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PROJECT MANUAL FOR:

CAPITAL AREA TRANSPORTATION AUTHORITY
CATA RTU REPLACEMENTS
420 S. GRAND AVENUE AND 4615 TRANTER STREET
LANSING, MI
PROGRESSIVE AE PROJECT NO: 75820015
SEPTEMBER 15, 2021- ISSUED FOR BIDS AND CONSTRUCTION

PROJECT MANUAL FOR:
CAPITAL AREA TRANSPORTATION AUTHORITY
CATA RTU REPLACEMENTS
LANSING, MI 48910

PREPARED FOR:
CAPITAL AREA TRANSPORTATION AUTHORITY
4615 TRANTER STREET
LANSING, MI 48910

PREPARED BY:
PROGRESSIVE AE
1811 4 MILE ROAD, NE
GRAND RAPIDS, MI 49525-2442
616/361-2664 (TELEPHONE)
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PRINTROOM@PROGRESSIVEAE.COM

PROJECT NO: 75820015

SEPTEMBER 15, 2021 - ISSUED FOR BIDS AND CONSTRUCTION

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TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 1113 ADVERTISEMENT FOR BIDS
00 2113 INSTRUCTIONS TO BIDDERS
00 4100 BID FORM
00 4325 SUBSTITUTION REQUEST FORM - DURING PROCUREMENT
00 7200 GENERAL CONDITIONS
00 7300 SUPPLEMENTARY CONDITIONS

DIVISION 01 - GENERAL REQUIREMENTS

01 1000 SUMMARY
01 2000 PRICE AND PAYMENT PROCEDURES
01 2500 SUBSTITUTION PROCEDURES
01 4000 QUALITY REQUIREMENTS
01 4100 REGULATORY REQUIREMENTS
01 4216 DEFINITIONS
01 6000 PRODUCT REQUIREMENTS
01 7800 CLOSEOUT SUBMITTALS

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

23 0517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
23 0519 METERS AND GAUGES FOR HVAC PIPING
23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 0593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 0719 HVAC PIPING INSULATION
23 0913 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
23 0993 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
23 2113 HYDRONIC PIPING
23 2114 HYDRONIC SPECIALTIES
23 2123 HYDRONIC PUMPS
23 2213 STEAM AND CONDENSATE HEATING PIPING
23 2214 STEAM AND CONDENSATE HEATING SPECIALTIES
23 2300 REFRIGERANT PIPING
23 2500 HVAC WATER TREATMENT
23 3600 AIR TERMINAL UNITS
23 5700 HEAT EXCHANGERS FOR HVAC
23 7413 PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING UNITS
23 8126.13 SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

FROM:

1.01 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):

A. Capital Area Transportation Authority

B. Address:
4615 Tranter Street
Lansing, MI, 48109

1.02 AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):

A. Progressive AE

B. Address:
1811 4 Mile Road NE
Grand Rapids, MI 49525

1.03 DATE: 9/15/21

1.04 TO: POTENTIAL BIDDERS

A. Your firm is invited to submit an offer under seal to Owner for construction of a replacement of roof top units at multiple locations located at 420 S. Grand Avenue and 4615 Tranter Street before 1:30 pm local standard time on the 6th day of October, 2021, for:

B. Project: CATA RTU Replacements

C. Owner's Project Number: 75820015

D. Project Description: Replacement of roof top units at 420 S. Grand Ave and 4615 Tranter Street.

E. Bid Documents for a Stipulated Sum contract may be obtained from the office of the Design Professional free of charge upon receipt of a deposit, by cash, in the amount of $0 for one set.

F. Bidders will be required to provide Bid security in the form of a Bid Bond in the amount of $_____.

G. Refer to other bidding requirements described in Document 00 2113 - Instructions to Bidders and Document 00 3100 - Available Project Information.

H. Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

I. Your offer will be required to be submitted under a condition of irrevocability for a period of 90 days after submission.

J. The Owner reserves the right to accept or reject any or all offers.

END OF SECTION

SUMMARY

1.01 INSTRUCTIONS TO BIDDERS

1.02 DOCUMENT INCLUDES

A. Bid Documents and Contract Documents
   1. Definitions
   2. Contract Documents Identification
   3. Availability
   4. Examination
   5. Inquiries/Addenda
   6. Product/Assembly/System Substitutions

B. Bid Submission

C. Bid Enclosures/Requirements
   1. Security Deposit
   2. Bid Form Requirements

D. RELATED DOCUMENTS
   1. Document 00 4325 - Substitution Request Form (During Procurement)
   2. Document 00 7300 - Supplementary Conditions:

INVITATION

2.01 PROPOSAL SUBMISSION

A. Proposals signed and under seal, executed, and dated will be received at the office of the Owner at 4615 Tranter Street, Lansing, MI 48910 before 1:30 p.m. local standard time on the 6th day of Octobter 2021.

2.02 INTENT

A. The intent of this bid request is to obtain an offer to perform work to complete CATA RTU Replacements located at 420 S. Grand Avenue, and 4615 Tranter Street for a Stipulated Sum contract, in accordance with the Contract Documents.

2.03 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS

A. Work of this proposed Contract comprises roofing demo, insulation replacement, and membrane installation.

2.04 CONTRACT TIME

A. Perform the Work in 5 months. The bidder may suggest a revision to the Contract Time with a specific adjustment to the Bid Amount.

BID DOCUMENTS AND CONTRACT DOCUMENTS

3.01 CONTRACT DOCUMENTS IDENTIFICATION

A. The Contract Documents are identified as Project Number 75820015, as prepared by the Architect who is located at 1811 4 Mile Road NE, Grand Rapids, MI 49525, and with contents as identified in the Table of Contents.

3.02 AVAILABILITY

A. Proposal documents will be available through the office of the Architect, electronically. Contact Seth Horton at hortons@progressiveae.com

3.03 INQUIRIES/ADDENDA

A. Addenda may be issued during the proposal period. All Addenda become part of the Contract Documents. Include resultant costs in the Proposal Amount.

B. Verbal answers are not binding on any party.

3.04 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. When a request to substitute a product is made, Architect may or may not approve the substitution. If it is approved an Addendum will be issued to known bidders.

B. In submission of substitutions to products specified, bidders shall include in their bid all changes required in the Work and changes to Contract Time and Contract Sum to accommodate such

substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.

C. Provide complete information on required revisions to other work to accommodate each proposed substitution.

D. Provide products as specified unless substitutions are submitted in this manner and accepted.

E. See Section 01 6000 - Product Requirements for additional requirements.

SITE ASSESSMENT

4.01 PREBID CONFERENCE

A. A proposers conference has been scheduled for 10:00 a.m. on the 22nd day of September, 2021 at the location of 4615 Tranter Ave, Lansing, MI 48109.

B. Representatives of Architect will be in attendance.

C. Summarized minutes of this meeting will be circulated to attendees. These minutes will not form part of the Contract Documents.

D. Information relevant to the Proposal Documents will be recorded in an Addendum, issued to Bid Document recipients.

QUALIFICATIONS

5.01 EVIDENCE OF QUALIFICATIONS

A. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position, license to perform work in the State of Michigan.

5.02 SUBCONTRACTORS/SUPPLIERS/OTHERS

A. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

B. Refer to General Conditions.

BID SUBMISSION

6.01 SUBMISSION PROCEDURE

A. Proposers shall be solely responsible for the delivery of their proposal in the manner and time prescribed.

B. Submit bid to Nicole Wilson, PUrchasing Manager at 4615 Tranter Street, Lansing, MI 48910. Bids will be opened promptly at 1:30 PM. The bid opening will be public.

6.02 BID INELIGIBILITY

A. Proposals that are unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.

PROPOSAL ENCLOSURES/REQUIREMENTS

7.01 SECURITY DEPOSIT

A. Proposals shall be accompanied by a security deposit as follows:
   1. Bid Bond of a sum no less than 5 percent of the Bid Amount on AIA A310 Bid Bond Form.

B. Endorse the Bid Bond in the name of the Owner as obligee, signed and sealed by the principal (Contractor) and surety.

C. The security deposit will be returned after delivery to the Owner of the required Performance and Payment Bond(s) by the accepted bidder.

D. After a proposal has been accepted, all securities will be returned to the respective bidders and other requested enclosures.

E. If no contract is awarded, all security deposits will be returned.

7.02 PERFORMANCE ASSURANCE

A. Include the cost of performance assurance bonds as a supplement to the Bid Amount.

7.03 ADDITIONAL BID INFORMATION

A. The lowest bidder may be requested to complete the Supplements To Bid Forms within 24 hours after submission of bids.

B. Submit the following Supplements 24 hours after bid submission:
   1. Document 00 4336 - Proposed Subcontractors Form: Include the names of all Subcontractors and the portions of the Work they will perform.
   2. Document 00 4334 - Proposed Mechanical Products Form.
   3. Document 00 4333 - Proposed Products Form.

7.04 FEDERAL CERTIFICATES

A. Bidders must submit the following with their bid if it is considered to be responsive:
   1. Buy America Compliance
   2. DBE Participation Form
   3. Debarment - Prime Contractor
   4. Lobbying
   5. Debarment - Lower Tier
   6. Iran Linked Business

OFFER ACCEPTANCE/REJECTION

8.01 DURATION OF OFFER

A. Proposals shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the bid closing date.

8.02 ACCEPTANCE OF OFFER

A. Owner reserves the right to accept or reject any or all offers.

B. After acceptance by Owner, Architect on behalf of Owner, will issue to the successful bidder, a written Bid Acceptance.

END OF SECTION

BUY AMERICA CERTIFICATE

Pursuant to Section 165 of the Surface Transportation Assistance Act of 1982, as amended by Section 337 of the Surface Transportation and Uniform Relocation Assistance Act of 1987, FTA regulations at 49 CFR, Part 661, and at 49 CFR, Part 663, and guidance issued by FTA, all bidders shall submit the following certificate with their bid or proposal. Failure to submit this certificate will automatically disqualify the bidder from consideration of a Contract award for this Project. An exemption from the "Buy America" requirements may be sought by CATA if grounds for an exemption exist.

Please check the appropriate box (661.6 or 661.12) then complete remainder of form.

☐ **§661.6 Certification requirements for procurement of steel or manufactured products.**

If steel, iron, or manufactured products (as defined in §§661.3 and 661.5 of this part) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder or offeror in accordance with the requirement contained in §661.13(b) of this part.

☐ **§661.12 Certification requirement for procurement of buses, other Rolling Stock and associated equipment.**

If buses or other rolling stock (including train control, communication, and traction power equipment) are being procured, the appropriate certificate as set forth below shall be completed and submitted by each bidder in accordance with the requirement contained in §661.13(b) of this part.

Certificate of Compliance with Buy America Requirements

The bidder or offeror hereby certifies that *it will* comply with the requirements of 49 U.S.C. 5323(j)(1), and the applicable regulations in 49 CFR part 661 for Goods or for 49 CFR 661.11 for Rolling Stock.

DATED:_____

COMPANY:_____

SIGNATURE:_____

PRINTED NAME:_____

TITLE:_____

Certificate of Non-Compliance with Buy America Requirements

The bidder or offeror hereby certifies that *it cannot* comply with the requirements of 49 U.S.C. 5323(j), but it may qualify for an exception to the requirement pursuant to 49 U.S.C. 5323(j)(2), as amended, and the applicable regulations in 49 CFR 661.7.

DATED:_____

COMPANY:_____

SIGNATURE:_____

PRINTED NAME:_____

TITLE:_____

[71 FR 14117, Mar. 21, 2006, as amended at 72 FR 53698, Sept. 20, 2007; 74 FR 30239, June 25, 2009]

CERTIFICATION OF PRIMARY CONTRACTOR REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The Primary Contractor, _____, certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

2. Have not within a three (3) year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or Local) with commission of any of the offense enumerated in paragraph (2) of this certification; and

4. Have not within a three (3) year period preceding this application/proposal had one (1) or more public transactions (Federal, State, or Local) terminated for cause or default.

If the above named Primary Contractor is unable to certify to any of the the statements in this certification, the Primary Contractor shall attach an explanation to this certification.

The Primary Contractor, _____, certifies or affirms the truthfulness and accuracy of the contents of the statements submitted on or with this certification and understands that the provision of 31 U.S.C. Section 3801 et seq. are applicable thereto.

_____

Signature and Title of Authorized Official

INSTRUCTION FOR FILLING OUT THIS FORM ARE ON OTHER SIDE

DBE PARTICIPATION FORM

Separate information is required for each DBE subcontractor. This form may be duplicated as necessary.

1. DBE Firm Name: _____

   Address: _____

   _____

2. Dollar amount awarded: _____

3. Description of work to be performed : _____

   _____

   _____

   _____

4. **CONTRACTOR'S COMMITMENT TO USE DBE FIRM**

_____ is committed to utilize the DBE
(Name of Contractor)

contractor to utilize the above named DBE subcontractor/supplier in the manner and amount described on this form.

Dated _____ _____
(Authorized Signature)

5. **DBE'S COMMITMENT TO PARTICIPATE**

_____, as a DBE firm, is committed to
(Name of subcontractor/supplier)

perform the work as described above for the amount specified.

Dated _____ _____
(Authorized Signature)

6. **NO SUBCONTRACT OPPORTUNITIES, AVAILABLE.**

_____, has no subcontractor opportunities
(Name of subcontractor/supplier)

available for work to be performed.

Dated _____ _____
(Authorized Signature)

BLANK forms are NOT acceptable. If DBE subcontractor opportunities are available please fill out sections 1 thru 5.If no subcontractor opportunities available fill out section 6. SIGNATURES ARE REQUIRED.

DBE PARTICIPATION FORM

Separate information is required for each DBE subcontractor. This form may be duplicated as necessary.

1. DBE Firm Name: _____

   Address: _____

   Sub contractor name and address

2. Dollar amount awarded: _____

   Amount awarded to Sub contractor

3. Description of work to be Performed: _____

   _____

   _____

   Work description.

   _____

4. **CONTRACTOR'S COMMITMENT TO USE DBE** Prime contractor fills out.

   _____ is committed to utilize the DBE
   (Name of Contractor)

   contractor to utilize the above named DBE subcontractor/supplier in the manner and amount described on this form.

   Dated _____ _____
   (Authorized Signature)

5. **DBE'S COMMITMENT TO PARTICIPATE** Sub contractor fills out.

   _____, as a DBE firm, is committed to
   (Name of subcontractor/supplier)

   perform the work as described above for the amount specified.

   Dated _____ _____
   (Authorized Signature)

6. **NO SUBCONTRACT OPPORTUNITIES, AVAILABLE.** Prime contractor fills out.

   _____, has no subcontractor opportunities
   (Name of subcontractor/supplier)

   available for work to be performed.

   Dated _____ _____
   (Authorized Signature)

DBE PARTICIPATION FORM

Prior to Contract award, the apparent successful bidder shall submit a written assurance of meeting the above goals and shall include names of DBE subcontractors, addresses of contact persons, a description of work to be performed and dollar values of each proposed DBE subcontract. Contact information should be filled out on the DBE Participation Form on the backside of this sheet. The DBE certification (which is a federal requirement) also needs to be filled out with the contract dollar amount, address, etc.

If the goals were not met, the bidder (prime) must demonstrate an honest intent to meet the DBE project goal and shall document the steps he/she has taken to obtain DBE subcontractor participation.

Failure to provide required documentation of good faith efforts may be reason for disqualification of the Bid / Proposal.

Reasonable effort to consider DBE subcontractors will include the following actions.

a. Soliciting through all reasonable and available means the interest of all certified DBE's who have the capability to perform work under the contract. This shall include attendance at pre-bid meetings, advertising and /or written notices. The bidder shall allow sufficient time to allow the DBE's to respond to the solicitation.
b. Selecting portions of the work to be performed by DBE's.
c. Providing interested DBE's with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
d. Negotiations in good faith with interested DBE's. It will be the responsibility of the bidder to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or materials consistent with the available DBE's. ***Evidence of negotiations shall include the names, addresses, and telephone numbers of DBE's that were considered and a description of the information provided regarding the plans and specifications for the work selected for subcontractors, and evidence as to why additional agreements could not be reached for DBE's to perform the work.***
e. Not rejecting DBE's as being unqualified without sound reasons based on a thorough investigation of their capabilities.
f. Efforts to assist interested DBE's in obtaining bonding, lines of credit, or insurance as required.
g. Efforts to assist interested DBE's in obtaining necessary equipment, supplies, materials, or related assistance or services.
h. Use of services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations that provide assistance in the recruitment and placement of DBE's.

The prime contractor agrees not to terminate for convenience a DBE subcontractor, and then perform the work of the terminated subcontract with its own forces or those of an affiliate, without CATA prior written consent. When a DBE subcontractor is terminated, or fails to complete its work on the contract for any reason, the prime contractor agrees to make every effort to find another DBE subcontractor to substitute for the original DBE. These efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the DBE that was terminated.

DBE PARTICIPATION FORM

Work Category: _____
Trade Opportunity: _____
DBE Contractor Contacted: Name: _____
Phone: _____ Date Contacted ___/___/_____
Qualifications: _____
Decision:_____
_____

Work Category: _____
Trade Opportunity: _____
DBE Contractor Contacted: Name: _____
Phone: _____ Date Contacted ___/___/_____
Qualifications: _____
Decision:_____
_____

Work Category: _____
Trade Opportunity: _____
DBE Contractor Contacted: Name: _____
Phone: _____ Date Contacted ___/___/_____
Qualifications: _____
Decision:_____
_____

Work Category: _____
Trade Opportunity: _____
DBE Contractor Contacted: Name: _____
Phone: _____ Date Contacted ___/___/_____
Qualifications: _____
Decision:_____
_____

Copy this page as much as required to document intent.

APPENDIX D

CERTIFICATION REGARDING LOBBYING

The undersigned [Contractor] certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form--LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, *et seq.*)]

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The Contractor,_____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. A 3801, *et seq.,* apply to this certification and disclosure, if any.

Signature of Contractor's Authorized Official: _____

Name and Title of Contractor's Authorized Official: _____

Date: _____

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR PROPOSAL

CERTIFICATION OF LOWER-TIER PARTICIPANTS (SUBCONTRACTORS) REGARDING DEBARMENT, SUSPENSION, AND OTHER INELIGIBILITY AND VOLUNTARY EXCLUSION

The Lower Tier Participant (Subcontra ctor to the Primary Contractor), _____, certifies, by submission of this proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from parti cipation in this transaction by a ny Federal department or agency.

If the above named Lower Tier Part icipant (Subcontractor) is unable to certify to any of the statements in this certification, such participant shall attach an explanation to this proposal.

The Lower-Tier participant (Subcontract or), _____, certifies or affirms the truthfulness and accu racy of the contents of the statements su bmitted on or with this certification and understands that the provisions of 31. U.S.C. Sections 3801 et seq. are applicable thereto.

_____

Signature and Title of Authorized Official

APPENDIX E
IRAN ECONOMIC SANCTIONS ACT CERTIFICATE

In accordance with the Iran Economic Sanctions Act, Michigan 2012 PA 517, effective April 1, 2013, (MCL 129.311, *et seq*.), the undersigned certifies in support of its bid or proposal that it is not an Iran linked business as such is defined in the Act.

Bidder: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

THIS PAGE MUST BE COMPLETED AND RETURNED WITH YOUR PROPOSAL

"General Decision Number: MI20210084 08/13/2021

Superseded General Decision Number: MI20200084

State: Michigan

Construction Type: Building

County: Ingham County in Michigan.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021
1	01/29/2021
2	02/05/2021
3	05/14/2021
4	06/25/2021
5	07/02/2021
6	07/16/2021
7	08/13/2021

ASBE0047-002 07/01/2020

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 32.52	17.88

BOIL0169-001 03/01/2018

	Rates	Fringes
BOILERMAKER	$ 38.65	26.22

BRMI0009-009 08/01/2020

	Rates	Fringes
BRICKLAYER		
Bricklayer	$ 31.57	22.65
Terrazzo and Tile Finisher	$ 22.80	17.54
Terrazzo and Tile Setter	$ 26.40	20.08

FOOTNOTE:

Paid Holiday: Fourth of July, if the worker was employed by the contractor in any period of seven working days before said holiday within the current calendar year.

CARP1004-004 06/01/2020

	Rates	Fringes
CARPENTER (Soft Floor Layer, Including Carpet & Resilient Flooring)	$ 26.46	20.71

CARP1004-018 06/01/2020

	Rates	Fringes
CARPENTER, Includes Acoustical Ceiling Installation, Drywall Hanging, Form Work, and Metal Stud Installation	$ 26.46	20.71

CARP1102-002 06/01/2020

	Rates	Fringes

MILLWRIGHT.....$ 35.30 34.10

ELEC0252-001 06/01/2021

Townships of Bunker Hill, Leslie, Onodaga & Stockbridge

	Rates	Fringes
ELECTRICIAN		
Alarm Installation & Low Voltage Wiring	$ 32.13	16.42
Excludes Alarm Installation and Low Voltage Wiring	$ 48.48	27%+12.25

ELEC0665-004 05/31/2021

Townships of Alaiedon, Aurelius, Delhi, Ingham, Lansing, Leroy, Locke, Meridian, Vevay, Wheatfield, White Oak and Williamson

	Rates	Fringes
ELECTRICIAN		
Alarm Installation & Low Voltage Wiring	$ 30.00	9.25+5.5%
Excludes Alarm Installation & Low Voltage Wiring	$ 36.90	25.19

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* ENGI0324-012 06/01/2021

	Rates	Fringes
OPERATOR: Power Equipment		
GROUP 1	$ 42.38	24.85
GROUP 2	$ 39.08	24.85
GROUP 3	$ 35.63	24.85
GROUP 4	$ 34.72	24.85
GROUP 5	$ 34.72	24.85
GROUP 6	$ 28.86	24.85
GROUP 7	$ 26.38	24.85

FOOTNOTES:

Crane operator with main boom and jib 300' or longer: $1.50 per hour above the group 1 rate. Crane operator with main boom and jib 400' or longer: $3.00 per hour above the group 1 rate.

PAID HOLIDAYS: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Crane operator with main boom and jib 400', 300', or 220' or longer.

GROUP 2: Crane operator with main boom and jib 140' or longer, tower crane, gantry crane, whirley derrick

GROUP 3: Concrete Pump; Crane; Highlift; Hoist; Loader; Roller; Scraper; Stiff Leg Derrick; Trencher

GROUP 4: Bobcat/Skid Loader; Broom/Sweeper; Fork Truck (over 20' lift)

GROUP 5: Boom Truck (non-swinging)

GROUP 6: Fork Truck (20' lift and under for masonry work)

GROUP 7: Oiler

IRON0025-001 06/01/2019

	Rates	Fringes
IRONWORKER		
REINFORCING	$ 29.48	27.74
STRUCTURAL (Excluding Metal Building Erection)	$ 36.77	29.03

LABO0499-012 06/01/2019

	Rates	Fringes
LABORER		
Common or General; Grade Checker; Mason Tender - Brick; Mason Tender - Cement/Concrete; Pipelayer; Sandblaster	$ 26.83	12.90

PAIN0845-001 06/01/2020

	Rates	Fringes
PAINTER: Brush, Roller, Spray and Paperhanging	$ 23.95	15.14

PAINTER: Drywall
Finishing/Taping.....$ 27.16 16.13

PLAS0016-011 04/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 24.64	12.88

PLUM0333-006 06/01/2021

	Rates	Fringes
PIPEFITTER, Includes HVAC Pipe and Unit Installation	$ 40.29	23.83
PLUMBER, Excludes HVAC Pipe and Unit Installation	$ 40.29	23.83

FOOTNOTE:

Paid Holidays: Memorial Day, Independence Day and Labor Day, if the employee works the work day preceding and following the holiday unless proven illness or injury prevents the employee from working.

ROOF0070-003 06/01/2021

	Rates	Fringes
ROOFER	$ 30.93	16.18

SFMI0669-001 04/01/2021

	Rates	Fringes
SPRINKLER FITTER (Fire Sprinklers)	$ 36.97	24.12

SHEE0007-004 05/01/2018

	Rates	Fringes
SHEET METAL WORKER (Including HVAC Duct Installation; Excluding HVAC System Installation)	$ 32.61	19.66

SUMI2011-009 02/01/2011

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 18.48	7.93
LABORER: Landscape & Irrigation	$ 8.00	0.00
METAL BUILDING ERECTOR	$ 16.92	6.32
OPERATOR: Backhoe/Excavator/Trackhoe	$ 21.34	7.57
OPERATOR: Bulldozer	$ 20.63	8.21
OPERATOR: Grader/Blade	$ 22.00	6.29
OPERATOR: Tractor	$ 19.10	8.48
TRUCK DRIVER: Dump Truck	$ 16.00	7.26
TRUCK DRIVER: Lowboy Truck	$ 14.50	0.44
TRUCK DRIVER: Tractor Haul Truck	$ 13.57	1.18

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within

the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007

in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Opportunity Clause, specific Affirmative Action obligations required by the specifications set forth at 41 CFR § 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall made a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in at 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

(3) The Contractor shall provide written notification to the Director Of The Office Of Federal Contract Compliance Programs within ten (10) working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

(4) As used in this notice, and in the contract resulting from this solicitation, the "Covered Area" is Ingham County, Michigan.

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35) WAGE RATES

For construction project utilizing Davis – Bacon Wages Rates, please refer to the following link:

https://sam.gov/wage-determination/MI20210084/8

INSTRUCTION TO BIDDERS

CONSTRUCTION IFB

1) FUNDING

This Project will be funded with the assistance of capital improvement grants from the Federal Government under the Federal Transit Act and the Michigan Department of Transportation (MDOT). The successful bidder will be required to comply with all terms and conditions prescribed for third party contracts in a grant contract between the United States of America and CATA. This grant contract is available for examination by prospective bidders at the CATA offices.

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2) PROJECT BUDGET

The budget for this Project will be funded through financial assistance grants from the Federal Transit Administration (FTA) and Michigan Department of Transportation (MDOT). The total Project budget will be determined by the final negotiated price between CATA and the successful bidder.

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3) PRE-PROPOSAL CONFERENCE

A Pre-Proposal Conference will be held on September 22nd at 10:00 am, 4615 Tranter Street, Lansing, MI 48109

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4) TYPE OF CONTRACT

The Contract for this Project shall be a firm fixed price type.

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5) PROJECT NUMBER(S)

All bidders and Contractors will include the FTA Project Number in all correspondence with CATA and with the FTA. The FTA Project Number for this Project is TBD.

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6) USE OF "CAPITAL AREA TRANSPORTATION AUTHORITY" NAME IN CONTRACTOR ADVERTISING OR PUBLIC RELATIONS

CATA reserves the right to review and approve any advertising copy related to this Project in any way prior to publication. The successful bidder will not allow such copy to be

published in their advertisements or public relations programs until submitting such copy and receiving prior written approval from CATA. The successful bidder agrees that published information relating to this Project will be factual and in no way imply that CATA endorses the successful bidder's firm, service or product.

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7) INTENT OF SPECIFICATIONS

It is the intent of these specifications to provide completed Project of substantial and durable construction in all respects, which will be most suitable and advantageous for CATA. Experimental or unproven equipment, materials or design will not be accepted without prior review and written acceptance by CATA.

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8) APPROVED EQUALS AND DEVIATIONS

All bids must be in strict compliance with the requirements and provisions of these specifications, including the provisions herein regarding "approvals", "approved equals", and "deviations". Where a feature, component or item is specified by brand name in these specifications, the words "or approved equal" will apply. Where the approval of CATA is specifically required by these specifications in connection with a particular feature, or if the bidder proposes to submit a bid containing "approved equals" or "deviations" from specific requirements of these specifications, the bidder must obtain such approval, confirmed in writing, prior to the date for the bid opening. With respect to "approved equals" or "deviations", the details of same and the reasons and justifications therefor must be submitted to CATA, including a statement whether the bidder has previously furnished or offered to furnish the item in question, is herein specified. Bids may be submitted containing such "approvals", "approved equals", or "deviations", as are specifically approved by CATA, confirmed in writing, prior to the bid opening date. Each bid must be accompanied by documentation regarding any such approvals granted by CATA for the bid. Notice of any such approvals required by and/or granted to a bidder shall be furnished by CATA to other prospective bidders prior to the bid opening date. Any unapproved deviations, exceptions, substitutions, alternates, or conditional qualifications contained in a bid may be cause for its rejection. The decision of CATA, as represented by the Executive Director, shall be final with respect to whether any proposed deviations from the specifications are acceptable. It should be understood that specifying a brand name, components, and/or equipment in this specification shall not relieve the supplier from his responsibility to produce the product in accordance with the performance warranty and contractual requirements. The supplier is responsible for notifying CATA of any inappropriate brand name, component, and/or equipment that may be called for in the specifications, and to propose a suitable substitute for consideration.

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9) PROTEST PROCEDURES

Protest procedures are available online at the CATA website: https://www.cata.org/About/Doing-Business-with-CATA/Procurement-Protest-Procedures

10) SUBMISSION OF BIDS

Sealed bids will be accepted until October 6th at 1:30 pm, local time. They shall be submitted to:

Nicole Wilson - Purchasing Manager

Capital Area Transportation Authority
4615 Tranter Street
Lansing, MI 48109

One copy is sufficient.

11) SEALED PROPOSAL LABEL

The bidder should apply a "Sealed Proposal" label and attached it to the envelope containing the bid or proposal. CATA assumes no responsibility for the premature opening of sealed bids or proposals which do not have this label attached to the outside of the envelope.

12) MAILING BIDS/PROPOSALS

Bids or proposals submitted by mail shall be mailed a minimum of three (3) days prior to the bid opening date or date scheduled for receipt of proposals. Postmarks by the U.S. Postal Service or other mail delivery service is required. Postage meter dates are not acceptable. Bids or proposals which are not mailed in a timely manner and received after the scheduled bid opening or proposal submittal date will not be accepted.

13) DURATION OF OFFER

All bids or proposals shall remain in effect for a minimum of 90 days from the bid opening date or scheduled date for receipt of proposals. Offers that allow less than 90 days for acceptance by CATA will be considered non-responsive and will be rejected.

14) BID PRICE

(a) Bid prices shall be submitted on the forms provided. Prices submitted in any other form may be considered non-responsive and may be rejected.
(b) Bid prices shall be based on F.O.B. CATA, Lansing, Michigan.
(c) The price stated in any bid submitted shall include all items of labor, materials, equipment, tools and other costs necessary to fully complete and deliver this Project

pursuant to the specifications. It is the intention of these specifications to provide and require a complete project of the type prescribed. Any item or items omitted from such specifications which are clearly necessary for the completion of such Project and its appurtenances shall be considered a portion of such Project although not directly specified or called for in these specifications.

15) TAX EXEMPTION

CATA is exempt from payment of all Federal, State, and local taxes in connection with this Project. **This provision does not relieve the Contractor from the responsibility to pay all applicable taxes for goods, services, and labor acquired in the performance of this Project – Bidder will include sales tax within their bid.**

16) DISCOUNTS

Prompt payment discounts will not be considered in the evaluation of proposals or bids. However, any offered discount will form a part of the award, and will be taken if payment is made within the discount period indicated in the offer by the bidder. As an alternative to offering a prompt payment discount in conjunction with the offer, bidders awarded Contracts may include prompt payment discounts on individual invoices.

17) PAYMENT TERMS

CATA will make payment within thirty (30) days after delivery and final acceptance of the project. The Contractor may submit invoices to CATA prior to or upon delivery. Payment will not be made without an invoice.

18) PROJECT COMPLETION DATE

Bidders shall state in the bid or proposal the earliest possible date offered for completion of the Project.

19) LATE BIDS, MODIFICATIONS OF BIDS OR WITHDRAWAL OF BIDS

a) Any bid or modification to a bid received at the CATA office designated in the solicitation after the exact time specified for bid opening will not be considered and will be returned to the bidder unopened.

A bid may be modified or withdrawn in person by a bidder or their authorized representative, provided their identity is made known and a receipt is signed for the bid, but only if the modification or withdrawal is made prior to the exact time set for opening of bids.

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20) DETERMINATION OF SUCCESSFUL BIDDER

In determining the successful bidder, consideration is given to bid price, responsiveness of the bidder to the solicitation, and the bidder's responsibility. The Contract award for this Project will be made to the lowest, responsive and responsible bidder.

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21) BIDDER QUALIFICATIONS

In order to be eligible for award, bidders must be responsive and responsible.

(a) Responsive offers are those complying in all material aspects of the solicitation, both as to the method and timeliness of submission and as to the substance of the resulting Contract. Bids or proposals which do not comply with all the terms and conditions of the solicitation may be rejected as non-responsive.

(b) Responsible bidders are those prospective Contractors who, at a minimum, must:

1) Have adequate financial resources, as required during performance of the Contract.

2) Are able to comply with the required or proposed delivery or performance schedule, taking into consideration all existing business commitments.

3) Have a satisfactory record of past performance.

4) Have necessary technical capability to perform.

5) Provide evidence satisfactory to CATA that the bidder will comply with the DBE requirements.

6) Certify that they are not on the U.S. Comptroller General's list of ineligible Contractors.

7) Are qualified as a manufacturer or regular dealer of the items being offered.

8) Are otherwise qualified and eligible to receive an award under applicable laws and regulations.

All prospective bidders may be requested to submit written evidence verifying that they meet the minimum criteria necessary to be determined a responsible Contractor. Refusal to provide requested information may cause rejection of the bid or proposal.

22) ACCEPTANCE OF BID

Each bid shall be submitted with the understanding that the acceptance in writing by CATA of the offer to furnish any or all goods or services described therein shall bind the bidder on his part to furnish and deliver at the bid price, in accordance with the condition of said accepted bid and specifications.

23) WITHHOLDING AWARD

This solicitation for bids or proposals does not commit CATA to award a contract, pay any costs incurred in preparation of bid or proposals in response to this solicitation, or to procure or contract for good or services. Bidder shall be responsible for all costs incurred as part of their participation in the pre-award process.

24) BID ACCEPTANCE, REJECTION, AND POSTPONEMENT

The CATA reserves the right to postpone, accepts, or reject any and all bids in whole or in part, on such basis as the CATA Board deems to be in its best interest to do so, subject to the rules and regulations set forth by the U.S. Department of Transportation.

25) USDOT/FTA CONCURRENCE FOR CONTRACT AWARD

The award of a Contract for this Project may be subject to review and concurrence by the U.S. Department of Transportation, Federal Transit Administration

26) SINGLE BID RESPONSE

If only one (1) bid is received in response to the Invitation for Bids, a detailed cost proposal may be requested of the single bidder. A cost/price analysis and evaluation and/or audit may be performed of the cost proposal in order to determine if the price is fair and reasonable.

26) DBE PARTICIPATION

In connection with the performance of this Contract, the successful bidder agrees to cooperate with CATA in meeting its commitments and goals with regard to maximum utilization of Disadvantaged Business Enterprises (DBE). The policy and obligations for maximum utilization of DBE's are herein set forth:

(a) Policy - It is the policy of the Department of Transportation that Disadvantaged Business Enterprises, as defined in 49 CFR, Part 26, shall have the maximum opportunity to participate in the performance of contracts financed in whole or apart with Federal funds under this Agreement. Consequently, the DBE requirements of 49 CFR, Part 26 apply to this Agreement.

(b) DBE Obligation - CATA or its Contractor agrees to ensure that Disadvantaged Business Enterprises, as defined in 49 CFR, Part 26, have the maximum opportunity to participate in the performance of contracts and subcontracts financed in whole or in part with Federal funds provided under this Agreement. In this regard, CATA or its Contractors shall take all necessary and reasonable steps in accordance with 49 CF, Part 26, to ensure that Disadvantaged Business Enterprises have the maximum opportunity to compete for and to perform contracts. CATA and its Contractors shall not discriminate on the basis of race, color, national origin, or sex in the award and performance of DOT assisted contracts.

Requirements and goals for Disadvantaged Business Enterprise participation in this Project are as follows:

A minimum of zero percent (0%) of the total contract price, as awarded. However, the corporate goal for CATA is 2.57%. Compliance with the percentage goal may be fulfilled by DBE's performing as either:

1) A member of a joint venture as a prime contractor;
2) An approved subcontractor;
3) An owner-operator of equipment;
4) A renter of equipment to a prime contractor;
5) A firm manufacturing and supplying goods used in the project;
6) A firm supplying goods used in the project (when supplying goods, only 60 percent (60%) will be counted).

Prior to Contract award, the apparent successful bidder shall submit a written assurance of meeting the above goals and shall include names of DBE subcontractors, addresses of contact persons, a description of work to be performed and dollar values of each proposed DBE subcontract. This information shall be submitted on the attached 'DBE Participation Form" furnished with this solicitation.

If the goals were not met, the bidder must demonstrate that sufficient good faith efforts were made to meet the DBE contract goals and shall document the steps he has taken to obtain DBE participation.

Failure to provide required documentation of good faith efforts may be reason for disqualification of the Bid / Proposal.

Bidders good faith efforts will include the following actions.

Soliciting through all reasonable and available means the interest of all certified DBE's who have the capability to perform work under the contract. This shall include attendance at pre-bid meetings, advertising and /or written notices. the bidder shall allow sufficient time to allow the DBE's to respond to the solicitation.
Selecting portions of the work to be performed by DBE's.
Providing interested DBE's with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
Negotiations in good faith with interested DBE's. It will be the responsibility of the bidder to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or materials consistent with the available DBE's. Evidence of negotiations shall include the names, addresses, and telephone numbers of DBE's that were considered and a description of the information provided regarding the plans and specifications for the work selected for subcontractors, and evidence as to why additional agreements could not be reached for DBE's to perform the work. Not rejecting DBE's as being unqualified without sound reasons based on a thorough investigation of their capabilities.
Efforts to assist interested DBE's in obtaining bonding, lines of credit, or insurance as required.
Efforts to assist interested DBE's in obtaining necessary equipment, supplies, materials, or related assistance or services.
Use of services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations that provide assistance in the recruitment and placement of DBE's.

The prime contractor agrees not to terminate for convenience a DBE subcontractor, and then perform the work of the terminated subcontract with its own forces or those of an affiliate, without CATA's prior written consent. When a DBE subcontractor is terminated, or fails to complete its work on the contract for any reason, the prime contractor agrees to find another DBE subcontractor to substitute for the original DBE. These good faith efforts shall be directed at finding another DBE to perform at least the same amount of work under the contract as the DBE that was terminated.

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27) DEBARMENT AND SUSPENSION

Bidders shall complete and submit as part of their bid, the Certification of Primary Contractor Regarding Debarment, Suspension, And Other Responsibility Matters for all projects when the total aggregate value of the contract exceeds $25, 000. The bidder shall also submit a list of subcontracts and subcontractors which will have a financial interest in this Project which exceeds $25,000 or will have a critical influence on or a substantive control over the Project. A Certification Of Lower-Tier Participants Regarding Debarment, Suspension, And Other Ineligibility And Voluntary Exclusions shall be submitted by the bidder to CATA for each listed subcontractor prior to contract award.

During the term of the Contract the successful bidder will be required to immediately notify CATA of 1) any potential subcontractor that is subject to this provision and to submit the appropriate certification prior to award of a subcontract, 2) any information that its certification or certification of its subcontractors was erroneous when submitted, 3) any information that certifications have become erroneous by reason of changed circumstances.

28) LOBBYING CERTIFICATION

Bidders shall complete and submit as part of their bid the Certification of Restrictions on Lobbying for all projects when the total aggregate value of the contract exceeds $100,000. The Contractor shall also submit a list of subcontracts and subcontractors which will exceed $100,000. A Certification of Restrictions on Lobbying shall be submitted by the bidder to CATA for each listed subcontractor prior to contract award.

29) PRODUCT DESCRIPTION

Bids or proposals must be accompanied by a comprehensive description of bidder's product. This description shall include drawings, overall dimensions and photographs which show the construction characteristics and explain the operation of the bidder's product. The descriptive literature shall also include information on design details, components, performance characteristics, methods of manufacture and assembly. The descriptive literature is required for the purpose of evaluation and award. Failure of the descriptive literature to show that the product proposed conforms to the specifications and other requirements of this solicitation may result in rejection of the bid or proposal. Additionally, failure to submit the descriptive literature will require rejection of the bid or proposal. The quality of standard components not covered by the language of these specifications will be a factor in determining an award. No advantage shall be taken by the bidder or manufacturer in the omission of any part or detail which goes to make the product complete and ready for service, even though such part is not mentioned in this specification. All units or parts not specified shall be Contractor's standard units or parts and shall conform in materials, design and workmanship to the best practices known in the industry. All parts will be new and in no case will used, reconditioned, or obsolete parts be accepted without prior review and written acceptance by CATA.

30) DEMONSTRATION

Bidder may be requested to demonstrate to CATA the capability of their proposed product to perform and function as herein called for by this specification. The demonstration shall be at no expense to CATA in compliance with provisions outlined in the technical specifications contained herein.

31) BID BOND

As security for the acceptance of the Contract, each bid shall be accompanied by a bidder's bond or certified check in the amount of five percent (5%) of the bid drawn payable to CATA. Such bid deposits of all bidders will be held by CATA until all bids submitted shall have been canvassed, and the bids have either been rejected in whole or in part, or the award of the Contract or Contracts has been made. The bid deposit of the successful bidder will be held until the Contract is duly executed. Bid deposits will be returned to unsuccessful bidder(s) upon award of the Contract. If the successful bidder to whom the Contract has been awarded refuses to execute the Contract within ten (10) calendar days, after Contract award, the amount of its bid deposit shall be forfeited to and retained by CATA as liquidated damages for such neglect or refusal, and CATA may proceed to place the order with another company.

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32) PERFORMANCE & PAYMENT BONDS

The successful bidder shall furnish at its own expense performance and payments bonds. These bonds shall be furnished to CATA within ten (10) calendar days after contract award. Bond requirements are as follows:

* A performance bond shall be payable to CATA in the amount of 100 percent (100%) of the full contract amount as a guarantee of good faith on behalf of the Contractor that the Contractor will perform all of its obligations under the contract.
A payment bond shall be payable to CATA in the amount of 100 percent (100%) of the full contract amount to assure payment as required by law of all persons supplying labor and material in the execution of work provided for in the contract.

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33) PAYMENT TERMS

CATA will make payment in accordance with the following payment schedule, unless specified elsewhere. By month on a percent complete basis. Pay application with certified payroll shall be submitted to the office of the Architect for certification.
Partial payments do not constitute acceptance.

The CATA Project Manager shall have the power to withhold payment or nullify the whole or a part of any payment, to such extent as may be reasonably necessary to protect CATA from loss on account of:

(a) Defective work not remedied.

(b) Claims filed or reasonable evidence indicating probable filing of claims.

(c) Failure of the Contractor to make payments properly to subcontractors for material or labor.

(d) A reasonable doubt that the Contract can be completed for the balance then unpaid.

(e) Damage to another Contractor.

When the above grounds are removed, payment shall be made for amounts withheld to another Contractor.

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34) EQUAL EMPLOYMENT OPPORTUNITY NOTICE FOR GOALS

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE
EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER NO. 11246)

(1) The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

(2) (a) The goals and the timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for Minority Participation in Each Trade	Goals for Female Participation In Each Trade
0.0%	0.0%

(b) These goals are applicable to all the Contractor's construction work (whether or not it is federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed with regard to this second area, the Contractor also is subject to the goals for both its federally involved and non federally involved construction.

(c) The Contractor's compliance with the Executive Order and the regulations at 41 CFR Part 60-4 shall be based on its implementation of the Equal

Opportunity Clause, specific Affirmative Action obligations required by the specifications set forth at 41 CFR § 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall made a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in at 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

(3) The Contractor shall provide written notification to the Director Of The Office Of Federal Contract Compliance Programs within ten (10) working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

(4) As used in this notice, and in the contract resulting from this solicitation, the "Covered Area" is Ingham County, Michigan.

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35) WAGE RATES

For construction project utilizing Davis – Bacon Wages Rates, please refer to the following link:

https://sam.gov/wage-determination/MI20210084/8

STANDARD TERMS AND CONDITIONS OF PROCUREMENT

A. THE FOLLOWING TERMS AND CONDITIONS WILL BE A PART OF THE CONTRACT AWARDED.

1. CHANGES. CATA, at any time, by a written order, and without notice to the sureties, may make changes within the general scope of this contract, in (a) drawings, designs or specifications where the supplies to be furnished are specifically manufactured for CATA in accordance therewith; (b) method of shipment or packing; and (c) place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for performance of this contract, whether changed or not changed by such order, an equitable adjustment shall be made by written modification of the contract. Any claim by the Contractor for adjustment under this clause must be asserted within thirty (30) days from the date of receipt by the Contractor of the notification of change; provided that CATA, if it decides that the facts justify the action, may receive and act upon any such claim if asserted prior to dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes." However, nothing in this clause shall excuse the Contractor from proceeding with the contract as changed.

2. TERMINATION FOR DEFAULT. CATA, by written notice, may terminate the contract awarded on the basis of this proposal, in whole or in part, for failure of the Contractor to perform any of the provisions hereof. In such event, the Contractor shall be liable for damages, including the excess cost of reprocuring similar supplies or services, provided, that if (a) it is determined for any reason that the contract was not in default or, (b) the Contractor's failure to perform is without his control, fault or negligence, the termination shall be deemed to be a termination for convenience under the following Paragraph 3.

3. TERMINATION FOR CONVENIENCE. CATA, by written notice, may terminate the contract, awarded on the basis of this proposal, in whole or in part, when it determines it is in the best interest of CATA. If this contract is for supplies and is so terminated, the Contractor shall be compensated in accordance with its auditable cost incurred at the time of notification of termination. To the extent that the contract is for services and is so terminated, CATA shall be liable only for payment in accordance with the payment provisions of the contract for services rendered to the effective date of termination.

4. ADDITIONAL INFORMATION. The Contractor shall promptly furnish any additional information requested by CATA relative to the equipment it proposes.

5. SUPPLIER RESPONSIBILITY. No advantage shall be taken by the Contractor or its Subcontractor in the omission of any part or detail which goes to make the equipment complete and operable for use by CATA. In case of any variance, this specification shall overrule Contractor or Subcontractor specifications. The Contractor shall assume responsibility for all materials used whether the same is manufactured by the Contractor or purchased ready made from a source outside Contractor’s company. In the case of the replacement of a Subcontractor, the Contractor must, within five (5) working days, notify CATA in writing of the replacement and provide name, address, telephone number, and the type of service.

6. DELIVERY. Service and/or equipment will be delivered to Capital Area Transportation Authority, 4615 Tranter Street, Lansing, Michigan 48910. The Authority will assume custody of all property at one of its other locations, if so directed, in writing by CATA. Invoices shall be furnished with the delivery of each item. CATA reserves the right to inspect all deliveries or services before acceptance.

7. BREACH OF CONTRACT. If the Contractor shall fail, refuse or neglect to comply with the terms of these contract conditions, such failure shall be deemed a total breach of contract. Contractor shall be subject to all legal remedies that CATA may have and CATA may recover,

in addition to any damages or costs relating to failure to comply, its reasonable attorneys' fees resulting from Contractor's breach.

8. DISPUTES (AFTER BID AWARD). Except as otherwise provided in the contract, any dispute concerning a question of fact arising under the contract which is not disposed of by agreement between CATA and Contractor shall be decided by CATA's Program Manager in writing, with a copy mailed or otherwise furnished to the Contractor. The decision of CATA shall be final and conclusive unless within ten (10) days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to CATA a written appeal addressed to CATA's Chief Executive Officer for the determination of such appeal, which shall be final and conclusive, unless determined by a court of competent jurisdiction to have been fraudulent or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending a final decision of the dispute, the Contractor shall proceed diligently with the performance of the contract and in accordance with CATA's decision.

9. DELIVERY EXTENSION AND DELAYS. CATA reserves the right to extend, postpone or reschedule delivery in case the delivery of service equipment, under this contract, shall be necessarily delayed because of strike, injunction, civil disturbance, government controls, or by reason of any cause or circumstance beyond the control of the Contractor, as detailed in writing by the Contractor, the time of completion or a delivery shall be extended by a number of days to be determined in each instance by CATA.

10. INSTALLATION. If specified, the Contractor shall install and place in operation, subject to approval by CATA, the equipment at the Contractor's expense within thirty (30) days from issuance of a notice to install issued by CATA.

11. INSTALLATION EXTENSION AND DELAYS. CATA reserves the right to extend, postpone, or reschedule installation in case the installation of equipment under this contract shall be necessarily delayed because of strike, injunction, civil disturbance, government controls, or by reason or cause or circumstances beyond the control of the Contractor. The time of completion or installation shall be extended by a number of days to be determined in each instance by CATA.

12. ASSEMBLY. If required, the Contractor shall assemble the equipment at its expense prior to installation.

13. ACCESSORIES. The Contractor shall furnish, without additional cost, all accessories required to permit CATA to operate any equipment being provided.

14. TRAINING. The Contractor, without additional cost, shall properly train CATA personnel in the operation and maintenance of the equipment provided.

15. SERVICE MANUAL AND WIRING SCHEMATIC. If specified, the Contractor will provide at least one copy of a service manual and at least one copy of a wiring schematic for individual components and other schematics and drawings.

16. WARRANTY. The Contractor shall describe its policy or warranty(s) both on workmanship and material as applying to the equipment, along with the method or adjustment, and shall be further subject to warranty requirements of CATA as set forth in the following Paragraph 17.

17. CATA WARRANTY. The Contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable warranties the Contractor gives any customer for such equipment and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to CATA by any other clause of this contract. The Contractor shall state the warranty and supply with its bid.

18. INSURANCE. The Contractor shall place and maintain with responsible insurance carriers the following insurance. The Contractor shall deliver to CATA, upon request, certificates of insurance which shall provide thirty (30) days' written notice to be given to CATA in the event of cancellation. Contractor shall require all Subcontractors to maintain adequate insurance coverage.

(a) Workers' Compensation and Employer's Liability Insurance.

(1) Workers' Compensation in compliance with the applicable state and federal laws.
(2) Employer's Liability. Limit $1,000,000.

(b) Commercial General Liability Insurance, including Professional Liability, Blanket contractual, XCU Hazards, Broad Form Property Damage, Completed Operations, and Independent Contractor's Liability, all applicable to Personal Injury, Bodily Injury and Property Damage to a combined single limit of $1,000,000 each occurrence/claim, subject to a $2,000,000 annual aggregate for Professional Liability, Completed Operations and Personal Injury other than Bodily Injury.

(c) Automobile Liability Insurance, including owned, hired and non-owned automobiles, Bodily Injury and Property Damage, to a combined single limit of $1,000,000 each occurrence.

19. INDEMNIFICATION. In addition to the protection afforded by any policy of insurance, the Contractor agrees to indemnify and save harmless CATA, the Michigan Department of Transportation ("MDOT"), the Federal Transit Administration ("FTA"), and all officers, agents, and employees thereof:

(a) From any and all claims by persons, firms, or corporations for labor, materials, supplies, or services provided to the Contractor in connection with the Contractor's performance of the contract; and

(b) From any and all claims for injuries to or death of any and all persons, for loss of or damage to property, for environmental damage, degradation and response, and cleanup costs, and for attorney fees and related costs arising out of, under, or by reason of the Contractor's negligent performance of the contract.

CATA will not be subject to any obligations or liabilities by Subcontractors of the Contractor or their Subcontractors or any other person not a party to this contract without its specific consent and notwithstanding its concurrence in or approval of the award of any contract or subcontract or the solicitation thereof.

20. ACCEPTANCE OF MATERIAL - NO RELEASE. Unless CATA otherwise agrees in writing, acceptance of any portion of the material prior to final acceptance shall not release the Contractor from liability for faulty workmanship or materials or for failure to fully comply with all of the terms of this contract. CATA reserves the right and shall be at liberty to inspect all materials and workmanship at any time during the manufacturing process, and shall have the right to reject all materials and workmanship which do not conform with the contract requirements and specifications; provided, however, that CATA is under no duty to make such inspection and no inspection so made shall relieve Contractor from any obligation to furnish materials and workmanship in accordance with the contract requirements and specifications.

21. FINAL ACCEPTANCE. Upon final acceptance by CATA of all work to be performed by the Contractor, CATA will so notify the Contractor in writing. The date of final acceptance shall commence the warranty period.

22. LIQUIDATED DAMAGES. N/A

23. NO ASSIGNMENT OF CONTRACT. Contractor may not assign or transfer any interest in the contract without the prior written consent of CATA.

24. DEFECTIVE WORKMANSHIP AND MATERIAL. When and as often as CATA determines that the work done or being done under the contract or the kind of quality or materials supplied in connection therewith are not fully and completely in accordance with any requirement of the contract documents, it may give notice of such noncompliance to the Contractor in writing and the Contractor shall immediately upon receipt of such notice do all things required to remedy such noncompliance without additional cost to CATA. If the Contractor fails to comply with such written notice, then CATA, upon written notice to the Contractor, shall deduct the cost of repair, replacement or correction of defective or damaged work from the compensation due or to become due to the Contractor.

25. WAIVER OF BREACH. The waiver by either party hereto or any breach of any provision of this contract by the other party shall not operate or be construed as a waiver of any subsequent breach of the same or any other provision of this contract by either party hereto.

26. OWNERSHIP OF DOCUMENTS. All original documents, calculations, and work product produced by CONTRACTOR, whether produced on paper or electronic media or otherwise in performance of this Agreement, shall be the property of CATA. CONTRACTOR shall have the right to retain a copy of such documents, calculations, and work product. CONTRACTOR shall make available to CATA copies of all CONTRACTOR correspondence, notes, and other papers relating to the work, upon request of CATA. All works of original authorship created in the scope of this Agreement are "works made for hire", as that term is used in connection with the U.S. Copyright Act. To the extent that by operation of law CONTRACTOR retains any intellectual property rights to any work product, CONTRACTOR hereby irrevocably assigns and licenses to CATA all right, title, and interest in such work product, including copyrights and patents, and agrees to execute such assignments and licenses as may be required in the opinion of CATA's legal counsel to confirm this provision. The work product produced by CONTRACTOR in the performance of services under this Agreement is intended for use by CATA solely for the purpose intended. Any use or reuse of such work product by CATA for any purpose other than its intended purpose shall be at the sole risk of CATA and without any liability or responsibility of CONTRACTOR. To the extent that the work product produced by CONTRACTOR contains standard design or construction details or other standardized material previously developed by CONTRACTOR in its professional architectural, engineering, and planning practices, then CONTRACTOR shall have the right to reuse any such material on other projects for other clients or persons without the prior knowledge or permission of CATA and without the payment of any compensation to CATA, provided that the reuse or continued use of such material contains no CATA identifying information or confidential information.

27. EXCUSES FOR FAILURE TO PERFORM OR DELAYS. The Contractor will not be in default by reason of any failure in the performance of this contract, if such failure arises out of causes beyond the control and without the fault or negligence of Contractor. Such causes may include, but are not limited to, acts of God or the public enemy, acts of the government either in its sovereign or contractual capacity, fires, floods, and strikes. But in every case, a failure to perform must be beyond the control and without the fault or negligence of the Contractor or its Subcontractors. An excusable delay will permit the Contractor an extension of time for such reasonable period as may be mutually agreed upon between the parties.

28. COMPUTATION OF TIME. In computing a period of time prescribed by these conditions, the following rules apply:
    (a) "Day" means days of the week (e.g., Monday through Friday), not business days.
    (b) The day of the act or event after which the designated period of time begins is not included.
    (c) The last day of the period is included, unless it is a Saturday, Sunday, or legal holiday. In that event, the period runs until the end of the next day that is not a Saturday, Sunday or legal holiday.

29. NOTICE. All notices and other communications required under this Contract shall be given in writing, signed by an authorized representative, and be personally delivered or delivered by overnight courier, or certified mail (return receipt requested) to the addresses set forth below:

To CATA:
Chief Executive Officer
Capital Area Transportation Authority
4615 Tranter Street
Lansing, MI 48910

To Contractor: _____
_____
_____
_____

With a copy to: _____
_____
_____
_____

30. JURISDICTION. This Contract will be governed by the internal laws of the State of Michigan without reference to its choice of law rules. Exclusive jurisdiction and venue of any suit, action or claim relating to this contract will be in the Ingham County Circuit Court or the Federal District Court for the Western District of Michigan.

31. This contract constitutes the entire contract between the parties and supercedes all negotiations, commitments, and previous contracts and may be modified only by a further written contract which is executed by a duly authorized officer of each of the parties.

32. COST COMPUTATION. The Federal Acquisition Regulation, 48 CFR, Chapter 1, Part 31.2, shall be used, in all instances, to determine the amount of costs incurred by Contractor that CATA shall be required to pay, or reimburse, to Contractor, including, without limitation, where this Agreement requires CATA to pay Contractor's costs as part of the contract price, where the contract price is adjusted resulting from changes to the requirements of Agreement, and when calculating the amount due Contractor pursuant to Termination for Convenience clause.

33. TRAVEL EXPENSES. CATA shall not reimburse Contractor for travel costs, including accommodations, meals, transportation and fuel costs, unless the travel activity and the travel costs have been approved in advance by an authorized representative of CATA. All travel costs to be paid by CATA shall not exceed amounts determined in conformance with the Federal Acquisition Regulation, 48 CFR Section 31.205-46, Travel Costs.

B. <u>TERMS INCLUDED IN CONTRACTS FUNDED IN WHOLE OR PART BY FTA, MDOT, OR OTHER GOVERNMENTAL AGENCY</u>.

1. NONDISCRIMINATION.

(a) <u>Compliance with Regulations.</u> Contractor shall comply with Federal Regulations relative to nondiscrimination of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, and Title 23, Code of Federal Regulations, Part 710.405(b), as they may be amended from time to time (hereinafter referred to as the Regulations), and with Executive Order 11246 titled Equal Employment opportunity, as amended by Executive Order 11375, and as supplemented by Department of Labor Regulation (41 CFR 60) which are herein incorporated by reference and made a part of this contract. Contractor agrees that it will comply with

the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 CFR Part 1630, pertaining to employment of persons with disabilities. In addition, Contractor agrees to comply with any implementing requirements FTA may issue.

(b) Nondiscrimination. With regard to the work performed by it during this contract, Contractor shall not discriminate on the grounds of race, color, sex, disability, religion, age, or national origin against any employee or applicant for employment or in the selection and retention of Subcontractors, including procurement of materials and leases of equipment. Contractor shall not participate either directly or indirectly in discrimination prohibited by Section 21.5 and Part 710.405(b) of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

(c) In connection with the performance of services under this contract, Contractor agrees to comply with the State of Michigan provisions for "prohibition of discrimination in state contracts" as set forth in Appendix A dated March 19, 1998, a copy of which is attached hereto and made a part hereof.

(d) ADA Access. All work performed and all services provided pursuant to this contract shall be in compliance with Federal policy to ensure that elderly individuals and individuals with disabilities have an equal right to use of public transportation services and facilities. To the extent this Contract requires planning and design of services and facilities, special efforts shall be made to implement the transportation and accessibility rights of elderly individuals and individuals with disabilities. The work performed and services provided in this Contract shall be in compliance with all State and Federal statutes and laws ensuring equal access of transportation services and facilities for the elderly and individuals with disabilities, including 49 USC § 5301(d), § 504 of the Rehabilitation Act of 1973, as amended, 29 USC § 794, The Americans with Disabilities Act of 1990, as amended, 42 USC § 12101 et seq, and the Architectural Barriers Act of 1968, as amended, 42 USC § 4151 et seq, and any applicable implementing Federal regulations or directives as they may from time to time be promulgated or amended.

(e) This provision B.1 (a)-(e) will be included in all subcontracts relating to this contract. Further, each contract which Contractor signs with a Subcontractor must include the following assurance:

> The Contractor, Subrecipient, or Subcontractor shall not discriminate on the basis of race, color, national origin, creed, disability, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of US DOT-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

2. DBE REQUIREMENTS.

(a) Contractor will carry out the applicable requirements of the Michigan Department of Transportation's Disadvantaged Business Enterprise ("DBE") program and 49 CFR 26, including, but not limited to those requirements set forth in Appendix B, attached hereto and made a part hereof. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which my result in the termination of this Contract or such other remedy as CATA deems appropriate, which may include, but is not limited to, withholding monthly progress payments, assessing sanctions, liquidated damages and/or disqualifying the Contractor from future bidding as non-responsible.

(b) Contractor shall pay its subcontractors performing work related to this contract for satisfactory performance of that work no later than thirty (30) days after the Contractor's receipt of payment for that work from CATA. In addition, Contractor shall return any retainage payments to those subcontractors within thirty (30) days after the subcontractor's work related to this contract is satisfactorily completed. Contractor must promptly notify CATA whenever a DBE subcontractor performing work related to this contract is terminated or fails to complete the work, and must make good faith efforts to engage another DBE subcontractor to perform at least the same amount of work. The Contractor may not terminate any DBE subcontractor and perform that work through its own forces or those of an affiliate without prior written consent of CATA.

3. CONTINGENT FEES. The Contractor warrants that it has not employed or retained any company or person, other than a bonafide employee working solely for the Contractor, to solicit or secure this contract and that it has not paid or agreed to pay any company or person, other than a bonafide employee working solely for the Contractor, any fee, commission, percentage, brokerage fee, gifts or any other consideration, contingent upon or resulting from the award or making of this contract. For breach or violation of this warranty, CATA shall have the right to annul this contract without liability.

4. RECORDS/AUDITS. The Contractor shall maintain and retain, and shall require all its subcontractors to maintain and retain, complete and accurate books, documents, papers, accounting records, contracts, and other evidence with respect to allowable costs incurred and manpower expended under this contract. All such records shall be maintained on the basis of generally-accepted accounting principles and shall be clearly identified and readily accessible. The Contractor shall provide during regular business hours to the U.S. Secretary of Transportation, the FTA Administrator, the Comptroller General of the United States, and CATA, or their duly authorized representatives, access to such data and records, and the right to inspect and audit all data and records of the Contractor relating to its performance under the contract, and to make transcripts therefrom as necessary. Contractor shall retain all work data, documents, records, accounts and reports related to this contract for a period of three (3) years from the date of final payment under this contract or from expiration or other termination of this contract. In the event of a dispute as to allowable costs or any other issue under this contract, Contractor will thereafter continue to maintain such records until the dispute has been resolved.

5. CONFLICT OF INTEREST. The Contractor certifies that, to the best of its knowledge, no CATA employee or office of any public agency interested in this contract has any pecuniary interest in the business of the Contractor and that no person associated with the Contractor has any interest that would conflict in any manner or degree with the performance of this contract.

6. INTEREST OF MEMBER OF CONGRESS OR DELEGATES TO CONGRESS. No member of Congress or delegates to the Congress of the United States shall be admitted to any share or part of the contract, or to any benefit arising therefrom. This shall not be construed to prevent any such person from owning stock in a publicly owned corporation.

7. DEBARMENT AND SUSPENSION. Contractor must comply with U.S. DOT regulations "Nonprocurement Suspension and Debarment", 2 CFR Part 1200, which adopt and supplement the U.S. Office of Management and Budget ("U.S. OMB") "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 CFR Part 180. Contractor will not make any contract, subcontract, or lease for the project without first confirming that its proposed contractor, subcontractor, or lessee is not listed as barred or excluded from participating in government contracts in the System for Award Management (SAM) at www.sam.gov.

Contractor agrees to comply with federal debarment and suspension regulations and guidelines when administering any contract or subcontract of $25,000 or more, regardless of tier. A contract or subcontract award may not be made to a prospective contractor or subcontractor if that contractor is excluded or disqualified under the standards of the U.S.

DOT regulations in the U.S. OMB Guidelines, unless the federal government has provided an exception as permitted under those regulations and guidelines. In addition, contracts of any amount for federally required audit services or for contracts which require the consent of a federal official are also covered by these DOT regulations and U.S. OMB Guidelines. Contractor must obtain the compliance of lower tier contractors, subcontractors, and lessees with the U.S. DOT debarment and suspension regulations and the U.S. OMB Guidelines that apply to them. The Contractor further agrees to include provisions requiring compliance as set forth above in lower tier covered transactions.

8. MDOT AND FTA TERMS. All contractual provisions that the Michigan Department of Transportation ("MDOT") or the Federal Transit Administration ("FTA"), by law or regulation, require to be included in contracts supported by state or federal financial assistance, including the requirements set forth in FTA Circular 4220.1F, as updated and amended, and the Master Agreement between CATA and FTA as it may be amended, are hereby incorporated by reference. FTA required terms and MDOT required terms shall be deemed to control in the event of a conflict with other provisions contained in this contract. Contractor shall not refuse to comply with any CATA request to conform this contract to include MDOT or FTA required contractual provisions. The Contractor shall not perform any act, fail to perform any act, or refuse to comply with any CATA requests which would cause CATA to be in violation of the FTA mandated contractual provisions.

9. COMPLIANCE WITH LAWS. The Contractor shall at all times observe and comply with all laws, ordinances, and regulations of the state, federal, local, and city government which may, in any manner, affect the performance of the contract.

10. CLEAN AIR. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. 7401, et seq. If state or local air pollution regulations are in force, the more restrictive criteria shall govern. The Contractor and any subcontractors or suppliers must submit evidence to CATA that the governing air pollution criteria will be met. The Contractor agrees to report each violation to CATA and understands and agrees that CATA will, in turn, report each violation as required to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FTA.

11. BUY AMERICA PROVISIONS. Contractor agrees to comply with 49 U.S.C. 5323(j) and FTA's Buy America Regulations in 49 CFR Part 661. These require that iron, steel, and manufactured products used in FTA funded projects be produced in the United States, with specific provisions that apply to rolling stock procurements, unless a waiver has been granted by FTA or the product is subject to a general waiver. The continued accuracy of the certificate, attached as Appendix C, entitled "Buy America Certification", submitted with Contractor's proposal/bid is a term and condition of this Agreement.

12. CERTIFICATION REGARDING LOBBYING. This procurement is subject to the Federal Transportation Administration Lobbying requirements. The attached certificate, entitled Certificate Regarding Lobbying (Appendix D), must be signed and returned as a term and condition of the procurement.

13. FEDERAL WAGE REQUIREMENTS FOR CONSTRUCTION CONTRACTS.

(a) This procurement is subject to the Davis-Bacon Act, 40 USC § 3141, *et seq*, and to the Copeland Anti-Kickback Act, 18 USC § 874, and to Contract Work Hours and Safety Standards Act, 40 USC § 3701, *et seq,* and to the regulations promulgated thereunder ("the Acts"). As required by federal regulations promulgated under the Acts, the following provisions set forth in Paragraph 13(b) and (c) are incorporated into the Agreement, with the understanding that the term "contracting officer" refers to the appointed representative of CATA.

(b) **Davis-Bacon and Copeland Anti-Kickback Acts**

(1) **Minimum wages**

(i) All laborers and mechanics employed or working under the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fridge benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) Except with respect to helpers as defined as 29 CFR 5.2(n)(4), the work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination; and

(4) With respect to helpers as defined in 29 CFR 5.2(n)(4), such a classification prevails in the area in which the work is performed.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(v) (A) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination with 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(v) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(2) **Withholding** - Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, Owner may, after written notice to the Contractor, sponsor, applicant, or agency, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) **Payrolls and basic records**

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractor's employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to Owner for transmission to the Federal Transit Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, DC 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be maintained under section 5.5(a)(3)(i) of Regulations, 29 CFR part 5 and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Federal Transit Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or agency, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) **Apprentices and trainees**

(i) Apprentices - Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid

fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator of the Wage and Hour Division of the U.S. Department of Labor determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees - Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity - The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) **Compliance with Copeland Act requirements** - The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) **Subcontracts** - The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) **Contract termination: debarment** - A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 CFR 5.12.

(8) **Compliance with Davis-Bacon and Related Act requirements** - All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) **Disputes concerning labor standards** - Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) **Certification of eligibility**

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(c) **Contract Work Hours and Safety Standards Act**

(1) **Overtime requirements** - No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) **Violation; liability for unpaid wages; liquidated damages** - In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

(3) **Withholding for unpaid wages and liquidated damages** - Capital Area Transportation Authority shall upon its own action or upon written request of an

authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

(4) **Subcontracts** - The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.

14. BID BOND. A bid bond must be included with all bid documents as set forth in CATA's bid requests.

15. PROTESTS. Any protests shall be filed timely in accordance with the CATA Procurement Protest Procedures. These Procedures are available from the CATA Purchasing & Contracts Manager and the CATA CEO/Executive Director, at the following address: Capital Area Transportation Authority, 4615 Tranter Street, Lansing, MI 48910.

16. PERFORMANCE & PAYMENT BONDS. The successful bidder on a construction contract shall furnish at its own expense performance and payments bonds. These bonds shall be furnished to CATA within ten (10) calendar days after contract award. Bond requirements are as follows:

    (a) A performance bond for construction contracts shall be payable to CATA in the amount of 100 percent (100%) of the full contract amount as a guarantee of good faith on behalf of the Contractor that the Contractor will perform all of its obligations under the contract.

    (b) A payment bond shall be payable to CATA in the amount of 100 percent (100%) of the full amount of any construction contract to assure payment as required by law of all persons supplying labor and material in the execution of work provided for in the contract.

17. FEDERAL CHANGES. Contractor shall at all times comply with all applicable FTA regulations, policies, procedures and directives, including without limitation those listed directly or by reference in the Master Agreement between CATA and FTA, as they may be amended or promulgated from time to time during the term of this contract. Contractor shall not, by action or by inaction, cause CATA to be in violation of FTA regulations, policies, procedures, or directives. Contractor's failure to comply with this paragraph shall constitute a material breach of this contract.

18. NO GOVERNMENT OBLIGATION. Notwithstanding any concurrence by the Federal Government or MDOT in, or approval of, the solicitation or award of this Agreement, absent the express written consent by the Federal Government or by MDOT, neither the Federal Government nor the State of Michigan is a party to this Agreement, and neither shall be subject to any obligations or liabilities to CATA, the Contractor or any other party (whether or not a party to this Agreement) pertaining to any matter resulting from this Agreement. The Contractor agrees to include this clause in each subcontract financed in whole or in part with Federal assistance provided by FTA. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to its provisions.

19. CLEAN WATER. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 *et seq*. The Contractor agrees to report each violation to CATA and understands and agrees that CATA will, in turn, report each violation as required to FTA and the appropriate EPA Regional Office. The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

20. SEISMIC SAFETY. The Contractor agrees that any new building or addition to an existing building will be designed and constructed in accordance with the standards for Seismic Safety required in Department of Transportation Seismic Safety Regulations 49 CFR Part 41 and will certify to compliance to the extent required by the regulation. The Contractor also agrees to ensure that all work performed under this Contract including work performed by a subcontractor is in compliance with the standards required by the Seismic Safety Regulations and the certification of compliance issued on the project.

21. ENERGY CONSERVATION. The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

22. RECOVERED MATERIALS. The Contractor agrees to comply with all requirements of Section 6002 of the Resource Conservation and Recovery Act ("RCRA"), as amended (42 USC 6962), including but not limited to the regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in subpart B of 40 CFR Part 247.

23. FLY AMERICA REQUIREMENTS. Contractor agrees to comply with 49 U.S.C. 40118 ("Fly America Act") in accordance with the General Services Administration's regulations at 41 CFR Part 301-10, which provide that recipients and subrecipients of federal funds and their contractors are required to use United States Flag air carriers for U.S. Government financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a United States Flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation.

24. CARGO PREFERENCE. The Contractor agrees (a) to use privately owned United States Flag commercial vessels to ship at least 50% of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to the underlying contract to the extend such vessels are available at fair and reasonable rates for United States Flag commercial vessels; (b) to furnish within twenty (20) working days following the date of loading of shipments originating within the United States or within thirty (30) working days following the date of loading for shipments originating outside the United States, a legible copy of the rated, "on-board" commercial ocean bill of lading, in English, for each shipment of cargo described in the preceding paragraph to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, D.C., 20590. CATA (through the Contractor in the case of a subcontractor's bill of lading); and (c) to include these requirements in all subcontracts issued pursuant to this contract where the subcontract may involve the transport of equipment, material, or commodities by ocean vessel.

25. PROGRAM FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS.

    (a) The Contractor acknowledges that the provisions of the Program Fraud Civil Rights Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S. DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to this Project. Upon execution of the underlying contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes,

or may make, or causes to be made, pertaining to the underlying contract or the FTA assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

(b) The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance originally awarded by FTA under authority of 49 U.S.C. § 5307, the Federal Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, or the applicable Federal law to the extent the Federal Government deems appropriate.

(c) The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance by FTA. It is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions.

26. SAFE OPERATION OF MOTOR VEHICLES

(1) Seat Belt Use - Contractor is encouraged to adopt and promote on-the-job seat belt use policies and programs for its employees and other personnel that operate company-owned vehicles, company-rented vehicles, or personally operated vehicles. The terms "company-owned" and "company-leased" refer to vehicles owned or leased either by the Contractor or CATA.

(2) Distracted Driving - Contractor agrees to adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers, including policies to ban text messaging while using an electronic device supplied by an employer and driving a vehicle the driver owns or rents, a vehicle either Contractor or CATA owns, leases, or rents, or a privately-owned vehicle when on official business in connection with the work performed under this agreement.

27. VETERANS EMPLOYMENT. Contractors working on a federally funded project give a hiring preference, to the extent practicable, to veterans (as defined in 5 USC §2108) who have the requisite skills and abilities to perform the construction work required under the contract. This provision shall not be understood, construed, or enforced in any manner that would require an employer to give preference to any veteran over any equally qualified applicant who is a member any racial or ethnic minority, female, an individual with a disability, or former employee.

APPENDIX A

PROHIBITION OF DISCRIMINATION IN STATE CONTRACTS

In connection with the performance of work under this contract, Contractor agrees as follows:

1. In accordance with Act 453, Public Acts of 1976, Contractor hereby agrees not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or as a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, or marital status. Further, in accordance with Act No. 220, Public Acts of 1976 as amended by Act No. 478, Public Acts of 1980, Contractor hereby agrees not to discriminate against an employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of a disability that is unrelated to the individual's ability to perform the duties of a particular job or position. A breach of the above covenants shall be regarded as a material breach of this contract.

2. Contractor hereby agrees that any and all subcontracts to this contract, whereby a portion of the work set forth in this contract is to be performed, shall contain a covenant the same as hereinabove set forth in Section 1 of this Appendix.

3. Contractor will take affirmative action to insure that applicants for employment and employees are treated without regard to their race, color, religion, national origin, age, sex, height, weight, marital status or a disability that is unrelated to the individual's ability to perform the duties of a particular job or position. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer, recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

4. Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, age, sex, height, weight, marital status or disability that is unrelated to the individual's ability to perform the duties of a particular job or position.

5. Contractor or its collective bargaining representative will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the Contractor's commitments under this appendix.

6. Contractor will comply with all relevant published rules, regulations, directives, and orders of the Michigan Civil Rights Commission which may be in effect prior to the taking of bids for any individual state project.

7. Contractor will furnish and file compliance reports within such time and upon such forms as provided by the Michigan Civil Rights Commission, said forms may also elicit information as to the practices, policies, program, and employment statistics of each subcontractor as well as Contractor itself, and said Contractor will permit access to its books, records, and accounts by the Michigan Civil Rights Commission and/or its agent, for purposes of investigation to ascertain compliance with this contract and relevant with rules, regulations, and orders of the Michigan Civil Rights Commission.

8. In the event that the Civil Rights Commission finds, after a hearing held pursuant to its rules, that Contractor has not complied with the contractual obligations under this Agreement, the Civil Rights Commission may, as part of its order based upon such findings, certify said findings to the Administrative Board of the State of Michigan, which Administrative Board may order the cancellation of the contract found to have been violated and/or declare Contractor ineligible for future contracts with the state and its political and civil subdivisions, departments, and officers, and including the governing boards of institutions of higher education, until Contractor complies with said order of the Civil Rights Commission. Notice of said declaration of future ineligibility may be given to any or all of the persons with whom Contractor is declared ineligible to contract as a contracting party in future contracts. In any case before the Civil Rights Commission in which cancellation of an existing contract is a possibility, the contracting agency shall be notified of such possible remedy and shall be given the option by the Civil Rights Commission to participate in such proceedings.

9. Contractor will include, or incorporate by reference, the provisions of the foregoing paragraphs (1) through (8) in every subcontract or purchase order unless exempted by the rules, regulations or orders of the Michigan Civil Rights Commission, and will provide in every subcontract or purchase order that said provisions will be binding upon each subcontractor or seller.

APPENDIX B

ASSURANCES THAT CONTRACTORS AND SUBCONTRACTORS MUST MAKE PURSUANT TO US DOT REGULATION 49 CFR § 26, *et seq*

A. Contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex, in the performance of this contract. Contractor shall carry out applicable requirements of 49 CFR § 26 in the award and administration of DOT-assisted contracts. Failure of the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

1. Withholding monthly progress payments;
2. Assessing sanctions;
3. Liquidated damages; and/or
4. Disqualifying the Contractor from further bidding as non-responsible.

B. Each contract Contractor signs with a subcontractor must include the preceding assurance.

THE PROJECT AND THE PARTIES

1.01 FOR: CATA RTU REPLACEMENTS

1.02 DATE: _____ (BIDDER TO ENTER DATE)

1.03 SUBMITTED BY: (BIDDER TO ENTER NAME AND ADDRESS)

A. Bidder's Full Name _____
   1. Address _____
   2. City, State, Zip_____

1.04 OFFER

A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Progressive AE for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____
_____ dollars
($_____), in lawful money of the United States of America.

C. We have included the required security deposit as required by the Instruction to Bidders.

D. We have included the required performance assurance bonds in the Bid Amount as required by the Instructions to Bidders.

E. All applicable federal taxes are included and State of Michigan taxes are included in the Bid Sum.

1.05 ACCEPTANCE

A. This offer shall be open to acceptance and is irrevocable for 90 days from the bid closing date.

B. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.06 CONTRACT TIME

A. If this Bid is accepted, we will complete the project within nine months award date.

1.07 CHANGES TO THE WORK

A. When Architect establishes that the method of valuation for Changes in the Work will be net cost plus a percentage fee in accordance with General Conditions, our percentage fee will be:
   1. ___10_ percent overhead and profit on the net cost of our own Work;
   2. ___5__ percent on the cost of work done by any Subcontractor.

B. On work deleted from the Contract, our credit to Owner shall be Architect-approved net cost plus ____0____ of the overhead and profit percentage noted above.

1.08 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.

1.09 BID FORM SIGNATURE(S)

A. The Corporate Seal of

B. _____

C. (Bidder - print the full name of your firm)

D. was hereunto affixed in the presence of:

E. _____

F. (Authorized signing officer, Title)

G. (Seal)

H. _____

I. (Authorized signing officer, Title)

1.10 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADD ADDITIONAL FORMS OF EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE.

END OF BID FORM

PROJECT: CATA RTU REPLACEMENTS

PROJECT NO. : 75820015

To: Progressive AE; Attention: Pam Young; youngp@progressiveae.com

Re: _____

From: _____ Date: _____

DESCRIPTION:

Specification Title: _____

Section No.: _____ Page: _____

Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____

Trade Name: _____

Model No.: _____

Web Site: _____

SUPPORTING DATA ATTACHED:

- Attached data to include product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are to be clearly identified.

- Attached data to also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

( ) Drawings ( ) Product Data ( ) Samples ( ) Tests ( ) Reports ( ) _____

THE UNDERSIGNED CERTIFIES:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.

- Same warranty will be furnished for proposed substitution as for specified product.

- Same maintenance service and source of replacement parts, as applicable, is available.

- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.

- Proposed substitution does not affect dimensions and functional clearances.

- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

Signed by: (printed) _____

(signature) _____

Address: _____

Email: _____

A/E'S REVIEW AND ACTION:

( ) Substitution approved - Make submittals in accordance with Specification Section 01 6000 - Product Requirements, Substitution Procedures.

( ) Substitution approved as noted - Make submittals in accordance with Specification Section 01 6000, Substitution Procedures.

( ) Substitution rejected - Use specified materials.

( ) Substitution request received too late - Use specified materials.

Remarks _____

Signed by: _____ Date: _____

END OF SECTION

FORM OF GENERAL CONDITIONS

1.01 GENERAL CONDITIONS

A. The General Conditions of the contract for Construction (AIA Document A201, 1997) Articles 1 through 14, as published by the American INstitute of Architects, are herewith made part of the specifications.

B. Reference to the General Conditions can be made at the Architect's office, or copies may be obtained from the American Institute of Architects, 1735 New York Avenue, NW, Washington DC 20006.

C. The General conditions are modified in certain particulars. See Section 00 7300 - Supplementary conditions.

1.02 RELATED REQUIREMENTS

A. SECTION 00 7300 - Supplementary Conditions.

1.03 SUPPLEMENTARY CONDITIONS

A. REFER TO DOCUMENT 00 7300 - Supplementary Conditions FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 - General Conditions and other provisions of the Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.

B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 RELATED SECTIONS

A. Section 01 4216 - Definitions.

1.03 MODIFICATIONS TO GENERAL CONDITIONS

A. General Conditions of Contract for Construction (American Institute of Architects, Document A201, 2007 edition, Articles 1 through 15 inclusive) as modified hereinafter are hereby made part of these specifications to same extent as if bound herein and shall apply to all Contractors, separate Contractors, and/or subcontractors.

B. The following supplements shall modify, delete, and/or add to the General Conditions. Where any article or paragraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect, and the supplemental provisions shall be considered as added thereto. Where any article, paragraph, or subparagraph in the General Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph, or subparagraph not so amended, voided, or superseded shall remain in effect.

C. ARTICLE 1 - GENERAL PROVISIONS

1. CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS
    a. Add "and to make all working systems operational" to the first sentence of 1.2.1.
    b. Add 1.2.1.1 and 1.2.1.2 as follows:
    c. "1.2.1.1 Figures given on the drawings govern scale measurements, and large scale governs small scale. Discrepancies shall be brought to the attention of the Architect for interpretation; and the Architect's decision, in writing, shall govern."
    d. "1.2.1.2 If the drawings and specifications disagree in themselves or with each other, estimate on and furnish the greater quantity or better quality unless otherwise instructed in writing by the Architect."
2. INTERPRETATION
    a. Add 1.4.2 as follows:
    b. Request for Interpretation: Contractor shall utilize the following procedure to procure specific written interpretation of an item in the contract documents.
        1) The Request for Interpretation form included herein must be faxed or e-mailed to the Architect. Responses will be forwarded back to the Contractor promptly or, in special exceptions where a prompt answer is not possible, a fax or e-mail will be returned promptly stating that the issue is being reviewed and a response will be available by the date stated. The Contractor will complete the following items on the form:
            (a) RFI inquiry number (assigned by Contractor),
            (b) Check the type of question (architectural, civil, structural, mechanical, electrical).
            (c) Drawing and specification reference numbers.
            (d) Advise of any potential cost/schedule impacts.
            (e) Describe the question.
            (f) Contractor recommendation considering field conditions.
        2) Fax or e-mail to Architect.
        3) All questions will be handled by fax or e-mail as stated above. No telephone/verbal responses will be provided except in extreme emergencies. In such instances, an RFI confirming the verbal communication must be submitted by the Contractor for record purposes, as reasonably practical within 5 business days.

4) All questions and responses given by the Architect during field visits will be documented in Field Reports. The Contractor should not wait for the Architect's visit to the site to obtain responses, but questions should be faxed or e-mailed to the Architect as they occur."

3. OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS, AND OTHER INSTRUMENTS OF SERVICE
   a. Add 1.5.3 as follows:
   b. Electronic media copies of the documents are available upon written request. Requesting party shall utilize "Agreement for Use of Electronic Media" form included herein, fill out completely, and e-mail to Architect for approval. Payment must be received by Progressive AE before electronic media can be released.
      1) List all documents requested.
         (a) Indicate CAD format/version requested.
         (b) Clearly identify purpose for request.
         (c) Submit check payable to "Progressive AE" in the correct amount. Identify on the check the Project Name and Number, and reference "Electronic Media."
         (d) Sign form as indicated, including e-mail address and telephone number, and submit accordingly to Progressive AE."

D. ARTICLE 3 - CONTRACTOR
   1. REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR
      a. Delete Subparagraph 3.2.2 and substitute the following:
      b. Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3. The Contractor shall take field measurements and verify field conditions and other information known to the Contractor with the contract documents before commencing activities. Errors, inconsistencies or omissions discovered or made known to the Contractor shall be reported to the Architect promptly as a request for information in such form as the Architect may require."
   2. WARRANTY
      a. Add to 3.5.2 as follows:
      b. "The Contractors shall guarantee their work for a period of 1 year from the date of Substantial Completion and shall leave the work in perfect order at completion. Neither the final certificate of payment nor any provision in the contract documents shall relieve the Contractor of the responsibility for negligence or faulty material or workmanship within the extent and period provided by law. Upon written notice, he/she shall remedy the defects due thereto and shall pay all expenses for any damage to other work resulting therefrom. Any material or system specifically specified to have a longer guarantee period shall be guaranteed for the length of the specified time."
   3. CUTTING AND PATCHING OF WORK
      a. Add 3.14.3 as follows:
      b. "3.14.3 Permission to patch any areas or items of work does not imply a waiver of the Architect's right to require complete removal and replacement if, in Architect's opinion, said patching does not satisfactorily restore the quality and appearance of the work."
   4. CLEANING UP
      a. Add 3.15.3 as follows:
      b. "3.15.3 Contractor shall also clean and remove all broken or scratched glass and replace it with new glass meeting the requirements of the specifications; shall remove all paint droppings, spots, stains, and dirt from finished surfaces; and shall thoroughly clean all plumbing fixtures, hardware, and floors. Carpet shall be vacuum cleaned. To the maximum extent that is reasonably possible, each Contractor shall keep the interior of the building free from waste combustible material and debris at all times."

E. ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

1. ARCHITECT'S ADMINISTRATION OF THE CONTRACT
   a. Add 4.2.7.1 as follows:
   b. "4.2.7.1 Architect's Action: General: Except for submittals for the record and similar purposes, where action and return on submittals are required or requested, the Architect will review each submittal and mark with appropriate "action" with reasonable promptness. Where the submittal must be held for coordination, the Architect will so advise the Contractor without delay. The Architect's review of a specific item shall not indicate review of an assembly of which the item is a component.
      1) Architect's Action Stamp: The Architect will stamp each submittal to be returned with a uniform, self explanatory action stamp, appropriately marked and executed. It shall read as follows:
         (a) "Corrections or comments made on the shop drawings during this review do not relieve Contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, coordinating his/her work with that of all other trades, and performing his/her work in a safe and satisfactory manner.
         (b) Marking X Reviewed
            (1) Final unrestricted release. Where the submittals are marked as above, the work covered by the submittal may proceed, provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.
         (c) Marking X Furnish as Corrected
            (1) Final but restricted release. When submittals are marked as above, work covered by submittal may proceed, provided it complies with both Architect's notations or corrections on the submittal and with the requirements of the contract documents; acceptance of the work will depend on that compliance.
         (d) Marking X Revise and Resubmit
            (1) Returned for resubmittal. When submittal is marked as above, revise or prepare new submittal in accordance with Architect's notations stating reasons for returning submittal; cloud all revisions to expedite review; resubmit submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site or elsewhere where work is in progress.
         (e) Marking X Rejected
            (1) Returned for resubmittal. When the submittal is marked as above, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal, or prepare a new submittal in accordance with the Architect's notations stating the reasons for returning the submittal. Resubmit the submittal without delay. Repeat if necessary to obtain a different action marking. Do not permit submittals with the above marking to be used at the project site or elsewhere where work is in progress."

F. ARTICLE 9 - PAYMENTS AND COMPLETION
   1. SUBSTANTIAL COMPLETION
      a. Add 9.8.4 as follows:
      b. "9.8.4. The Contractor is obligated to complete the punch list items of the work within 60 days after the issuance of the Certificate of Substantial Completion unless otherwise noted in said Certificate. In the event the Contractor fails to complete the punch list items to the satisfaction of the Owner and within the time specified, the Owner may elect to give notice and complete the work in accordance with Article 2.4."

G. ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

1. SAFETY OF PERSONS AND PROPERTY
   a. Add 10.2.1.4 as follows:
   b. "10.2.1.4 The Contractor shall assume the responsibility for the protection of all finished construction under his/her contract and shall repair and restore any and all damage to his/her finished construction to its original state."

H. ARTICLE 11 - INSURANCE AND BONDS
1. CONTRACTOR'S LIABILITY INSURANCE
   a. Revise 11.1.1: In the first line, following the word "business," insert the following: ". . . and acceptable to the Owner . . . ."
   b. Add to 11.1.2 as follows:
   c. "The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability required by law or by those shown below and shall include contractual liability insurance as applicable to the Contractor's obligations under Paragraph 3.18:
   d. Workmen's Compensation: Statutory
   e. Employer's Liability: $500,000--Each Accident
      1) $500,000--Disease, Policy Limit
         (a) $500,000--Disease, Each Employee
   f. General Liability (Including Premises - Operations, Independent Contractors' Protective, Products and Completed Operations, Broad Form Property Damage):
      1) Bodily Injury: $1,000,000--Each Occurrence
         (a) $2,000,000--Aggregate or Combined Single Limit
      2) Property Damage: $1,000,000--Each Occurrence
         (a) $2,000,000--Aggregate or Combined Single Limit
      3) Products and completed operations insurance shall be maintained for a minimum of 2 years after final payment with evidence of such coverage being provided on an annual basis.
      4) Property damage liability insurance shall include coverage for explosion, collapse, and underground hazards.
      5) Contractual Liability (Hold Harmless):
         (a) Bodily Injury: $1,000,000--Each Occurrence
         (b) Property Damage: $1,000,000--Each Occurrence
            (1) $1,000,000--Aggregate
      6) If the general liability policy includes a general aggregate, such general aggregate shall not be less than $2,000,000.
   g. Umbrella Excess Liability:
      1) Over Primary Insurance: $ 1,000,000
      2) Maximum Retention: $ 10,000
   h. Automobile Liability (Owned, Nonowned, Hired):
      1) Bodily Injury: $1,000,000--Each Person
         (a) $1,000,000--Each Accident
      2) Property Damage: $ 500,000--Each Occurrence
   i. Certificates of Insurance: Before commencing the work, the Contractor shall furnish the Owner with certificates of insurance showing the companies carrying the previously named coverages with the effective dates and expiration dates of each policy. The Owner and Architect shall be named additional insured with respect to comprehensive general liability and automobile coverages. The certificates shall provide that the policies may not be changed or terminated during the term mentioned except upon not less than 30 days' written notice to the Owner. Contractors shall, if requested, exhibit policies to the Owner.
   j. Fire Insurance and Certain Other Risks: The Contractor shall assume the risk of loss/damage to its machinery, tools/equipment, and field offices (including contents). The Contractor shall also assume the risk of loss/damage to its employees' tools and effects. The Owner shall in no event be liable for any such loss/damage to such property, nor shall the Owner be liable for any such loss/damage to any property of subcontractors.
   k. Contractor's Responsibility for Personal Injury and Property Damage: Except where due to Owner's sole negligence, Contractor agrees to indemnify Owner against all liability, loss, and damage arising out of injury to persons or properties (including

Contractor's employees or properties) caused by the Contractor or his employees and agents."

I. ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK
   1. CORRECTION OF WORK
      a. Revise the second to the last sentence in 12.2.2.1 as follows:
      b. "During the one-year period for correction of the Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the right to make a claim for breach of warranty."

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF DOCUMENT

PART 1 GENERAL

1.01 PROJECT

A. Project Name: CATA RTU Replacements

B. The Project consists of the RTU replacement at both the CTC and the Tranter Street Facility.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price.

1.03 OWNER OCCUPANCY

A. Owner intends to occupy the Project while work is ongoing.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Use of site and premises by the public.

B. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

B. Section 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

C. Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

D. Section 01 2100 - Allowances: Payment procedures relating to allowances.

E. Section 01 2200 - Unit Prices: Monetary values of unit prices; Payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

D. Forms filled out by hand will not be accepted.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

H. Submit one electronic and three hard-copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3000.
   3. Current construction photographs specified in Section 01 3000.
   4. Partial release of liens from Subcontractors and vendors.
   5. Affidavits attesting to off-site stored products.

6. Retainage: 10 percent through substantial completion and 5 percent thereafter until final payment.

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

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.
   4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. On request, provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

F. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.
   2. Requirements of Owner - Contractor Agreement.
   3. Requirements of General and Supplementary General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500 SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 4325 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).

B. Section 00 6325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

C. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
      b. Regulatory changes.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.
   4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.
   6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms included in the Project Manual are adequate for this purpose, and must be used.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):

1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Substitutions will not be considered under one or more of the following circumstances:
1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.
1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's design-related professional design services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 3100 - Available Project Information: Soil investigation data.

B. Section 01 3000 - Administrative Requirements: Submittal procedures.

C. Section 01 4216 - Definitions.

D. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2019.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2018.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2017.

1.04 DEFINITIONS

A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:

a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
   1. Structural Design of Formwork: As described in Section 03 1000 - Concrete Forming and Accessories.
   2. Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
   3. Structural Design of Steel Connections: As described in Section 05 1200 - Structural Steel Framing.
   4. Structural Design of Steel Connections: As described in Section 05 2100 - Steel Joist Framing.
   5. Structural Design of Steel Decking: As described in Section 05 3100 - Steel Decking.
   6. Structural Design of Metal Framing: As described in Section 05 4000 - Cold-Formed Metal Framing.
   7. Structural Design of Metal Fabrications: As described in Section 05 5000 - Metal Fabrications.
   8. Structural Design of Stairs: As described in Section 05 5100 - Metal Stairs.
   9. Structural Design of Railings: As described in Section 05 5213 - Pipe and Tube Railings.
   10. Structural Design of Wood Trusses: As described in Section 06 1753 - Shop-Fabricated Wood Trusses
   11. Structural Design: Include physical characteristics, engineering calculations, and resulting dimensional limitations as described in Section 08 4313 - Aluminum-Framed Storefronts.
   12. Structural Design: Include calculations for resisting wind loads, anchor locations, loads at points of attachment to building structure, physical characteristics, resulting dimensional limitations as described in Section 08 4413 - Glazed Aluminum Curtain Walls.
   13. Structural Design: Include calculations for resisting wind loads, physical characteristics, resulting dimensional limitations as described in Section 08 4500 - Translucent Wall and Roof Assemblies.
   14. Structural Design of Floor System: As described in Section 09 6900 - Access Flooring.
   15. Structural Design and Calculations: As described in Section 10 7113.43 - Fixed Sun Screens.
   16. Structural Design of Foundation: As described in Section 10 7500 - Flagpoles.
   17. Design of Structural Components: Include development of shop drawings, and performing shop and site work, as described in Section 13 3419 - Metal Building Systems.
   18. Design of Structural Components: As described in Section 14 2100 - Electric Traction Elevators.
   19. Design of Structural Components: As described in Section 14 2400 - Hydraulic Elevators.
   20. Sprinkler Layout: Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 21 1300 - Fire-Suppression Sprinkler Systems.
   21. Design of Structural Fill: As described in Section 31 2323 - Fill.
   22. Design of Geofoam Fill: As described in Section 31 2323.43 - Geofoam.
   23. Design of Piles: As described in Section 31 6316 - Auger Cast Grout Piles.
   24. Structural Calculations and Design: As described in Section 32 3223 - Segmental Retaining Walls

1.06 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
   1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
      a. Full name.
      b. Professional licensure information.
      c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
1. Include:
a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Compliance with Contract Documents.
k. When requested by Architect, provide interpretation of results.
2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a

Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.08 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.09 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

C. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in the State in which the Project is located.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

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

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

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

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY OF REFERENCE STANDARDS

A. Regulatory requirements applicable to this project are the following:
1. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
2. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
3. 29 CFR 1910 - Occupational Safety and Health Standards; current edition.
4. ICC (IFC) - International Fire Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
5. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
6. Building Code: Michigan Building Code 2015.
7. Plumbing Code: Michigan Plumbing Code 2015.
8. Mechanical Code: Michigan Mechanical Code 2015.
9. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
10. Electrical Code: NEC 2014 (State of Michigan Electrical Code) 2014 National Electrical Code with Part 8 amendments 2015.
11. Electrical Residential Code (1 and 2 family dwellings and townhouses): Michigan Residential Code 2015.
12. Energy Code: Michigan Uniform Energy Code 2015.
13. Residential Energy Code: Michigan Residential Code 2015 - Chapter 11
14. Erosion and Sedimentation Control Regulations: _____.
15. Wetland Protection: Goemare-Anderson Wetland Protection Act 203, 1979, and all subsequent amendments.
16. Inland Lakes and Streams: Inland Lakes and Streams Act 346, 1972, and all subsequent amendments.
17. Construction Lien Laws:
18. Wage Rates: https://sam.gov/wage-determination/MI20210084/8
19. Equal Opportunity for Employment (Michigan): comply with all applicable provisions of the Federal Civil rights Act and the Michigan Fair Employment Practices Act.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

1.03 PERMITS, FEES, AND NOTICES

A. Contractor(s) responsibilities shall be in accordance with Article 3.7 of the General Conditions of the Contract [except as noted below].

1.04 QUALITY ASSURANCE

A. Contractor's Designer Qualifications: Refer to Section - 01 4000 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Other definitions are included in individual specification sections.

1.02 DEFINITIONS

A. Furnish: To supply, deliver, unload, and inspect for damage.

B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.

C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

D. Provide: To furnish and install.

E. Supply: Same as Furnish.

Specifier note: Use the following if you are using the AIA A201 - General Conditions of the Contract. **Verify terms used in other versions of a General Conditions or terms and conditions.**

1.03 THE FOLLOWING TERMS ARE DEFINED IN THE GENERAL CONDITIONS OF THE CONTRACT:

A. Architect.

B. Change Order.

C. Claim.

D. Construction Change Directive.

E. Contract.

F. Contract Document.

G. Contract Sum.

H. Contract Time.

I. Contractor.

J. Date of Commencement of the Work.

K. Day.

L. Defective.

M. Drawings.

N. Instruments of Service.

O. Modification.

P. Owner.

Q. Product Data.

R. Project.

S. Samples.

T. Separate Contractor.

U. Shop Drawings.

V. Specifications.

W. Subcontractor.

X. (Date of) Substantial Completion.

Y. Sub-subcontractor.

Z. Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made using or containing CFC's or HCFC's used in the manufacturing process.
   2. Containing lead, cadmium, or asbestos.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

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

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

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site.

3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
3. Field changes of dimension and detail.
4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Additional information as specified in individual product specification sections.

D. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Manufactured sleeve-seal systems.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 09 9123 - Interior Painting: Preparation and painting of interior piping systems.

C. Section 22 0553 - Identification for Plumbing Piping and Equipment: Piping identification.

D. Section 23 0553 - Identification for HVAC Piping and Equipment: Piping identification.

E. Section 23 0719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

D. Buy America: All products must meet Buy America criteria.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Manufacturers:
   1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

C. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

D. Pipe Passing Through Below Grade Exterior Walls:
   1. Zinc coated or cast iron pipe.
   2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

E. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Manufacturers:
   1. Flexicraft Industries; PipeSeal: www.flexicraft.com/#sle.

B. Modular/Mechanical Seal:
   1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
   2. Provide watertight seal between pipe and wall/casing opening.
   3. Elastomer element size and material in accordance with manufacturer's recommendations.
   4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

3.02 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
   2. Aboveground Piping:
      a. Pack solid using mineral fiber in compliance with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
   4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

E. Manufactured Sleeve-Seal Systems:
   1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
   2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   3. Locate piping in center of sleeve or penetration.
   4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   5. Tighten bolting for a water-tight seal.
   6. Install in accordance with manufacturer's recommendations.

F. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pressure gauges and pressure gauge taps.

B. Thermometers and thermometer wells.

1.02 RELATED REQUIREMENTS

A. Section 23 0993 - Sequence of Operations for HVAC Controls.

B. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014.

D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.05 FIELD CONDITIONS

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

1.06 QUALITY ASSURANCE

A. Buy America: All products must meet Buy America criteria.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com.
   2. Moeller Instrument Company, Inc: www.moellerinstrument.com.
   3. Omega Engineering, Inc: www.omega.com.
   4. Weiss Instruments, LLC : www.weissinstruments.com.
   5. Amtek, Inc: www.ametekusg.com.
   6. Weksler-Gauges: www.weksler-gauges.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch diameter.
   3. Mid-Scale Accuracy: One percent.
   4. Scale: Psi.

2.02 PRESSURE GAUGE TAPPINGS

A. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.

B. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.03 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Dwyer Instruments, Inc: www.dwyer-inst.com.
   2. Omega Engineering, Inc: www.omega.com.
   3. Weiss Instruments, LLC : www.weissinstruments.com.
   4. Amtek, Inc: www.ametekusg.com.
   5. Weksler Glass Thermometer Corp: www.wekslerglass.com.

B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Accuracy: 2 percent, per ASTM E77.
   4. Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: 3/4 inch NPT brass.
   4. Accuracy: 2 percent, per ASTM E77.
   5. Calibration: Degrees F.

2.04 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.05 TEST PLUGS

A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for minimum 500 psig at temperatures up to 200 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.

C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Provide siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.

D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

E. Install thermometers in air duct systems on flanges.

F. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 0923. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.

G. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

H. Coil and conceal excess capillary on remote element instruments.

I. Provide instruments with scale ranges selected according to service with largest appropriate scale.

J. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

K. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

L. Locate test plugs where indicated.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

1.02 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

A. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

1.05 QUALITY ASSURANCE

A. Buy America: All products must meet Buy America criteria.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Terminal Units: Tags.

B. Heat Transfer Equipment: Nameplates.

C. Piping: Pipe markers.

D. Pumps: Nameplates.

E. Tanks: Nameplates.

2.02 MANUFACTURERS

A. Brady Corporation: www.bradycorp.com.

B. Champion America, Inc: www.Champion-America.com.

C. Seton Identification Products: www.seton.com/aec.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.03 NAMEPLATES

A. Manufacturers:
   1. Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
   2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.
   4. Plastic: Comply with ASTM D709.

2.04 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
   2. Brady Corporation: www.bradycorp.com.
   3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   4. Seton Identification Products, a Tricor Company: www.seton.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

E. Identify valves in main and branch piping with tags.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in I-P (inch-pound) units only.

1.04 QUALITY ASSURANCE

A. To avoid conflicts, the Testing and Balancing subcontractor is not to be the the controls subcontractor engaged in this project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

D. Pre-Qualified TAB Agencies:
   1. Synergy - Engineers.
   2. Great Lakes Test and Balance.
   3. Mechanical Testing Service..
   4. Third Coast Test and Balance.
   5. Control Solutions Inc.
   6. Substitutions: See Section 01 6000 - Product Requirements.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Promptly report abnormal conditions in mechanical systems or conditions that prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

3.03 AIR SYSTEM PROCEDURE

3.04 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Effect system balance with automatic control valves fully open to heat transfer elements.

D. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

E. Measure each branch flow at coils to set differential pressure sensor on variable flow pumping systems at critical branch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jackets and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2016.

H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 5 years of experience.

C. Buy America: All products must meet Buy America criteria.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.07 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Manufacturers:
   1. Basis of Design: Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com.
   2. CertainTeed Corporation: www.certainteed.com.
   3. Johns Manville Corporation: www.jm.com.
   4. Owens Corning Corporation: www.ocbuildingspec.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. K Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 650 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 5 by 5.

H. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Armacell LLC; AP Armaflex: www.armacell.us.
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. K Value: 0.28 at 75 degrees F.
   2. Minimum Service Temperature: Minus 40 degrees F.
   3. Maximum Service Temperature: 180 degrees F.
   4. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
      b. Proto Corp PVC Fitting Covers: www.protocorporation.com
      c. Substitutions: See Section 01 6000 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.
   3. Covering Adhesive Mastic: Compatible with insulation.

B. Protective Covering for Interior and Exterior Jackets and Fittings: Zeston Series 2000 PVC, 15 mil thickness, ASTM 1784.

C. Interior Applications: Vapor barrier jackets, kraft reinforced foil vapor barrier with self sealing adhesive joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

H. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

K. Extend Vapor barrier jacket and insulation through hangers, wall sleeves and floor sleeves to maintain vapor barrier. Pipe clamp supports are also required to have continuous vapor barrier and insulation.

L. Insulated piping with vapor barrier: Insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

M. Provide an insert, not less than 6 inches long, of the same thickness as adjoining insulation between support saddle and piping under the finish vapor barrier jacket to prevent insulation from crushing at support points. Inserts to be treated wood blocks or other heavy density insulating material. Factory fabricated inserts may be used.

N. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return:
      a. Pipe Size Range: 1 1/2 inch and smaller.
         1) Glass Fiber Insulation.
         2) Thickness: 1 1/2 inch.
      b. Pipe Size Range: 2 inch and larger.
         1) Glass Fiber Insulation.
         2) Thickness: 2 inch.
   2. Low Pressure Steam Piping (15 PSIG or Less):
      a. Pipe Size Range: 4 inch and smaller.
         1) Glass Fiber Insulation.
         2) Thickness: 2 1/2 inch.
      b. Pipe Size Range: 5 inch and larger.
         1) Glass Fiber Insulation.
         2) Thickness: 3 inch.
   3. Low Pressure Gravity Steam Condensate (15 PSIG or Less):
      a. Pipe Size Range: 4 inch and smaller.
         1) Glass Fiber Insulation.
         2) Thickness: 2 1/2 inch.
      b. Pipe Size Range: 5 inch and larger.
         1) Glass Fiber Insulation.
         2) Thickness: 3 inch.

B. Cooling Systems:
   1. Condensate Drains from Cooling Coils:
      a. Flexible Elastomeric Cellular Insulation:
         1) Pipe Size Range: 1/2-6 inch.
         2) Thickness: 1 inch.
   2. Refrigerant Suction:
      a. Flexible Elastomeric Cellular Insulation:
         1) Pipe Size Range: [1/2-3] inch.
         2) Thickness: [1] inch.
   3. Refrigerant Hot Gas:
      a. Flexible Elastomeric Cellular Insulation:
         1) Pipe Size Range: [1/2-3] inch.
         2) Thickness: [1] inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Ball valves and actuators.
   2. Butterfly pattern.
   3. Electronic operators.

C. Input/Output Sensors:
   1. Temperature sensors.
   2. Static pressure (air pressure) sensors.

D. Transmitters:
   1. Pressure transmitters.

1.02 RELATED REQUIREMENTS

A. Section 23 0519 - Meters and Gauges for HVAC Piping: Thermometer sockets and gauge taps.

B. Section 23 0993 - Sequence of Operations for HVAC Controls.

C. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

D. Section 23 2114 - Hydronic Specialties.

E. Section 23 2213 - Steam and Condensate Heating Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

F. Section 23 3300 - Air Duct Accessories: Installation of automatic dampers.

G. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.

C. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013 (Reaffirmed 2018).

D. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

E. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

F. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

G. ASTM B819 - Standard Specification for Seamless Copper Tube for Medical Gas Systems; 2019.

H. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

I. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

L. UL 444 - Communications Cables; Current Edition, Including All Revisions.

M. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).

N. ANSI/AMCA 500-D- Laboratory methods of testing dampers for rating.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

E. Operation and Maintenance Data: Include inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.

F. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Thermostats and Other Exposed Sensors: One of each type.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience approved by manufacturer.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

E. Buy America: All products must meet Buy America criteria.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CABLE

A. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.

B. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.

C. Cable Applications:
   1. All Control System Applications: Use listed NFPA 70 Type CMP plenum cable.

D. Aluminum conductors shall not be used under any circumstances.

2.03 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.04 CONTROL VALVES

A. Ball Valves and Actuators:
   1. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).
   2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
   3. Replacements in Kind: Provide pressure-independent type.
   4. Rangeability: 500 to 1.
   5. ANSI Rating: Class 150.
   6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   7. Body Size:
      a. Service Temperature:
         1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
         2) Ambient Side: From minus 4 to 122 degrees F.
   8. Actuator Requirements:
      a. Assembly: Factory-mounted.
      b. Input: 0 to 5 VDC configured for proportional control.
      c. Accessories: Provide with valve position indicator and manual override.

B. Butterfly Pattern:
   1. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.
   2. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F.
      b. Size for 1 psig maximum pressure drop at design flow rate.

C. Electronic Operators:
   1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
   2. Select operator for full shut off at maximum pump differential pressure.

2.05 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Performance Characteristics:
      a. RTD:
         1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
      b. Thermistor:
         1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
      c. Sensing Range:
         1) Use temperature transmitters in conjunction with RTD's when RTD's are incompatible with DDC controller direct temperature input.
   2. Room Temperature Sensors and Thermostats:
      a. Type S1 - Wall sensor with occupancy override, based on Schneider Micronet MN-S2.
      b. Type S2 - Wall sensor with occupancy override and temperature adjustment, based on Schneider Micronet MN-S3.

B. Static Pressure (Air Pressure) Sensors:
   1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
   2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
   3. Accuracy: One percent of full scale with repeatability 0.3 percent.
   4. Output: 0 to 5 vdc with power at 12 to 28 vdc.

2.06 TRANSMITTERS

A. Pressure Transmitters:
   1. One pipe direct acting indicating type for gas, liquid, or steam service, range suitable for system, proportional electronic output.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide separable sockets for liquids and flanges for air bulb elements.

C. Provide valves with position indicators and with pilot positioners where sequenced with other controls.

D. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.

E. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.

F. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of NFPA 70.
   1. Cable and wiring installed in return air plenums shall be plenum rated.

3.03 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of control system for one year from Date of Substantial Completion.

D. Provide complete service of controls systems, including call backs, and submit written report of each service call.

END OF SECTION

SECTION 23 0993 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
   1. Air terminal units.
   2. Roof top units.
   3. Makeup air units.
   4. Cabinet heaters.
   5. Boilers.
   6. Hydronic pumps.
   7. Heating coils.
   8. Unit heaters.
   9. Exhaust fans.
   10. Dryer exhaust fans.
   11. Infrared gas-fired radiant heaters.
   12. Snowmelt

1.02 RELATED REQUIREMENTS

A. Section 23 0913 - Instrumentation and Control Devices for HVAC.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
   1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
   2. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in the contract documents.
   3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
   5. Include schedules, if known.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include flow diagrams for each control system, graphically depicting control logic.
   3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
   4. Include draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.
   5. Include all monitoring, control and virtual points specified in elsewhere.
   6. Include a key to all abbreviations.

D. Points List: Submit list of all control points indicating at least the following for each point.
   1. Name of controlled system.
   2. Point abbreviation.
   3. Point description; such as dry bulb temperature, airflow, etc.
   4. Display unit.

5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 STEAM-TO-HEATING HOT WATER HEAT EXCHANGER (HX-1)

A. Hot Water System Run Conditions:
   1. The hot water system shall be enabled to run whenever their is a call for heat or re-heat.
   2. The hot water system system shall also run for freeze protection whenever outside air temperature is less than 38°F (adj.)

B. Hot Water System Pump (P-1, P-2):
   1. The hot water pump shall run anytime there is a call for heat or reheat and shall have a user definable delay (adj.) on stop.
   2. Alarms shall be provided as follows:
      a. Hot Water Pump Failure: Commanded on, but the status is off.
      b. Hot Water Pump Running in Hand: Commanded off, but the status is on.
      c. Hot Water Pump Runtime Exceeded: Status runtime exceeds a user definable limit.

C. Hot Water Supply Temperature Setpoint Reset:
   1. The hot water supply temperature setpoint shall reset based on outside air temperature.
   2. As outside air temperature rises from 0°F (adj.) to 70°F (adj.) the hot water supply temperature setpoint shall reset downwards by subtracting from 0°F (adj.) up to 40°F (adj.) from the current boiler setpoint.
      a. 100°F supply temperature at 70°F outdoor air temperature.
      b. 180°F supply temperature at 0°F outdoor air temperature.

D. Primary Hot Water Temperature Monitoring:
   1. The following temperatures shall be monitored:
      a. Primary hot water supply.
      b. Primary hot water return.
   2. Alarms shall be provided as follows:
      a. High Primary Hot Water Supply Temp: If greater than 200°F (adj.).
      b. Low Primary Hot Water Supply Temp: If less than 100°F (adj.).

3.02 HEATING HOT WATER PUMPS (P-1, P-2)

A. Hot Water Pump Run Conditions:
   1. The hot water pumps shall be enabled whenever outside air temperature is less than 65°F (adj.).
   2. The pumps shall run continuously for freeze protection anytime outside air temperature is less than 38°F (adj.).
   3. To prevent short cycling, the pumps shall run for and be off for minimum adjustable times (both user definable).

B. Hot Water Pump Lead/Lag Operation:
   1. The two variable speed hot water pumps shall operate in a lead/lag fashion.
      a. The lead pump shall run first.
      b. On failure of the lead pump, the lag pump shall run and the lead pump shall turn off.
      c. On decreasing hot water differential pressure, the lag pump shall stage on and run in unison with the lead pump to maintain hot water differential pressure setpoint.

2. The designated lead pump shall rotate upon one of the following conditions (user selectable):
   a. manually through a software switch
   b. if pump runtime (adj.) is exceeded
   c. daily
   d. weekly
   e. monthly
3. Alarms shall be provided as follows:
   a. Hot Water Pump 1
      1) Failure: Commanded on, but the status is off.
      2) Running in Hand: Commanded off, but the status is on.
      3) Runtime Exceeded: Status runtime exceeds a user definable limit.
   b. Hot Water Pump 2
      1) Failure: Commanded on, but the status is off.
      2) Running in Hand: Commanded off, but the status is on.
      3) Runtime Exceeded: Status runtime exceeds a user definable limit.

C. Hot Water Differential Pressure Control:
1. The controller shall measure hot water differential pressure and modulate the hot water pump VFDs or EC motors in sequence to maintain its hot water differential pressure setpoint.
2. The following setpoints are recommended values. All setpoints shall be field adjusted during the commissioning period to meet the requirements of actual field conditions.
3. The controller shall modulate hot water pump speeds to maintain a hot water differential pressure of 8-12lbf/in2 (adj.) based on the test and balancing procedures. The VFDs or EC motors minimum speed shall not drop below 20% (adj.).
4. Differential pressure setpoint is to be reset downward based on valve positions until one valve is nearly wide open.
5. On dropping hot water differential pressure, the VFDs shall stage on and run to maintain setpoint as follows:
   a. The controller shall modulate the lead VFD to maintain setpoint.
   b. If the lead VFD speed is greater than a setpoint of 90% (adj.), the lag VFD shall stage on.
   c. The lag VFD or EC motor shall ramp up to match the lead VFD speed and then run in unison with the lead VFD or EC motor to maintain setpoint.
6. On rising hot water differential pressure, the VFDs or EC motors shall stage off as follows:
   a. If the VFDs speeds drops back to 60% (adj.) below setpoint, the lag VFD or EC motor shall stage off.
   b. The lead VFD or EC motor shall continue to run to maintain setpoint.
7. Alarms shall be provided as follows:
   a. High Hot Water Differential Pressure: If 25% (adj.) greater than setpoint.
   b. Low Hot Water Differential Pressure: If 25% (adj.) less than setpoint.
8. Install differential pressure sensors in the hot water piping. Install sensors near the last system coil for direct return system. Install sensors near the first and last coils for reverse return systems.

D. Hot Water Temperature Monitoring:
1. The following temperatures shall be monitored:
   a. Hot water supply.
   b. Hot water return.
2. Alarms shall be provided as follows:
   a. High Hot Water Supply Temp: If the hot water supply temperature is greater than 200°F (adj.).
   b. Low Hot Water Supply Temp: If the hot water supply temperature is less than 100°F (adj.).

3.03 VARIABLE AIR VOLUME TERMINAL UNITS

A. Run Conditions - Scheduled:
1. The unit shall run according to a user definable time schedule in the following modes:
   a. Occupied Mode: The unit shall maintain

1) A 74°F (adj.) cooling setpoint
2) A 70°F (adj.) heating setpoint.

b. Unoccupied Mode (night setback): The unit shall maintain
1) A 85°F (adj.) cooling setpoint.
2) A 55°F (adj.) heating setpoint.

2. Alarms shall be provided as follows:
a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

B. Zone Setpoint Adjust:
1. The occupant shall be able to adjust the zone temperature heating and cooling setpoints at the zone sensor.
2. Applicable for sensors with this option. See specification section 23 0913 for sensor requirements and drawings for sensor assignments.

C. Variable Volume Terminal Unit - Flow Control:
1. The unit shall maintain zone setpoints by controlling the airflow through one of the following:
a. Occupied:
1) When zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum occupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.
2) When the zone temperature is less than the cooling setpoint, the zone damper shall maintain the minimum required zone ventilation (adj.).
b. Unoccupied:
1) When the zone is unoccupied the zone damper shall control to its minimum unoccupied airflow (adj.).
2) When the zone temperature is greater than its cooling setpoint, the zone damper shall modulate between the minimum unoccupied airflow (adj.) and the maximum cooling airflow (adj.) until the zone is satisfied.

D. Reheating Coil Valve:
1. The controller shall measure the zone temperature and modulate the reheating coil valve open on dropping temperature to maintain its heating setpoint.

E. Reheating - High Discharge Air Temperature Limit:
1. The controller shall measure the discharge air temperature and limit reheating if the discharge air temperature is more than 15°F (adj.) above the zone temperature.

F. Discharge Air Temperature:
1. The controller shall monitor the discharge air temperature.
2. Alarms shall be provided as follows:
a. High Discharge Air Temp: If the discharge air temperature is greater than 120°F (adj.).
b. Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.).

3.04 VARIABLE AIR VOLUME ROOF TOP UNITS (TRANTER ADMIN BUILDING: RTU-1, RTU-2, RTU-3, RTU-4, RTU-5 ---- CTC BUILDING: RTU-3, RTU-4)

A. Run Conditions - Scheduled:
1. The unit shall run based upon an operator adjustable schedule.

B. Freeze Protection:
1. The unit shall shut down and generate an alarm upon receiving a freezestat status.

C. High Static Shutdown:
1. The unit shall shut down and generate an alarm upon receiving an high static shutdown signal.

D. Return Air Smoke Detection:
1. The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.

E. AHU Optimal Start:

1. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied setpoints. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.

F. Supply Fan:
   1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime. Provide current sensor on each fan.
   2. Alarms shall be provided as follows:
      a. Supply Fan Failure: Commanded on, but the status is off.
      b. Supply Fan in Hand: Commanded off, but the status is on.
      c. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

G. Supply Air Duct Static Pressure Control:
   1. The controller shall measure duct static pressure and shall modulate the supply fan VFD speed to maintain a duct static pressure setpoint. The supply fan VFD speed shall not drop below 30% (adj.). The static pressure setpoing shall be reset based upon the position of the zone dampers, with a goal of reducing the static pressure unil at least one zone damper is nearly wide open. Measure duct static pressure 2/3 rd's of the way down the supply duct.
      a. The initial duct static pressure setpoint shall be 1.5 in H2O (adj.).
      b. If no zone damper is nearly wide open, the setpoint shall incrementally reset down to a minimum of 1.3 in H2O (adj.).
      c. As one or more dampers nears the wide open position, the setpoint shall incrementally reset up to a maximum of 1.8 in H2O (adj.).
   2. Alarms shall be provided as follows:
      a. High Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) greater than setpoint.
      b. Low Supply Air Static Pressure: If the supply air static pressure is 25% (adj.) less than setpoint.
      c. Supply Fan VFD Fault.

H. Powered Exhaust Fan:
   1. The powered exhaust fan shall run whenever the supply fan runs and outside air dampers are open. Provide current sensor on each fan.
   2. Alarms shall be provided as follows:
      a. Powered Exhaust Fan Failure: Commanded on, but the status is off.
      b. Powred Exhaust Fan in Hand: Commanded off, but the status is on.
      c. Powered Exhaust Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).
      d. Powered Exhaust Fan VFD Fault.

I. Building Static Pressure Control:
   1. The controller shall measure building static pressure and modulate the exhaust fan ECM speed to maintain a building static pressure setpoint of 0.05 in H2O (adj.). The exhaust fan speed shall not drop below 20% (adj.).

J. Supply Air Temperature Setpoint - Optimized:
   1. The controller shall monitor the supply air temperature and shall maintain a supply air temperature setpoint reset based on zone cooling and heating requirements
   2. The supply air temperature setpoint shall be reset for cooling based on zone cooling requirements as follows:
      a. The initial supply air temperature setpoint shall be 55°F (adj.).
      b. As cooling demand increases, the setpoint shall incrementally reset down to a minimum of 53°F (adj.).
      c. As cooling demand decreases, the setpoint shall incrementally reset up to a maximum of 72°F (adj.) .
   3. If more zones need heating than cooling, then the supply air temperature setpoint shall be reset for heating as follows:
      a. The initial supply air temperature setpoint shall be 82°F (adj.).
      b. As heating demand increases, the setpoint shall incrementally reset up to a maximum of 85°F (adj.).

c. As heating demand decreases, the setpoint shall incrementally reset down to a minimum of 72°F (adj.).

K. Cooling Stage:
1. The controller shall measure the supply air temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling , there shall be a user definable (adj.) delay between stages, and each stage shall have a user definable (adj.) minimum runtime.
2. The cooling shall be enabled whenever the following conditions are met:
a. Outside air temperature is greater than 60°F (adj.).
b. The economizer (if present) is disabled or fully open.
c. The supply fan status is on.
d. The heating (if present) is not active.
3. Alarms shall be provided as follows:
a. High Supply Air Temp: If the supply air temperature is 5°F (adj.) greater than setpoint.

L. Gas Heating Stage:
1. The controller shall measure the supply air temperature and modulate the heating to maintain its heating setpoint.
2. The heating shall be enabled whenever the following conditions are met:
a. Outside air temperature is less than 65°F (adj.).
b. The supply fan status is on.
c. The cooling (if present) is not active.
3. The heating stage shall run for freeze protection whenever:
a. Supply air temperature drops from 40°F to 35°F (adj.) and the supply fan status is on.
4. Alarms shall be provided as follows:
a. Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

M. Enthalpy Economizer:
1. The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain the minimum adjustable position whenever occupied.
2. The economizer shall be enabled whenever the following conditions are met:
a. Outside air temperature is less than 65°F (adj.).
b. AND the outside air enthalpy is less than 22 Btu/lb (adj.)
c. AND the outside air temperature is less than the return air temperature.
d. AND the supply fan status is on.
3. The economizer shall close whenever:
a. Mixed air temperature drops from 40°F to 35°F (adj.).
b. OR the freezestat (if present) is on.
c. OR on loss of supply fan status.
4. The motorized outside and exhaust air dampers shall close and the motorized return air damper shall open when the unit is off. If Optimal Start Up is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

N. Dehumidification
1. The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at or below 60% RH (adj.).
2. Dehumidification shall be enabled whenever the supply fan status is on.

O. Mixed Air Temperature:
1. The controller shall monitor the mixed air temperature and use as required for economizer control (if present) or preheating control (if present).
2. Alarms shall be provided as follows:
a. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
b. Low Mixed Air Temp: If the mixed air temperature is less than 45°F (adj.).

P. Return Air Carbon Dioxide (CO2) Concentration Monitoring:
1. The controller shall measure the return air CO2 levels.
2. Alarms shall be provided as follows:

a. High Return Air Carbon Dioxide Concentration: If the return air CO2 concentration is greater than 1000ppm (adj.) when in the occupied mode.

Q. Return Air Humidity:
1. The controller shall monitor the return air humidity and use as required for economizer control (if present) or humidity control (if present).
2. Alarms shall be provided as follows:
a. High Return Air Humidity: If the return air humidity is greater than 70% (adj.).
b. Low Return Air Humidity: If the return air humidity is less than 35% (adj.).

R. Return Air Temperature:
1. The controller shall monitor the return air temperature and use as required for setpoint control or economizer control (if present).
2. Alarms shall be provided as follows:
a. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
b. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).

S. Supply Air Temperature:
1. The controller shall monitor the supply air temperature.
2. Alarms shall be provided as follows:
a. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
b. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

3.05 SINGLE ZONE VARIABLE AIR VOLUME ROOF TOP UNITS (CTC BUILDING: RTU-1, RTU-2, RTU-5, RTU-6)

A. Operation: Single zone variable air volume.

B. Run Conditions - Scheduled:
1. The unit shall run in an occupied or unoccupied mode based on a user definable time schedule.
2. Occupied Mode
a. The supply fan shall run continuously.
b. The outside air damper shall modulate to minimum position.
c. The unit shall maintain space temperature:
1) A 74°F (adj.) cooling setpoint.
2) A 70°F (adj.) heating setpoint.
3. Unoccupied Mode
a. The supply fan shall turn off.
b. The outside air damper shall fully close.
c. If the space sensor falls below the unoccupied heating setpoint, the supply fan shall start and shall run until the sensor is satisfied.
d. If the space sensor reads above the unoccupied cooling setpoint, the supply fan shall start and shall stage cooling as required and run until the sensor is satisfied.
e. The unit shall maintain:
1) A 85°F (adj.) cooling setpoint.
2) A 55°F (adj.) heating setpoint.
4. Alarms shall be provided as follows:
a. High Zone Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
b. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (adj.).

C. Optimal Start:
1. The unit shall use an optimal start algorithm for morning start-up. This algorithm shall minimize the unoccupied warm-up or cool-down period while still achieving comfort conditions by the start of scheduled occupied period.

D. Freeze Protection:
1. The unit shall shut down and generate an alarm upon receiving a freezestat status.

E. Cooling Operation - DX & Economizer:
1. The fan speed shall be at minimum 50% (adj.).

2. On a call for cooling, the fresh air dampers shall modulate open. The rate of economizer modulation is based on deviation of the zone temperature from setpoint: the further away from setpoint, the faster the fresh air damper will open.
3. When economizer conditions are not suitable for space cooling, primary cooling is staged on (or modulated open).
4. To prevent compressor short cycling, there shall be a user definable (adj.) delay between cooling stages, and each stage shall have a user definable (adj.) minimum runtime.
5. When available cooling through primary cooling is not sufficient to meet the space load demands, the supply fan motor speed shall ramp up ramp up in order to meet the load.
6. Hot gas re-heat to stage on when cooling demand is low and humidity is high utilizing factory control.

F. Dehumidification:
1. The controller shall measure the return air humidity and override the cooling sequence to maintain return air humidity at or below 60% relative humidity (adj.).
2. Dehumidification shall be enabled whenever the supply fan status is on.
3. Reheating Coil Valve / Hot Gas Re-Heat:
   a. The controller shall measure the zone temperature and modulate the reheating coil valve open on dropping temperature to maintain its heating setpoint.
   b. The controller shall measure the discharge air temperature and limit reheating if the discharge air temperature is more than 15°F (adj.) above the zone temperature.

G. Heating Operation:
1. When there is not a call for cooling (call for heating), the fan speed shall modulate to minimum speed 50% (adj.) and the heating valve shall modulate open / stage on.
2. The fan speed shall modulate such that the mixed air temperature does not fall to below 50°F (adj.).

H. Enthalpy Economizer:
1. The controller shall measure the mixed air temperature and modulate the economizer dampers in sequence to maintain a setpoint 2°F (adj.) less than the supply air temperature setpoint. The outside air dampers shall maintain the minimum adjustable position whenever occupied.
2. The economizer shall be enabled whenever the following conditions are met:
   a. Outside air temperature is less than 65°F (adj.).
   b. AND the outside air enthalpy is less than 22 Btu/lb (adj.)
   c. AND the outside air temperature is less than the return air temperature.
   d. AND the supply fan status is on.
3. The economizer shall close whenever:
   a. Mixed air temperature drops from 40°F to 35°F (adj.).
   b. OR the freezestat (if present) is on.
   c. OR on loss of supply fan status.
4. The motorized outside and exhaust air dampers shall close and the motorized return air damper shall open when the unit is off. If Optimal Start Up is available the mixed air damper shall operate as described in the occupied mode except that the outside air damper shall modulate to fully closed.

I. Powered Exhaust Fan:
1. The return fan shall run whenever the supply fan runs. Provide current sensor on each fan.
2. Alarms shall be provided as follows:
   a. Powered Exhaust Fan Failure: Commanded on, but the status is off.
   b. Powered Exhaust Fan in Hand: Commanded off, but the status is on.
   c. Powered Exhaust Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

J. Building Static Pressure Control:
1. The controller shall measure building static pressure and modulate the exhaust fan ECM speed to maintain a building static pressure setpoint of 0.05 in H2O (adj.). The exhaust fan speed shall not drop below 20% (adj.).

K. Return Air Smoke Detection:

1. 1. The unit shall shut down and generate an alarm upon receiving a return air smoke detector status.

L. Supply Fan:
1. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.
2. The supply fan VFD speed shall not drop below 30% (adj.).
3. Alarms shall be provided as follows:
   a. Supply Fan Failure: Commanded on, but the status is off.
   b. Supply Fan in Hand: Commanded off, but the status is on.
   c. Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

M. Mixed Air Temperature:
1. The controller shall monitor the mixed air temperature and use as required for heating and economizer control.
2. Alarms shall be provided as follows:
   a. High Mixed Air Temp: If the mixed air temperature is greater than 90°F (adj.).
   b. Low Mixed Air Temp: If the mixed air temperature is less than 50°F (adj.).

N. Return Air Carbon Dioxide (CO2) Concentration Monitoring:
1. The controller shall measure the return air CO2 levels.
2. Alarms shall be provided as follows:
   a. High Return Air Carbon Dioxide Concentration: If the return air CO2 concentration is greater than 1000ppm (adj.) when in the occupied mode.

O. Return Air Temperature:
1. The controller shall monitor the return air temperature and use as required for economizer control (if present).
2. Alarms shall be provided as follows:
   a. High Return Air Temp: If the return air temperature is greater than 90°F (adj.).
   b. Low Return Air Temp: If the return air temperature is less than 45°F (adj.).

P. Supply Air Temperature:
1. The controller shall monitor the supply air temperature.
2. Alarms shall be provided as follows:
   a. High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).
   b. Low Supply Air Temp: If the supply air temperature is less than 45°F (adj.).

Q. Return Air Humidity:
1. The controller shall monitor the return air humidity and use as required for economizer control or humidity control.
2. Alarms shall be provided as follows:
   a. High Return Air Humidity: If the return air humidity is greater than 70% (adj.).

3.06 SPLIT SYSTEM AIR CONDITIONING UNITS (AC-1/CU-1)

A. Utilize factory thermostat/controls or provide sensor as necesssary for sequence and monitoring noted below.

B. Run Conditions:
1. The unit shall run continuously and shall maintain:
   a. A 85°F (adj.) cooling setpoint.
   b. Alarms shall be provided as follows:
      1) High Space Temp: If the zone temperature is greater than the cooling setpoint by a user definable amount (adj.).
      2) Low Space Temp: If the zone temperature is less than the cooling setpoint by a user definable amount (adj.).

C. Emergency Shutdown:
1. The unit shall shut down and generate an alarm upon receiving an emergency shutdown signal.

D. Fan:
1. The fan shall run anytime the unit is commanded to run, unless shutdown on safeties.

E. Cooling Stage:
   1. The controller shall measure the zone temperature and stage the cooling to maintain its cooling setpoint. To prevent short cycling, the stage shall have a user definable (adj.) minimum runtime.

F. Discharge Air Temperature:
   1. The controller shall monitor the discharge air temperature.
   2. Alarms shall be provided as follows:
      a. High Discharge Air Temp: If the discharge air temperature is greater than 75°F (adj.).
      b. Low Discharge Air Temp: If the discharge air temperature is less than 40°F (adj.).

G. Fan Status:
   1. The controller shall monitor the fan status.
   2. Alarms shall be provided as follows:
      a. Fan Failure: Commanded on, but the status is off.
      b. Fan in Hand: Commanded off, but the status is on.
      c. Fan Runtime Exceeded: Fan status runtime exceeds a user definable limit (adj.).

3.07 OUTDOOR AIR MONITORING (CONFIRM/REVISE EXISTING)

A. Outside Air Conditions:
   1. The controller shall monitor the outside air temperature and humidity and calculate the outside air enthalpy on a continual basis. These values shall be made available to the system at all times.
   2. Alarm shall be generated as follows:
      a. Sensor Failure: Sensor reading indicates shorted or disconnected sensor. In the event of a sensor failure, an alternate outside air conditions sensor shall be made available to the system without interruption in sensor readings.
   3. If an OA Temp Sensor cannot be read, a default value of 65°F will be used.
   4. If an OA Humidity Sensor cannot be read, a default value of 50 % will be used.

B. Outside Air Temperature History:
   1. The controller shall monitor and record the high and low temperature readings for the outside air. These readings shall be recorded on a daily, month-to-date, and year-to-date basis.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hydronic system requirements.
B. Heating water piping, above grade.
C. Equipment drains and overflows.
D. Pipe hangers and supports.
E. Unions, flanges, mechanical couplings, and dielectric connections.
F. Valves:
   1. Ball valves.
   2. Butterfly valves.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
C. Section 23 0553 - Identification for HVAC Piping and Equipment.
D. Section 23 0719 - HVAC Piping Insulation.
E. Section 23 2114 - Hydronic Specialties.
F. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
C. ASME A13.1- Scheme for the Identification of Piping Systems.
D. ASME B1.20.1- Pipe Threads, General Purpose (inch)
E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.
F. ASME B16.9 – Factory Made Wrought Butt Welded Fittings
G. ASME B16.15 - Cast Copper Alloy Threaded Fittings Classes 125 and 250; 2013.
H. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
I. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
J. ASME B16.26- Cast Copper Alloy Fittings for Flared Copper Tube
K. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2013.
L. ASME B16.51- Copper and Copper Alloy Press-Connect Pressure Fittings
M. ASME B31.1 – Chemical Plant and Petroleum Refining Piping
N. ASME B31.9 - Building Services Piping; 2014.
O. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
P. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2014.
Q. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
R. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2003 (Reapproved 2009).
S. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
T. ASTM A-449 – Quenched and Tempered Steel Bolts and Studs
U. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
V. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

W. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

X. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

Y. ASTM B813- Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

Z. ASTM B828- Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings

AA. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

AB. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2006.

AC. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

AD. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

AE. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2008).

AF. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

AG. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

AH. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

AI. UL 508 - Industrial Control Equipment; Underwriters Laboratories Inc; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Include data on pipe materials, pipe fittings, valves, and accessories.
   2. Provide manufacturers catalog information.
   3. Indicate valve data and ratings.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with documented experience.

C. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

D. Welder Qualifications: Certify in accordance with ASME BPVC-IX.
   1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

E. Buy America: All products must meet Buy America criteria.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
   1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
   2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
   3. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges or unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated on plans or specification:
   1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
   2. Install unions downstream of valves and at equipment or apparatus connections.
   3. Install brass male adapters each side of valves in cooper piped systems. Sweat solder adapters to pipe.
   4. For throttling, bypass, or manual flow control services, use globe or ball valves.
   5. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves. At AHUs with multiple coils, provide valve for each coil supply and return.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.02 HEATING WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
   1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
   2. Threaded Joints: ASME B16.3, malleable iron fittings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
      b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2.03 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
   1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, 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.
   5. Vertical Support: Steel riser clamp.
   6. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
   7. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:

B. Flanges for Pipe 2 Inches and Greater:

C. Dielectric Connections:
   1. Waterways:
      a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
      b. Dry insulation barrier able to withstand 600-volt breakdown test.
      c. Construct of galvanized steel with threaded end connections to match connecting piping.
      d. Suitable for the required operating pressures and temperatures.

2.06 BALL VALVES

A. Up To and Including 2 Inches:
   1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

B. Over 2 Inches:
   1. Ductile iron body, chrome plated stainless steel ball, teflon or Virgin TFE seat and stuffing box seals, lever handle or gear operated, flanged ends, rated to 800 psi.

2.07 BUTTERFLY VALVES

A. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.

B. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.

C. Operator: 10 position lever handle.

PART 3 EXECUTION

3.01 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 using jointing system specified.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

E. After completion, fill, clean, and treat systems. See Section 23 2500 for additional requirements.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and to avoid interference with use of space.

D. Group piping whenever practical at common elevations.

E. Sleeve pipe passing through partitions, walls, and floors.

F. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified.

G. Slope piping and arrange to drain at low points.

H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 0516.

I. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

J. Pipe Hangers and Supports:
1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 22 0719.

L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 3100.

M. Use eccentric reducers to maintain top of pipe level.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

O. Install valves with stems upright or horizontal, not inverted.

P. Auxiliary drain pan's to be equipped with a water-level detection device conforming to UL 508 that will shut off the equipment served prior to overflow of the pan.

3.03 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. All hot water systems shall be chemically cleaned after all items of equipment have been connected to the system and all piping has been completed. Cleaning shall be done prior to installing chemical treatment or glycol, and prior to acceptance by the Owner. See Section 23 25 00 for cleaning requirements:
5. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
6. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
7. Fire stopping shall meet the requirements of ASTM E814. Pipe insulations or fire resistive coating shall be removed where the pipe passes through a fire stop and, if required by the firestop manufacturer, for 3 inches beyond the firestop outside of the fire barrier.

B. Perform the following tests on steel and/or copper hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure, or 100 psi, whichever is greater. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed

90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

5. After hydrostatic test pressure has been successfully applied for at least 2 hours, contact owner's representative for 15 minute inspection period. Examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing, with owner's representative signature verifying 15 minutes with zero pressure loss

C. Perform the following before operating the system:
1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Pressure-temperature test plugs.

F. Balancing valves.

G. Relief valves.

1.02 RELATED REQUIREMENTS

A. Section 23 2113 - Hydronic Piping.

B. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

C. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

E. Project Record Documents: Record actual locations of flow controls.

F. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Buy America: All products must meet Buy America criteria.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 EXPANSION TANKS

A. Manufacturers:
   1. Amtrol Inc: www.amtrol.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Armstrong Fluid Technology: www.armstrongfluidtechnology.com.
   4. Wessels: www.westank.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

C. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psi.

D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.02 AIR VENTS

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. ITT Bell & Gossett: www.bellgossett.com.
   3. Armstrong Fluid Technology: www.armstrongfluidtechnology.com.
   4. Metraflex : www.metraflex.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

C. Float Type:
   1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

2.03 AIR SEPARATORS

A. Centrifugal Air Separators/Strainers:
   1. Manufacturers:
      a. ITT Bell & Gossett: www.bellgossett.com.
      b. Amtrol
      c. Wessels: www.westank.com/.
      d. Armstrong Fluid Technology: www.armstrongfluidtechnology.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.
   2. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.
   3. Maximum Service Flow and Pressure: 16 gpm at 125 psi.

B. Air Elimination Valve: Bronze, float operated, for 125 psig operating pressure.

2.04 STRAINERS

A. Manufacturers:
   1. Armstrong Fluid Technology: www.armstrongfluidtechnology.com.
   2. The Metraflex Company: www.metraflex.com.
   3. Victaulic: www.victaulic.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Under:
   1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. Magnet: Strainer shall be equipped with minimum 8000 Gauss magnet(s). Magnets shall be neodymium. A 304 stainless steel magnet tube shall be installed in a 304 stainless steel drywell.

2.05 PRESSURE-TEMPERATURE TEST PLUGS

A. Manufacturers:
   1. Ferguson Enterprises Inc: www.fnw.com.
   2. Peterson Equipment Company Inc: www.petesplug.com.
   3. Sisco Manufacturing Company Inc: www.siscomfg.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

C. Application: Use extended length plugs to clear insulated piping.

2.06 BALANCING VALVES

A. Manufacturers:
   1. Ferguson Enterprises Inc: www.fnw.com.

2. Hays Fluid Controls: www.haysfluidcontrols.com.
3. ITT Bell & Gossett: www.bellgossett.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Size 2 inch and Smaller:
1. Provide ball style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
2. Metal construction materials consist of brass.
3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.

C. Size 2.5 inch and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and flanged or weld end connections.
2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
3. Internal components construction materials consist of brass or EPDM.

2.07 RELIEF VALVES

A. Manufacturers:
1. Armstrong International, Inc: www.armstronginternational.com.
2. ITT Bell & Gossett: www.bellgossett.com.
3. Cash Acme
4. Watts
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Support tanks inside building from building structure.

C. Adjust the charge of expansion tanks to actual system pressure (including pre-charged tanks).

D. Where large air quantities can accumulate, provide enlarged air collection standpipes.

E. Provide manual air vents at system high points and as indicated.

F. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain. Provide ball valve for isolation.

G. Provide air separator on suction side of system circulation pump and connect to expansion tank.

H. Remove air separator start-up strainer after system cleaning is completed.

I. Provide valved drain and hose connection on strainer blow down connection. Provide cap and chain.

J. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

K. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

L. Pipe relief valve outlet to nearest floor drain.

M. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vertical in-line pumps.

1.02 RELATED REQUIREMENTS

A. Section 23 0719 - HVAC Piping Insulation.

B. Section 23 2113 - Hydronic Piping.

C. Section 23 2114 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

A. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

1.04 PERFORMANCE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Millwright's Certificate: Certify that base mounted pumps have been aligned.

1.06 QUALITY ASSURANCE

1.07 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL 778 as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Armstrong Pumps Inc: www.armstrongpumps.com.

B. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com.

C. Taco

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 HVAC PUMPS - GENERAL

A. Buy America: All equipment must meet Buy America criteria.

B. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

C. Base Mounted Pumps: Aligned by qualified millwright.

D. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.

2.03 VERTICAL IN-LINE PUMPS

A. Type: Vertical, single stage, close coupled, radially or horizontally split casing, for in-line mounting, for 175 psi working pressure.

B. Casing: Cast iron, with suction and discharge gauge port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed directly to motor shaft or extension.

D. Shaft: Carbon steel with stainless steel impeller cap screw or nut and bronze sleeve.

E. Seal: Mechanical seal, 225 degrees F maximum continuous operating temperature.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

D. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.

E. Provide air cock and drain connection on horizontal pump casings.

F. Provide drains for bases and seals, piped to and discharging into floor drains.

G. Check, align, and certify alignment of base-mounted pumps prior to start-up.

H. Qualified millwright shall check, align, and certify base mounted pumps prior to start-up.

I. Lubricate pumps before start-up.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe and pipe fittings.

B. Pipe hangers and supports.

C. Steam piping system.

D. Steam condensate piping system.

1.02 RELATED REQUIREMENTS

A. Section 23 0553 - Identification for HVAC Piping and Equipment.

B. Section 23 0719 - HVAC Piping Insulation.

1.03 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

B. ASME B31.1 - Power Piping; 2014.

C. ASME B31.9 - Building Services Piping; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.04 SYSTEM DESCRIPTION

A. When more than one piping system material is selected, ensure systems components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

B. Use unions and flanges downstream of valves and at equipment or apparatus connections. Use dielectric unions where joining dissimilar materials. Do not use direct welded or threaded connections.

C. Use gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Use globe valves for throttling, bypass or manual flow control services.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Project Record Documents: Record actual locations of valves.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section, with minimum 5 years of documented experience.

C. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

D. Buy America: All products must meet Buy America criteria.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labelling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 and ASME B31.1 code for installation of piping system.

B. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of welders.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

2.02 LOW PRESSURE STEAM PIPING (15 PSIG MAXIMUM)

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
   1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A 234/A 234M wrought steel Class 125.
   2. Joints: Screwed for pipe 2 inches and under; ANSI/AWS D1.1. welded for pipe over 2 inches.

2.03 LOW PRESSURE STEAM CONDENSATE PIPING

A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
   1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
   2. Joints: Screwed for pipe 2 inches and under; ANSI/AWS D1.1, welded for pipe over 2 inches.

2.04 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

E. Vertical Support: Steel riser clamp.

F. Floor Support for Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

H. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

I. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

J. Shield for Insulated Piping 2 inches and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

K. Shield for Insulated Piping 2 1/2 inches and larger: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long, with protection saddle.

2.05 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:
   1. Ferrous Piping: 150 psig galvanized malleable iron, threaded.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

PART 3 EXECUTION

3.01 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.

D. Keep open ends of pipe free from scale and dirt. Whenever work is suspended during construction protect open ends with temporary plugs or caps.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Sleeve pipe passing through partitions, walls, and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Place hangers within 12 inches of each horizontal elbow.
   4. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   7. Provide copper plated hangers and supports for copper piping.
   8. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access where valves and fittings are not exposed.

J. Slope steam piping one inch in 40 feet in direction of flow. Use eccentric reducers to maintain bottom of pipe level. Provide drip trap assembly at low points.

K. Slope steam condensate piping one inch in 40 feet. Provide drip trap assembly at low points and before control valves. Run condensate lines from trap to nearest condensate receiver. Provide loop vents over trapped sections.

L. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

M. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 9123.

N. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
   3. 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.
   4. 2-1/2 inch: Maximum span, 9 feet; minimum rod size, 3/8 inch.

B. Hanger Spacing for Steel Steam Piping.
   1. 1/2 inch: Maximum span, 8 feet; minimum rod size, 1/4 inch.
   2. 3/4 inch and 1 inch: Maximum span, 9 feet; minimum rod size, 1/4 inch.

3. 1-1/4 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
4. 1-1/2 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
5. 2 inches: Maximum span, 13 feet; minimum rod size, 3/8 inch.
6. 2-1/2 inches: Maximum span, 14 feet; minimum rod size, 3/8 inch.

C. Hanger Spacing for Steel Steam Condensate Piping.
1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
6. 3 inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steam traps.

B. Steam air vents.

C. Condensate return units.

1.02 RELATED REQUIREMENTS

A. Section 23 0716 - HVAC Equipment Insulation.

B. Section 23 0719 - HVAC Piping Insulation.

C. Section 23 2213 - Steam and Condensate Heating Piping.

1.03 REFERENCE STANDARDS

A. ASME B31.9 - Building Services Piping; 2014.

B. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).

C. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2014).

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide for manufactured products and assemblies required for this project.
   2. Include product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes.
   3. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
   4. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Indicate application, selection, and hookup configuration. Include pipe and accessory elevations.

D. Operation and Maintenance Data: Include installation instructions, servicing requirements, and recommended spare parts lists.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Pump Seals: One set for each type and size of pump.
   3. Steam Trap Service Kits: One for each type and size.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Michigan standard for installation of boilers and pressure vessels.
   1. Maintain one copy of each document on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

C. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose indicated.

D. Buy America: All products must meet Buy America criteria.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 STEAM TRAPS

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. Spirax-Sarco: www.spiraxsarco.com/us.
   3. Watson McDaniel: www.Watson McDaniel.com.
   4. Illinois: www.ilmechsales.com.

B. Steam Trap Applications:
   1. Use Thermostatic Steam Traps for:
      a. Steam radiation units.
      b. Convectors.
      c. Unit ventilators.
   2. Use Float and Thermostatic Traps for:
      a. Unit heaters.
      b. Converters.
      c. Heating coils.
   3. Use Inverted Bucket Steam Traps for:
      a. Main headers.
      b. Branch lines.

C. Steam Trap Performance:
   1. Select to handle minimum of two times maximum condensate load of apparatus served.
   2. Pressure Differentials:
      a. Low Pressure Systems (5 psi and less): 1/4 psi.
      b. Medium Pressure Steam (25 psi maximum): 5 psi.

D. Inverted Bucket Traps: ASTM A126, cast iron or semi-steel body with bolted cover, brass bucket, stainless steel seats and plungers, and stainless steel lever mechanism with knife edge operating surfaces.
   1. Rating: 60 psi WSP.
   2. Features: Access to internal parts without disturbing piping, top test plug, bottom drain plugs.
   3. Accessories:
      a. Integral inlet strainer of brass.
      b. Integral inlet check valve.
      c. Integral bimetal air vent.

E. Float and Thermostatic Traps: ASTM A126 cast iron or semi-steel body and bolted cover, stainless steel or bronze bellows type air vent, stainless steel or copper float, stainless steel lever and valve assembly.
   1. Rating: 15 psi WSP.
   2. Features: Access to internal parts without disturbing piping, bottom drain plug.
   3. Accessories: Gauge glass with shut-off cocks.

F. Thermodynamic Traps: Stainless steel body, disc, and cap.
   1. Rating: 300 psi WSP.
   2. Features:
      a. Stainless steel insulating cap.
      b. 1/4 inch steel blow down valve.
      c. Integral strainer.

G. Pressure Balanced Thermostatic Traps: ASTM A395/A395M cast iron body and bolted or screwed cover and integral ball joint union for 125 psi WSP; phosphor bronze bellows, stainless steel valve and seat, integral stainless steel strainer.

2.02 STEAM AIR VENTS

A. Manufacturers:
   1. Armstrong International, Inc: www.armstronginternational.com.
   2. Bell and Gossett, a xylem brand: www.bellgossett.com.
   3. Spirax-Sarco: www.spiraxsarco.com/us.

4. Watson McDaniel: www.Watson McDaniel.com.

B. 225 psi WSP: Balanced pressure type; ASTM A126 cast iron body and cover; access to internal parts without disturbing piping; phosphor bronze bellows, stainless steel valve and seat.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install steam and steam condensate piping and specialties in accordance with ASME B31.9.

B. Install specialties in accordance with manufacturer's instructions.

C. Steam Traps:
1. Provide minimum 3/4 inch size on steam mains and branches.
2. Install with union or flanged connections at both ends.
3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
4. Provide minimum 10 inch long, line size dirt pocket between apparatus and trap.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AHRI 710 - Performance Rating of Liquid-Line Driers; 2009.

B. AHRI 730 - Flow Capacity Rating and Application of Suction-Line Filters and Suction-Line Filter-Driers; 2005.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.

E. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

1.04 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.
   3. Use line size on leaving side of liquid solenoid valves.

C. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.
   3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
   4. Use check valves on compressor discharge.
   5. Use check valves on condenser liquid lines on multiple condenser systems.

D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

E. Strainers:
   1. Use line size strainer upstream of each automatic valve.
   2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
   3. On steel piping systems, use strainer in suction line.
   4. Use shut-off valve on each side of strainer.

F. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

G. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
   2. Use a filter-drier on suction line just ahead of compressor.
   3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
   4. Use sealed filter-driers in low temperature systems.
   5. Use sealed filter-driers in systems utilizing hermetic compressors.
   6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
   7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
   8. Use filter-driers for each solenoid valve.

H. Solenoid Valves:
   1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
   2. Use in liquid line of single or multiple evaporator systems.
   3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

I. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Test Reports: Indicate results of leak test, acid test.

F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

G. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

H. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Filter-Dryer Cartridges: One of each type and size.
   3. Extra Refrigerant: One container of refrigerant, _____ pounds size.

1.06 QUALITY ASSURANCE

A. Buy America: All products must meet Buy America criteria.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   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.
   5. Vertical Support: Steel riser clamp.
   6. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   7. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
   8. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

9. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.02 MOISTURE AND LIQUID INDICATORS

A. Manufacturers:
   1. Henry Technologies: www.henrytech.com.
   2. Parker Hannifin/Refrigeration and Air Conditioning: www.parker.com.
   3. Sporlan, a Division of Parker Hannifin: www.parker.com.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Indicators: Double port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.03 VALVES

A. Manufacturers:
   1. Henry Technologies: www.henrytech.com.
   2. Alco
   3. Sporlan
   4. Mueller Brass
   5. Superior Valves
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.04 FILTER-DRIERS

A. Performance:
   1. Flow Capacity - Liquid Line: As indicated in schedule, minimum, rated in accordance with AHRI 710.
   2. Flow Capacity - Suction Line: As indicated in schedule, minimum, rated in accordance with AHRI 730.
   3. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
   4. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Replaceable Core Type: Steel shell with removable cap.
   2. Sealed Type: Copper shell.
   3. Connections: As specified for applicable pipe type.

PART 3 EXECUTION

3.01 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.

3.02 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 avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

3.03 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
   2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.

3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

B. Hanger Spacing for Steel Piping.
1. 1/2 inch, 3/4 inch, and 1 inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
2. 1-1/4 inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
3. 1-1/2 inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
4. 2 inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
5. 2-1/2 inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials.
   1. System cleaner.
   2. Closed system treatment (water).

B. By-pass (pot) feeder.

1.02 RELATED REQUIREMENTS

A. Section 01 6000 - Product Requirements: Owner furnished treatment equipment.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

C. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.

D. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

C. Buy America: All products must meet Buy America criteria.

PART 2 PRODUCTS

2.01 MANUFACTURERS / SUPPLIERS

A. KLM Specialty chemicals:; (Tomm Heyboer 616-240-3596): www.kmlinc.com.

B. H.V. Burton Compay: www.hvburtonco.com.

C. Mitco custom water treatement : www.mitcoinc.com/index.php

D. Enerco Corporation : www.enercocorp.com.

E. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. System Cleaner:
   1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
   2. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B. Closed System Treatment (Water):
   1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
   2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
   3. Conductivity enhancers; phosphates or phosphonates.

2.03 BY-PASS (POT) FEEDER

A. Manufacturers:
   1. Griswold Controls: www.griswoldcontrols.com.
   2. J. L. Wingert Company: www.jlwingert.com.
   3. Neptune, a brand of the Dover Company: www.neptune1.com.

4. Substitutions: See Section 01 6000 - Product Requirements.

B. 2 quart quick opening cap for working pressure of 175 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.02 CLEANING SEQUENCE

A. Concentration:
1. One pound per 100 gallons of water for hot systems and one pound per 50 gallons of water for cold systems.

B. Hot Water Heating Systems:
1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
3. Circulate for 6 hours at design temperatures, then drain.
4. Refill with clean water and repeat until system cleaner is removed.

C. Use neutralizer agents on recommendation of system cleaner supplier and approval of Architect.

D. Remove, clean, and replace strainer screens.

E. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.04 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.05 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
1. Provide minimum of 1 hour of instruction for two people.
2. Have operation and maintenance data prepared and available for review during training.
3. Conduct training using actual equipment after treated system has been put into full operation.

3.06 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

C. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

D. Provide laboratory and technical assistance services during this maintenance period.

E. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single-duct terminal units.
   1. Single-duct, variable-volume units.

1.02 RELATED REQUIREMENTS

A. Section 23 0993 - Sequence of Operations for HVAC Controls.

B. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. AHRI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils; 2001 (R2011).

B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2011 with Addendum 1.

C. ASHRAE Std 130 - Methods of Testing Air Terminal Units; 2008 (R2014).

D. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2013).

E. ASTM A603 - Standard Specification for Zinc-Coated Steel Structural Wire Rope; 1998 (Reapproved 2014).

F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association; 2008.

I. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Buy America: All products must meet Buy America criteria.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for air terminal units.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

A. Manufacturers:
   1. Krueger-HVAC: www.krueger-hvac.com.
   2. Price Industries, Inc.: www.priceindustries.com.
   3. Trane, a brand of Ingersoll Rand: www.trane.com.
   4. Nailor Industries: www.nailor.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. General:
   1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.

2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:
1. Minimum 22 gauge, 0.0299 inch galvanized steel.
   a. Assembled with longitudinal lock seam construction.
   b. Casing leakage to meet ASHRAE Std 130.
2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
   a. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
      1) Secure with adhesive.
      2) Coat edges exposed to airstream with NFPA 90A approved sealant.
      3) Cover liner with non-porous foil.
   b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:
1. Heavy-gauge, galvanized steel or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.
   a. Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 inch wg inlet static pressure, tested in accordance with ASHRAE Std 130.

E. Hot Water Heating Coil:
1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
   a. Access Door: Gasketed and insulated located on bottom and downstream of coils.
2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
   a. Fins to be formed in a high heat transfer sine wave configuration.
   b. Two rows with twelve fins-per-inch heating capacity density.
3. Coil leak tested to minimum 350 psig.
   a. Minimum Burst Pressure: 1800 psi.
4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

F. Controls:
1. Airflow Sensor: Differential pressure airflow device measuring total, static, and wake pressures.
   a. Basis of Design: Price Industries, Inc; SP300 Air Flow Sensor: www.priceindustries.com.
      1) Plastic parts are fire-resistant, complying with UL 94.
      2) Provides accuracy within 5 percent with a 90 degree sheet metal elbow directly at the inlet of the assembly.
      3) Control tubing is protected by grommets at the wall of the air flow sensor's housing.
      4) Furnished with twelve total pressure sensing ports and a center averaging chamber that amplifies the sensed air flow signal.
      5) Provide velocity pressure sensor with a removable access section for maintenance.
   b. Signal accuracy: Plus/minus five percent throughout terminal operating range.
2. Control Sequence:
   a. Suitable for operation with duct pressures between 0.25 and 3.0 inch wg inlet static pressure.
   b. Include factory-mounted and piped, 5-micron filter; and adjustable, velocity-resetting, high-limit control with amplifying relay.
   c. See Section 23 0993.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.

C. Provide ceiling access doors or locate units above easily removable ceiling components.

D. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.

E. Do not support from ductwork.

F. Connect to ductwork in accordance with Section 23 3100.

3.02 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to zero percent full flow. Set units with heating coils for minimum 50 percent full flow.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shell and tube type heat exchangers.

1.02 RELATED REQUIREMENTS

A. Section 23 2114 - Hydronic Specialties.

B. Section 23 2213 - Steam and Condensate Heating Piping.

C. Section 23 2214 - Steam and Condensate Heating Specialties.

1.03 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data with dimensions, locations, and size of tappings and performance data.

C. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect internals from entry of foreign material by temporary caps on flanged openings.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for _____.

PART 2 PRODUCTS

2.01 SHELL AND TUBE TYPE HEAT EXCHANGER

A. Buy America: All equipment must meet Buy America criteria.

B. Manufacturers:
   1. Armstrong Pumps Inc: www.armstrongpumps.com/.
   2. Bell & Gossett, a xylem brand: www.bellgossett.com/.

C. Heat Transfer Configuration: Heating fluid in shell and heated fluid within tubes.

D. Water Chamber and Tube Bundle: Removable type for inspection and cleaning.

E. Comply with ASME BPVC-VIII-1 for manufacture of tubular heat exchangers and heat exchanger shells.

F. Maximum Service Temperature: 375 degree F on shell and tube sides.

G. Tubes: U-tube type with 3/4 inch OD minimum seamless copper tubes suitable for 125 psi working pressure.

H. Shell: Steel pipe with threaded or flanged piping connections and necessary tappings, steel saddle and attaching U-bolts, prime coated.

I. Heads: Cast iron or fabricated steel with steel or bronze tube sheets, threaded or flanged for piping connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Support heat exchangers from structure on threaded rods or on saddle from floor.

C. Pitch shell to completely drain condensate.

D. Pipe relief valves to nearest floor drain.

3.02 STEAM TO WATER HEAT EXCHANGER TRIM

A. Shell: Pressure gauge tapping with pigtail siphon, vacuum breaker; see Section 23 2214.

B. Water Inlet: Thermometer well, pressure gauge tapping, valved drain; see Section 23 2114.

C. Water Outlet: Thermometer well for temperature regulator sensor, ASME rated pressure and temperature relief valve, thermometer well, pressure gauge tapping; see Section 23 2114.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Packaged roof top unit.

B. Roof mounting curb and base.

C. Maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2008.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from physical damage by storing off site until roof mounting curbs are in place, ready for immediate installation of units.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane, a brand of Ingersoll Rand: www.trane.com.

B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Buy America: All equipment must meet Buy America criteria.

B. General: Roof mounted units having gas burner and electric refrigeration.

C. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan with packaged VFD, internal or external powered exhaust fan (see drawings), stainless steel heat exchanger with burner and minimum 10:1 turndown for modulating operation, hot gas reheat coil for dehumidification, controls, air filters, refrigerant cooling coil and compressor, condenser coil and condenser fan.

D. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) of less than 50.

E. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 2717.

2.03 FABRICATION

A. Cabinet: Galvanized steel with baked enamel finish, including access panels with factory installed hinges and toolless access.. Structural members shall be minimum 18 gage, 0.0478 inch, with access doors or panels of minimum 20 gage, 0.0359 inch.
   1. Single wall construction.

Editor's Note: Injected foam insulation with no through-metal connections (no thermal bridging) is generally has better thermal and acoustical performance than fiberglass insulation. It is not standard on most units. Trane and York have 1/2" and 1" fiberglass insulation as standard in the base models (R-value of 3 ft²•h•ºF/Btu). High efficiency units (AAON, Daikin Rebel and Trane's Symbio included) will have foam injected panels and publish the R-values (R-value of 9 ft²•h•ºF/Btu to 13 ft²•h•ºF/Btu). Select what is appropriate for the project. Select either Thermal Performance or individual insulation thicknesses below.

B. Thermal Performance:
   1. Panel insulation shall provide a minimum thermal resistance (R) value of 3.5 ft²•h•ºF/Btu throughout the entire unit. Insulation shall completely fill the panel cavities in all directions so that no voids exist and settling of insulation is prevented. Panel insulation shall comply with NFPA 90A.
   2. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
   3. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.

C. Leakage Performance: All casings shall be constructed to minimize leakage and shall be in accordance with duct and plenum leakage class required by ASHRAE Std 90.1 I-P or better.

2.04 FANS

A. Supply and Return Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch motor pulley, and rubber isolated hinge mounted high efficiency motor or direct drive as indicated. Isolate complete fan assembly. Refer to Section 22 0548.

B. Fans and motors: internally isolated, statically and dynamically balanced and rated for continuous operation at maximum-rated fan speed and motor horsepower.

C. Bearings shall be grease-lubricated, self alighting type, minimum L10 of 200,000 hours. Provide extended grease lines to motor an drive side of fan.

D. Fan drive and belts shall be factory mounted with final alignment and belt adjustment to be made by the Contractor after installation.

E. Roof Mounting Curb: Provide/install galvanized steel curb adapter.

2.05 BURNER

A. Gas Burner: Fan-assisted type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

B. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

C. Provide modulating control with minimum 10:1 turndown.

D. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

2.06 EVAPORATOR COIL

A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection. Drain pan shall be sloped to drain.

B. Provide thermostatic expansion valves or electronic expansion valves.

C. Each refrigerant circuit shall be completely independent including separate expansion valves.

2.07 COMPRESSOR

A. Provide hermetic scroll type compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier. Minimum 2 compressors providing minimum 4 stages of compressor operation.

2.08 MODULATING HOT GAS REHEAT

A. A reheat condenser coil shall be factory installed downstream of the unit evaporator coil. Modulating electronic valves shall control the flow of refrigerant between the indoor reheat and outdoor condensers in response to the unit discharge air temperature in order to dehumidify the space wihtout using additional energy.

B. Include humidity sensor to control activation of hot gas reheat dehumidification control.

2.09 CONDENSER COIL

A. Provide copper tube aluminum fin coil assembly with subcooling rows and coil guard.

B. Provide direct drive propeller fans, resiliently mounted with fan guard, motor overload protection, wired to operate with compressor. Provide high efficiency fan motors.

2.10 MIXED AIR CASING

A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position.

B. Provide dual enthalpy economizer control capabilities.

2.11 FILTERS

A. Minimum MERV 13 outside air intake filters and minimum MERV 8 final filters.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that roof is ready to receive work and opening dimensions are as illustrated by the manufacturer.

B. Verify that proper power supply is available.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 SYSTEM STARTUP

A. Prepare and start equipment. Adjust for proper operation.

3.04 CLOSEOUT ACTIVITIES

A. See Section 01 7900 - Demonstration and Training, for additional requirements.

3.05 MAINTENANCE

A. Provide service and maintenance of packaged roof top units for one year year from Date of Substantial Completion.

B. Provide routine maintenance service with a two month interval as maximum time period between calls.

C. Include maintenance items as outlined in manufacturer's operating and maintenance data, including minimum of six filter replacements, minimum of one fan belt replacement, and controls check-out, adjustments, and recalibration.

D. After each service call, submit copy of service call work order or report that includes description of work performed.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air cooled condensing units.

B. Indoor air handling (fan and coil) units for ducted systems.

C. Controls.

1.02 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; 2010.

E. NEMA MG 1 - Motors and Generators; 2014.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. All equipment must meet Buy America criteria.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience and approved by manufacturer.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Trane Inc: www.trane.com/.

B. Liebert DataMate: www.vertivco.com.

C. Substitutions: Not permitted.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating: None.
   2. Cooling: Outdoor electric condensing unit with evaporator coil in central ducted indoor unit.
   3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.

1. Air Flow Configuration: Upflow.
2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
2. Motor Electrical Characteristics:

C. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
2. Manufacturers: System manufacturer.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: Hermetic, two speed 1800 and 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.

E. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.
2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION