with joint substrates.

1.5 DELIVERY AND STORAGE

A. Deliver in the manufacturer’s original unopened container, clearly identifying each product.

B. Store under the manufacturer’s recommendations.

1.6 TEMPERATURE REQUIREMENTS

A. Do not apply sealants at ambient temperatures below those recommended in writing by the manufacturer, and in no case, in rain or snow, or with, dirt, frost, or water on the components.

B. Install with temperatures between 25- and 55-degrees F. by temporary enclosure and heating as necessary for 12 hours before, during, and 24 hours after installation.

C. Protect sealants until cured.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compatibility: Provide sealants, backing, and primers that are compatible with one another and recommended by the manufacturer for substrates and for conditions of service.

B. Acceptable Sealant Manufacturers: Subject to compliance with specified criteria:
1. Dow Corning www.dow.com
2. General Electric www.gesealants.com
3. Tremco www.tremco.com
4. Sika Corporation www.usasika.com
5. Sonneborn www.sonneborn.com

2.2 TYPICAL JOINT SEALANTS

A. Typical use unless otherwise noted:
1. Single component non-sag, non-staining, silicone type.
2. Movement range 50 percent, plus or minus.
3. Shore A hardness 15-25.
4. Recommended in writing by the manufacturer for the condition of use.
5. ASTM C920.
6. Color: match adjacent surfaces as closely as possible unless indicated otherwise on the DRAWINGS, using one of the manufacturer's standard colors including black, white, brown, grey, and translucent.

B. For metal flashing, tile, and vapor retarder and as indicated or specified in applicable product sections:
1. Single component non-sag non-staining polyurethane type.
2. Movement range plus or minus 25 percent.
3. Shore A hardness 25-40.
4. ASTM C920.
5. Color: Same as those specified for silicone.

2.3 DRY FOAM TAPE SEALANT

A. Self-stick adhesive roll form with resilient PVC foam core per ASTM D1667.
1. Pressure-sensitive adhesive on one side.
2. 3/16-inch minimum thickness or as necessary for 30 percent compression in the completed joint.
3. Closed cell water absorption: none.
4. Corrosive reaction to bare metal: none.
5. Service temperature range: 65 degrees F - 200 degrees F.

6. Storage life: indefinite at 100 degrees F or below.
7. Shrinkage: none.

B. Acceptable Manufacturers: Subject to specified criteria:
1. Schnee-Morehead, Inc. (ITW) www.gluespec.com
2. Gaska-Tape Inc. www.gaska.com
3. Saint Gobain Norseal www.tapesolutions.saint-gobain.com

2.4 ACOUSTICAL (SOUND) SEALANT

A. Single component non-sag ASTM C834 non-hardening acrylic latex, or synthetic rubber recommended in writing for the condition of use.

B. Surface fire characteristics: flame spread 5, smoke developed 0.

2.5 BACKING MATERIALS AND BOND BREAKERS

A. Flexible closed cell polyethylene or polyurethane foam backing filler rod and bond break tips per ASTM C1330 and recommended in writing by the sealant manufacturer for joint conditions. Bond breaker materials shall not stain adjacent materials.

B. Oversized thirty to fifty percent larger than joint width.

C. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit the application to prevent 3-sided adhesion where the backer rod cannot be used.

2.6 PRIMERS AND CLEANERS

A. Recommended in writing by the sealant manufacturer for the joint material and condition of use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine DRAWINGS and field conditions to receive sealants for defects that will adversely affect the work, and for deviations beyond allowable tolerances.

B. Beginning of installation shall mean the installer accepts existing conditions as capable of producing an acceptable job.

3.2 PREPARATION

A. Clean and remove loose dirt, oil, corrosion, curing agents, protective coatings, existing sealants, waterproofers, moisture, frost, and other foreign material from surfaces to receive sealants and primers using approved techniques and cleaning agents recommended by the sealant manufacturer.

B. Paint: Where scheduled shall be applied after sealant application.

C. Primer: Where recommended by the sealant manufacturer shall be neatly applied before backup materials and sealant application. Mask or otherwise protect adjacent surfaces from the excess primer.

3.3 BACKING MATERIALS AND BOND BREAKERS INSTALLATION

A. Install per ASTM C1193, approved sealant manufacturer's written recommendations, and the following. Apply acoustical sealants per ASTM C919. Verify non-staining of adjacent porous materials and compatibility.

B. Use joint backer bond breaker filler rod for joints over 1/4-inch wide.

C. Allow for the manufacturer's recommended width-to-depth ratio. Do not set deeper than the width of the joint.

D. Do not stretch lengthwise to the joint.

3.4 SEALANT INSTALLATION

A. Apply following the manufacturer's written recommendations for conditions of use.

B. Mask as necessary to provide straight neat edges.

C. Size sealant materials to achieve the sealant manufacturer's recommended width-to-depth ratio: typical depth in joint shall be 1/2 width of the joint. Sealant depth shall be 1/4 to 3/8-inch and joint width at least 2 times the expected movement.

D. Install weep tubes to drain exterior cavities to outside at 16-inch maximum spacing.

E. Lapped joints: shall receive continuous bed of sealant or sealant tape before assembly. Whenever practical, joints shall be bedded or coated continuously before assembly. Lap joint sealant shall have a minimum lap width of 3/8-inch by 1/4-inch minimum depth.

F. Apply under continuous pressure ahead of the sealant gun.

G. Tool joints as soon as possible to produce a consistent smooth joint without voids and foreign matter shape sealant to shed water.

H. Completed sealed joints shall have a uniform, straight sealant bead free of voids, sags, and foreign material.

3.5 JOINTS TO RECEIVE SEALANT

A. Exterior: Building joints exposed to the weather and moisture in the completed work as specifically indicated on DRAWINGS and including:
   1. Louver frames.
   2. Pipe and duct penetrations in walls and roof
   3. Flashing joints.

B. Interior as specifically indicated on DRAWINGS and including:
   1. Around the edges of electrical outlet boxes in gypsum board walls (acoustical Sealant).
   2. Floor joints to wall joints in mechanical rooms.
   3. Around louver frames.
   4. Around pipe and duct penetrations in walls and roof.

C. Other Joints: As indicated on DRAWINGS and SPECIFICATIONS.

3.6 CLEAN UP

A. Remove surplus materials and excess sealant from surrounding surfaces at completion of each day's work.

END OF SECTION

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.2 WORK INCLUDED

A. The work to be included in these and all other plumbing subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.3 RELATED WORK

A. Related Work Specified Elsewhere:

1. Heating, Ventilating and Air Conditioning (HVAC) Specifications: Division 23.

2. Electrical Specifications: Division 26.

B. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.4 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 70 National Electrical Code (NEC).

B. IMC International Mechanical Code.

C. UPC Uniform Plumbing Code.

D. IECC International Energy Conservation Code.

E. IFC International Fire Code.

F. IFGC International Fuel Gas Code.

G. IBC International Building Code.

1.5 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.

B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the DEPARTMENT.

C. Show the location of all valves and their appropriate tag identification.

D. At completion of project, deliver these drawings to the DEPARTMENT and obtain a written receipt.

1.6 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

E. Submit product data for:

1. Hangers and Supports for Plumbing Piping and Equipment.

2. Identification for Plumbing Piping and Equipment.

1.7 HANDLING

A. See General Conditions and the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.8 SUBSTITUTIONS

A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The DEPARTMENT shall be the final authority regarding acceptability of substitutes.

1.9 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the DEPARTMENT for consideration before proceeding with the work.

1.10 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the DEPARTMENT of any such conflicts before installation.

1.11 PERMITS, FEES, ETC.

A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.12 TESTING

A. The Contractor under each section shall perform the various tests as specified and required by the DEPARTMENTand as required by applicable code, the State and local authorities. The Contractor shall furnish all labor, fuel and materials necessary for making tests.

1.13 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.14 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The DEPARTMENT will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process work so as to ensure the proper execution of it.

1.15 COOPERATION AND CLEANING UP

A. The Contractor for the work under each section of the specifications shall coordinate the Contractors work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on the work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the DEPARTMENT, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.16 WARRANTY

A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the DEPARTMENT. All defects in labor and materials occurring during this period, as determined by the DEPARTMENT, shall be repaired and/or replaced to the complete satisfaction of the DEPARTMENT. Guarantee shall be in accordance with Division 01.

1.17 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.

2. Contractors One Year Warranty.

3. All Manufacturers' Guarantees.

4. Test and Balance Reports.

5. Operation and Maintenance Manuals.

1.18 INSPECTION OF SITE - REMODEL PROJECTS

A. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.19 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of the Contractors particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.20 SALVAGE MATERIALS

A. The Contractor shall remove existing fixtures, equipment and other items associated with the plumbing systems where no longer required for the project. Where such items are exposed to

view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the DEPARTMENT), they shall be removed.

B. All items or materials removed from the project shall be made available for the DEPARTMENT'S inspection. The DEPARTMENT retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the DEPARTMENT. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.2 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed.

B. No solder or flux containing lead shall be used on this project.

C. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be "lead free" in accordance with the Safe Drinking Water Act, Section 1417. "Lead free" materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

D. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.3 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated plastic with engraved letters.

B. Plastic Tags: Laminated plastic with engraved letters, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.4 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:

1. Anvil.

2. Eaton.

3. Erico.

4. Holdrite.

5. PHD Manufacturing, Inc.

6. Or approved equal.

B. Plumbing Piping - Water:

1. Conform to ANSI/MSS SP58.

2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

C. Design hangers to allow installation without disengagement of supported pipe.

D. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe shall have copper plating, hanger rings with factory-applied 1/16 inch minimum thick plastic, or tape cushion strip over all contact surfaces.

E. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 570 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

F. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180º segments, minimum 12 inches long at pipe support.

G. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.

H. Shields for Vertical Copper Pipe Risers: Galvanized steel pipe.

2.5 HANGER RODS

A. Steel Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded. Minimum Hanger Rod Sizes:

PIPE AND TUBE SIZE (INCHES)	ROD SIZE (INCHES)
¼-4	3/8

2.6 ANCHOR BOLTS

A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

PART 3 - EXECUTION

3.1 DRAWINGS

A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.2 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NEC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.3 MEASUREMENTS

A. Verify all measurements on the job site.

B. Check all piping, etc. to clear openings.

3.4 SYSTEM ADJUSTING

A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all plumbing systems. Test all plumbing equipment, fixtures and piping for proper water distribution, drainage, pressure and flow, adjust systems as required to eliminate splashing, noise and vibration.

3.5 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.6 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the DEPARTMENT. Provide the following items as a part of plumbing work:

1. Factory applied prime and finish coats on plumbing equipment.

2. Factory applied prime coat on access doors.

3. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.7 IDENTIFICATION

A. Tag all valves with heat resistant laminated plastic labels or brass tags engraved with readily legible letters. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten directory under glass, and installed where directed. Provide complete record drawings that show all valves with their appropriate label. Seton 250-BL-G, or 2961.20-G, 2” round or approved equal.

B. Identify piping to indicate contents and flow direction of each pipe exposed to view by a labeled sleeve in letters readable from floor at least once in each room and at intervals of not more that 20' apart and on each side of partition penetrations. Coloring scheme in accordance with ANSI/ASME A13.1, Seton Opti-Code or approved equal.

END OF SECTION

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

B. Jackets and Accessories.

1.2 RELATED WORK

A. Division 09 - Painting: Painting Insulation Jacket.

B. Section 22 05 00 - Common Work Results for Plumbing.

C. Section 22 10 00 - Plumbing Piping.

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

B. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

D. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

E. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

G. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

H. ANSI/ASTM C553 - Mineral Fiber Blanket Thermal Insulation.

I. ANSI/ASTM C578 – Rigid, Cellular Polystyrene Thermal Insulation.

J. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

K. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

L. ASTM C1136 - Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

M. ASTM C1427 – Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form.

N. ASTM D635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

O. ASTM E84 – Test Method for Surface Burning Characteristics of Building Materials.

P. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.

Q. UL 723 – Test for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include product description, thermal performance, thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three years minimum experience.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, or ASTM E84.

D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.6 DELIVERY STORAGE AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Shipment of materials from manufacturer to installation location shall be in weather tight transportation.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

1.8 FIELD MEASURMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armacell.

B. Certain-Teed.

C. IMCOA.

D. Johns Manville.

E. Knauf.

F. Owens-Corning.

G. Manson.

H. Pittsburgh - Corning.

I. K-Flex USA.

J. Armstrong.

K. TRUEBRO.

L. Or approved equal.

2.2 INSULATION - PIPING

A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75º F, rated from 0º F to 850º F, vapor retarder jacket of Kraft paper bonded to aluminum foil, self-sealing lap and butt strips; Johns Manville "Micro-Lok" or approved equal.

2.3 FIELD APPLIED JACKET

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets and solvent welding adhesive: One piece, pre-molded type, Johns Manville “Zeston 2000” or approved equal, fitting covers and jacketing material. Johns Manville “Perma-Weld” solvent welding adhesive or approved equal.

2.4 INSULATION ACCESSORIES

A. Adhesives: Waterproof and fire-retardant type.

B. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

C. Joint Tape: Glass fiber cloth, open mesh.

D. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240º F service temperatures; Venture Tape “1525CW” or approved equal.

E. Tie Wire: Annealed steel, 16 gauge.

F. Insulated pipe supports: Calcium silicate with galvanized steel jacket (min. 24 gauge); ANSI/ASTM C533; rigid white; 'k' value of 0.37 at 100º F, rated to 1,200º F; Thermal Pipe Shields "T-2000 Calsil" or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping and equipment has been tested and approved.

B. Clean surfaces for adhesives.

C. Prepare surfaces in accordance with manufacturer's recommendations.

3.2 INSTALLATION - PIPING

A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

B. Continue insulation vapor barrier through penetrations except where prohibited by code.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system, including under fitting jackets.

F. Fully insulate all piping including all spaces under jacketing.

G. Jackets:

1. Indoor, Concealed Applications: Insulated pipes shall have vapor barrier jackets, factory-applied. Vapor barrier PVC fittings may also be used provided joints are sealed with solvent welding adhesive approved by the jacket manufacturer.

2. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers.

3.3 SCHEDULE – PIPING

PIPING	TYPE	PIPE SIZE Inch	MINIMUM INSULATION THICKNESS Inch
Domestic Cold Water	A	All Sizes	½"
Cold Condensate Drains	A	All Sizes	1"

3.4 INSTALLATION - EQUIPMENT

A. Install materials in accordance with manufacturer's instructions.

B. Do not insulate factory insulated equipment.

C. Apply insulation as close as possible to equipment by grooving, scoring, and beveling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires, or bands. Minimum 2" overlap on blanket material.

D. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

E. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

F. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.

G. Where canvas jacketing is indicated, apply mastic in sufficient thickness to completely cover the texture of the canvas material.

END OF SECTION

SECTION 22 10 00 - PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Water Piping.

B. Valves.

1.2 RELATED WORK

A. Section 22 05 00 - Common Work Results for Plumbing.

B. Section 22 07 00 - Plumbing Insulation.

1.3 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be “lead free” in accordance with the Safe Drinking Water Act, Section 1417. “Lead free” materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include data on pipe materials, pipe fittings, valves and accessories.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of piping, valves, and components.

B. Disinfection and Test reports: Submit to DEPARTMENT for approval. Include all disinfection and testing reports in O&M manuals.

1.6 WARRANTY

A. Polypropylene pipe and fittings shall be covered by a factory warranty for 30 years to be free of defects in materials or manufacturing.

B. PEX pipe and fittings shall be covered by a manufacturer warranty for a duration of 25 years.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 CONDENSATE PIPING AN EQUIPMENT DRAINS

A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813.

B. Polyvinyl Chloride (PVC): Schedule 80, ASTM D1785, Type 1, Grade 1, Cell classification 12454B. Fittings: Schedule 80 ASTM D2467 socket. Joints: Solvent socket weld, flanged joints shall be provided at unions, valves and equipment connections. Flanges: One piece molded hub type PVC Flat face flange conforming to ANSI B16.1.

2.2 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper.

2. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813 or Press-Fit.

3. Press Fittings: The press fittings connections shall be compatible with seamless K, L or M copper tube made to ASTM B 88. Fittings shall comply with NSF 61, CSA and the UPC. The Fittings shall have a maximum non-shock working pressure of 200 PSI between the temperatures of -20°F and +250°F. Elastomeric seals shall be made of EPDM material. Acceptable manufacturers: Viega ProPress, Nibco Press System, or approved equal.

B. Polypropylene Pipe:

1. Polypropylene (PP-RCT) piping in SDR 11 in accordance ASTM F2389. Pipe shall be shall have NSF 14 and 61 listings for potable water use.

2. Pipe and fittings shall be manufactured from a beta crystalline PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389 and CSA B137.11. The piping shall be extruded with a middle layer that has glass fiber content to restrict thermal expansion.

3. Fittings shall be manufactured from a PP-RCT resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. All fittings shall comply with NSF 14, ASTM F 2389 and CSA B137.11. Fittings may be either socket fusion through nominal 5 inch, electrofusion through 8 inch or butt fusion in nominal 2 inch through 24 inch sizes. Electrofusion may also be performed in nominal sizes 10 inch through 24 inch by means of the use of electrofusion couplings as applied on butt fusion fittings and pipe.

4. Installation of Polypropylene piping in return air plenums is prohibited.

5. Acceptable Manufacturers: Aquatherm, Nupi.

C. PEX Piping:

1. PEX-a (Engel-method crosslinked polyethylene), ASTM F876 and F877, SDR 9, CTS, 1/2 inch through 3 inch nominal pipe size. Piping shall be rated for not less than 180°F working temperature and 100 psig working pressure.

2. Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from lead-free (LF) brass. Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked “F1960”.

2.3 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

2.4 ACCEPTABLE MANUFACTURERS - DIELECTRIC CONNECTIONS

A. Elster Perfection - Clearflow.

B. Or approved equal.

2.5 DIELECTRIC CONNECTIONS

A. Dielectric Connections: Dielectric waterway fitting shall have zinc electroplated steel casing with polypropylene inner lining to provide a dielectric waterway. The fitting shall be designed to meet requirements of ASTM F1545 for continuous use at temperatures up to 225°F and for pressures up to 300 psi. IAPMO, UPC and NSF-61 listed for use with potable water.

2.6 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

A. Apollo.

B. FNW.

C. Hammond.

D. Milwaukee.

E. NIBCO.

F. Red-White Valve Corp.

G. Or approved equal.

2.7 BALL VALVES

A. Up to 2 Inches: 600 PSI CWP Lead free bronze two piece body, full port, forged lead free brass ball, Teflon seats and adjustable packing, lever handle, solder, threaded or press-fit ends.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Provide clearance for installation of insulation and access to valves and fittings.

F. Establish elevations of buried piping outside the building to ensure not less than 10 ft. of cover.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Division 09.

I. Establish invert elevations, slopes for drainage to 1/4” per foot, 1/8” per foot if 4" or over, minimum. Maintain gradients.

J. Install valves with stems upright or horizontal, not inverted.

K. Provide properly sized handles for valve operation. Handles shall not be cut or bent to make fit where installed.

L. Press Fittings shall be installed in accordance with the manufacturer’s installation instructions.

M. Support all piping in accordance with Uniform Plumbing Code and Manufacturer installation instructions. Where there is a conflict between requirements of the Uniform Plumbing Code and Manufacturer installation instructions, the more restrictive requirement shall apply.

N. Polypropylene piping shall not be installed in any locations used as a return air plenums. Transition to copper or steel piping prior to routing piping through a return air plenum.

O. Fusion Welding of Joints for Polypropylene Piping:

1. Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting or joint type. All fusion-weld joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.
2. Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.
3. Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and the manufacturer's specifications.
4. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

P. PEX Piping:

1. PEX Piping shall be installed in accordance with manufacturer’s product data, including product technical bulletins, installation instructions, and manufacturer’s design drawings.
2. PEX piping shall be installed per ASTM E84 requirements for plenum applications.
3. Install PEX-a Pipe Support and provide all required hangers and supporting strapping as required by manufacturer to provide a code compliant installation.
4. Install PEX piping in straight runs free of sags and kinks and provide bend supports at all 1/2 inch and 3/4 inch drops.
5. All PEX piping penetrations through wall plates shall be protected or shielded as required to prevent damage to piping.
6. PEX tubing passing through metal studs shall use grommets or sleeves at the penetration.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment connections.

B. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.4 TESTING

A. Test all water piping in accordance with Section 609 of the UPC. Submit a signed statement to the DEPARTMENT stating testing dates, procedure and initials of tester. The test pressure for a hydrostatic test shall be 1.5 times the design pressure or 150 psi, whichever is greater, and for an air test shall be 1.1 times the design pressure or 150 psi, whichever is greater.

B. Plastic piping tests are to be performed hydrostatically in accordance with manufacturer installation manuals. For polypropylene piping submit all testing results and documentation to manufacturer as required for manufacturer Warranty.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush, clean and disinfect the potable water system in accordance with Section 609 of the UPC. Submit a signed statement to the DEPARTMENT stating disinfection dates, procedure and initials of tester.

END OF SECTION

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.2 WORK INCLUDED

A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.

B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.3 RELATED WORK

A. Related Work Specified Elsewhere:

1. Plumbing Specifications: Division 22.

2. Electrical Specifications: Division 26.

3. Motors and Connections: Division 26.

4. Starters and Disconnects: Division 26.

B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 23 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.

C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.4 REFERENCED CODES - LATEST ADOPTED EDITION

A. NFPA 70 National Electrical Code (NEC).

B. IMC International Mechanical Code.

C. UPC Uniform Plumbing Code.

D. IECC International Energy Conservation Code.

E. IFC International Fire Code.

F. IFGC International Fuel Gas Code.

G. IBC International Building Code.

1.5 PROJECT RECORD DRAWINGS

A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.

B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the DEPARTMENT.

C. Show the location of all valves and their appropriate tag identification.

D. At completion of project, deliver these drawings to the DEPARTMENT and obtain a written receipt.

1.6 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.

C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.

D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.

E. Submit product data for:

1. Hangers and Supports for HVAC Piping and Equipment.

2. Vibration and Seismic controls for HVAC Piping, Ductwork and Equipment.

3. Identification for HVAC Piping, Ductwork and Equipment.

1.7 OPERATING AND MAINTENANCE MANUALS

A. See General Conditions and the General Requirements in Division 01 regarding Operating and Maintenance Manuals.

B. Submit maintenance manuals to the DEPARTMENT covering all equipment, devices, etc. installed by the Contractor.

C. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:

1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.

2. Catalog cuts of all equipment, etc. installed (Marked to identify the specific items used).

3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.

4. Identification numbers of all parts and nearest sources for obtaining parts and services.

5. Reduced scale drawings of the control system and a verbal description of how these controls operate.

6. A copy of the final test and balance report.

7. A copy of valve schedule and reduced scale drawings showing valve locations.

8. Written summary of instructions to DEPARTMENT.

9. All manufacturers' warranties and guarantees.

10. Contractors Warranty Letter.

D. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment with a list of manufacturers recommended inspection and maintenance tasks, and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.8 HANDLING

A. See General Conditions and the General Requirements in Division 01 regarding material handling.

B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.9 SUBSTITUTIONS

A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.

B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The DEPARTMENT shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.

B. Any differences, which may be found, shall be submitted to the DEPARTMENT for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the DEPARTMENT of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

A. The Contractor under each section shall perform the various tests as specified and required by the DEPARTMENT and as required by applicable code, the State and local authorities. The Contractor shall furnish all labor, fuel and materials necessary for making tests.

1.14 TERMINOLOGY

A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.

C. The use of the word "shall" conveys a mandatory condition to the contract.

D. "This section" refers to the section in which the statement occurs.

E. "The project" includes all work in progress during the construction period.

F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The DEPARTMENT will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

A. The Contractor for the work under each section of the specifications shall coordinate the Contractors work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on the work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.

B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the DEPARTMENT, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the DEPARTMENT. All defects in labor and materials occurring during this period, as determined by the DEPARTMENT, shall be repaired and/or replaced to the complete satisfaction of the DEPARTMENT. Guarantee shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.

2. Contractors One Year Warranty.

3. All Manufacturers' Guarantees.

4. Test and Balance Reports.

5. Operation and Maintenance Manuals.

1.19 INSPECTION OF SITE - REMODEL PROJECTS

A. The accompanying plans do not indicate completely the existing plumbing and mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.20 RELOCATION OF EXISTING INSTALLATIONS

A. There are portions of the existing plumbing, mechanical and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of the Contractors particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.21 SALVAGE MATERIALS

A. The Contractor shall remove existing equipment, duct, grilles and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to

view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the DEPARTMENT), they shall be removed.

B. All items or materials removed from the project shall be made available for the DEPARTMENT'S inspection. The DEPARTMENT retains the option to claim any item or material. Contractor shall deliver any claimed item or material in good condition to the place designated by the DEPARTMENT. All items not claimed become the property of the contractor and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.2 RESTRICTED MATERIALS

A. No materials containing asbestos in any form shall be allowed.

B. No solder or flux containing lead shall be used on this project.

C. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.3 ELECTRICAL MOTORS

A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.

B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.

C. All motors for use with equipment with variable frequency drives shall be inverter ready motors. Verify compatibility and sizing of motor with variable frequency drive.

D. Size motors for 1.15 service factor and not to exceed 40º C temperature rise above ambient.

E. Fractional horsepower motors to have self-resetting thermal overload switch.

F. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

2.4 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Plastic Nameplates: Laminated plastic with engraved letters.

B. Plastic Tags: Laminated plastic with engraved letters, minimum 1-1/2 inches diameter.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.

D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.5 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:

1. Anvil.
2. Eaton.
3. Erico.
4. Holdrite.
5. PHD Manufacturing, Inc.
6. Or approved equal.

B. Steam and Steam Condensate Piping:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1 ½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

C. Refrigerant Piping:

1. Conform to ANSI/MSS SP58.
2. Hangers for Pipe Sizes ½ to 1 ½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

D. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180º segments, minimum 12 inches long at pipe support.

E. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.

F. Design hangers to allow installation without disengagement of supported pipe.

G. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe shall have copper plating, hanger rings with factory-applied 1/16 inch minimum thick plastic, or tape cushion strip over all contact surfaces.

H. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 653 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

2.6 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, or continuous threaded.

2.7 ANCHOR BOLTS

A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.8 FLASHING

A. Metal Flashing: 26-gauge minimum galvanized steel.

B. Metal Counter Flashing: 22 gauge minimum galvanized steel.

C. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.

D. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

2.9 EQUIPMENT CURBS

A. Fabricate curbs of concrete unless specifically called out otherwise.

2.10 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Beams and Walls,: Form with steel pipe or 18 gauge galvanized steel for 4 inch diameter and larger, 22 gauge up to 3" diameter.

B. Fire Stopping Insulation: Mineral fiber type, non- combustible.

C. Caulk: Fire stop sealant in compliance with ASTM E814, UL 1479 and Division 07.

D. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.11 FORMED STEEL CHANNEL

A. Manufacturers:

1. Atkore Allied Tube & Conduit Corp.
2. Eaton B-Line Series.
3. PHD Manufacturing, Inc.

4. Or approved equal.

B. Product Description: Galvanized 12 gauge (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

2.12 ACCEPTABLE MANUFACTURERS: VIBRATION ISOLATORS AND SEISMIC RESTRAINT

A. Vibration isolators and Seismic Restraint shall be manufactured by:

1. Amber/Booth.

2. Cooper Industries.

3. International Seismic Application Technology.

4. Kinetics Noise Control.

5. Mason Industries.

6. Vibro-Acoustics

7. Or approved equal.

2.13 VIBRATION ISOLATORS (ROTATING EQUIPMENT EXCEPT FANS)

A. Floor Mount: Closed spring mount with iso-stiff springs and limit stop for seismic restraint. Isolators are to be sized and selected by equipment manufacturer.

B. Hangers: Closed spring hanger with acoustic isolator.

C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

D. Color code spring mounts, spring selected to operate at no greater than 2/3 solid deflection and have ¼" ribbed neoprene pads.

2.14 FAN ISOLATION

A. Provide spring type isolators for fans and heating and ventilation units.

B. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or ¼ inch neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be not less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

C. Seismically restrained spring isolators shall be as described above, built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of ¼ inch travel in all directions before contacting the resilient snubbing collars. Mountings shall be SSLFH as manufactured by Mason Industries or approved equal.

D. Cabinet unit heaters, panel fans, and other ventilation units mounted to solid ductwork or structure shall be internally factory isolated.

2.15 VENTILATING SYSTEMS FLEXIBLE CONNECTIONS

A. Fabricate of neoprene coated flameproof fabric a minimum of 2" wide tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6" intervals. DuroDyne Dynalon treated duct material, or approved equal. Durolon or approved equal for outdoor or high pressure applications.

2.16 LIMITS OF VIBRATION

A. The factory is to statically and dynamically balance all rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor.

B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment HP, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.

C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.17 EARTHQUAKE BUMPERS AND SNUBBERS

A. Bumpers:

1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.

2. Attach one or more elastomeric mountings to pad the 6" leg of the angle iron.

3. Design the mounting to deflect not more than ¾" under the shock loading of 1 g in any direction in the horizontal plane.

4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or approved equal.

B. Snubbers:

1. Interlocking steel members restrained by shock absorbent rubber materials.

2. Elastomeric materials shall be replaceable and a minimum of ¾” thickness.

3. Maintain 1/8” air gap in all directions in design of snubber.

4. Acceleration of 4 g’s in any direction.

5. All-directional restraint.

6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

2.18 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the structural department of record.

2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.

3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.

4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.

5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.19 SEISMIC BRACING COMPONENTS

A. Steel strut shall be 1-5/8 wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.

1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.

2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.

3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.

4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS. Gr.33.

5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

PART 3 - EXECUTION

3.1 DRAWINGS

A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural, Structural, and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.2 INSTALLATION

A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NEC, NFPA, IECC, IFGC and IFC Standards; all local and state amendments to all codes and standards.

B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

C. Compliance with codes and ordinances shall be at the Contractor's expense.

D. Install in accordance with manufacturer's instructions.

3.3 MEASUREMENTS

A. Verify all measurements on the job site.

B. Locate all equipment on the centers of walls, openings, spaces, etc., unless specified otherwise.

C. Check all piping, ducts, etc. to clear openings.

D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.4 OPERATING INSTRUCTIONS

A. Before the facility is turned over to the DEPARTMENT, instruct the DEPARTMENT or DEPARTMENT personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.

B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of four hours of onsite instruction to the department designated personnel.

C. When required by individual specification sections provide additional training on HVAC systems and equipment as indicated in the respective specification section.

D. Provide schedule for training activities for review prior to start of training.

3.5 SYSTEM ADJUSTING

A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all controls, proper air distribution, elimination of drafts, noise and vibration.

B. Balance air and water systems for volume quantities shown and as required to ensure even temperature and the elimination of drafts. Balancing shall be done by a qualified firm acceptable to the DEPARTMENT. Provide balancing log to the DEPARTMENT before substantial completion.

3.6 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.

C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.7 PAINTING

A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the DEPARTMENT. Provide the following items as a part of mechanical work:

1. Factory applied prime and finish coats on mechanical equipment.

2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.

3. Factory applied prime coat on access doors.

4. Pipe identification where specified.

B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.8 IDENTIFICATION

A. Tag all valves with heat resistant laminated plastic labels or brass tags engraved with readily legible letters. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten directory under glass, and installed where directed. Provide complete record drawings that show all valves with their appropriate label. Seton 250-BL-G, or 2961.20-G, 2” round or approved equal.

B. Label all equipment with heat resistant laminated plastic labels having engraved lettering ½" high. If items are not specifically listed on the schedules, consult the DEPARTMENT concerning designation to use. Seton engraved Seton-Ply nameplates or approved equal.

C. Identify piping to indicate contents and flow direction of each pipe exposed to view by a labeled sleeve in letters readable from floor at least once in each room and at intervals of not more that 20' apart and on each side of partition penetrations. Coloring scheme in accordance with ANSI/ASME A13.1, Seton Opti-Code or approved equal.

3.9 PIPE HANGERS AND SUPPORTS

A. Support piping as follows:

Pipe Size	Max. Hanger Spacing	Hanger Diameter
½ to 1-¼ inch	6'-0"	3/8"
1-½ to 2 inch	10'-0"	3/8"
Polypropylene (PP) Piping 1” or smaller	32” [a]	3/8”
Polypropylene (PP) Piping 1-1/4” or 2”	4’-0” [a]	3/8”

Notes:

[a] See piping manufacturer installation instructions for additional requirements.

B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Use hangers with 1-½ inch minimum vertical adjustment.

E. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

3.10 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of where shown on plans and where required by equipment manufacturer installation instructions.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Anchor (Expansion) Bolts: Install anchor bolts for all mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where equipment, piping, and ductwork is hung. Install anchor (expansion) bolts in holes drilled in concrete where necessary to hang piping or ductwork, or to anchor stationary equipment from existing concrete slabs.

3.11 FLASHING

A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

3.12 SLEEVES

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Set sleeves in position in construction. Provide reinforcing around sleeves.

C. Where piping or ductwork penetrates ceiling or wall, install sleeve, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Use fire rated caulking where fire rated walls are penetrated. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

D. Install chrome plated steel escutcheons at finished surfaces.

3.13 SCOPE OF VIBRATION ISOLATION WORK

A. All vibrating equipment and the interconnecting pipe shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.

B. HVAC equipment shall be carefully checked upon delivery for proper mechanical performance, which shall include proper noise and vibration operation.

C. All installed rotating equipment with excessive noise and/or vibration, which cannot be corrected in place, shall be replaced at no cost to DEPARTMENT.

3.14 GENERAL PROCEDURES – VIBRATION ISOLATION

A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.

B. Install isolators so they can be easily removed for replacement.

C. Mount all equipment absolutely level.

D. Install all isolators per manufacturer's instructions.

E. Install vibration isolators for mechanical motor driven equipment.

F. Set steel bases for 1" clearance between housekeeping pad and base.

G. All vibration isolated equipment shall be fitted with earthquake bracing and snubbers suitable for seismic control in accordance with the IBC.

H. Piping vibration isolation flexible connections shall be installed at a 90° angle to equipment deflection direction unless otherwise noted.

3.15 SEISMIC RESTRAINT

A. General:

1. All equipment, piping and ductwork shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.

2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.

3. Attachment to structure for suspended equipment, pipe and duct: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.

5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.

6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.

7. Where rigid restraints are used on equipment, ductwork or piping, support rods for the equipment, ductwork or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.

8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the DEPARTMENT if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Equipment Restraints:

1. Seismically restrain equipment all equipment. Install fasteners, straps and brackets as required to secure the equipment.

2. Install seismic snubbers on HVAC equipment supported by floor-mounted, non-seismic vibration isolators. Locate snubbers as close as possible to vibration isolators and attach to equipment base and supporting structure as required.

3. Install neoprene grommet washers on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 1/8" (3.2 mm).

4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

3.16 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports

suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.

F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Air Systems:

1. Constant Volume Air Systems.

1.2 SCOPE

A. Furnish the professional services of a qualified and approved balancing and testing firm to perform the work of this specification section.

B. The work of this section includes but is not necessarily limited to:

1. Testing and balancing ventilation systems as indicated on drawings.

2. Testing and balancing fans and air handling systems.

3. Working directly with the control subcontractor to obtain proper system adjustments.

C. The work of this section does not include:

1. Adjusting burners for proper combustion operation.

2. Liquid waste transfer system adjustment.

3. Fire protection systems.

1.3 APPLICABLE CODES AND STANDARDS

A. SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.

B. AMCA Publication 203, Field Performance Measurements.

C. American Air Balancing Council (AABC) Recommended Procedures

D. National Environmental Balancing Bureau (NEBB) Recommended Procedures

1.4 QUALIFICATION OF THE BALANCING FIRM OR COMPANY

A. Subcontractor minimum qualifications include:

1. NEBB Certified in Testing, Adjusting and Balancing of Air and Hydronic Systems and Demonstration of satisfactory completion of five projects of similar scope in the State of Alaska during the past five years. Provide references if requested.

1.5 TIMING OF WORK

A. Do not begin balancing and testing until the systems, including controls, are completed and in full working order.

B. Schedule the testing and balancing work in cooperation with other trades.

C. Complete the testing and balancing at least one week before the date of substantial completion and before any occupancy occurs

1.6 CONTRACTOR RESPONSIBILITY TO BALANCING AGENCY

A. Award the test and balance contract to an approved firm or company upon receipt of contract to allow the Balance and Testing Agency to schedule this work in cooperation with other trades involved and comply with completion date.

B. Put all heating, ventilating and air conditioning systems, equipment and controls into full operation for the Balancing Agency and continue the operation of same during each working day of testing balancing.

C. Provide scaffolding, ladders and access to each system for proper testing balancing.

D. Ensure that the building enclosure is complete, including but not limited to, structural components, windows and doors installed, door hardware complete, ceilings complete, stair, elevator and mechanical shafts complete, roof systems complete, all plenums sealed, etc.

E. Make any changes in pulleys, belts and dampers, or add any dampers as required for correct balance as recommended by the Balance and Testing Agency at no additional cost to the DEPARTMENT.

F. Complete installation, programming (including design parameters and graphics), calibration, and startup of all building control systems.

G. Require that the building control system firm provide access to hardware and software, or onsite technical support required to assist the TAB effort. The hardware and software or the onsite technical support shall be provided at no cost to the TAB firm.

1.7 REPORT

A. Certified Reports shall be included in project O & M manuals. Reports shall include: testing, adjusting, and balancing reports bearing the signature of the Test and Balance Agency Representative. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the system. Follow the procedures and format specified below:

1. Draft Reports: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be

complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports.

2. Final Reports: Upon verification and approval of the draft report; prepare final reports, typewritten, organized and formatted as specified below.

3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Report shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed. Divide the contents into the below listed sections, with bookmarks for each section:

    a. General Information and Summary.

    b. Air Systems.

    c. Hydronic Systems.

    d. Temperature Control Systems.

    e. Special Systems.

    f. System Deficiency Reports and Corrective Actions.

4. Report Contents: Provide the following minimum information, forms and data:

    a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency; contractor; DEPARTMENT, architect, department and project. Include addresses, contact names and telephone numbers. Also, include a certification sheet containing the name, address, telephone number and signature of the Certified Test and Balance Personnel. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.

    b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

    c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.8 SUBMITTALS

A. Submit in accordance with Division 01.

B. Submit balancing agency qualifications and sample balancing forms.

C. Provide list of equipment to be used and date of last calibration.

D. Submit preliminary balance report a minimum of one week prior to substantial completion inspection.

PART 2 - PRODUCTS

2.1 INSTRUMENTS

A. Maintain all instruments accurately calibrated and in good working order. Use instruments with the following minimum performance characteristics.

1. Air Velocity Instruments: Direct reading in feet per minute, 2% accuracy.

2. Static Pressure Instruments: Direct reading in inches' water gauge, 2% accuracy.

3. RPM Instruments: Direct reading in revolutions per minute, .5% accuracy; or revolution counter accurate within 2 counts per 1,000.

4. Pressure Readout: Direct reading in feet of water or PSI, .5% accuracy.

5. Temperature Instruments - Direct reading in degrees F, +.5% accuracy.

6. Sound Measuring Instrument: Octave Band Analyzer which essentially complies to AASA Standards SI.6 1960 with a range of 24DB to 150 DB sound pressure level ref. .0002 microbar. Calibrate sound test instrument before use to a closed coupler and a driving loudspeaker that produces a know-sound pressure level at the microphone of the analyzer.

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES FOR ALL SYSTEMS

A. Start with new, clean filters.

B. In cooperation with the control manufacturer's representative, coordinate adjustments of automatically operated dampers and valves to operate as specified, indicated and/or noted.

C. Use manufacturer's ratings on all equipment to make required calculations.

D. Make final adjustments for each space per heating or cooling comfort requirement. State reason for variance from design CFM, i.e., "too noisy", "drafty", etc.

E. Mark equipment and balancing device settings (including damper-control positions, valve position indicators, fan-speed-controls, and similar controls and devices) with paint or other suitable permanent identification material to show final settings.

3.2 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

A. Identify each diffuser, grille and register as to location and area.

B. Identify and list size, type and manufacturer of diffusers, grilles, registers and all testing equipment.

C. In readings and tests of diffusers, grilles and registers, include required FPM velocity and required CFM and test CFM after adjustments. If test apparatus is designed to read CFM directly, velocity reading may be omitted. Identify test apparatus used. Identify wide open (W.O.) runs.

D. Check and record the following items:

1. Air temperatures; mixed air, after coils, outside air, return air and supply air.

2. Pressure drop at each coil, filter bank, etc.

3. Operating suction and discharge pressure.

4. Full nameplate data of all equipment.

5. Rated and actual running amperage and voltage of all motors.

6. Drive data including sheaves and belts and adjustments.

7. Electrical overloads/heaters sizes and ranges of motors.

3.3 BALANCING LOW VELOCITY CONSTANT VOLUME DUCTWORK

A. Analyze system and identify major branches. Tabulate design CFM for each branch.

B. Select the branch which appears to be the longest run from the fan or to have the highest static pressure requirements.

C. Adjust other branch dampers or the fan to establish 110% design air flow through the selected branch.

D. Adjust the air flow through each air inlet (exhaust systems) or outlet (supply systems) on the selected branch to within +5% of the requirements so that at least one branch damper serving an inlet (or outlet) is wide open.

E. Proceed to another branch and set up 110% design airflow. Balance each inlet or outlet to within +5% of requirements, again leaving at least one wide open run. Repeat this process until all branches are balanced 110% airflow.

F. Once each branch has been balanced at 110% flow with one wide open run on each branch, balance with branches together, leaving at least one branch damper wide open. At this point, adjust the fan delivery so that each branch is at about 110% design airflow. Adjust the branch dampers so that each inlet (or outlet) in the system is within 10% of the required airflow.

G. Adjust the fan for design airflow.

H. Read and record the airflow at each inlet and outlet.

I. Secure each branch damper and mark the balanced position of the damper quadrant.

J. Test and record entering and leaving air temperatures of coils.

K. Test and record entering and leaving water temperatures of coils.

L. Test and record static pressure drop across each filter and coil bank.

END OF SECTION

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping Insulation.

B. Equipment Insulation.

C. Ductwork Insulation.

D. Jackets and Accessories.

1.2 RELATED WORK

A. Division 09 - Painting.

B. Section 23 05 00 - Common Work Results for HVAC Systems.

C. Section 23 22 13 - Steam and Condensate Heating Piping.

D. Section 23 22 16 - Steam and Condensate Heating Piping Specialties.

E. Section 23 23 00 - Refrigeration Piping.

F. Section 23 31 00 - HVAC Ducts and Casings.

G. Section 23 33 00 - Air Duct Accessories.

1.3 REFERENCES

A. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

B. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

C. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.

F. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

G. ANSI/ASTM C547 - Mineral Fiber Pipe Insulation (Preformed).

H. ANSI/ASTM C552 - Cellular Glass Thermal Insulation.

I. ANSI/ASTM C553 - Mineral Fiber Blanket Insulation.

J. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.

K. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

L. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

M. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

N. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.

O. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).

P. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

Q. ASTM C1427 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

R. ASTM D774 - Standard Test Method for Bursting Strength of Paper.

S. ASTM D1000 - Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.

T. ASTM E84 - Surface Burning Characteristics of Building Materials.

U. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

V. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include product description, thickness for each service, and locations.

C. Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with three years minimum experience.

B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.

C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, ASTM E84.

D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

C. Shipment of materials from manufacturer to installation location shall be in weather tight transportation.

D. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesive, mastics, and insulation cements.

1.8 FIELD MEASURMENTS

A. Verify field measurements prior to fabrication.

1.9 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armacell.

B. Certain-Teed.

C. IMCOA.

D. Johns Manville.

E. Knauf.

F. Owens-Corning.

G. Manson.

H. Pittsburgh - Corning.

I. K-Flex USA.

J. Armstrong.

K. Or approved equal.

2.2 INSULATION - PIPING

A. Type A: Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. Type E: Elastomeric foam; EPDM-based closed-cell flexible foam, ASTM C534; flexible cellular elastomeric in sheet or pre-formed tube, ’k’ value of 0.26 at 75º F, max. service temp - 300º F, ASTM C534; max. flame spread = 50, max. smoke developed = 50, ASTM E84; UV-resistant coating/jacketing if exposed to sunlight; K-FLEX USA “Insul-Tube”, “Insul-Sheet”, or approved equal.

2.3 FIELD APPLIED PIPING JACKET

A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

B. PVC Jackets and solvent welding adhesive: One piece, pre-molded type, Johns Manville “Zeston 2000” or approved equal, fitting covers and jacketing material. Johns Manville “Perma-Weld” solvent welding adhesive or approved equal.

C. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.

D. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

2.4 INSULATION - DUCTWORK

A. Type K: Exterior FSK Duct Wrap: Flexible glass fiber; ASTM C553; commercial grade; 'k' value of 0.27 at 75º F, 0.6 lb./cu. ft. density. 0.00035 inch vinyl scrim facing with 2” stapling tab. Johns Manville “Microlite Standard Duct Wrap” or approved equal.

B. Type L: Exterior FSK Rigid Fiber Board Duct Insulation; ASTM C612, ‘k’ value of 0.23 at 75° F, 3.0 lb./cu. ft. density. 0.00035 inch foil scrim facing. Johns Manville “814 Spin-Glas” or approved equal.

C. Type M: Duct Liner: Rigid Fiber Board; ASTM C1071; 'k' value of 0.23 at 75º F; coated air side for maximum 6,000 ft./min. air velocity, UL listed adhesive galvanized steel pins. Johns Manville “Permacote Linacoustic R-300" or approved equal.

2.5 INSULATION ACCESSORIES

A. Adhesives: Waterproof and fire-retardant type.

B. Lagging Adhesive: Fire resistive to ASTM E84 and UL 723.

C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.

D. Joint Tape: Glass fiber cloth, open mesh.

E. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240º F service temperatures; Venture Tape “1525CW” or approved equal.

F. Tie Wire: Annealed steel, 16 gauge.

G. Insulated pipe supports: Calcium silicate with galvanized steel jacket (min. 24 gauge); ANSI/ASTM C533; rigid white; 'k' value of 0.37 at 100º F, rated to 1,200º F; Thermal Pipe Shields “T-2000 Calsil” or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after piping, equipment and ductwork has been tested and approved.

B. Clean surfaces for adhesives.

C. Prepare surfaces in accordance with manufacturer's recommendations.

3.2 INSTALLATION – PIPING INSULATION

A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.

B. Continue insulation vapor barrier through penetrations except where prohibited by code.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Provide insulated piping supports on piping 1-½" inch diameter to 3 inch diameter Insulated piping supports shall not be less than the following lengths:

1-½" to 2-½" pipe size 10" long

F. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.

G. Fully insulate all piping including all spaces under jacketing.

H. Jackets:

1. Indoor, Concealed Applications: Insulated pipes shall have vapor barrier jackets, factory-applied. Vapor barrier PVC fittings may also be used provided joints are sealed with solvent welding adhesive approved by the jacket manufacturer.

2. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers or metal jacket.

3.3 SCHEDULE – PIPING

A.

PIPING	TYPE	PIPE SIZE	MINIMUM INSULATION THICKNESS
Steam Piping	A	3” and Smaller	1"
Steam Condensate	A, E	1-1/4” and Smaller	1"
Cold Condensate Drains	A, E	All Sizes	1"
Refrigerant Suction Piping	E	All Sizes	1"
Refrigerant Liquid Piping	E	All Sizes	1"
Humidifier Piping	A	All Sizes	1"

3.4 INSTALLATION – DUCTWORK INSULATION

A. Install materials in accordance with manufacturer's instructions.

B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature. Continue insulation with vapor barrier through penetration.

C. Duct Exterior Insulation (Type K,L) Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.

2. Secure insulation without vapor barrier with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use mechanical fasteners to prevent sagging. Secure insulation with mechanical fasteners on 15 inch centers maximum, on bottom and side of ductwork with dimension exceeding 20 inches. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

4. Maximum 25% compression.

D. Fiberglass Duct Liner (Type M) Application:

1. Adhere insulation with approved adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Butt joints together tightly then seal and smooth. Thoroughly coat ends of liner with adhesive. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.

2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.

3. Install liner as indicated on plans.

E. Where ductwork is scheduled for exterior insulation and is shown on the plans to be internally lined, the exterior insulation thickness may be reduced by the thickness of the lining. Where exterior insulation can be eliminated or reduced due to thickness of lining, overlap exterior insulation a minimum 24 inches over lined ductwork.

F. Where canvas jacketing is indicated, apply mastic in sufficient thickness to completely cover the texture of the canvas material.

3.5 SCHEDULE - DUCTWORK

DUCTWORK	TYPE	INSULATION THICKNESS	FINISH
Exhaust & Relief Ducts Within 10 ft. of Exterior Openings	K,L	1"	FSK
Outside Air Intake Ducts	L	2" Rigid	CANVAS

DUCTWORK	TYPE	INSULATION THICKNESS	FINISH
Ventilation Equipment Casings	M	2"	
Supply Ducts	K	1"	FSK
Supply/Return Ducts in Unconditioned Spaces	K, L	2”	FSK
Return and Relief Ducts in Mechanical Rooms	K, L	1"	FSK
Internal Acoustic Lining	M,N	1"	
Internal Lining in Supply Ducts	M,N	1"	

END OF SECTION

SECTION 23 09 23 - DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

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

B. Amend the existing BAC-net compliant hardware as necessary for the remodel configuration.

C. Provide all 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.

D. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

E. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs, and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

F. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

G. Provide and install all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

H. Provide and install all interconnecting cables between all operator's terminals and peripheral devices (such as printers, etc.) supplied under this section.

I. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

J. Provide supervisory specialists and technicians at the job site to assist in system startup, and commissioning.

K. Provide a comprehensive operator and technician training program as described herein.

L. Provide as-built documentation, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum total of which accurately represents the final system.

M. Provide new sensors, dampers, valves, and install only new electronic actuators. No used components shall be used as any part or piece of installed system.

1.2 SYSTEM DESCRIPTION

A. Distributed logic control systems complete with all software and hardware functions shall be provided and installed. System shall be completely based on ANSI/ASHRAE Standard 135, BACnet. This system is to control all mechanical equipment, including all unitary equipment such as condensing units, air handlers, etc. and any other listed equipment using native BACnet-compliant components.

B. Building controllers shall include complete energy management software, including scheduling building control strategies with optimum start and logging routines. All energy management software and firmware shall be resident in field hardware and shall not be dependent on the operator's terminal. Operator's terminal software is to be used for access to field-based energy management functions only. Provide zone-by-zone direct digital logic control of space temperature, scheduling, runtime accumulation, equipment alarm reporting, and override timers for after-hours usage. All application controllers all equipment and any other piece of controlled equipment shall be fully programmable. Application controllers shall be mounted next to controlled equipment and communicate with building controller via BACnet LAN.

C. Room sensors shall allow room setpoint adjustment within preset limits. Initial settings 68-72 Degrees F.

D. Provide all alarms, manual control, and status indication functions as indicated under the sequence of operation, Specification Section 23 09 93.

E. The system shall be Web Enabled and shall be accessible through any computer connected to the internet using a standard web browser and appropriate password protection. Contractor shall include costs for all network wiring and coordination with the DEPARTMENT for IP Address connection.

F. The system shall include remote notification services to allow messaging of critical alarms to department designated personnel and to the central alarm facility.

G. The DDC system shall be hosted on the existing Central Server. Coordinate with DEPARTMENT for integration and hosting requirements on existing central server.

1.3 RELATED SECTIONS

A. Section 23 05 00 - Common Work Results For HVAC.

B. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

C. Section 23 33 00 - Air Duct Accessories.

D. Division 26 - Electrical Specifications

1.4 REFERENCES

A. ANSI/ASHRAE 135, BACNET - A Data Communication Protocol for Building Automation and Control Networks (BACnet).

1.5 QUALITY ASSURANCE

A. The direct digital control system provided shall be designed, furnished, installed, tested, certified and placed into service by Siemens.

1.6 EQUIPMENT AND SHOP DRAWING REVIEW SUBMITTALS

A. Provide electronic submittals in accordance with Section 23 05 00 and Division 01.

B. Prior to programming, ordering of equipment, or installation of any portion of the system submit the following in a single tabbed and indexed PDF package for review by the DEPARTMENT. The shop drawings shall include an electronic bookmark for every major system initial sheet. Shop drawings without bookmarks will be rejected without review for correction.

1. System architecture diagram showing power supply to each component; interconnection of direct digital controllers, building management station, and peripherals; and indication of proposed location of direct digital controllers.

2. Sequence of operations. Print sequence of operations on the schematic control diagrams so that the relevant sequence is on the same diagram with the control schematic it describes. The Sequence of Operations provided in the Contract Documents is written in directive language. Rewrite the sequence of operations to be submitted to the DEPARTMENT in language that explains the sequences of operation. Remove all directives to the Contractor.

3. Schematic control diagrams 11 inches by 17 inches minimum paper size with upper case lettering, minimum 1/16 inch high plotted from digitized files in AutoCAD format. Clearly indicate wire and terminal labels, set points, reset schedules, switch over points, signal ranges, and other points required to completely describe the system. Show interface with any existing control systems. Depict circuitry on schematic control diagrams to allow circuits to be traced from connection to connection using one of the following methods:

    a. Diagram each wire or tube depicting full length of circuit from connection to connection.

    b. Reference each wire to a uniquely labeled terminal. Depict terminals on a sequentially labeled terminal strip showing attached wires and the device labels of the components attached at the other end. If the wiring label used is different than the terminal label indicate the wire label. In addition provide ladder diagrams indicating current or air flow through circuitry components.

    c. Construct digitized schematic control diagrams using a symbol library so that symbols for similar equipment are common. Use separate layers or line type designations for the following items:

        1) Device Symbols.

        2) Equipment Symbols.

        3) Ductwork.

        4) Piping.

        5) Wiring.

4. Control Wiring Floor Plans. Provide architectural floor plans overlaid with control components. Plans shall include locations of sensors, valves, dampers, transformers, control cabinets, mechanical and electrical equipment interlocked or controlled by BAS, and communication and power wiring.

5. Subpanel and panel face layouts.

6. Control components data sheets, installation, operation, and adjustment instructions. Further index and tab this section of the submittal by item number.

    a. Each control component shall be identified with a separate item number. Separate each item with a divider sheet with plastic index tabs.

b. Provide two alphabetical listings of all items included in the binder in an index at the front of the binder. One index shall list items by functional name. The other index shall list items by symbol used in the control diagrams.

c. Each sheet or page shall indicate the specific item(s) proposed for this project. Delete or cross out all other items.

d. For all system elements operator's workstation(s), building controller(s), application controllers, routers, and repeaters, provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135.

e. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.

7. Orientation and training instruction schedule and course outlines.

8. Control Transformer Schedule. Provide control transformer schedule indicating tag id, location, equipment serviced, and VA consumed. Transformers shall be UL listed, class 2 power limited, provide built in circuit breaker and have a minimum of 15% spare capacity.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Provide electronic operations and maintenance manuals in accordance with Section 23 05 00 and Division 01 Standard General Provisions.

B. Operation and Maintenance Manuals must be submitted for review, reviewed by the DEPARTMENT, corrected in accordance with review comments, and accepted by the DEPARTMENT before a request for final or substantial completion inspection will be considered by the DEPARTMENT.

C. The Operation and Maintenance Manual shall include the information required for the equipment review submittal, updated as required to reflect current as-built conditions, plus the following:

1. A brief customized guide to system operation prepared for the proprietary programming and interfacing software. Include copies of the guide in the Operation and Maintenance Manual, laminated between two plastic sheets for use away from the workstations. The guide shall include:

a. Log on procedure.

b. Procedure for accessing interactive video display screens, changing set points, acknowledging alarms, creating history logs, and reviewing history logs.

c. Instructions for backing up the building management system and start up the system after a computer failure.

d. Instructions for backing up individual direct digital controllers and start them up after a controller failure.

2. Maintenance information and parts lists for control components.

3. Complete system as-built wiring diagrams indicating the following:

a. Wiring for all control and power circuits indicating the voltage and breaker location for each circuit.

b. Wiring for direct digital controllers and interface panels.

c. Terminal number or code name for terminals in direct digital controllers and interface panels with unused terminals marked "spare".

d. Assigned name, address, and department units for direct digital controller input and output terminals.

4. Control Wiring Floor Plans. Provide architectural floor plans overlaid with control components. Plans shall include locations of sensors, valves, dampers, transformers, control cabinets, mechanical and electrical equipment interlocked or controlled by BAS, and communication and power wiring.

5. Control Transformer Schedule. Provide control transformer schedule indicating tag id, location, equipment serviced, and VA consumed.

6. Valve Schedule.

7. List of software with current revision numbers, vendor name and support telephone numbers.

8. Include copies of programming and variable printouts for the direct digital control logic created to fulfill the sequence of operation requirements. Include the following information:

a. Print the sequence of operation corresponding to the program listing on that page.

b. Block Programming diagrams if block programming is used.

9. Provide backup copy of programming and graphics for the direct digital control system with instructions on how to install the backup software if the system needs to be re-installed. Provide on USB drive.

10. Provide digitized copies of O & Ms, as built schematic control diagrams, wiring diagrams, and graphic screens recorded on USB drive in PDF drawing format.

11. Provide a print out of the configuration files for each controller. Place controller specific print out in specific controller cabinet.

12. Provide other information required for the DEPARTMENT to properly troubleshoot and maintain the control system.

D. Published and bound building management system software or hardware manuals are not required to be included in the three ring “Operation and Maintenance Manual”. Provide one digital copy of each published building management system software or hardware manual required for the maintenance and operation of building management system to the DEPARTMENT one week prior to request for substantial completion. Provide a separate index sheet describing each separate manual as part of the “Operation and Maintenance Manual”.

E. Provide editing facilities used in the developing of the building management system so that any custom programming required to apply the building management system to this project is accessible to a trained operator for viewing, editing, or creating similar software structures. List software that cannot be changed by the operator with model and version number. Any custom software is considered the property of the DEPARTMENT with full right to copy. This software is required to work across the BACNET/IP network.

F. After the final inspection and subsequent punch list inspections update each copy of the Operation and Maintenance Manual to reflect final as-built conditions.

1.8 SYSTEMS DEMONSTRATION

A. The Contractor will completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequences of operation.

B. Provide complete demonstration of system operation to the department representative at the project substantial completion inspection. The Contactor will demonstrate to the DEPARTMENT'S satisfaction that all equipment and systems operate in accordance with the sequence of operation as outlined under Section 23 09 93. Demonstration will include all equipment controlled by the Direct Digital Control System.

C. Building management station demonstration will consist of:

1. Running sample point log and system configuration reports as requested.

2. Display and demonstrate each data entry to show site specific customizing capability. Demonstrate parameter changes.

3. Step through penetration tree, display all graphics, demonstrate dynamic update and direct access to graphics.

4. Execute system commands in graphic mode including operation of control system set points, schedules, valves, dampers and control relays. Commands shall be executed as necessary to demonstrate the system is controlling in accordance with the sequence of operations.

5. Demonstrate update, and alarm responsiveness.

6. Demonstrate digital system configuration graphics with interactive upload and download, and demonstrate specified diagnostics.

1.9 WARRANTY

A. Under provisions of Division 01 Standard General Provisions.

B. All components, system software, parts and assemblies will be guaranteed against defects in materials and workmanship for one year from acceptance date.

C. Labor to troubleshoot, repair, reprogram, or replace system components will be furnished by the Contractor at no charge to the DEPARTMENT during the warranty period.

D. All corrective software modifications made during warranty service periods will be updated on user documentation and on user and manufacturer archived software.

1.10 SUBSTANTIAL INSPECTION SUPPLEMENTAL DATA

A. Substantial inspection supplemental data must be submitted for review, reviewed by the DEPARTMENT, corrected in accordance with review comments, and accepted by the DEPARTMENT before a request for substantial completion inspection will be considered by the DEPARTMENT.

PART 2 - PRODUCTS

2.1 APPROVED BUILDING AUTOMATION SYSTEMS

A. Siemens Industry, Inc.

B. No Substitutions

2.2 BUILDING CONTROLLER

A. General:

1. All communication with operator workstation and all application controllers shall be via BACnet. Building controller shall incorporate as a minimum, the functions of a 3-way BACnet router. Controller shall route BACnet messages between the high-speed LAN (Ethernet 10/100MHz) master slave token passing (MS/TP) LANs, a point-to-point (PTP - RS-232) connection and modem.

    a. Each MS/TP LAN must be software configurable from 9.6 to 76.8Kbps.

    b. The RJ-45 Ethernet connection must accept either 10Base-T or 100Base-TX BACnet over twisted pair cable (UTP).

    c. The direct access port must be a female DB-9 connector supporting BACnet temporary PTP connection of a portable BACnet operator terminal at 9.6 to 115.2 Kbps over RS-232 null modem cable.

2. Building controller shall be capable of providing global control strategies for the system based on information from any objects in the system regardless if the object is directly monitored by the controller or by another controller. The program that implements these strategies shall be completely flexible and user definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site or downloaded via remote communications are not acceptable. Changing global strategies via firmware changes is also unacceptable.

3. Programming shall be object-oriented using control function blocks, supporting DDC functions, 1000 Analog Values and 1000 Binary Values. All flowcharts shall be generated and automatically downloaded to controller. Programming tool shall be resident on workstation and the same tool used for all controllers.

4. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's workstation or field computer.

5. Building controller shall provide battery-backed real-time (hardware) clock functions.

6. Controller shall have a memory needed to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative).

7. Global control algorithms and automated control functions should execute via 32-bit processor.

8. Controller installation shall include memory-free gel-cell battery providing ongoing power conditioning and noise filtering for operation data integrity. It shall provide up to 5 minutes of powerless operation for orderly shutdown and data backup.

B. BACnet Conformance:

1. Building Controller shall as a minimum support Point-to-Point (PTP), MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Global controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

   a. Clock Functional Group.

   b. Files Functional Group.

   c. Reinitialize Functional Group.

   d. Device Communications Functional Group.

   e. Event Initiation Functional Group.

2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum: Analog Value, Binary Value, Calendar, Device, File, Group, Notification Class, Program and Schedule object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. The Building Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internetwork, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

C. Schedules:

1. Each building controller shall support a minimum of 250 BACnet Schedule Objects and 250 BACnet Calendar Objects.

D. Logging Capabilities:

1. Each building controller shall log a minimum of 1000 trend logs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.

2. Logs may be viewed both on-site or off-site via remote communication.

3. Building controller shall periodically upload trended data to networked operator's workstation for long term archiving if desired.

4. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

E. Alarm Generation:

1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

2. Each alarm may be dialed out as noted in paragraph 2 above.

3. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.

4. Controller must be able to handle up to 1500 alarm setups stored as BACnet event enrollment objects - system destination and actions individually configurable.

2.3 APPLICATION CONTROLLERS

A. Provide one or more native BACnet application controllers for each mechanical system and provide native BACnet application controllers as needed for control that adequately cover all objects listed in object list. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of units. Controllers shall be fully programmable. Programming tool shall be resident on operator workstation and be the same tool as used for the building controller. No auxiliary or non-BACnet controllers shall be used.

B. BACnet Conformance:

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as native BACnet devices. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:

a. Files Functional Group.

b. Reinitialize Functional Group.

c. Device Communications Functional Group.

2. Please refer to BACnet Functional Groups, in the BACnet standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File, and Program object types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

4. Application controllers shall include universal inputs with 10-bit resolution that accept thermistors or RTDs, 0-10VDC, 0-5 VDC, 4-20 mA and dry contact signals. Any input on a controller may be either analog or digital. Controller shall also include support and

modifiable programming for interface to intelligent room sensor with digital display. Controller may include binary and analog outputs on board. Analog outputs shall be switch selectable as either 0-10VDC or 0-20mA. Software shall include scaling features for analog outputs. Application controller shall include 24VDC voltage supply for use as power supply to external sensors.

5. All program sequences shall be stored on board application controller in EEPROM nonvolatile flash memory. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and capable of multiple PID loops for control of multiple devices. All calculations shall be completed using floating-point math and system shall support display of all information in floating-point nomenclature at operator's terminal. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using programming tools as described in operator's terminal section.

6. Application controller shall include support for intelligent room sensor. Display on intelligent room sensor shall be programmable at application controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.4 EXPANDABLE APPLICATION CONTROLLERS

A. General:

1. Expandable application controller shall be capable of providing control strategies for the system based on information from any or all connected inputs. The program that implements these strategies shall be completely flexible and user definable. Any systems utilizing factory pre-programmed global strategies that cannot be modified by field personnel on-site via simple download are not acceptable. Changing global strategies via firmware changes is also unacceptable. Program execution of controller shall be a minimum of once per second.

2. Controller shall support additional Analog and Binary Values. Each and every analog and binary value shall support standard BACnet priority arrays. Programming tool shall be provided with system and shall be the same tool that is used to program the Building Controller. All flowcharts shall be generated and automatically downloaded to controller. No re-entry of database information shall be necessary.

3. Provide means to graphically view inputs and outputs to each program block in real-time as program is executing. This function may be performed via the operator's terminal or field computer.

4. Controller shall have adequate data storage to ensure high performance and data reliability. Battery shall retain static RAM memory and real-time clock functions for a minimum of 1.5 years (cumulative). Battery shall be a field-replaceable (non-rechargeable) lithium type. Unused battery life shall be 10 years.

5. The onboard, battery-backed real time clock must support schedule operations and trend logs.

6. Global control algorithms and automated control functions should execute via 32-bit processor.

7. Controller shall include both on-board 10BASE-T/100BASE-TX Ethernet BACnet communication over twisted pair cable (UTP) and shall include BACnet IP communication. In addition, controller shall include BACnet PTP connection port.

8. The base unit of the controller shall host up to 8 expansion modules with various I/O combinations. These inputs and outputs shall include universal 12-bit inputs, binary triac outputs, and 8-bit switch selectable analog outputs (0-10V or 0-20 mA). Inputs shall support thermistors or RTDs, 0-5VDC, 0-10VDC, 4-20mA, dry contacts and pulse inputs directly.

9. All outputs must have onboard Hand-Off-Auto switches and a status indicator light. HOA switch position shall be monitored. Each analog output shall include a potentiometer for manually adjusting the output when the HOA switch is in the Hand position.

10. The position of each and every HOA switch shall be available system wide as a BACnet object. Expandable Controller shall provide up to 176 discreet inputs/outputs per base unit.

B. BACnet Conformance:

1. Controller shall as a minimum support Point-to-Point (PTP), MS/TP and Ethernet BACnet LAN types. It shall communicate directly via these BACnet LANs as a native BACnet device and shall support simultaneous routing functions between all supported LAN types. Building controller shall be a BACnet conformance class 3 device and support all BACnet services necessary to provide the following BACnet functional groups:

   a. Clock Functional Group.

   b. Files Functional Group.

   c. Reinitialize Functional Group.

   d. Device Communications Functional Group.

   e. Event Initiation Functional Group.

2. Please refer to section 22.2, BACnet Functional Groups, in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All necessary tools shall be supplied for working with proprietary information.

3. Standard BACnet object types supported shall include as a minimum: Analog Input, Binary Input, Analog Output, Binary Output, Analog Value, Binary Value, Device, File, Group, Event Enrollment, Notification Class, Program and Schedule object types. All necessary tools shall be supplied for working with proprietary information.

4. The Controller shall comply with Annex J of the BACnet specification for IP connections. This device shall use Ethernet to connect to the IP internet work, while using the same Ethernet LAN for non-IP communications to other BACnet devices on the LAN. Must support interoperability on wide area networks (WANs) and campus area networks (CANs) and function as a BACnet Broadcast Management Device (BBMD).

C. Schedules:

1. Each controller shall support a minimum of 50 BACnet Schedule Objects.

D. Logging Capabilities:

1. Each controller shall support a minimum of 200 trend logs. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator's workstation.

2. Controller shall periodically upload trended data to system server for long term archiving if desired.

3. Archived data stored in database format shall be available for use in third-party spreadsheet or database programs.

E. Alarm Generation:

1. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes things such as analog object value changes, binary object state changes, and various controller communication failures.

2. Alarm log shall be provided for alarm viewing. Log may be viewed on-site at the operator's terminal or off-site via remote communications.

3. Controller must be able to handle up to 200 alarm setups stored as BACnet event enrollment objects - system destination and actions individually configurable.

2.5 TERMINAL UNIT APPLICATION CONTROLLERS

A. Provide one native BACnet application controller for each piece of unitary mechanical equipment that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include input, output and self-contained logic program as needed for complete control of unit.

B. BACnet Conformance:

1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4 and 76.8 Kbps, as a native BACnet device. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:

a. Files Functional Group.

b. Reinitialize Functional Group.

c. Device Communications Functional Group.

d. Please refer to section 22.2, BACnet Functional Groups in the BACnet standard for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

e. Standard BACnet object types supported shall include as a minimum-Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device,

File and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

C. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K thermistors or RTDs, 0-10 VDC, 4-20 mA, dry contact signals. Any input on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor. Controller shall include binary outputs on board with analog outputs as needed.

D. All program sequences shall be stored on board controller in EEPROM nonvolatile flash memory. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple PID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and tying blocks together on screen. Application controller shall be programmed using same programming tools as building controller and as described in operator workstation section. All programming tools shall be provided and installed as part of system.

E. Application controller shall include support for intelligent room sensor (see Section 2.9.B.) Display on room sensor shall be programmable at controller and include an operating mode and a field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence of operation for specific display requirements at intelligent room sensor.

2.6 SENSORS

A. General:

1. Provide sensors with specified output type for remote sensing of temperature, humidity pressure, and flow rate. Factory calibrate for the specific application.

2. Provide two or three wire sensors and transmitters. Whenever transmitters are indicated or are required as part of sensor provide transmitters with 0-10VDC or 4-20ma signal output.

B. Space Temperature:

1. Thermistor or RTD with minimum 32-150 deg F range, accuracy of plus or minus 0.4 deg F over full range, and maximum drift of 0.1 deg F/year. Removable covers with tamper proof fasteners.

C. Space Temperature - Tamper Resistant

1. Where tamper resistant sensors are indicated provide temperature sensor bonded to a stainless steel handy box cover plate.

2. Provide sensor with logo decal and insulated back.

D. Duct Air Temperature, Probe Type:

1. Thermistor or RTD with minimum 32 deg F to 150 deg F range, accuracy of plus or minus 0.4 deg F over full range, and maximum drift of 0.1 deg F/year.

2. Handy box enclosure, with probe length suitable for duct size.

E. Duct Air Temperature, Averaging Type:

1. Thermistor or RTD continuous sensing element inside copper tube with minimum 32 deg F150 deg F range, accuracy of plus or minus 0.75 deg F over full range, and maximum drift of 0.1F/year. Provide Sensor element length suitable for complete duct coverage.

F. Outside Air Temperature:

1. Thermistor or RTD with minimum minus 58 deg F to 110 deg F range, Accuracy of plus or minus 1.0 deg F over full range, and maximum drift of 1 deg F per year. Provide with ventilated sun shield and weather proof box.

G. Duct Static or Air Differential Pressure:

1. Differential pressure transducer with range 150 percent of operating pressure and over pressure tolerance of 200 percent of range pressure, plus or minus 2 percent accuracy over full range, and maximum drift of 1 percent full range per year. Veris Px series or approved equal.

2. Provide static pressure tips for reference tubing at duct penetrations.

H. Current Sensor:

1. Current transformer and conditioning circuitry to convert AC line current to binary output, Veris Hawkeye or approved equal.

2.7 SWITCHES

A. Bypass timer/timer switch:

1. Instant close, timed open, spring wound timer switch, Mark-Time or approved equal.

2. Digital push button timer, settings available from 5 minutes to 12 hours, time scrolling for custom duration run time, Watt Stopper Inteliswitch TS-400-24-W or approved equal.

B. Low Voltage Thermostats – Space Temperature:

1. Adjustable setpoint, adjustable calibration of setpoint, room temperature indication, setpoint index, adjustable heat anticipator.

2. Heating thermostats: 55 deg F to 75 deg F minimum setpoint adjustment range.

3. Combination heating and cooling thermostats: 55 deg F to 85 deg F minimum setpoint adjustment range. Dual setpoint. Adjustable deadband, 0 deg F to 10 deg F.

4. Covers: Removable and without temperature or setpoint indication unless specifically indicated otherwise. Setpoint adjustment shall require cover removal.

C. Line Voltage Thermostat - Space Temperature:

1. Provide where non-DDC space temperature control is indicated.

2. Adjustable setpoint, room temperature, and setpoint indication.

3. Switching through SPDT contacts rated 16 amp inductive current at 120V.

4. Setpoint range: 50 deg F to 80 deg F minimum setpoint adjustment range.

5. Removable setpoint adjustment knob.

6. Covers: Removable and without temperature or setpoint indication unless specifically indicated otherwise.

7. Mount covers to bases with tamper proof fasteners.

D. Current Operated Switches:

1. Provide current sensing relays for status of fans or pumps as called out in sequence of operation. Provide with field adjustable current setpoint range suitable for application. Adjust sensor for equipment current draw. Veris or approved equal.

2. Internal circuits powered by induced line current.

2.8 TRANSMITTERS

A. Temperature Transmitter:

1. Two or three wire transmitter, with adjustable setpoint, and selectable range. Select range with mid range at setpoint.

2. Accuracy, 0.1F or 0.2 percent of span.

3. Optional LED display.

2.9 CONTROL RELAYS

A. General: Provide relays rated for current and voltage requirements of controlled equipment.

B. Panel Mounted Relays:

1. Plug in type, with DIN rail mountable plug in sockets. IDEC RH series or approved equal.

2. UL listed.

C. Field Mounted Relays:

1. Solid state packaged relay including relay, LED indicator, provisions for mounting, transient protection and housing. Functional Devices RIB T series or approved equal.

2. Provide with a Hand-Off-Auto switch.

3. Provide internal separation between class 1 and class 2 wiring including separate wire ways or nipples.

4. UL listed.

2.10 DAMPER AND VALVE ACTUATORS

A. General:

1. Where exposed to outdoor air or air temperatures lower than 32 deg F provide completely weatherproof actuators with internal heaters to allow normal operation at minus 50 deg F.

2. Provide spring return to normal position type actuators except at and variable air volume terminal units where fail to last position actuators are acceptable.

3. Provide actuators of the following signal types:

   a. Modulating Electronic Actuators. Actuator to convert electronic 1-10VDC or 4-20mA analog signal to a linear, positive positioning stroke. Provide modulating electronic actuators for modulating control except as indicated. Belimo or approved equal.

   b. Tri-State Reversing or Floating Point Electric Actuators. Actuator to reverse or hold position depending on contact closure state. Tri-state reversing or Floating Point electric actuators may be used for terminal unit control. Belimo or approved equal.

   c. Two Position Electric Actuator. Direct mounting actuator to open or close depending on contact closure state. Belimo or approved equal.

2.11 WIRING AND RACEWAYS

A. Provide wiring and raceway complying with the National Electrical Code, Division 26, State and Local Codes and Ordinances

   1. The minimum size of conduit shall be 1/2”. This shall apply to conduit and cabling operating at voltages less than 48V.

B. Raceways:

   1. EMT, metal duct, IMC, surface metal raceways, or totally enclosed metal trough with flexible metal tubing unless otherwise noted.

   2. Provide rigid steel conduit raceways when raceway is buried or embedded in concrete.

   3. Provide 18 inches minimum to 36 inches maximum flexible metal conduit of galvanized steel construction for final connection to control devices. For connections to pipe mounted devices, and to devices in damp, wet, or exterior locations, or in mechanical rooms containing boilers or steam converters, provide oil-resistant liquid-tight flexible metal conduit.

   4. Provide EMT connectors with rain tight compression fittings and insulated throats.

   5. Wire mould is generally not allowed except as approved on a case-by-case basis with the department representative.

C. Wiring:

   1. Provide wire with copper stranded conductors. Provide color or number coded jackets.

   2. Low voltage wiring from control components to input/output modules: 20-gauge minimum foil-shielded cable rated 100 VDC at 80 deg C.

   3. Provide plenum rated cable whenever wire is run without conduit.

4. Provide communications network wiring meeting the gauge, impedance, capacitance, resistance and shielding requirements specified by the manufacturer of the connected devices.

5. Identify wires and cables with permanent self-laminating machine print labeling system. Provide labels capable of receiving 8 characters of type written text, with minimum print on area of 1 inch by 1/2 inch, and protected by a clear sheath. Thomas & Betts E-Z Code or approved equal.

6. Support or bundle wire with self-locking, UL listed cable ties. Provide 40 lb rated cable ties incorporating a stainless-steel locking insert. Provide UL 94V-0 flammability rated, halar cable ties when installed without panel enclosure. Thomas & Betts Ty-Rap or approved equal.

7. Provide cable tie anchors designed for mechanical anchoring, allowing removal of cable tie without removal of anchor, capable of accepting at a minimum a number 8 screw. Adhesive cable tie anchors are allowed only on the interior surface of panel doors. Panduit TM series or approved equal.

2.12 PANELS

A. General: Investigate potential reuse of existing panel enclosures, otherwise locate new panels in same locations these panel were located.

1. UL listed, not over 24 inches wide by 42 inches high, constructed of 14 U.S.S gauge steel except that enclosures less than 20 inches in both dimensions may be 16 gauge. Provide multi-section or multiple individual panels as required. Hoffman or approved equal.

2. Equipped with subpanels.

3. Punched or stamped when needed to receive front mounted switches, gauges, indicating lights and alarms.

4. Secure to the front of every control panel that has more than one source of power the following warning label: The word "WARNING" shall be in 1-inch-high letters. Other letters shall be 1/4 inch high.

   a. WARNING Complete de-energization of this control panel requires that circuit breakers supplying all equipment controlled by this panel be opened.

5. Provide track mounted terminals with integral permanent labeling system. Integral screws for securing connected wires. Voltage and amperage ratings to match terminated wire ratings. Marathon or approved equal.

6. Provide nylon insulated crimp connectors with voltage and amperage rating matching connected wire ratings unless terminal strip is designed to connect to connected wire type without using a crimp connector. Thomas & Betts STA-KON connectors or approved equal.

7. Indicating lamps on panel shall be long life type, rated for a minimum life of 10,000 hours.

B. Interior Enclosures:

1. Piano hinged front with latch and lock.

2. Baked enamel finish.

3. Concealed enclosures may be standard electrical boxes.

2.13 VARIABLE FREQUENCY DRIVES (VFDs)

A. Description:

1. This specification covers a complete Variable Frequency Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor or better.

2. The drive manufacturer shall supply the drive, and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of fifteen years.

B. Acceptable Manufacturers:

1. ABB.

2. Square D.

3. Danfoss.

4. Yaskawa.

5. Or approved equal.

C. Referenced Standards:

1. Institute of Electrical and Electronic Engineers (IEEE) Standard 519, IEEE Guide for Harmonic Content and Control.

2. Underwriters laboratories UL508C.

3. National Electrical Manufacturer's Association (NEMA) ICS 7.0, AC Adjustable Speed Drives.

D. Testing: All printed circuit boards shall be completely tested and burned-in before being assembled into the completed VFD. The VFD shall then be subjected to a computerized systems test (cold), burn-in, and computerized systems test (hot). The burn-in shall be at 104°F, at full rated load. All testing and manufacturing procedures shall be ISO 9001 certified.

E. Qualifications: VFDs and options shall be UL listed as a complete assembly. VFDs and options shall be cUL listed as a complete assembly. VFDs and options shall be CE labeled as a component. VFDs shall be listed for use at remote locations from devices.

F. Warranty: Warranty shall be 24 months from the date of shipment (with certified start-up).

G. Products: The Variable Frequency Drives (VFDs) shall be solid state, with a Pulse Width Modulated (PWM) output. The VFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The VFD shall employ a full wave rectifier (to prevent input line notching), Capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output-switching device. The drive efficiency shall be 97% or better at full speed

and full load. Fundamental power factor shall be no less than 0.98 at all speeds and loads. Provide VFDs that are compatible with motors provided under this project.

H. Harmonic Distortion Control:

1. The VFD shall limit harmonic distortion reflected onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications. This shall be accomplished by using drive components specifically designed to reduce harmonic distortion. AC line reactors are required where their use will assist in reducing harmonic distortion.

2. Any harmonic calculations shall be done based on kVA capacity X/R ratio and the impedance of the utility transformer feeding the installation and the total system load. The calculations shall be made with the point of the common coupling being the utility feeder.

3. The system containing the VFD shall comply with the 5% level of total harmonic distortion on line voltage and the line current limits as defined in IEEE 519.

I. Specifications:

1. Input voltage 208-240, 380-480, 575-600 VAC +/- 10%, 3 phase, 48-63 Hz.

2. Undervoltage trip @ rated input -35%, Overvoltage trip @ rated input +30%.

3. Interrupt rating 65 kAIC, suitable for use on a circuit capable of delivering not more than 10,000 RMS symmetrical amps, 480 V maximum.

4. Output Frequency 0 to 150 Hz. Operation above 60 Hz shall require programming changes to prevent inadvertent high-speed operation.

5. Environmental operating conditions: 0 to 4°C, 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.

6. Provide line side filter.

7. Enclosure shall be rated NEMA 1 or as specifically mentioned elsewhere.

8. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad is to be used for local control, for setting all parameters, and for stepping through the displays and menus. The keypad shall be removable, capable of remote mounting, and shall have it's own non-volatile memory. An optional keypad shall allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.

9. VFD shall be rated for use in remote located setups.

J. Input/Output Features:

1. Four (4) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.

2. A custom PID preset for HVAC & fluid systems, allow a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The auxiliary power supply shall have overload and over

current protection. The PID setpoint shall be adjustable from the VFD keypad, analog inputs, digital inputs, or over the communications bus.

3. Two (2) programmable analog inputs shall accept a current, voltage, or Ni 1000 sensor level input signal for speed reference, or for reference and actual (feedback) signals for PID controller.

4. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon customer reset (reclosure of interlock) drive is to resume normal operation. These inputs can also be used to activate the setpoints of individual control loops.

5. Two (2) programmable analog output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.

6. Two (2) programmable digital relay outputs. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC.

7. The VFD shall Ramp or Coast to a stop, as selected by the user.

K. Operator Display: The following operating information displays shall be standard using an optional VFD digital display. All applicable operating values shall be capable of being displayed in department (user) units. All parameters viewed from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable).

1. Output frequency.

2. Motor speed (RPM, %, or department units).

3. Motor current.

4. Calculated motor torque.

5. Calculated motor power (kW).

6. DC bus voltage.

7. Output voltage.

8. Analog input values.

9. Analog output value.

10. Keypad reference values.

11. Digital input status.

12. Digital output status.

L. Safeties: The VFD shall have the following protection circuits. In the case of a protective trip, the drive shall stop and announce the fault condition in complete words (alphanumeric codes are not acceptable):

1. Overcurrent trip 350% instantaneous (170% RMS) of the VFD's variable torque current rating.

2. Overvoltage trip 130% of the VFD's rated voltage.

3. Undervoltage trip 65% of the VFD's rated voltage.

4. Overtemperature +90° C, Heatsink Temperature.

5. Ground Fault either running or at start.

6. Adaptable Electronic Motor Overload (I 2 t). The Electronic Motor Overload protection shall protect the motor based on speed, load curve, and external fan parameter. Circuits, which are not speed dependent, are unacceptable. The electronic motor overload protection shall be UL Listed for this function.

M. Communications:

1. The VFD shall have an RS-485 port as standard. The standard protocol shall be selectable between Siemens Building Technologies, Inc. P1 (FLN) protocol, and Johnson Controls Inc. N2 Metasys protocol. There shall be an optional LON (LONMARK) interface and Modbus interface.

2. Serial communication capabilities shall include, but not be limited to, run-stop control; speed set adjustment, proportional/integral/derivative PID control (Set Point) adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), relay outputs, digital inputs and diagnostic warning and fault information. Additionally, remote (LAN) VFD fault reset shall be possible. A minimum of 15 field parameters shall be capable of being monitored.

3. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. The serial communications interface shall allow for DO (relay) control and AO (analog) control without being tied to a VFD function. In addition, all drive digital and analog inputs shall be capable of being monitored by the DDC system.

N. Product Support: Factory trained application department and service personnel that are thoroughly familiar with the drive products offered shall be locally available at both the specifying and installation locations.

O. Required Features: The following features to be furnished and mounted by the drive manufacturer. All features shall be UL Listed by the drive manufacturer as a complete assembly.

1. Bypass Controller - Manual or automatic (selectable) transfer to line power via contactors. When in the "Drive" mode, the bypass contactor is open and the drive output contactor is closed. In the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed via Start/stop command. Start/stop via customer supplied maintained contact shall be Dry type 115V compatible and shall function in both the "Drive" and "Bypass" modes. The design shall include single-phase protection in both the VFD and bypass modes.

2. Customer Interlock Terminal Strip - provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, Drive or Bypass modes.

3. Automatic / manual bypass operation shall be selectable in the standard bypass design.

4. Door / cover interlocked disconnect switch will disconnect all input power from the drive, bypass and all internally mounted options. The disconnect handle shall be through the door, and be lockable in the "Off" position.

2.14 FIRESTOPPING

A. Capable of maintaining an effective barrier against flame, heat, and smoke. Metalines, Dow, 3M, or approved equal.

B. Provide installations classified in Underwriter's Laboratories (UL) Building Materials Directory or listed in the Warnock Hersey International Directory.

C. Paintable where exposed to view.

D. Waterproof in plumbing chases.

E. Provide the product of more than one manufacturer if required to provide listed installations throughout.

PART 3 - EXECUTION

3.1 GENERAL

A. Modify existing control system devices as indicated. Extend and modify the existing wiring and control system power source to accommodate indicated direct digital control system devices.

B. Before beginning installation of new system components, test the existing system devices that are being reused in modified control systems for proper operation and report any devices in need of replacement or repair to the DEPARTMENT. At the option of the DEPARTMENT, he will issue a contract amendment to replace or repair the defective devices or he will have DEPARTMENT maintenance personnel replace or repair the defective devices. The Contractor shall be responsible for providing new devices to replace existing devices that are not brought to the DEPARTMENT'S attention before beginning installation of new system components.

C. Work must comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards. Perform work by persons qualified to produce workmanship of specified quality. If required by the State of Alaska workers shall be licensed. If requested provide copy of license.

D. Do not install control devices in locations where they are subject to damage or malfunction due to normally encountered ambient temperatures.

E. Mount damper operators and other control devices secured to insulated ductwork on brackets such that the device is external of the insulation.

F. Schematics and diagrams, when indicated on the Drawings, show approximate functional relationships and sequences only. All required devices are not shown. Contractor is responsible for providing all components required for a complete functioning system selected to meet the specific functional requirements of each application.

G. Hard wire control devices. Do not use power line carriers.

H. Ensure that the direct digital controller network, and power wiring will support both a 15 percent increase in network length, and a 10 percent increase in controllers similar to those installed without having to add additional network repeaters, increase power wire size or circuit breaker capacity.

I. Unless indicated otherwise, connect the primary sensing input and the associated output for each control loop to the same controller. A secondary or resetting input may be attached to any controller and communicated over the network.

J. After the final inspection and subsequent punch list inspections provide wiring schematic and Control Drawings with written sequence of operations, 11 inches by 17 inches in size, produced from the as-built Control Drawings. Provide one copy in each Operation and Maintenance Manual, and one copy, at its applicable control panel. Provide one set of system backup on USB drive to restart and reload all programmable devices used in the control system.

K. Tune control loops to respond quickly to control fluctuations without hunting.

L. Label control devices mounted in the field and within control cabinets with 1/4 inch high white embossed letters and black tape background. Dymo or approved equal. Tags to match tags used on Control Drawings.

3.2 DEMOLITION

A. Remove existing valves, dampers, operators, sensors, and controllers that are replaced by new devices or that are not reused. Present all removed equipment to DEPARTMENT for first right of refusal before disposing of equipment. Review copy of existing system “As-Built” control schematics for existing device location and extent of required demolition.

B. Patch holes in existing ductwork at removed sensors that are not reused with sheet metal patches of equal gauge or heavier material sheet metal that are seal airtight with adhesive and then screwed or pop riveted to the ductwork.

C. Existing conduit and wiring may be reused when available and when wiring is rated for application. Remove existing unused conductors.

D. Demolish unused pneumatic tubing back to main air connection. Plug tubing with brass fittings.

E. Repairs: Any portion of the facility damaged, cut back or made inoperable shall be repaired with similar materials as the existing structure and/or damaged item as instructed by the DEPARTMENT.

3.3 SHUT DOWN OF EXISTING SYSTEMS

A. Refrigeration, Heating and Ventilation are critical to the function of the facility. Schedule any required shutdowns with DEPARTMENT. Provide a minimum of 5 days written notification to the DEPARTMENT.

B. This building depends on operation of the ventilation systems for space heating and cooling. During system shutdowns the contractor is responsible for maintaining all spaces within the building at a minimum temperature of 68 deg F. and maximum of 77 deg F.

3.4 WIRING AND RACEWAYS

A. Permanently label electrical or electronic wiring at each end indicating location and the device at opposite end. At the direct digital controller end use either the I/O address, if it describes the

connected device, or the unique control device tag used on the control schematics. At the device end indicate both the terminal number and the controller connected at the other end. For color coded multi-conductor cable, label cable sheath not individual conductors.

B. At field devices where conductors are not wired to terminal strips wire using a unique color for each conductor connected to that device.

C. Install wiring in a neat and orderly manner generally running along building lines.

D. Support low voltage wiring run without conduit at a maximum of 4 feet between anchors.

E. Seal conduit penetrations at floor and wall penetrations with firestopping installed as indicated. Note that this applies to all floor and wall penetrations, not just fire barrier penetrations. At all mechanical rooms or other rooms containing floor drains, except those with slab on grade floors, make penetration watertight and extend sleeve 3 inches above the floor.

F. Wire all electrical controls and switches furnished under this Section of the Specifications.

G. Make wire connections using factory fabricated jack assemblies, terminal strips, or solder connections. Use crimp connectors on stranded wire unless connecting to terminal strips approved for direct stranded wire connection. Insulate solder connections with heat shrink tubing. Field connections in control power wiring circuits may be made using wire nuts.

H. Avoid splices in signal wire, where unavoidable connect with solder connections and label on each side of splice. Use identical wire type and color on each side of splice.

I. Conceal wiring in finished areas. Unless otherwise noted, install wiring inside conduit or fully enclosed metallic raceway.

J. Low voltage wiring installed in concealed accessible locations may be run without conduit. Sleeve wiring at wall penetrations.

K. Metal raceways crossing expansion joints make provision for 3 way movement. For conduits 1 & 1/2 inch and larger use O-Z type DX fittings, or approved equal.

L. At raceway penetrations of the vapor barrier provide a double splice patch (one on each side of vapor barrier) by cutting a square piece of vapor barrier 12 inches larger on all sides than the pipe. Cut a round hole in the center of the square splice patch, smaller than the pipe, to form a stretched fit. Force the pipe through the splice patch and tape all sides to the vapor barrier and seal the vapor barrier to the pipe at the penetration with an adhesive compatible with the vapor barrier material.

M. Securely seal at both ends, raceways running from a warm area to a cold area. Ductseal or approved equal.

N. Install all wiring in accordance with National Electrical Code, and State and Local Codes and Ordinances.

3.5 PANELS

A. Provide UL listed panel assemblies when required by local authorities.

3.6 VARIABLE FREQUENCY DRIVES (VFDs)

A. Install in accordance with manufacturers installation instructions.

B. Installation shall be the responsibility of the Division 26 electrical contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

C. Power wiring shall be the responsibility of the Division 26 electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

D. Start-up: Provide certified factory start-up shall be provided for each drive by a factory authorized service center. Start-up shall include verification of input/output wiring, voltage, current and control settings. A certified start-up form shall be filled out for each drive with a copy provided to the DEPARTMENT, included in the operations and maintenance manual, and a copy kept on file at the manufacturer.

3.7 SENSORS AND SWITCHES

A. Mount room sensors and fan control switches in offices 48 inches above finished floor, with any operable portion no higher than 48 inches, unless otherwise indicated. Where adjacent to light switches mount at same height as switches to provide a clean horizontally aligned installation unless doing so requires the operable portion to be above 48 inches. For sensors with tamper proof guards, sensors may be mounted between 48 inches and 60 inches above finished floors.

B. Provide tamper proof protective guards for all components installed in public spaces. Concealed sensors can be used in lieu of protective guards if approved by DEPARTMENT.

C. Air flow across fans, etc. shall be sensed using current sensor unless indicated otherwise.

D. Differential pressure transducers shall be used to sense differential pressure unless indicated otherwise.

E. Connect low temperature limit switches directly to the controlled equipment's motor starter control coil or, for equipment with no motor starter, to contacts of a relay in the equipment's power circuit.

F. Provide sensors and thermostats installed on exterior surfaces with insulated bases such that actual room temperature not wall surface temperature is sensed.

G. Provide ventilated, non-breakable shields and mounting brackets for sensors which are indicated to have protective covers.

H. Provide averaging sensors in air handling unit casings or in areas where stratification is likely to occur. Provide averaging element of sufficient length to accurately indicate the average duct temperature.

I. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support averaging or capillary tubes with copper capillary clips which maintain a minimum tubing bend radius of 1 inch.

3.8 CONTROL POWER SUPPLY

A. Provide uninterruptible power supply (UPS) on power supply to all control panels and control transformers.

B. Provide electric power to control devices from control system power circuit or from device or equipment being controlled.

C. Carry a dedicated ground wire to controllers from the associated breaker panel. Do not use the conduit system for grounding purposes.

3.9 TESTING AND ADJUSTING

A. Upon completion of the installation, the contractor shall initiate operation of the control system and perform all necessary testing and diagnostics to ensure proper operation. A formal commissioning procedure shall be utilized to insure complete system integrity and conformance to these specifications. This procedure shall consist of two separate steps incorporating point verification and program verification. Commissioning forms shall address all field devices, field controllers, software statements, and software points. Submit for approval a written testing procedure indicating how each of these steps will be accomplished at least two weeks prior to the start of the commissioning process.

B. Verify correct installation and wiring of all points.

C. Prior to commissioning the system, submit for approval Point Verification Commissioning Forms listing all points for the system.

D. Confirm that all devices are installed correctly. Verify that terminations are tight and of correct polarity. Document and signoff the results on Point Verification form.

E. Coordinate the final adjustments and "fine tuning" of control functions and devices so that the building, the mechanical systems, and the control systems operate and respond as an integrated, comfortable and energy efficient component of this facility.

F. Upon completion of start up test existing smoke detectors to ensure fan shutdown. Note that test of circuitry is sufficient.

G. Verify that all points are wired to the correct termination block at the control panel by verifying continuity between the device and the panel termination. Document and signoff results on Point Verification form. Verify that each sequence performs as specified in contract documents. Tune each loop as required for proper operation.

H. Document and signoff the results on Program Verification form.

I. Command all digital output points on and off and confirm proper operation of the associated output device. Command all analog output points to various levels within their range and confirm proper operation of the associated output device. Activate all digital input sensors and confirm proper point status at the panel. Measure conditions at all analog input sensors with an independent reference device, calibrate as required, and confirm proper point status at the panel. Document and signoff the results on Point Verification form.

J. Deficiencies revealed by failed test(s) shall be repaired and corrected and the test(s) repeated until successful.

K. Provide Substantial inspection data to consist of the following as a minimum:

1. Provide signed off Point Verification commissioning forms to the DEPARTMENT prior to DEPARTMENT acceptance walkthrough.

2. Provide signed off Point Verification forms indicated the correct execution of all sequence of operations for each piece of equipment. List test procedure and results.

3. Point logs indicated point values with time and date stamp.

3.10 SPECIAL TOOLS AND SPARE PARTS

A. Provide three sets of special tools required to adjust control devices. This includes allen wrenches and other special tools. This does not include common tools such as pliers, adjustable wrenches, flat blade or Phillips screwdrivers. This set shall be provided during DEPARTMENT'S instruction period and proper use shall be demonstrated to DEPARTMENT personnel during said period.

3.11 DATABASE ARCHIVAL AND UPGRADE

A. Provide a complete database backup USB drive for the building management system and each direct digital controller to the DEPARTMENT at final inspection. If software modifications are required during the warranty period update USB drive.

3.12 ORIENTATION AND TRAINING

A. Provide 6 hours of on-site orientation and training to department personnel designated by theDEPARTMENT. Orientation and training sessions shall be conducted by a factory trained manufacturers representative familiar with the systems software, hardware, and accessories. Limit training time per day to 6 hours. Complete training and orientation according to the following schedule:

1. 6 hours (3 days) of instruction after acceptable performance of the system hardware and software has been established and prior to final inspection.

B. Submit proposed training dates and instruction session course outlines for acceptance by DEPARTMENT.

C. Provide instructions on all the operations listed in the initial course outline during the first training session.

D. Initial course outline:

1. Determine the control strategies that have been defined for a specific piece of equipment.

2. Utilize X-Y graphing and histories as an aid for control loop tuning.

3. Enable or disable control strategies.

4. Assign sensors and/or actuators to a control strategy.

5. Simulate control strategies with substituted inputs or outputs.

6. Define appropriate control loop algorithms and choose optimum loop parameters for loop control.

7. Add/delete control loops to the system.

8. Add/delete points to the system.

9. Label parameters and variables with names or acronyms of a minimum of eight letters.

10. Select points to be alarmable and define the alarm state(s).

11. Download programming to the system after all direct digital controllers and building management station program memory has been lost.

12. Process stored historical data and display and printout data in tabular and graphical formats.

13. Diagnose system malfunctions.

14. Change system operating sequences.

3.13 SUBSTANTIAL INSPECTION REQUIREMENTS

A. Substantial inspection data must be submitted for review, reviewed by the DEPARTMENT, corrected in accordance with review comments, and accepted by the DEPARTMENT before a request for final or substantial completion inspection will be considered by the DEPARTMENT.

B. Prior to the substantial inspection, review and test entire installation for conformance with contract documents. Test shall include thorough field check of sequence of operations for each system and piece of equipment including simulation of all possible modes of operation. With the call for inspection, verify in writing that this system review and test has been performed and anything not conforming to contract documents shall be so noted.

C. During the Substantial inspection Contractor personnel shall provide on-site assistance to inspection personnel required for a complete and thorough inspection.

D. During the Substantial inspection Contractor personnel shall demonstrate that the control system performs in accordance with the contract documents. Provide material and personnel required to perform the demonstration.

END OF SECTION

SECTION 23 22 13 - STEAM AND STEAM CONDENSATE HEATING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Pipe and Pipefittings.

B. Valves.

C. Steam Piping System.

D. Steam Condensate Piping System.

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 07 00 - HVAC Insulation.

C. Section 23 09 23 - Direct Digital Control System for HVAC.

D. Section 23 22 16 - Steam and Condensate Heating Piping Specialties.

1.3 REFERENCES

A. ANSI/ASME SEC 9 - Welding and Brazing Qualifications.

B. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.

C. ANSI/ASME B16.18 - Cast Bronze Solder Joint Pressure Fittings.

D. ANSI/ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.

E. ANSI/ASME B31.1 - Code for Power Piping.

F. ANSI/ASME B31.9 - Building Services Piping.

G. ANSI/AWS A5.8 - Brazing Filler Metal.

H. ANSI/AWS D1.1 - Structural Welding Code.

I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

J. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

K. ASTM B32 - Solder Metal.

L. ASTM B88 - Seamless Copper Water Tube.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.9

1.5 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Include data on pipe materials, pipe fittings, valves and accessories. Indicate valve data and ratings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 LOW PRESSURE STEAM PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53, Schedule 40 black.

1. Fittings: ANSI/ASTM B16.3, malleable iron Class 150, or ASTM A234, forged steel Class 150.

2. Joints: Screwed, or ANSI/AWS D1.1, welded.

2.2 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2 Inches and Under: Class 150 for low pressure malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

B. Install piping to conserve building space and not interfere with use of space, other work, or equipment.

C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.

D. Provide clearance for installation of insulation and access to valves and fittings.

E. Provide access where valves and fittings are not exposed.

F. Slope steam piping one inch in 40 feet (0.25 percent) in direction of flow. Use eccentric reducers to maintain bottom of pipe level.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Division 09.

I. Install valves with stems upright or horizontal, not inverted.

3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections. Install dielectric unions where joining dissimilar materials.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

END OF SECTION

SECTION 23 23 00 - REFRIGERATION PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Refrigerant Piping.

B. Refrigerant Moisture and Liquid Indicators.

C. Refrigerant Valves.

1.2 RELATED SECTIONS

A. Section 23 07 00 - HVAC Insulation: Product requirements for Piping Insulation for placement by this section.

B. Section 26 05 83 - Wiring Connections: Execution requirements for electric connections specified by this section.

1.3 REFERENCES

A. Air-Conditioning and Refrigeration Institute:

1. ARI 495 - Refrigerant Liquid Receivers.

2. ARI 710 - Liquid-Line Driers.

3. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter Dryers.

4. ARI 750 - Thermostatic Refrigerant Expansion Valves.

5. ARI 760 - Solenoid Valves for Use with Volatile Refrigerants.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. American Society of Mechanical Engineers:

1. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

2. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.

3. ASME B31.5 - Refrigeration Piping.

D. ASTM International:

1. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

2. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

E. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

2. AWS D1.1 - Structural Welding Code - Steel.

F. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.

2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.

3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.4 SUBMITTALS

A. Submit shop data under provisions of Division 01.

B. Submit product data indicating general assembly of specialties, including manufacturer's catalogue information.

C. Submit manufacturer's installation instructions under provisions of Division 01.

D. Submit design data as a submittal under provisions of Division 01.

E. Submit data indicating pipe sizing.

F. Submit test reports under provisions of Division 01.

G. Submit Test reports indicating results of leak test.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division 01.

B. Accurately record exact locations of equipment and refrigeration accessories on record drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store, protect and deliver products to site under provisions of Division 01.

B. Deliver and store piping and specialties in shipping containers with labeling in place.

C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

PART 2 - PRODUCTS

2.1 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.

1. Fittings: ASME B16.22 wrought copper.

2. Joints: AWS A5.8 BCuP silver braze.

B. Copper Tubing to 7/8 inch OD: ANSI/ASTM B88, Type K, annealed.

1. Fittings: ANSI/ASME B16.26 cast copper.

2. Joints: Flared.

2.2 MANUFACTURERS

A. Alco Controls Div, Emerson Electric Company.

B. Parker Hannifin Corporation.

C. Or approved equal.

2.3 MOISTURE AND LIQUID INDICATORS

A. Indicators:

1. Port: Single, UL listed.

2. Body: Copper or brass, flared or solder ends.

3. Sight glass: Color-coded paper moisture indicator with removable element cartridge and plastic cap.

4. Maximum working pressure: 500 psig.

5. Maximum working temperature: 200 degrees F.

2.4 VALVES

A. Diaphragm Packless Valves: UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

B. Packed Angle Valves: Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Packed Ball Valves: Two piece forged brass Body with Teflon ball seals and copper tube extensions, brass seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Provide non-conducting dielectric connections when joining dissimilar metals.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Division 01.

I. Insulate piping, refer to Section 23 07 00.

J. Locate expansion valve sensing bulb immediately downstream or evaporator on suction line.

K. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

L. Install flexible connectors at right angles to axial movement of compressor.

M. Fully charge completed system with refrigerant after testing.

N. Provide electrical connection to solenoid valves. Refer to Section 26 05 83.

3.3 APPLICATION

A. Provide line size liquid indicators in main liquid line leaving condenser, or if receiver is provided, in liquid line leaving receiver.

B. Provide line size strainer upstream of each automatic valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.

C. Provide shut-off valve on each side of strainer.

D. Provide permanent filter-driers in low temperature systems and systems utilizing hermetic compressors.

E. Provide replaceable cartridge filter-driers vertically in liquid line adjacent to receivers with three valve bypass assembly to permit isolation of driers for servicing.

F. Provide replaceable cartridge filter-driers, with three-valve bypass assembly. Provide filter-driers for each solenoid valve.

G. Provide solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

H. Provide refrigerant charging (packed angle) valve connections in liquid line between receiver shut-off valve and expansion valve.

I. Utilize flexible connectors at or near compressors where within piping configuration does not absorb vibration.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Test refrigeration system in accordance with ASME B31.5

C. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using halide torch or electronic leak detector. Test to no leakage.

END OF SECTION

SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct Materials.

2. Duct Fabrication.

3. Flexible Ducts.

1.2 RELATED SECTIONS

A. Section 23 07 00 - HVAC Insulation: Product requirements for duct liners for placement by this section.

D. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.3 REFERENCES

A. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

4. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

5. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

6. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association:

1. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Air Duct Leakage Test Manual.

2. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

B. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

C. Constant Volume Supply Air Ductwork: Ductwork shall be sheet metal ductwork designed for static pressure class of +2" wg.

D. Return Air Ductwork: Ductwork shall be sheet metal ductwork designed for static pressure class of -2" wg upstream of the fan and +2” wg downstream of the fan.

E. Outside Air Ductwork: Ductwork shall be sheet metal ductwork designed for static pressure class of -2" wg.

1.5 SUBMITTALS

A. See General Conditions and the General Requirements in Division 01 regarding submittals.

B. Product Data: Submit data for duct materials, duct sealant.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Division 01 - Product Requirements.

B. Maintain manufacturers requirements for duct sealant temperatures during and after installation of duct sealant.

1.10 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90/A90M.

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic. Maximum VOC content of 75 g/L.

D. Hanger Rod: ASTM A36/A36M; steel; threaded both ends, threaded one end, or continuously threaded.

2.2 DUCTWORK FABRICATION

A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence wherever possible. Maximum 30° divergence upstream of equipment and 45°convergence downstream.

E. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

F. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.

G. Use double nuts and lock washers on threaded rod supports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

A. Install ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to SMACNA standard duct sealing requirements per pressure construction class.

C. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Install duct hangers and supports in accordance with Section 23 05 00.

E. Connect flexible ducts to metal ducts with per SMACNA using adhesive plus sheet metal screws.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.

B. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.

C. Connect air outlets and inlets to supply ducts directly or with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.4 SCHEDULES

A. Ductwork Material Schedule:

Air System	Material
Supply	Galvanized Steel
Supply, 3’-0” Downstream and 1’-0” Upstream of Humidifier Manifolds.	Stainless Steel
Return and Relief	Galvanized Steel
Outside Air Intake	Galvanized Steel
General Exhaust	Galvanized Steel

END OF SECTION

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Back-draft Dampers.
2. Duct Access Doors.
3. Volume Control Dampers.
4. Flexible Duct Connections.
5. Duct Test Holes.
6. Turning Vanes.
7. Flexible Duct Connections.
8. Insulated Control Dampers.

1.2 RELATED SECTIONS

A. Section 23 09 23 - Direct-Digital Control System for HVAC: Execution and Product requirements for connection and control of Combination Smoke and Fire Dampers for placement by this section.

B. Section 23 31 00 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.

C. Division 26 - Equipment Wiring Connections: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.

1.3 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. ASTM International:

1. ASTM E1 - Standard Specification for ASTM Thermometers.

C. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 92A - Recommended Practice for Smoke-Control Systems.

D. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

E. Underwriters Laboratories Inc.:

1. UL 555 - Standard for Safety for Fire Dampers.

2. UL 555C - Standard for Safety for Ceiling Dampers.

3. UL 555S - Standard for Safety for Smoke Dampers.

1.4 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate shop fabricated assemblies including volume control dampers and duct access doors.

C. Product Data: Submit data for shop fabricated assemblies and hardware used.

D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.

1. Backdraft dampers.

2. Flexible duct connections.

3. Volume control dampers.

4. Duct access doors.

5. Duct test holes.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access doors and test holes

C. Operation and Maintenance Data: Submit for Combination Smoke and Fire Dampers.

1.6 QUALITY ASSURANCE

A. Dampers tested, rated and labeled in accordance with the latest UL requirements.

B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Protect dampers from damage to operating linkages and blades.

C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.

D. Storage: Store materials in a dry area indoor, protected from damage.

E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work where appropriate with building control Work.

1.11 WARRANTY

A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.12 EXTRA MATERIALS

A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two of each size and type of fusible link.

1.13 COMPLETION REQUIREMENTS

A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.

2. Contractors One Year Warranty.

3. All Manufacturers’ Guarantees.

4. Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 BACK-DRAFT DAMPERS

A. Manufacturers:

1. Ruskin.

2. Greenheck.

3. Penn.

4. Or approved equal.

B. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturer's standard construction.

C. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gauge galvanized steel, or extruded aluminum, with center pivoted blades of maximum 6" width, with felt of flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.2 DUCT ACCESS DOORS

A. Manufacturers:

1. Duro-Dyne.

2. Ruskin.

3. Nailor.

4. Or approved equal.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.

C. Review locations prior to fabrication.

D. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.

E. Access doors smaller than 12 inches square may be secured with sash locks.

F. Access doors with sheet metal screw fasteners are not acceptable.

2.3 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Fabricate splitter dampers of material same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Where volume dampers are located above gypsum or other non-accessible ceilings, extend damper rods to ceiling and install recessed concealed regulator with adjustable cover for flush installation, with cover. Exposed portions shall be chrome plated. Regulator shall include spring washer, lock nut, coupling, ninety degree screw or gear drive and rod as required, Young Regulator or approved equal.

H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.4 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

1. Duro-Dyne.

2. Or approved equal.

B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.

C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 3 inches wide, crimped into metal edging strip.

2.5 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 TURNING VANES

A. Double Width: Air foil design double width galvanized turning vanes with 2 inch inside radius.

B. Single Width: Single galvanized turning vane with 2 inch radius and minimum 1" trailing straight leg.

C. Acoustical Vanes: Double width vanes with inner vane of perforated galvanized steel with 3/32 inch holes on 5/32 inch spacing. Fill space between vanes with minimum 1.5 lb/cu ft glass fiber duct liner.

2.7 CONTROL DAMPERS – ACCEPTABLE MANUFACTURERS

A. Manufacturers:

1. Ruskin.

2. Greenheck.

3. Tamco.

4. Or approved equal.

2.8 CONTROL DAMPERS

A. Multi-blade, opposed blade action, control dampers of extruded aluminum, with airfoil type blades of maximum six inch width, blades positioned across short air opening dimension, field replaceable extruded vinyl sealed edges, linked together in rattle-free manner, non-corrosive molded synthetic bearings, square or hexagonal axles for positive locking connection to blades and linkage, with documented leakage rate not to exceed 6 CFM/sq. ft. at 4” W.G.

B. Thermally Broken Control Dampers:

1. Extruded aluminum damper frame shall not be less than .080" in thickness. Damper frame shall be insulated with polystyrofoam on three sides if "Installed in Duct" type and on four sides if "Flanged to Duct" type.

2. Blades to be extruded aluminum profiles, internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29. All blades shall be symmetrically pivoted.

3. Blade seals shall be of extruded EPDM. Frame seals shall be of extruded silicone. Seals to be secured in an integral slot within the aluminum extrusions.

4. Bearings shall be a dual bearing system composed of an inner bearing, rotating within a polycarbonate outer bearing inserted in the frame. Bearings are to be maintenance-free, requiring no lubrication.

5. Control shaft shall have an adjustable length and shall be an integral part of the blade axle.

6. Linkage hardware shall be installed in the frame side and constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for a slip-proof grip.

7. Dampers are to be designed for operation in temperatures ranging between -20°F and 185°F.

8. Dampers shall be available with either opposed blade action or parallel blade action. Provide opposed blade dampers for modulating damper applications and parallel blade damper action for open/closed damper applications.

9. Leakage shall not exceed 3 cfm/ft² against 1" w.g. differential static pressure.

10. Dampers shall be AMCA rated for Leakage Class 1A, not to exceed 3 cfm/ft² at 1 in w.g. static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

11. Dampers shall be made to size required without blanking off free area.

12. Dampers shall be installed in flanged connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installations are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to all features, symmetry, and lighting arrangement.

3.2 INSTALLATION.

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Access Doors: Install access doors at the following locations and as indicated:

1. Spaced every 50 feet of straight duct.

2. Upstream of each elbow.

3. Upstream of each DX coil.

4. Before and after each duct mounted filter.

5. Before and after each duct mounted humdifier.

6. Before and after each duct mounted fan.

7. Before and after each automatic control damper.

D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Install 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

E. Install temporary duct test holes as required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.

3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

4. Inspect turning vanes for proper and secure installation.

5. Operate remote damper operators to verify full range of movement of operator and damper.

3.4 DEMONSTRATION

A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.

END OF SECTION

SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Diffusers.

B. Registers/Grilles.

C. Louvers.

D. Roof Hoods.

1.2 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets.

E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.

F. SMACNA - HVAC Duct Construction Standard.

1.3 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

B. Earthquake tabs, in seismic zones, in accordance with IBC Standards.

1.5 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Provide product data for items required for this project.

C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – DIFFUSERS, REGISTERS AND GRILLES

A. Krueger.

B. Price.

C. Titus.

D. Or approved equal.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Rectangular, adjustable pattern, stamped, multicore type diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Provide surface mount type frame.

C. Fabricate of steel with baked enamel off-white finish.

2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers at a 45° angle for a sight-proof finish.

B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.

C. Fabricate of aluminum with factory baked enamel finish.

2.4 SLOT DIFFUSERS

A. Continuous one inch wide slot, two slots wide, with adjustable vanes for left, right, or vertical discharge.

B. Fabricate of aluminum extrusions with factory baked enamel off-white finish.

C. Fabricate 1-1/4 inch margin frame with countersunk screw.

2.5 ACCEPTABLE MANUFACTURERS - LOUVERS

A. Greenheck.

B. Ruskin.

C. Penn.

D. Carnes.

E. Or approved equal.

2.6 LOUVERS

A. Provide 6 inch deep louvers with blades on 45 degree slope with center baffle and return bend, heavy channel frame, birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.

B. Fabricate of 16 gauge galvanized steel or 12 gauge extruded aluminum, welded assembly, with factory baked enamel finish.

C. Furnish with angle flange for installation.

D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.

E. Model ELF6375DX as manufactured by Ruskin.

2.7 ACCEPTABLE MANUFACTURERS - ROOF HOODS

A. Pace.

B. Greenheck.

C. Carnes.

D. Or approved equal.

2.8 ROOF HOODS

A. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards.

B. Fabricate of galvanized steel, minimum 16 gauge base and 20 gauge hood, or aluminum, minimum 16 gauge base and 18 gauge hood; suitably reinforced; with removable hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory baked enamel finish.

C. Mount unit on minimum 16 inch high curb base with insulation between duct and curb.

D. Make hood outlet area minimum of twice throat area.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

SECTION 23 45 50 - VENTILATION SYSTEM CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Cleaning of air distribution systems including, but not limited to, fans, air handling equipment, duct work and accessories, supply and return air distribution devices, and coils as applicable under the scope of this project specified herein and elsewhere in this document.

1.2 REFERENCE

A. North American Insulation Manufacturers Association (NAIMA) Cleaning Fibrous Glass Insulated Air Duct Systems.

B. ACR, The NADCA Standard: 2021 Edition for the Assessment, Cleaning, and Restoration of HVAC Systems.

C. Asbestos Hazardous Emergency Response Action (AHERA) Documentation.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections.

C. Provide Qualifications included and minimum 3 project references for projects of similar size and complexity.

D. Initial Contractor Work Plan Submittal.

1. Initial Contractor Work Plan shall be submitted by the Contractor for review and approval by the DEPARTMENT.

2. Initial Contractor Work Plan shall consist of two separate parts, a Project Work Plan manual and a separate set of Contractor Project Drawings.

3. Project Work Plan manual shall include the following information presented in a report, bound 8-1/2"x11" format, arranged in the sections as follows:

    a. Cover sheet bearing the title and date of the project and the name, address, and contact number of the Contractor.

    b. PROJECT SUMMARY: This section shall outline the intended approach to be exercised by the Contractor to successfully perform this project. It shall also include the work plan and work practices. A statement shall be explicitly made certifying that the Contractor has full knowledge of the extent of the services required to complete this project.

    c. PROJECT SCHEDULE: This section shall outline the preliminary schedule of the project identifying specific critical points with respect to inspections of system for partial acceptance by the DEPARTMENT.

d. PROJECT PERSONNEL: This section shall include information concerning personnel to be assigned to specific tasks.

e. MEANS AND METHODS: This section shall include information concerning equipment that will be utilized for this project. Specific approved methods shall be identified with respect to each equipment type, air handling unit, coils, ductwork, etc., to be cleaned. INCLUDE HEPA EQUIPMENT PERFORMANCE DATA showing capture efficiency of 99.97% rated at 0.3 micron particulate.

f. QUALITY CONTROL PROCEDURE: This section shall include, in statement form, Contractor's own inspection procedure to be executed prior to submission of work for inspection by the DEPARTMENT.

4. Contractor Project Drawing shall consist of markup of project plans by the Contractor showing location of required demolition and repair and showing proposed new access points, access panels, access doors, and shall identify all equipment and areas to be cleaned. The Contractor Project Drawing shall form the basis and record of inspection during the progress of this project.

E. Final Submittal/Project Completion Report.

1. The Contractor shall make final submittal of an updated Contractor Project Work Plan and Contractor Project Drawing reflecting the actual work performed and the as-built conditions and revise the report title as the Project Completion Reports. The Contractor Project Drawings shall accurately depict the as-built locations of all access points, access panels, access doors, etc. Final submittal shall be submitted minimum of one week prior to request for final inspection to allow the DEPARTMENT sufficient time for review and approval.

2. The Contractor shall include an appendix in the Project Completion Report for the inclusion of photographic records of selected duct sections, duct work accessories such as turning vanes, etc., and other system equipment demonstrating conditions before and after the cleaning. Number of photo-documented locations shall be a minimum of 5 distinct system locations per single system set. Arrange photographs on 8-1/2" x 11" pages with captions denoting information presented. Photographs shall be color of sufficient clarity to show the intended information. Black and white photocopies not allowed.

3. The Contractor shall include an appendix in the Project Completion Report for the documentation of observed deficiencies relating to this project observed during the work of this project and those not addressed as part of this project. Provide sufficient information for use by the DEPARTMENT in separate follow-up remediation efforts.

1.4 APPROVED CLEANING METHODS

A. Direct Impact Removal Method.

1. This method involves the direct removal of embedded dirt and debris using hand tools or hand held power tools such as scrapers and brushes from surfaces that are capable of sustaining significant degree of impact without permanent deformation.

2. Tools for this method are limited to that which will not damage surface coating or removal of base material as a result of the application.

3. Where application of this method may introduce airborne dust, negative pressure HEPA vacuum collection equipment must be utilized as a means of capturing the airborne dust

while work is in progress. HEPA vacuum equipment exhaust must be exhausted to the outside of the facility.

B. Contact Vacuuming Method.

1. This method involves the application of HEPA vacuum-cleaning equipment with hand operated brush head in direct contact with the surface to be cleaned.

2. Tools for this method are limited to that which will not damage surface coating as a result of the application.

3. Where application of this method may introduce air borne dust, negative pressure HEPA vacuum collection equipment must be utilized as a means of capturing the airborne dust while work is in progress. HEPA vacuum equipment exhaust must be exhausted to the outside of the facility.

C. Air Wash Method.

1. This method involves the direct application of compressed air as a means to loosen dirt and debris which is then drawn into a HEPA vacuum collection equipment utilized to develop a negative pressure in the area to be cleaned. HEPA vacuum equipment exhaust must be exhausted to the outside of the facility.

D. Power Brush Method.

1. This method involves the use of pneumatic or electrically powered rotary bristle brush to loosen dirt and debris which is then drawn into a HEPA vacuum collection equipment utilized to develop a negative pressure in the area to be cleaned. HEPA vacuum equipment exhaust must be exhausted to the outside of the facility.

1.5 QUALIFICATIONS

A. Minimum qualifications: NADCA certified Air Systems Cleaning Specialits and Demonstration of satisfactory completion of five projects of similar scope in the State of Alaska during the past five years. Provide references if requested.

1.6 QUALITY ASSURANCE

A. The Contractor shall arrange work in such manner as to not impact the normal operation of the facility.

B. The Contractor shall assign only personnel regularly engaged in the specific tasks assigned throughout the project.

C. The Contractor shall make available the entire project for inspection by the DEPARTMENT at all times. Where such inspection may require specific access, observation, or personnel protective equipment, the Contractor shall make such equipment available for use by the DEPARTMENT.

D. The DEPARTMENT reserves the right to make inspections of work site, work in progress, and re-inspection of completed work regardless of previous inspection performed. The Contractor shall make arrangements to allow for inspection by the DEPARTMENT.

1.7 PROJECT/SITE CONDITIONS

A. The Contractor shall arrange the work in such manner as to minimize potential for contamination of occupied spaces.

B. The Contractor shall be responsible for the condition of the occupied areas served by the systems under this project and shall provide the necessary cleaning effort on a daily basis.

C. The Contractor shall be responsible for the safety of the workers and building occupants. Where overhead work is performed, provide hard hats for workers in place and for any building occupants that may enter into the work area.

1.8 INSPECTION OF PARTIAL WORK/PARTIAL ACCEPTANCE

A. The Contractor shall coordinate for the DEPARTMENT'S inspection and acceptance of components of systems that may not be available at time of final inspection. Submit request for inspection in writing to the DEPARTMENT a minimum of 24 hours prior to the requested inspection.

B. Partial inspection shall be on a system basis. In general, an entire ductwork system and accessories associated with one air handling system shall be covered under one inspection.

1.9 SYSTEM START-UP/FINAL INSPECTION

A. The Contractor shall coordinate for the DEPARTMENT'S witness of the Startup and Final Inspection of all equipment at the completion of the project. Submit request for inspection in writing to the DEPARTMENT a minimum of 24 hours prior to the requested inspection and only after the approval of the Final Submittal.

B. Upon completion of Final Inspection, the Contractor shall perform the startup of the equipment and, after the initial start-up period, conduct a walk-through of the facility with the DEPARTMENT to verify the condition of the spaces served by the equipment is ready for final air quality clearance monitoring.

C. At completion of the project, proper operation of Fire/Smoke dampers shall be demonstrated. Deficiencies shall be identified for potential change order notified through the Contractor to the DEPARTMENT.

PART 2 - PRODUCT

NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary Filters

1. The Contractor shall provide temporary filters in all equipment where filters are installed and in operation during this project. Existing filters may not be reused and shall be disposed of by the Contractor. The Contractor-installed temporary filters shall remain in place during the project until the time of final inspection except when the filter section is being cleaned. Prior to system start-up/final inspection, new final service filters shall be installed.

B. Work Area Preparation

1. Prior to start of work, the Contractor shall provide sufficient covering over all surfaces around work area with plastic sheets or drop cloth. Pay particular attention to any equipment that may be damaged by dust or debris.

2. Provide floor covering where the contractor may store material or tools to avoid damage to the flooring.

3. Provide temporary plastic covering over smoke detectors to avoid accidental trip due to airborne dust and to minimize dust build-up in the detector sensor components.

3.2 CLEANING PROCEDURE

A. Ductwork and Accessories.

1. Provide adequate access to allow cleaning of sections of ductwork and accessories.

2. Interior of ductwork shall be cleaned free of dirt and debris on all surfaces.

3. Exposed internal acoustical and thermal lining to be cleaned in place. Contractor shall immediately notify DEPARTMENT if lining is found to be damaged upon initial inspection. If lining is damaged during cleaning, Contractor is responsible for replacement of damaged lining. DEPARTMENT will visually inspect damage and determine whether lining is to be resurfaced or replaced.

4. Avoid damage to ductwork and accessories. Ensure ductwork integrity is maintained and ductwork accessories are fully functional after cleaning operation.

5. Where existing ductwork is located under floor slab, remove grilles, registers and diffusers and clean all accessible surfaces. Access points or panels not required in under slab ductwork.

6. Methods approved for cleaning of ductwork and accessories shall be Direct Impact Removal, Contact Vacuuming Methods, Air Wash Method, and Power Brush Method.

B. Supply, Return and Exhaust Air Registers, Grilles, and Diffusers

1. Remove supply, return, and exhaust air distribution devices to allow thorough cleaning of all surfaces and takeoff connections.

2. Immediate building surfaces around locations where supply and return air distribution devices are installed shall be cleaned free of dirt and debris buildup prior to reinstallation.

3. Methods approved for cleaning of registers, grilles, and diffusers shall be Direct Impact Removal and Contact Vacuuming Methods.

C. Coils

1. Provide access panels as necessary to allow cleaning of both sides of coils.

2. Coils shall be cleaned free of dirt and debris.

3. Avoid damage to coil fins. At the end of cleaning operation, comb the entire fin section on both sides.

4. Methods approved for cleaning of coils shall be Contact Vacuuming Method.

3.3 INSPECTIONS BY THE DEPARTMENT

A. The Contractor shall be responsible for providing adequate and safe access including ladders, lighting devices, and bore-scope equipment as appropriate for use by the DEPARTMENT to perform the necessary inspection activities.

B. The Contractor shall arrange the equipment for inspection to demonstrate the following:

1. All affected equipment shall be turned off during the inspection.

2. All access doors on air handling units in open position for the inspection of interior surfaces.

3. All filter racks shall be visible for inspection showing new air filters and filter bracket in place.

C. DEPARTMENT'S Acceptance of Contractor's Performance.

1. The DEPARTMENT shall, based on the inspection result, accept the systems as having been cleaned or reject all or part of the systems as deficient work requiring immediate remediation by the Contractor.

2. If the work is considered to be deficient, the Contractor shall immediately remediate the deficiencies reported and request for re-inspection upon completion.

3.4 START-UP OF SYSTEMS WITH DUCTWORK CONNECTIONS

A. The Contractor may start up the system upon acceptance by the DEPARTMENT. Prior to system start-up, the Contractor shall provide filter media at all system outlets to protect the occupied spaces and to replace the temporary construction filters in all air moving equipment with new final service filters.

B. Upon start-up of systems, conduct an initial purge run. The Contractor shall coordinate with the DEPARTMENT as appropriate to allow system to operate a minimum of 4 hours at full flow condition with outlet filter media in place.

C. At the end of the initial purge run, the Contractor shall remove all outlet filter media and return the system to normal operation.

D. The Contractor shall re-inspect the system and the affected occupied spaces within 12 hours of normal operation to ensure no dirt and debris is present from the operation of the system. If dirt and debris is evident due to the operation of the system, the Contractor shall bear the cost of the necessary remedial cleaning.

END OF SECTION

SECTION 23 63 00 - REFRIGERANT CONDENSERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Condensing Unit Package.

B. Internal Piping and Accessories.

C. Controls.

D. Charge of Refrigerant and Oil.

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 09 23 - Direct Digital Control System for HVAC.

C. Section 23 23 00 - Refrigerant Piping.

D. Section 23 23 16 - Refrigerant Piping Specialties.

E. Section 23 73 00 - Indoor Central Air-Handling Units.

F. Section 26 05 83 - Wiring Connections.

1.3 QUALITY ASSURANCE

A. Conform to requirements of UL and applicable codes.

B. Test and rate cooling system to ARI Standard 210.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Submit with shop drawings, schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

C. Submit complete pipe sizing data.

D. Submit manufacturer's installation instructions under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Samsung

B. Or approved equal.

2.2 CONDENSING UNITS

A. Provide packaged, factory assembled, prewired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, wind and snow deflector, screens.

2.3 MATERIALS

A. Use corrosion resistant materials for parts in contact with refrigerant.

B. Provide timer circuits to prevent rapid loading and unloading of compressor.

2.4 CABINET

A. Galvanized steel with baked enamel finish, and removable access doors or panels with quick fasteners.

2.5 COMPRESSOR

A. Provide hermetically sealed, 1750 rpm, resiliently mounted compressor with positive lubrication, crankcase heater, cylinder unloaders for capacity modulation, motor overload protection, service valves, and filter drier.

2.6 CONDENSER

A. Coil: Seamless copper tubing with aluminum fins.

B. Fans: Vertical discharge, direct drive axial fans, resiliently mounted with guard and motor.

C. Motors: Permanently lubricated ball bearing motors with built-in current and overload protection.

2.7 CONTROLS

A. Provide factory wired and mounted control panel containing fan motor contactors, compressor interlock, and control transformer.

B. Provide high and low pressure cutouts for compressor, oil pressure control, non-recycling pump-down, and reset relay.

C. Provide controls to permit operation down to 10ºF ambient temperature at minimum compressor load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

B. Furnish charge of refrigerant and oil.

3.2 ADJUSTING

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period. Supply to DEPARTMENT, one complete charge of lubricating oil in addition to that placed in the system.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Inspect and test for refrigerant leaks every six months during first year of operation.

END OF SECTION

SECTION 23 73 00 - INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Indoor Central-Station Air-Handling Units.

B. Energy Recovery Ventilators (ERVs)

1.2 RELATED WORK

A. Section 23 05 00 - Common Work Results for HVAC.

B. Section 23 09 23 - Direct Digital Control System for HVAC.

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Section 23 33 00 - Air Duct Accessories.

1.3 REFERENCES

A. AMCA 99 - Standards Handbook.

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.

E. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.

F. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

G. ANSI/AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.

H. ANSI/UL 900 - Test Performance of Air Filter Units.

I. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

J. ARI 430 - Standard for Central-Station Air-Handling Units.

K. ARI 435 - Standard for Application of Central-Station Air- Handling Units.

L. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

M. SMACNA - Low Pressure Duct Construction Standards.

1.4 QUALITY ASSURANCE

A. Fan Performance Ratings: Conform to AMCA 210

B. Sound Ratings: AMCA 301; tested to AMCA 300

C. Fabrication: Conform to AMCA

D. Filter Media: ANSI/UL 900 listed, Class I or Class II, approved by local authorities.

E. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.

F. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

C. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.

D. Provide fan curves with specified operating point clearly plotted.

E. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

F. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

G. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

H. Submit two samples of replacement filter media with frame, under provisions of Division 01.

I. Submit manufacturer's installation instructions under provisions of Division 01.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.

B. Store and protect products under provisions of Division 01.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.9 EXTRA STOCK

A. Provide one set of disposable panel filters under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – AIR HANDLING UNITS

A. VTS

B. Or approved equal.

2.2 GENERAL

A. Fabricate blow-through type air handling units suitable for low pressure operation.

B. Fabricate units with fan or fan and coil section plus accessories, including split heating DX coil, cooling DX coil, mixing box section, and filter section.

C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified.

D. Base performance on sea level conditions.

E. Model AVS040V manufactured by VTS.

2.3 ACCEPTABLE MANUFACTURERS – ERVS

A. Renewaire

B. Or approved equal.

2.4 GENERAL

A. Energy Recovery type air handling units suitable for low pressure operation.

B. Unit shall provide sensible and latent energy recovery as indicated on schedules.

C. Factory fabricate and test air handling units of sizes, capacities, and configuration as indicated and specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install unit on vibration isolators.

END OF SECTION

SECTION 23 81 13 - PACKAGED TERMINAL AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Packaged VRF Terminal Air Conditioning Units.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 26 05 83 - Wiring Connections: Installation of thermostats and other control components.

1.3 RELATED SECTIONS

A. Section 26 05 83 - Wiring Connections: Electrical supply to units.

1.4 REFERENCES

A. ARI 210 - Unitary Air-Conditioning Equipment.

B. ARI 240 - Air Source Unitary Heat Pump Equipment.

C. ARI 270 - Sound Rating of Outdoor Unitary Equipment.

D. MIL-H-22547B - Heat Pump, Heating and Cooling (Unitary).

1.5 MOCKUP

A. Provide mockup of installation of one unit under provisions of Division 01.

B. Approved mockup may remain as part of the Work.

1.6 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Submit shop drawings and product data for manufactured products and assemblies required for this project.

C. Indicate water, drain, and electrical rough-in connections on shop drawings or product data.

D. Submit samples under provisions of Division 01.

E. Submit manufacturer's installation instructions under provisions of Division 01.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Store and protect products under provisions of Division 01.

C. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.9 QUALIFICATIONS

A. Installer with a minimum of five years of documented experience installing VRF systems and a minimum of 4 completed projects with verified completion by the DEPARTMENT and VRF manufacturer.

1.10 WARRANTY

A. Provide five year warranty under provisions of Division 01.

B. Warranty: Include coverage of refrigeration compressors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Samsung

B. Or approved equal.

2.2 CABINET

A. Cabinet: Ceiling mounted of 18 gauge galvanized steel with removable front panel with concealed latches.

B. Discharge Grill and Access Door: 4-way fascia plate.

C. Fan coil unit may provide pass through discharge as indicated on plans.

2.3 CONTROLS

A. Control Module: Remote mounted adjustable thermostat with heat anticipator.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers' instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

C. Supply units fully charged with refrigerant and filled with oil.

D. Scheduled performance is based on ARI 210 test conditions. Scheduled sound rating is based on ARI 270.

END OF SECTION

SECTION 23 84 13 - HUMIDITY CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Dry Steam Humidifier with Distribution Manifold.

B. Humidistat and Controls Connections.

C. Dehumidification Equipment.

1.2 REFERENCES

A. Air-Conditioning and Refrigeration Institute:

1. ARI 630 - Selection, Installation, Servicing of Humidifiers.

B. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 QUALITY ASSURANCE

A. Units shall be product of manufacturer, regularly engaged in production of such units issuing complete catalog data on such products and providing local service personnel.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01.

B. Submit load calculation inputs and calculated humidity values.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 01.

B. Include installation instructions, assembly views, maintenance instructions, and replacement parts list.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – HUMIDIFIER EQUIPMENT

A. Dri Steem.

B. Or approved equal.

2.2 STEAM GENERATOR – H-1, H-2, AND H-3

A. TYPE: H-1, H-2 and H-3

1. Humidifier: Cylinder evaporative steam type.

2. Plastic disposable steam cylinder shall:

   a. Have welded seams to ensure water tightness.

   b. Provide full output for entire cylinder life.

   c. Have integral high water sensor probe to prevent overfilling.

3. Drain: An electric drain valve shall be cabinet mounted to allow cylinder to automatically drain periodically and at the end of a humidification season.

B. DISTRIBUTION MANIFOLD

1. Manifold: Designed to provide uniform distribution over entire length, and be jacketed by steam at supply pressure.

2. Distribution manifold includes a fabricated separator/header and multiple steam jacketed dispersion tube design of stainless steel wetted parts. No O-rings or slip couplings shall be used. Discharge orifices are sized and spaced to accept steam from the separator/header and provide dry and uniform discharge of steam.

3. Distribution manifold includes a steam supply control valve utilizing a parabolic plug design offering immediate response and precise modulation of flow throughout the complete valve stroke.

4. The control valve is protected by a steam supply strainer and float and thermostatic trap. A float and thermostatic trap will be used to drain the separator/header and a second float and thermostatic trap will drain the dispersion tube jackets.

C. CONTROLS

1. BacNet Controls.

2.3 ACCEPTABLE MANUFACTURERS - DEHUMIDIFIERS

A. Munters.

B. Or approved equal.

2.4 DEHUMIDIFIERS

A. The casing will be fabricated as a unitized body with welded aluminum construction for maximum strength and durability. Suitable access panel shall allow access for inspection or servicing without disconnecting ducting or electrical wiring. Airflow balancing dampers to be furnished.

B. The rotary structure shall be a monolithic fabricated extended surface consisting of inert silicates reinforced with uniform diameter glass fibers for maximum strength. The fabricated

structure shall be smooth and continuous in the direction of airflow without interruptions or sandwich layers which restrict airflow or create a leakage path at joining surfaces. Desiccant shall not channel, cake or fracture due to repeated temperature and moisture cycling. The materials of construction shall be water washable, non-toxic and NFPA 255-ASTM E84 compliant

C. Full face contact pressure seals shall be provided to separate the process and reactivation air streams and eliminate detrimental leakage of air or moisture with static pressure differentials of up to 3" of water gauge. Dehumidifier shall be factory assembled; fully automatic, complete with desiccant wheel, reactivation heaters, reactivation energy control system, roughing filters, industrial drive motor, fans, non-racheting desiccant drive unit, automatic controller and all components' auxiliaries. Reactivation energy modulation shall be stepless solid state proportioning type. Dehumidifier shall be functionally tested at the manufacturer's factory and shipped complete with all components necessary to maintain normal operation.

D. Optional Accessories:

1. Humidistat for on/off control.

2. Constant Process blower.

3. Process inlet transitions for round duct.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer's printed instructions and as indicated on drawings.

B. Coordinate electrical connections specified in Division 26.

C. Provide galvanized steel rods to support distribution manifolds and mount in air system plenums.

D. Connect unit steam supply. Provide ball valve, inlet strainer, and float and thermostatic steam trap.

E. Connect unit condensate piping.

END OF SECTION

SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General Requirements specifically applicable to Division 26, in addition to Division 01 provisions.

B. The electrical system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.2 WORK SEQUENCE

A. Construct Work in sequence under provisions of Division 01.

1.3 COORDINATION

A. Coordinate the Work specified in this Division under provisions of Division 01.

B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Department prior to proceeding.

1.4 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.

B. NECA - Standard of Installation.

C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. Electrical Reference Symbols: The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.

E. Electrical Drawings: Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Structural, and Mechanical Drawings and adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 70.

B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.

C. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.6 SUBMITTALS

A. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation are the sole responsibility of the Contractor.

B. In addition to requirements referenced in Division 01, the following is required for work provided under this division of the specification.

1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein. Separate from work furnished under other divisions.

2. Submittals shall be provided in PDF format with each section indexed in the PDF document. Submittals for Division 26 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed.

3. Clearly identify all material and equipment by item, name or designation used on drawings and in specifications.

4. Submit only pages which are pertinent; mark catalog sheets to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.

5. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.

6. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.

7. Coordinate submittals with requirements of work and of Contract Documents.

8. Certify in writing that the submitted shop drawings and product data are in compliance with requirements of Contract Documents. Notify Department in writing at time of submittal, of any deviations from requirements of Contract Documents.

9. Do not fabricate products or begin work which requires submittals until return of submittal with Department acceptance.

10. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.

1.7 SUBSTITUTIONS

A. In accordance with the General Conditions and the General Requirements, Substitution and Product Options, all substitute items must fit in the available space and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment.

1.8 PROJECT RECORD DRAWINGS

A. Maintain project record drawings in accordance with Division 01.

B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

C. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the Department at all times.

1.9 OPERATION AND MAINTENANCE MANUALS

A. Provide operation and maintenance manuals for training of Department in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 01, the following is required for work provided under this section of the specifications.

B. Manuals shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.

C. Unless otherwise noted in Division 01, provide one copy of all material for approval.

D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.

1. List chapters of information comprising the text. The following is a typical Table of Contents:

    a. Electrical power distribution.

    b. Other chapters as necessary.

2. Provide the following items in sequence for each chapter shown in Table of Contents:

    a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.

        1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.

        2) Give step-by-step instructions for shutdown procedure if a particular sequence is required.

        3) Include test results of all tests required by this and other sections of the specifications.

    b. Maintenance Instructions:

        1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:

            a) Distribution equipment.

2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.

3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.

4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.

5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each component by part number and manufacturer.

c. Inspection Certificate: Include copy of certificate of final inspection and acceptance from the Authority Having Jurisdiction.

1.10 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:

1. Conduct operating test for approval under provisions of Division 01.

2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.

3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.

4. Have instruments available for measuring voltage and current values.

5. Provide personnel to assist in taking measurements and making tests.

1.11 WARRANTY

A. In addition to the requirements of Division 01, or as specified in other sections. Warrant all materials, installation and workmanship for one (1) year from date of acceptance.

B. Copies of manufacturer product warranties for all equipment shall be included in the operation and installation manuals.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. All Materials and Equipment shall be new.

B. All Materials and Equipment shall be listed by Underwriter's Laboratories or equivalent third party listing agency for the use intended.

C. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.

D. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the Department.

E. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.2 TESTS

A. Notify the Department at least 72 hours prior to conducting any tests.

B. Following completion of installation, test system ground in accordance with the requirements of NETA ATS 7.13. and all feeders in accordance with NETA ATS 7.3. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.

C. Perform additional tests required under other sections of these specifications.

D. Perform all tests in the presence of the Department.

3.3 PENETRATIONS OF FIRE BARRIERS

A. All holes or voids created to extend electrical systems through fire walls or ceiling shall be sealed with an asbestos-free intumescent fire stopping material capable of expanding 8 to 10 times when exposed to temperatures 250ºF or higher.

B. Materials shall be suitable for the fire stopping of penetrations made by steel, glass, plastic and shall be capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E814 and UL 1479.

C. The rating of the fire stops shall be the same as the time-rated floor, wall or ceiling assembly.

D. Install fire stopping materials in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical Demolition.

1.2 RELATED SECTIONS

A. Division 01.

B. Division 02 - Minor Demolition for Remodeling.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition Drawings are based on a non-destructive walkthrough and existing record documents. Report discrepancies to department before disturbing existing installation.

D. Beginning of demolition means the installer accepts existing conditions.

3.2 PREPARATION

A. 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.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Division 01, Division 02, and this Division.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. Remove abandoned wiring to source of supply.

D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

E. Where abandoned conduit is installed below existing slab not scheduled for demolition, remove the conductors, cut conduit flush with floor, and patch surface.

F. 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.

G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

H. Repair adjacent construction and finishes damaged during demolition and extension work. T-bar ceiling tiles damaged under normal construction conditions or having voids where junction boxes were removed shall be replaced by the Contractor.

I. Maintain access to existing electrical installations which remain active.

J. Extend existing installations using materials and methods as specified.

K. Where materials or equipment are to be reused and installed by the Contractor, it shall be the Contractor's responsibility to maintain condition of materials and equipment equal to the existing condition of the equipment before the work began. Repair or replace damaged materials or equipment at no additional cost to the Department.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

3.5 INSTALLATION

A. Install relocated materials and equipment under the provisions of Division 01.

3.6 DISPOSAL

A. Dispose of all hazardous waste in accordance with all local, State and Federal requirements.

END OF SECTION

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building Wire.

B. Cable.

C. Wiring Connections and Terminations.

1.2 RELATED SECTIONS

A. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

A. ANSI/NEMA WC 70-2021 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.

B. NETA ATS – Acceptance testing specifications for Electrical Power Distribution and Systems.

C. NFPA 262 – Standard Method of test for flame travel and smoke of wires and cables for use in air-handling spaces.

D. UL 83 – Thermoplastic Insulated Wire and Cable.

E. UL 1063 – Standard for Machine and Tool Wire and Cable.

F. UL 1424 – Standard for Cables for Power-Limited Fire Alarm.

G. UL 1479 – Standard for Fire Tests of Through Wall Penetration Fire Stops.

H. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.4 SUBMITTALS

A. Submittals are not requested for the section.

1.5 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5m) when tested in accordance with NFPA 262.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

A. Thermoplastic-insulated Building Wire: NEMA WC 70.

B. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor.

C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor.

D. Insulation Type: 600 volt insulation.

1. Interior Locations: THHN/THWN or XHHW-2. THW may be used for feeders and branch circuits larger than 6AWG.

2. Exterior Locations: XHHW-2.

E. Branch Circuit Wire Color Code:

1. Color code wires by line or phase as follows:

a. Black, red, blue and white for 120/208V systems.

2. For conductors 6 AWG and smaller, insulation shall be colored. For conductors 4 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes.

3. Grounding conductors 6 AWG and smaller shall have green colored insulation. For 4 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.

F. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

2.2 REMOTE CONTROL AND SIGNAL CABLE

A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90º C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.

B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a PVC jacket; UL listed.

C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90º C, individual conductors twisted together, shielded or unshielded (as required), and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.3 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 8 AWG and smaller:

1. Dry interior areas: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or approved equal.

2. Motor connections: Spring wire connectors, pre-insulated “twist-on” rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.

3. Wet or exterior: Spring wire connectors, pre-insulated “twist-on”, resin filled rated for direct burial per UL 486D.

B. For conductors 6 AWG and larger:

1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.

2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.

3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

A. Use no wire smaller than 12 AWG for power circuits, and no smaller than 18 AWG for control wiring.

B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet.

C. Splice only in junction or outlet boxes.

D. Neatly train and lace wiring inside boxes, equipment, and panelboards.

E. Make Conductor lengths for parallel circuits equal.

F. Do not share neutral conductors. Provide a dedicated neutral conductor for each new branch circuit that requires a neutral.

3.2 WIRING INSTALLATION IN RACEWAYS

A. Pull all conductors into a raceway at the same time. Verify that raceway is complete and properly supported prior to pulling conductors. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.

B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

C. Do not install XHHW-2 conductors when ambient temperatures are below 23F and THHN/THWN conductors when ambient temperatures are below 32F.

D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the Department and at no additional cost to the Department.

E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.

G. No more than six current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings or without prior approval from the department.

H. Completely and thoroughly swab raceway system before installing conductors.

I. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 26 05 53.

3.3 CABLE INSTALLATION

A. Provide protection for exposed cables where subject to damage.

B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Do not support cables from ceiling suspension system. Include bridle rings or drive rings.

C. Use suitable cable fittings and connectors.

D. Trench and backfill for direct buried cable. Install warning tape along entire length of direct burial cables.

3.4 WIRING CONNECTIONS AND TERMINATIONS

A. Stranded wire shall not be wrapped around screw terminals.

B. Splice only in accessible junction boxes.

C. Thoroughly clean wires before installing lugs and connectors.

D. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

E. Terminate spare conductors with twist on connectors or heat shrink insulation to proper voltage rating.

F. Control systems wiring in conjunction with mechanical, electrical or miscellaneous equipment to be identified in accordance with wiring diagrams furnished with equipment.

G. Do not exceed manufacturer's recommended pull tensions.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Inspect wire and cable for physical damage and proper connection.

C. Torque conductor connections and terminations to manufacturer's recommended values.

3.6 WIRE AND CABLE INSTALLATION SCHEDULE

A. All Locations: Building wire and/or remote control and signal cable in raceways.

END OF SECTION

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Power System Grounding.

B. Electrical Equipment and Raceway Grounding and Bonding.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

1.3 REFERENCE STANDARDS

A. ASTM B 3 – Standard Specification for Soft or Annealed Copper Wire.

B. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.

C. IEEE Std 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.

D. UL 467 – Standard for Grounding and Bonding Equipment.

1.4 SYSTEM DESCRIPTION

A. Provide a complete grounding system for services and equipment as required by State and Local Codes, NEC, applicable portions of other NFPA codes, and as indicated herein.

1.5 SUBMITTALS

A. Submittals are not requested for this section.

1.6 COORDINATION

A. Division 01.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller diameter. Stranded bare copper wire for sizes No. 6 AWG and larger diameter. Conductors may be insulated conductors if used provide green insulation.

B. Grounding Conductors: Copper conductor bare or green insulated.

C. Mechanical Grounding and Bonding Connectors: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.

D. In external locations, clamping shall be used only where a disconnect type of connection is required. Connection device may utilize threaded fasteners and shall be constructed such that positive contact pressure shall be maintained at all times. Machine bolts with lock washers shall be used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide a separate, insulated equipment-grounding conductor in all new feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Multiple conductors on single lug not permitted. Each grounding conductor shall terminate on its own terminal lug.

B. Bond together exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and receptacle ground connectors.

C. Grounding conductors for branch circuits shall be sized in accordance with NEC, except minimum size grounding conductor shall be No. 12 AWG.

D. Grounding conductor is in addition to neutral conductor and in no case shall neutral conductor serve as grounding means.

3.2 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

B. Continuity Test: Continuity test shall be performed on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

END OF SECTION

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Section included hangers and supports for Power Systems.

B. Conduit Supports.

C. Spring Steel Clips.

D. Sleeves.

E. Equipment Bases and Supports.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

1.3 REFERENCES

A. International Building Code (IBC), Chapter 16 – Structural Design.

1.4 SUBMITTALS

A. Submittals are not requested for this section.

1.5 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

B. Perform Work in accordance with State of Alaska Standard Specifications.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Manufacturers:

1. Allied Tube & Conduit Corp.

2. Minerallac Fastening Systems.

3. O-Z Gedney Co.

4. Substitutions: per Division 01

B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

F. Cable Ties: High strength nylon temperature rated to 185 degrees F self-locking.

2.2 SLEEVES

A. Sleeves Through Non-fire Rated Floors: 18 gage thick galvanized steel.

B. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves Through Fire Rated and Fire Resistive Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Fire-stopping Insulation: Glass fiber type, non-combustible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01.

B. Verify openings are ready to receive sleeves.

3.2 PREPARATION

A. Obtain permission from the Department before using powder-actuated anchors.

B. Obtain permission from the Department before drilling or cutting structural members.

3.3 INSTALLATION - GENERAL

A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.

B. Use toggle bolts or hollow wall fasteners in hollow masonry partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

C. Do not support raceways or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. If dedicated support wires are used, wires and wire clips must be painted or color-coded.

D. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system.

E. Install surface-mounted panelboards with minimum of four anchors.

F. Securely fasten equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.

G. Provide wall attached equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.

H. Earthquake Anchorages:

1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.

2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

3.4 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Where conduit or raceway penetrates ceilings or walls, close off space between conduit or raceway and adjacent work with stuffing insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

F. Install chrome escutcheons at finished surfaces.

END OF SECTION

SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit.

B. Boxes.

C. Wireway

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Division 26.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

D. Section 26 05 29 – Hangers and Supports for Electrical Systems.

E. Section 26 05 53 – Identification for Electrical Systems.

F. Section 26 27 26 – Wiring Devices.

1.3 REFERENCES

A. American National Standards Institute (ANSI):

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.

B. American Society for Testing and Materials (ASTM):

1. ASTM A 123 – Specification for Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.

C. National Electrical Manufacturers Association (NEMA):

1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

2. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

3. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

4. UL651B – Continuous Length HDPE Conduit.

5. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.4 RACEWAY AND BOX INSTALLATION SCHEDULE

A. Underground more than 5 feet from foundation wall:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, PVC or HDPE. Schedule 40 PVC or HDPE shall be used in non-traffic areas.

B. Under or in concrete slab, or underground within 5 feet of foundation wall:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, PVC or HDPE. All metal conduit in contact with concrete or block shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit. Provide transition to rigid steel conduit 12 inches prior to exit penetration through foundations, concrete walls, or block walls. Provide transition to rigid steel conduit elbow and riser for penetration through slab. Arrange raceway so the curved portion of bend is not visible above finished slab.

C. In or through CMU walls:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may penetrate through CMU walls where the EMT is installed in a sleeve and does not come in direct contact with the CMU. All conduit in contact with concrete or block shall be rigid steel conduit half lapped wrapped with pipe wrap or be plastic-coated conduit.

D. Outdoor Above Grade, Damp or Wet Interior Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.

2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 4x Type 316 stainless steel sheet metal enclosures for safety and disconnect switches and NEMA 4x Type 316 stainless steel sheet metal enclosures with gaskets for motor controllers and control panels.

3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures.

E. Concealed Dry Locations:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

2. Boxes and Enclosures: Provide sheet-metal boxes.

3. Fittings: Provide galvanized malleable iron and steel.

F. Exposed Dry Locations:

1. Raceway: Provide rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.

2. Boxes and Enclosures: Provide sheet-metal boxes with raised steel covers.

3. Fittings: Provide galvanized malleable iron and steel.

G. Equipment Connections: Provide short extensions (three feet maximum) of flexible metal conduit for connections to light fixtures, motors, transformers, vibrating equipment or equipment

that requires removal for maintenance or replacement. Use Liquidtight flexible conduit and fittings for motors and equipment in damp or wet locations or subject to spilling of liquids as at pumps in mechanical rooms.

1.5 DESIGN REQUIREMENTS

A. Raceway Minimum Size:

1. Below Grade: Provide 1 inch minimum, unless otherwise noted.

2. Above Grade or Within Slab: Provide 1/2 inch minimum, unless otherwise noted.

3. Line Voltage Circuits: Raceway is sized on the drawings for copper conductors with 600-Volt type XHHW insulation, unless otherwise noted. Where a raceway size is not shown on the drawings, it shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9.

4. Fire Alarm and other Low-Voltage Circuits: Raceway size shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9, using the conduit dimensions of the NEC Table 4, Chapter 9, and cable diameter provided by the manufacturer.

B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 370 and as specified in this section.

1.6 SUBMITTALS

A. Submittals are not requested for this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT (RMC)

A. Rigid Steel Conduit: ANSI C80.1, UL 6.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted.

C. Provide insulated throat bushings at all conduit terminations.

2.2 INTERMEDIATE METAL CONDUIT (IMC)

A. Product Description: ANSI C80.6, UL 1242; Galvanized Steel Conduit.

B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; use fittings and conduit bodies specified above for rigid steel conduit.

C. Provide insulated throat bushings at all conduit terminations.

2.3 FLEXIBLE METAL CONDUIT (FMC)

A. Product Description: UL 1, FS WW-C-566; galvanized or zinc-coated flexible steel, full-wall or reduced wall thickness.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast zinc or threaded inside throat fittings are not acceptable.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Product Description: UL 360, flexible metal conduit with interlocked steel construction and PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; liquid tight steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.

B. Fire Alarm EMT: Provide EMT with factory or field-applied red topcoating.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression or set screw type with insulated throat bushings. Zinc die cast or indentor fittings are not acceptable.

D. Provide factory elbows on sizes 1-½" and larger.

2.6 POLYVINYL CHLORIDE CONDUIT (PVC)

A. Product Description: NEMA TC 2; Schedule 40 PVC, rated for 90º C cable.

B. Fittings and Conduit Bodies: NEMA TC 3.

C. Provide PVC-coated rigid steel factory elbows for bends in all PVC conduit runs, regardless of length.

2.7 HIGH DENSITY POLYETHYLENE CONDUIT (HDPE)

A. Conduit: NEMA TC 7; HDPE conduit rated for 90º C cable.

B. Provide conduit with pullstring installed.

C. Fittings and Conduit Bodies: NEMA TC 7.

D. HDPE to RMC Couplings: Basis of design is Duraline “Shur-Lock II” or approved equal.

E. HDPE to HDPE Couplings: Butt-fusion, electro-fusion couplers, self-threading couplings, or drive-on couplings. All couplings shall be UL listed for the intended purpose.

2.8 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, UL514A galvanized steel, with plaster ring where applicable.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.

2. Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep.

B. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron or copper-free cast aluminum. Furnish gasketed cover by box manufacturer. Furnish threaded hubs. "Bell" boxes are not allowed.

C. Wall Plates: As specified in Section 26 27 26 – Wiring Devices.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Pull and Junction Boxes: ANSI/NEMA OS 1, UL514A galvanized steel.

1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.

B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hoffman or approved equal.

C. Boxes for Outdoor and Wet Location Installations: NEMA 250, Type 4X; flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron Type 316 stainless steel.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover and screws.

2.10 EXPANSION FITTINGS

A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.11 BUSHINGS

A. Non-grounding: Threaded impact resistant plastic.

B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.12 LOCKNUTS

A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

2.13 WIREWAY

A. Product Description: General purpose type wireway.

B. Size per NEC minimum fill capacity unless otherwise indicated on Drawings.

C. Knockouts: Field-installed, no factory knockouts acceptable.

D. Cover: Screw cover. Provide raintight where installed outdoors.

E. Fittings and Accessories: Include factory couplings, offsets, elbows, adapters and support straps required for a complete system. Provide internal ground bonding jumper bonded to each section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 26 05 26.

B. Provide support and fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.

C. Identify raceway and boxes in accordance with Section 26 05 53.

D. Unless otherwise noted, do not inter-mix conductors from separate panelboards or any other system in the same raceway system or junction boxes.

3.2 INSTALLATION - GENERAL RACEWAY

A. Install raceway for all systems, unless otherwise noted.

B. Install an equipment grounding conductor inside of all raceways containing line voltage conductors.

C. Provide raceways concealed in construction unless specifically noted otherwise, or where installed at surface cabinets, motor and equipment connections and in Mechanical and Electrical Equipment rooms. Do not route conduits on roofs, outside of exterior walls, or along the surface of interior finished walls unless specifically noted on the plans.

D. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted, field-coordinate to provide complete wiring system.

E. Do not route raceways on floor. Where surface raceways are allowed in equipment rooms, arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom and present a neat appearance. Install raceways level and square. Route exposed raceways and raceways above accessible ceilings parallel and perpendicular to walls, ceiling, and adjacent piping.

F. Maintain minimum 6-inch clearance between raceway and mechanical and piping and ductwork. Maintain 12-inch clearance between raceway and heat sources such as flues, steam pipes, heating pipes, heating appliances, and other surfaces with temperatures exceeding 104 degrees F.

G. Do not install raceway embedded in spray applied fire proofing.

H. Route raceway through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate all requirements with Division 07 of these specifications.

I. Where raceway penetrates fire-rated walls and floors, seal raceway penetrations of fire-rated walls, ceilings, floors in accordance with the requirements of Section 26 05 00 and Division 07.

J. Raceways and boxes penetrating vapor barriers or penetrating areas from cold to warm shall be taped and sealed with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall include a vapor barrier on the outside.

K. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall or slab and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the

installation of conduit or equipment, notify the Department or Contracting Officer before proceeding.

L. Route conduits in slabs to have 1 inch minimum cover. Conduits in slab shall not compromise the structural integrity of the slab.

M. Arrange raceway supports to prevent misalignment during wiring installation.

N. Do not attach raceway to ceiling support wires or other piping systems and do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary raceway support during construction, before conductors are pulled. Raceway shall be installed to permit ready removal of equipment, piping, ductwork, or ceiling tiles.

O. Group raceway in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps, as specified in Section 26 05 29. Provide space on each rack for 25 percent additional raceway.

P. Cut conduit square; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings and fasten securely.

Q. Use threaded raintight conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Sealing locknuts are not acceptable.

R. Install no more than 360-degrees of bends between boxes.

S. Install conduit bodies to make sharp changes in direction, such as around beams. “Goosenecks” in conduits are not acceptable.

T. Provide protective plastic bushings or insulated throat bushings at each raceway termination not installed to an enclosure. Bushings shall be threaded to the raceway end or connector.

U. Avoid moisture traps; install junction box with drain fitting at low points in raceway system.

V. Install fittings designed and listed to accommodate expansion and contraction where raceway crosses control and expansion joints.

W. Provide weatherhead or threaded cap on all raceway stub ups which are outdoors and do not terminate into equipment.

X. Use cable sealing fittings forming a watertight non-slip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or approved equal cable sealing fittings.

Y. Use suitable caps to protect installed raceway against entrance of dirt and moisture.

Z. Provide nylon "jet-line" or approved equal pull string in empty raceway, except sleeves and nipples.

AA. Paint all exposed conduit in finished spaces to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions. Where raceway penetrates non-rated ceilings, floors or walls, provide patching, paint and trim to retain architectural aesthetics similar to surroundings.

3.3 INSTALLATION – GENERAL BOXES

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance. All electrical box locations shown on Drawings are approximate unless dimensioned.

B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Where installation is inaccessible, install outlet and junction boxes no more than 6 inches from ceiling access panel. Coordinate locations and sizes of required access doors with Division 08.

C. Coordinate layout and installation of boxes to provide adequate headroom and working clearance and to present a neat appearance. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

D. Unless otherwise dimensioned on Plans, align wall-mounted outlet boxes for switches, thermostats, and similar devices.

E. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.

F. Provide knockout closures for unused openings.

G. Install boxes in walls without reducing effectiveness of wall insulation.

H. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness.

I. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Accurately position bridges to allow for surface finish thickness.

J. Do not install flush mounted boxes back-to-back in walls; install with minimum 6 inches separation.

K. Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements, provide UL listed fire stop wrap acceptable to Authority having Jurisdiction.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.

O. Provide blank covers or plates for all boxes that do not contain devices.

P. Paint all exposed boxes in finished spaces to match surface to which it is attached to. Clean greasy or dirty boxes prior to painting in accordance with paint manufacturer's instructions.

3.4 INSTALLATION – BURIED CONDUITS

A. Excavation and backfilling shall be in accordance with these specifications:

1. Excavate and backfill as necessary for proper installation or work.

2. Provide bracing and shoring as necessary or required.

3. All conduits outside the building perimeter shall be buried a minimum of 24 inches below grade or as shown on Plans. Bottom of trench shall be smoothed and all rocks and cobbles 3 inches and larger shall be removed. Provide 3/4 inch minus material 6 inches above and below conduit. Backfill remaining trench with non-frost susceptible material free of debris or rocks greater than 1 inch in diameter. Provide detectable warning tape over raceways per Section 26 05 53.

4. Conduits shall be bedded in a minimum of 2 inches of sand and shall have a cover of 2 inches minimum of sand. Trench shall be backfilled with non-frost susceptible material and compacted.

5. Damage to existing underground utilities shall be repaired immediately by the Contractor at no cost to the Department.

END OF SECTION

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates

B. Tape Labels.

C. Wire and Cable Markers.

D. Fire Alarm Conduit and Box Identification.

E. Underground Warning Tape.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

D. Section 26 24 16 – Panelboards.

E. Section 26 27 26 – Wiring Devices.

1.3 SUBMITTALS

A. Submittals are not requested for this section.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.

B. Letter Size:

1. 1/4-inch high letters for identifying individual panel or equipment.

2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.

C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.2 TAPE LABELS

A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo Rhino series label printer or approved equal.

B. Embossed adhesive tape will not be permitted for any application.

2.3 WIRE AND CABLE MARKERS

A. Power and Lighting Description: Machine printed heat-shrink tubing, cloth or wrap-on type, for all neutrals and Phase conductors.

B. Low Voltage System Description: Self-adhesive machine printed label with unique wire number that is shown on shop drawing for system.

2.4 FIRE ALARM CONDUIT AND BOX IDENTIFICATION

A. Product Description: Red spray paint for fire alarm boxes.

B. Fire alarm conduit shall have red finish, as specified in Section 26 05 33.

2.5 UNDERGROUND WARNING TAPE

A. Product Description: Red, 6-inch wide, detectable.

B. Wording to read “Caution – Buried Electric Line Below”.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. Degrease and clean surfaces to receive nameplates and tape labels.

B. Install nameplates and tape labels parallel to equipment lines.

C. Underground Warning Tape Installation: Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

3.2 NAMEPLATE INSTALLATION

A. Secure nameplates to equipment fronts using machine screws tapped and threaded into panelboard, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.

B. Distribution Panel Nameplates:

1. Provide overall equipment identification.

    a. Line 1: Distribution panel name.

    b. Line 2: Source which panelboard is fed.

c. Line 3: Voltage, phase and wire configuration.

d. Line 4: AIC rating of the panel.

2. Provide circuit breaker identification for each feeder breaker.

a. Line 1: Name of panelboard or equipment served.

b. Line 2: Location of served panelboard.

C. Branch Panelboard Nameplates:

1. Provide nameplate for each panelboard with the following information:

a. Line 1: Panelboard name.

b. Line 2: Source from which the panelboard is fed.

c. Line 3: Voltage, phase and wire configuration.

d. Line 4: AIC rating of the panelboard.

D. Disconnects:

1. Provide nameplate for each device with the following information:

a. Line 1: Load served.

b. Line 2: Panelboard and circuit number from which the device is fed.

3.3 LABEL INSTALLATION

A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:

1. Distribution Panels – “PANEL xxxx IN ROOM #xxx”.

2. Panelboards – “PANEL xxxx FED FROM MDP xxx”.

B. Spare Raceways: Provide raceway label on each individual raceway denoting the source and termination point at each end.

C. Fire Alarm Device Labels: Install machine-printed device address labels on all relocated devices. Install label on exterior cover of device. Device labels shall show the unique address corresponding to the text annunciator description. Label installation shall not negatively impact operation of device.

3.4 WIRE IDENTIFICATION

A. Provide wire markers on each new conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:

1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.

2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.

3. Color code phases, neutral, and ground per NEC requirements and Section 26 05 19.

4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.

5. For power circuits, identify with branch circuit or feeder number.

6. Control Circuits: Control wire number as indicated on schematic and shop drawings.

7. Fire Alarm Circuits: Provide cable markers showing NAC or SLC loop identification number at all fire alarm junction boxes and pullboxes.

B. Provide pull string markers at each end of all new pull strings. Marker shall identify the location of the opposite end of the pull string.

3.5 JUNCTION BOX IDENTIFICATION

A. Fire Alarm: In accessible ceiling spaces, exposed ceiling spaces, mechanical/electrical rooms, and other non-public spaces, paint fire alarm junction boxes and pullboxes with red spray paint. If there are any questions as to whether fire alarm boxes shall be painted red in a specific area, the Contractor shall get clarification from the Department prior to painting.

B. Label each new power junction box with the panelboard name and circuit number.

C. For junction new boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For new junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.6 DEVICE PLATE IDENTIFICATION

A. Label each new receptacle device plate or point of connection denoting the panelboard name and circuit number.

B. Install adhesive label on the top of each plate.

3.7 PANELBOARD IDENTIFICATION

A. Provide panelboard circuit directories in accordance with Section 26 24 16.

END OF SECTION

SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment specified under other Sections.

1.2 RELATED SECTIONS

A. Division 22 – Plumbing Equipment.

B. Division 23 – HVAC Equipment.

C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

D. Section 26 05 33 - Raceway and Boxes for Electrical Systems.

E. Section 26 28 16 - Enclosed Switches and Circuit Breakers.

F. Section 26 29 13 - Enclosed Controllers.

1.3 REFERENCES

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

1.4 SUBMITTALS

A. No submittals are requested for this section.

1.5 COORDINATION

A. Division 01.

B. Obtain and review shop drawings, product data, manufacturer’s wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

C. Determine connection locations and requirements.

D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - EXECUTION

2.1 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

2.2 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

2.3 INSTALLATION

A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

B. Make conduit connections to equipment that is subject to vibration or movement using flexible conduit. Use Liquidtight flexible conduit in damp or wet locations.

C. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

D. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where required.

E. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches and connect with conduit and wiring as indicated in the equipment manufacturer's installation instructions.

2.4 ADJUSTING

A. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

END OF SECTION

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Service and Distribution Panelboards.

B. Surge Protective Devices.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

C. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA KS 1 - Enclosed Switches.

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. UL 50 – Enclosures for Electrical Equipment.

F. UL 67 – Panelboards.

G. UL 98 - Enclosed and Dead-front Switches.

H. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.

I. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service.

1.4 SUBMITTALS

A. Submit data under provisions of Division 01 and Section 26 05 00.

B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

C. Shop drawings: Submit shop drawings for each panelboard indicating features and device arrangement and size. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Submit final record panel schedules as hardcopy and in Microsoft Excel format. Submit under Section 26 05 00.

B. Operation and Maintenance Manuals: Provide product data and shop drawing information including replacement parts list. Provide installation, operation and maintenance information per manufacturer.

C. Panel Schedules: Prior to Substantial Completion, submit copies of all panel schedules for review by the Department. The Department will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the Department.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01.

B. Upon arrival at the site inspect equipment and report on any damage.

C. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.

D. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.7 WARRANTY

A. Manufacturer shall warrant specified equipment to be free of defects for a period of one year from the date of installation.

1.8 SPARE PARTS

A. Keys: Furnish 2 each to Department.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - PANELBOARDS

A. Schneider/Square D.

B. Eaton.

C. General Electric.

D. Siemens.

E. Substitutions: Under provisions of Division 01.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or 3R as indicated on Drawings. Boxes shall be galvanized steel constructed in accordance with UL50 requirements. Interiors shall be field convertible for

top or bottom incoming feed. Interior leveling provisions shall be provided for flush mounted applications.

C. Cabinet Size: 6 inches deep; 20 inches wide minimum.

D. Provide surface cabinet front as indicated on the Drawings with door-in-door cover concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide one continuous bus bar per phase each. Panelboards shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. Bussing shall be fully rated.

F. Integrated Short Circuit Rating: Provide panelboards with short circuit ratings as shown on the Drawings. Minimum ratings shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.

G. Main/Sub Feed Circuit Breakers: NEMA AB 1; Provide vertical mount main and/or sub feed circuit breaker in panelboards as shown on the drawings.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90^{o}C rated wire, sized according to the 75 ^{o}C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.

H. Branch Circuit Breakers: NEMA AB 1; Provide panelboards with bolt-on type thermal magnetic trip circuit breakers.

1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free with common trip handle for all poles.

2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90^{o}C rated wire, sized according to the 75 ^{o}C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.

3. Provide circuit breakers UL listed as type HACR for use with heating, air conditioning and refrigeration equipment.

2.3 PANELBOARD IDENTIFICATION

A. For each new panelboard, provide typed schedule denoting each circuit load by the load type and final name and room number actually in use in the facility. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the Department.

B. Provide panel schedule in O&M manual for every new panelboard.

C. All panelboards load centers shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 6 feet, 6 inches to top of panelboard.

C. Provide filler plates for unused spaces in panelboards.

D. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Receptacles.

B. Device Plates and Box Covers.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.

D. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. FS W-C-596 – Federal Specification for Electrical Power Connector, Plug, Receptacle, and Cable Outlet.

B. NEMA WD 1 - General Color Requirements for Wiring Devices.

C. ANSI/NEMA WD 6 – Wiring Devices – Dimensional Requirement.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 943 – Ground-Fault-Circuit-Interrupters.

1.4 SUBMITTALS

A. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - RECEPTACLES

A. Hubbell.

B. Leviton.

C. Pass & Seymour.

D. Arrow Hart

E. Substitutions: Under provisions of Division 01.

2.2 RECEPTACLES

A. Convenience and Straight-blade Receptacles: UL 498, ANSI/NEMA WD-6 and Federal Specification FS W-C-596 industrial grade receptacle.

B. Convenience Receptacle Configuration: ANSI/NEMA WD-6; Type 5-20R, white nylon face.

C. GFCI Receptacles: ANSI/NEMA WD-6; 20A, duplex convenience receptacle with integral class 'A' ground fault current interrupter, LED indicator lamp and integral lockout.

D. Weather-Resistant Receptacles: ANSI/NEMA WD-6; Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.9.

2.3 DEVICE PLATES

A. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use and identified as "Extra Duty" per NEC 406.9 (B)(1).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.

B. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.

C. Install devices flush and level.

D. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

E. Install circuit label on each receptacle and light switch in accordance with Section 26 05 53.

END OF SECTION

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Enclosed Switches.

B. Enclosures.

1.2 RELATED SECTIONS

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 and Section 26 05 00 – Common Work Results for Electrical.

B. Section 01.

C. Section 26 05 26 – Grounding and Bonding for Electrical Systems.

D. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

A. ANSI/UL 98 Enclosed and Dead Front Switches.

B. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

C. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

D. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.4 SUBMITTALS

A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

B. Shop Drawings: Submit shop drawings include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit current interrupting rating.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Drawings: Accurately indicate actual location of enclosed switches, circuit breakers and ratings of actual installed fuses.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - ENCLOSED SWITCHES

A. Schneider/Square D.

B. Siemens.

C. Eaton.

D. General Electric.

E. Substitutions: Under provisions of Division 01.

2.2 ENCLOSED SWITCHES

A. Nonfusible Switch Assemblies: NEMA KS 1; Heavy Duty type; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosures: NEMA KS 1; Type 1, 3R or 4 as indicated on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosed switches where indicated on Drawings, and where required for NEC required disconnect of equipment specified under other divisions, but installed under Division 26.

B. All enclosed switches shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

3.2 FIELD QUALITY CONTROL

A. Field inspecting, testing, adjusting and balancing.

B. Inspect and test in accordance with NETA ATS, exception Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 26 29 13 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual Motor Starters.

1.2 RELATED SECTIONS

A. Division 22 – Plumbing.

B. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC).

C. Section 26 05 29 – Hangers and Supports for Electrical Systems.

D. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01.

B. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

C. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Provide product data on motor starters and switches.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include recommended maintenance procedures and intervals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

A. Schneider/Square D.

B. Allen Bradley.

C. Siemens.

D. Eaton.

E. Substitutions: Under provisions of Division 01.

2.2 MANUAL MOTOR STARTERS

A. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, number of poles as required by the load served, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

B. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated 1 or 2 pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, and toggle operator.

C. Enclosure: ANSI/NEMA ICS 6; Type 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install motor control equipment in accordance with manufacturer's instructions.

B. Select and install heater elements in motor starters to match installed motor characteristics.

C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

D. After final connections are made, check and correct the rotation of all motors.

E. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers to approximately 11 times motor full load current. Determine full load current from motor nameplate following installation.

F. Motor starting equipment shall be listed for use with the motors specified under Division 22, 23.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Concrete.

D. Manual gates with related hardware.

E. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

1.4 SUBMITTALS

A. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

B. Manufacturer's Qualification Statement.

C. Fence Installer Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Line Posts: 2.38 inch (60 mm) diameter.

B. Corner and Terminal Posts: 2.88 inch (73 mm) diameter.

C. Gate Posts: 2.88 inch (73 mm) diameter.

D. Top and Brace Rail: 1.66 inch (42 mm) diameter, plain end, sleeve coupled.

E. Gate Frame: 1.90 inch (48 mm) diameter for welded fabrication.

F. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 9 gauge, 0.1483 inch (3.8 mm) thick, top selvage knuckle end closed, bottom selvage knuckle end closed.

G. Tension Wire: 7 gauge, 0.177 inch (4.50 mm) thick steel, single strand.

H. Tie Wire: Aluminum alloy steel wire.

2.2 MATERIALS

A. Posts, Rails, and Frames:

1. ASTM F1043 Group IA Heavy Industrial Fence Framework, schedule 40 galvanized pipe per ASTM F1083. Exterior hot dipped zinc coating minimum average 2.0 oz/ft², interior hot dipped zinc coating minimum average 2.0 oz/ft; High Strength Grade.

B. Wire Fabric:

1. ASTM A392 hot dipped galvanized after weaving, Class 2 – 2.0 oz/ft2 (610 g/m2). steel chain link fabric.

C. Concrete:

1. Type specified in Section 03 30 00.

2.3 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 72 inches (1,829 mm) high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp.

2.4 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

2.5 FINISHES

A. Components (Other than Fabric): Galvanized in accordance with ASTM A123/A123M, at 2.0 ounces per square foot (600 g/sq m).

B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

C. Accessories: Same finish as framing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

END OF SECTION