INVITATION TO BID

#21305

For

Luis Munoz-Marin AC-5 Replacement Design Build Project

FOR THE CLEVELAND MUNICIPAL SCHOOL DISTRICT
DBA: CLEVELAND METROPOLITAN SCHOOL DISTRICT
BOARD OF EDUCATION, 1111 SUPERIOR AVENUE E, SUITE 1800
CLEVELAND, OHIO 44114

UNDER THE DIRECTION OF OPERATIONS DEPARTMENT OF THE BOARD OF EDUCATION OF THE CLEVELAND METROPOLITAN SCHOOL DISTRICT - CUYAHOGA COUNTY, OHIO

Table of Contents

Part I: NOTICE OF REQUEST FOR PROPOSAL #21305

Separate Sealed Responses for the requirement set forth below will be received in the Cashier's Office of the Cleveland Metropolitan School District located at 1111 Superior Avenue E, Cleveland, Ohio 44114, until **1:00 pm current local time on July 24, 2020. Mailing of ITB responses are encouraged. However, hand deliveries will only be accepted from 11:00 AM to 1:00 PM on July 24, 2020**. This RFP will not be publicly opened.

Luis Munoz Marin AC-5 Replacement Design Build Project

Copies of Instructions to Proposers, may be obtained directly from the District's Webpage. Go to **clevelandmetroschools.org/purchasing** and click on the ITB number. If you require assistance, please email **seletha.thompson@clevelandmetroschools.org .**

There will be a Pre-Proposal Meeting for this Request for Proposal on **July 8, 2020 at 9:00 AM.** The Pre-Proposal Conference and site walk-thru will be held at the **Cleveland Metropolitan School District, Luis Munoz-Marin site, 1701 Castle Avenue, Cleveland, Ohio 44113**. Attendance at the Pre-Proposal Meeting is encouraged but not mandatory.

All questions and correspondence related to this RFP must be submitted in writing ONLY by **12:00 pm on July 10, 2020 to** seletha.thompson@clevelandmetroschools.org. All answers to corresponding questions and concerns will be sent directly to those submitting the question and will also be posted at clevelandmetroschools.org/purchasing. Any errors and/or omissions reported will be addressed via Addenda. Addenda will be issued no later than July 17, 2020**.**

A certified check for 10% of the total amount of the bid payable to the Treasurer of the Cleveland Metropolitan School District, or a satisfactory bid bond executed by the bidder and a Surety company shall be submitted with each bid on a form supplied by the bondsman. The Surety Company must be licensed to do business in the State of Ohio and acceptable to the Chief Financial and Administrative Officer. The successful bidder will be required to furnish a satisfactory performance bond amounting to 100% of the contract amount.

No bid may be withdrawn for at least ninety (90) days after the deadline for submittal.

The Cleveland Metropolitan School District reserves the right to reject any and all Proposals, to waive any and all informalities or irregularities, and to disregard all non-conforming responsive conditional Proposals.

The Cleveland Metropolitan School District does not discriminate in educational programs, activities or employment on the basis of race, color, national origin, sex, age, religion or disability.

The new Uniform Grant Guidance, 2 CFR200 (UGG) will go into effect for Cleveland Metropolitan School District (CMSD) on July 1, 2018 and will apply to awards or funding increments issued on or after this date. Purchases funded by federal grant funds must adhere to regulations found in Uniform Guidance "Super Circular", 2 CFR 200 (UGG), as a condition of receiving funds and to meet annual audit compliance. In an effort to keep policy for all grants consistent, the CMSD will implement the new federal guidelines regarding procurement utilized with federal grants immediately.

Bidders on this work shall be required to comply with all applicable requirements pertaining to fair labor, state and local government.

M. Angela Foraker
Executive Director, Procure to Pay
June 23, 2020

Section I: Instructions to Proposers

Luis Munoz Marin AC-5 Replacement Design Build Project

1. All Responses shall be made upon the Bid Form(s) furnished. All information requested in the bid and in the bid package must be filled in legibly and completely with blue ink signatures, or the bid may be considered non-responsive. No oral, telephonic or telegraphic bids or modifications will be considered. The **RFP Name and Number** must be stated on the exterior of the submission envelope(s), including shipping labels**.**

2. Responses are due at the Cashier's Office of the Board of Education, Cleveland Metropolitan School District, Administration Building, 1111 Superior Avenue E, Suite 1800, Cleveland Ohio, 44114, until **1:00 pm current local time on July 24, 2020. Mailing of ITB responses are encouraged. However, hand deliveries will only be accepted from 11:00 AM to 1:00 PM on July 24, 2020.** This RFP will not be publicly opened.

3. All submissions must include **One (1) original, with blue ink signatures, two (2) copies, and one (1) electronic format bid on a USB flash drive.** Vendors not complying with this requirement will be notified that they have twenty-four (24) hours in which to comply with this requirement or their Bid will be **disqualified.** This applies to **copies only**.

4. No Response may be withdrawn for at least ninety (90) days after receipt of bids at **1:00 p.m.** current local time, on **July 24, 2020.**

5. Written questions may be directed to the Purchasing Division via email to: **seletha.thompson@clevelandmetroschools.org no later than 12:00 pm on July 10, 2020.** The District will **NOT ACCEPT** any telephone calls regarding any of the submittals and/or "short lists." Under no circumstances should any firm interested in providing the services identified in this Bid, their designees, or anyone affiliated with their form, contact any other District employee or official during the Bid process, in an attempt to lobby or influence the selection of a vendor pursuant to this Bid. No oral, telephonic, telegraphic, or electronic modifications will be considered.

6. The Cleveland Metropolitan School District reserves the right to reject any and all Bids, to waive any and all informalities or irregularities, and to disregard all non-conforming responsive conditional bids.

7. Bidder understands and agrees that subsequent to submission of the Bid, any District resolution authorizing the award of a contract or agreement does not vest any contractual rights in the bidder.

8. Bidder understands and agrees that any such District resolution operates only to encumber funds necessary for the project and does not create a binding contract.

9. Bidder further acknowledges and agrees that any such District resolution may be revoked, at any time prior to execution of a formal, written contract.

10. Bidder acknowledges and agrees that it has no vested contractual right until such time as a purchase order and contract have been issued.

11. Bidder further acknowledges and agrees that execution of a contract and issuance of a purchase order is not a ministerial function, but is a formal requirement for acceptance of the bid.

12. Bidder must present evidence to the District, upon request, that they are fully competent and have the necessary facilities, equipment and financial resources to perform the work required in the Specifications within the time frame required.

13. Each and every page must have the bidder's company name in the header or footer.

14. No binding of any kind should be used: use only binder clips. No staples, No paper clips, No binders, No tabs should be used; use colored paper to separate Sections. Failure to comply with submission formation may result in the submittal being disqualified.

15. Any and all changes must be initialed by the bidder.

16. The District reserves the right to award the bid in whole or in parts, by item, by group of items, to a single vendor; or to multiple vendors, where such action serves the best interests of the District.

17. This RFP Response should be submitted before **1:00 p.m.** current local time, **July 24, 2020** to the Cleveland Metropolitan School District, Cashiers Office of the Cleveland Metropolitan School District, 1111 Superior Avenue E, Suite 1800 Cleveland, Ohio 44114, the submission to include **One (1) original, with blue ink signatures, two (2) copies, and one (1) electronic format bid on a USB flash drive** of the following:

a. Transmittal Cover Letter

b. Completed Bid Form with Addendum Acknowledgement including evidence of State certification to perform the work required.
Please note: ***Failing to acknowledge a published Addendum may cause your response to be rejected.***

c. Signed Acknowledgement for Instructions to Bidders.

d. Completed and notarized Bidder's Qualification Form.

e. Signed Conflict of Interest Form

f. Completed and notarized Non-Collusion Affidavit.

g. Completed and notarized EOA Compliance Declaration documents.

h. Completed and notarized Diversity Business Enterprise Participation Forms.

i. Properly executed Affidavit and/or Company Board of Directors Resolution authorizing certain person to sign legal documents such as the Bid Form, Bidder's Qualification Form, etc.

j. Completed Debarment Form

k. A certified check for 10% of the total amount of the bid payable to the Treasurer of the Cleveland Metropolitan School District, or satisfactory bid bond executed by the bidder and a Surety company shall be submitted with each bid on a form supplied by the bondsman.

18. Bidder shall not include Ohio Sales Tax in the price quoted. The Cleveland Metropolitan School District

will provide tax exempt certificate to the successful Bidder upon request.

19. SECURITY

Vendor's workmen, foremen, other personnel, and subcontractors on CMSD sight will be required to meet Cleveland Metropolitan School District security requirements. Contractor must issue personnel I.D. badges. Any worker not complying with CMSD security requirements will immediately be ordered off project and without prejudice or recourse to CMSD.

- Vendor agrees to successfully complete background checks on all of its employees, agents, and subcontractors who provide services under this Agreement to CMSD facilities. Vendor agrees to warrant that it will not at any time hire or utilize any individual to provide services under this Agreement on CMSD premises where such person has been convicted of, or pleaded guilty to, any criminal offense enumerated in O.R.C. 3319.39(B).

20. INSURANCE

The successful company, their subcontractors and suppliers of labor and/or materials for providing Repair Services for the Cleveland Metropolitan School District, including organizations having personnel, equipment and vehicles on District property, shall provide evidence of insurance as follows:

a. Commercial General Liability $1,000,000.00 Limit of Liability	-	including limited contractual liability (per occurrence)
b. Automobile Liability $1,000,000.00 Limit of Liability	-	including non-owned, and hired (per occurrence)
c. Workers Compensation	-	Workers compensation and employer's Insurance to the full extent as required
d. Professional Liability $1,000,000/ $3,000,000	-	By applicable law per occurrence/in the aggregate

This requirement must be fulfilled by the successful vendor providing the Purchasing Office of the CMSD with a current Certificate of Insurance (standard ACORD form), showing the Board of Education of the Cleveland Municipal School District as an additional insured (Certificate Holder does not constitute being an additional insured), within five (5) days of Notice of Intent to Award Agreement. The certificates of insurance shall contain a provision that the policy or policies shall not be canceled without thirty (30) days' prior written notice to the District.

The required insurance must be provided by a company licensed by the State of Ohio, which company must be financially acceptable to the Administration of the Cleveland Municipal School District

The District is not liable for vandalism which results in damage(s) to the property or vehicles of the Vendor. The school District will not reimburse for private insurance deductibles for such vandalism.

- Vandalism damage is defined as damage resulting from criminal conduct for which an individual may (but not necessarily be processed under the Ohio Revised Code

21. DIVERSITY BUSINESS GOAL

The Diversity Business and Vendor Contract Compliance Programs shall make every good faith effort to ensure that certified diversity business enterprises in the Cleveland Metropolitan School's relevant geographic market

area shall be afforded the maximum opportunity to compete for contracts, services, and purchases. The general goals for diversity business participation are: 15% for services, 20% for goods and supplies, and 30% for maintenance, construction, and repair.

Non-diversity vendors will have their diversity business participation counted toward their goal attainment only with minority vendors who are certified and demonstrate previous experience in the respective business classification of the prime contractor. Only direct participation in the subcontract will be counted toward diversity business enterprise goal attainment.

Vendors shall refer to Section V of this ITB for further information and requirements on the District's diversity goals.

The diversity business goal for this ITB is: 30% Maintenance/Construction Repair

22. ADVERTISING

In submitting a bid, Vendors agree, unless specifically authorized in writing by an authorized representative of CMSD on a case by case basis, that it shall have no right to use, and shall not use, the name of Cleveland Metropolitan School District, its officials or employees, (a) in any advertising, publicity, promotion, nor (b) to express or imply any endorsement of Agent's services.

23. The term of this agreement will begin on immediately upon selection, approval and contract execution through completion to the lowest responsive and responsible vendor. The Contract Documents consist of the following:

a. All Purchasing Documents set forth in Part I herein;
b. Certified Purchase Order or Supplier Contract to be issued to Lowest Responsive and Responsible Bidder;
c. Specifications herein;
d. Notice to Bidders;
e. Instructions to Bidders;
f. Bid Form;
g. Bid Guaranty;
h. All applicable addenda, attachments, and exhibits hereto.

The awarded Bidder shall perform all Work described in the Contract Documents, including without limitation, all terms and conditions of the specifications contained herein or otherwise stated in the bid documents and reasonably inferable therefrom by the Bidder as necessary to produce the results intended thereby for specifications and scope of work requested herein by the District.

Bids will be evaluated, first, as responsive or non-responsive to the Bid specifications. A preliminary review will be conducted of all bids submitted on time to ensure the bid adheres to the mandatory requirements specified in the Bid. Bids that do not meet the mandatory requirements will be deemed non-responsive and may be rejected. CMSD reserves the right to select the bid which most closely meets the requirements specified in the Bid. Second, the bids will be evaluated based on the information presented in the bid. The Bid will be awarded to the lowest responsive and responsible vendor

CMSD reserves the right to reject all bids and deviate from this purchasing process to utilize other purchasing mechanisms available to the district under Ohio Law. Scope review and follow-up discussions with the apparent low bidder may be requested. CMSD reserves the right to interview or to seek additional information related to criteria already specified in the Invitation to Bid after opening the bids prior to issuance a certified Purchase Order or Supplier Contract.

Part II: DISTRICT RELATED FORMS

Required Purchasing Division Documents and Instructions

Section I: Addendum Acknowledgement Form for RFP #21305

Having read and examined the Request for Proposal Documents, including the specifications, prepared by the Cleveland Metropolitan School District for the above-referenced Project, and the following Addenda:

Addendum Number	Date of Receipt
_____	_____
_____	_____
_____	_____
_____	_____

Bidder:_____.

The undersigned Vendor proposes to perform all work for the applicable contract, in accordance with the contract document for the proposed sums.

Failing to acknowledge a published Addendum may cause your bid to be rejected.

Signature:_____ Date:_____

Section II: Acknowledgement

_____
(Name of Company)

Hereby acknowledges receipt of this Request for proposal and the reading of these Instructions to Bidder s. We further agree that if awarded the contract, we will submit the required Performance Bond and Insurance Certificate within five (5) days of written notification that the District has adopted a resolution authorizing the encumbrance of funds for the project. We understand, however, that a formal written contract, similar to the one contained in the ITB Package, will need to be executed and purchase order issued by the District before we have any vested contractual rights. Wherever, we agree to commence the work as required herein and timely complete the project pursuant to the Specifications by the date stated in the Notice to Proceed.

By: _____
(Name and Title)

Date: _____

Section III: Vendor Request Form

VENDOR INFORMATION

VENDOR NUMBER (IF APPLICABLE) _____

VENDOR NAME _____

ADDRESS LINE 1 _____

ADDRESS LINE 2 _____

CITY _____ **STATE** _____ **ZIP** _____

TELEPHONE NO. _____ _____ **FAX NO** _____ _____

Area Code *Number* *Area Code* *Number*

E-MAIL ADDRESS _____

PRIMARY CONTACT PERSON _____

REMIT TO (IF DIFFERENT FROM ABOVE)

VENDOR NAME _____

ADDRESS LINE 1 _____

ADDRESS LINE 2 _____

CITY _____ **STATE** _____ **ZIP** _____

TELEPHONE NO. _____ _____ **FAX NO** _____ _____

(Area Code) *Number* *(Area Code)* *Number*

PRIMARY SERVICE, PRODUCT, OR SPECIALTY:

-

NOTE: VENDOR NAME AND TAX ID NUMBER MUST BE AS FILED WITH THE INTERNAL REVENUE SERVICE.

PLEASE INDICATE WHERE APPLICABLE

DIVERSITY BUSINESS ENTERPRISE: **YES** ☐ **NO** ☐

MINORITY BUSINESS ENTERPRISE: **YES** ☐ **NO** ☐

FEMALE BUSINESS ENTERPRISE: **YES** ☐ **NO** ☐

Section IV: Taxpayer ID Form

PLEASE NOTE: FAILURE TO UTILIZE THE MOST CURRENT TAXPAYER ID FORM (DATED October 2018) MAY CAUSE YOUR RESPONSE TO BE REJECTED

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

► Go to *www.irs.gov/FormW9* for instructions and the latest information.

Give Form to the requester. Do not send to the IRS.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☐ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ►

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ►

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

Print or type. See Specific Instructions on page 3.

5 Address (number, street, and apt. or suite no.) See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

___ - ___ - ____

or

Employer identification number

__ - _____

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here Signature of U.S. person ► Date ►

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

Cat. No. 10231X Form **W-9** (Rev. 10-2018)

Section V: No Proposal Form

RFP #21305

This form must be completed only if vendor is not submitting a proposal

To all prospective bidders/proposers:

Each company or person receiving this package has at some point in time requested to be placed on the proposal list of the Cleveland Metropolitan School District for this product and/or service.

It is the intent of the District to update this list subsequent to the contract cycle. Please note the following and take action accordingly.

If you are making a bid/proposal this cycle, disregard the remainder of this letter. Your name will remain on the active bidder list.

_____ (1) If you are not making a bid/proposal this cycle, but want to remain on the active's list for the future ITBs, place a check mark in the box to the left. Complete the name and address section below and return this letter to Purchasing at the address below.

_____ (2) If you do not wish to remain on the active bidder's list, place a check mark to the left. Complete the name and address section below and return this letter to Purchasing at the address below.

Name of Company:_____

Company Representative: _____

Address:_____

City, State:_____ Zip Code:_____

Telephone Number: _____

Fax Number: _____

Date: _____

Section VI: Certificate of Debarment

Certification Regarding
Debarment, Suspension, and Other Responsibility Matters
Primary Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 13 CFR Part 145. The regulations were published as Part VII of the May 26, 1988 *Federal Register* (pages 19160-19211). Copies of the regulations are available from local offices of the U.S. Small Business Administration.

(BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS ON REVERSE)

(1) The prospective primary participant certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for disbarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application 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;

(c) 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 offenses enumerated in paragraph (1)(b) of this certification; and

(d) Have not within a three-year period preceding this application had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective primary participant shall attach an explanation to this proposal.

Business Name _____

Date _____ By _____

Name and Title of Authorized Representative

_____

Signature of Authorized Representative

SBA Form 1623 (10-88) Federal Recycling Program Printed on Recycled Paper

This form was electronically produced by Elite Federal Forms, Inc.

INSTRUCTIONS FOR CERTIFICATION

1. By signing and submitting this proposal, the prospective primary participant is providing the certification set out below.

2. The inability of a person to provide the certification required below will not necessarily result in denial of participation in this covered transaction. The prospective participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective primary participant to furnish a certification or an explanation shall disqualify such person from participation in this transaction.

3. The certification in this clause is a material representation of fact upon which reliance was placed when the department or agency determined to enter into this transaction. If is is later determined that the prospective primary participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

4. The prospective primary participant shall provide immediate written notice to the department or agency to which this proposal is submitted if at any time the prospective primary participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549. You may contact the department or agency to which this proposal is submitted for assistance in obtaining a copy of those regulations (13 CFR Part 145).

6. The prospective primary participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

7. The prospective primary participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Covered Transactions," provided by the department or agency entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.

8. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the ineligibility of its principals. Each participant may, but is not required to, check the Nonprocurement List.

9. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

10. Except for transactions authorized under paragraph 6 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

Section VII: Conflict of Interest Form

Statement of Potential Conflicts of Interest

Vendor Name:	Primary Contact:
Address 1:	Telephone #:
Address 2:	Fax #:
City:	Email:
State, Zip:	Website:

Cleveland Metropolitan School District (CMSD) adheres to Ohio Ethics Law and strictly follows the opinion of the Ohio Ethics Commission. As such, each vendor is requested to submit this statement declaring any potential conflicts of interest in doing business with the District. Please answer the following two questions providing all requested information.

1. Are any current Cleveland Metropolitan School District (CMSD) employees, Cleveland Board of Education members, or any of their immediate family members, also members of the vendor's board of directors, hold any officer position with the vendor, or own any shares of any stock issued by the vendor?

Yes_____ No_____

If **Yes**, and if the CMSD employee, CMSD board member, or immediately family member is a member of the vendor's board of directors or holds an office with the vendor, please state the person's name and position with the vendor.

Name: _____

Position: _____

If **Yes**, and if the CMSD employee, CMSD board member, or immediate family member owns share of any stock in the vendor organization or company, state the percentage of all outstanding company shares owned by the CMSD employee or board member.

_____%

2. Are any current CMSD employees, CMSD board members, or any immediate family members also employees of the vendor?

Yes_____ No_____

If **Yes**, please state the person's name and provide a description of their job duties for the provider:

Name: _____

Job Duties:_____

If **Yes**, please describe the contact that the vendor will have with the CMSD employee or CMSD board member in the course of providing services to the District:

_____

_____

CERTIFICATION

I do hereby certify that the foregoing statements are true and accurate, and that my signature below attests to the authenticity of my identity as the person actually signing this form. This document is not a contract. In order for a binding Agreement to exist, a signed Agreement will be required prior to any legally binding commitment by the District.

NOTARIZED STATEMENT

_____being duly sworn and deposes says

That he/she is the _____of
(title)

_____, and answers to all the
(organization)
foregoing questions and all statements therein contained are true and correct.

_____
(signature)

Subscribed and sworn before me this ____day of _____, 20____

Notary Public: _____

My commission expires: _____

Section VIII: Bidder Qualifications Form

Bidder must answer all questions or attach a written explanation for each question.

PROPOSER NAME:_____

ADDRESS:_____

CITY; STATE:_____ ZIP:_____

CONTACT PERSON:_____

TITLE:_____

TELEPHONE: ( )_____ __ TOLL FREE: ( )_____

TAXPAYER IDENTIFICATION NUMBER:_____

1. What type of organization? (i.e. corporation, partnership, etc.)

2. How many years has your organization been in business?

3. How many years has your organization been in business under its current name?

4. List any other aliases your organization has utilized in the last two years and the form of Business

5. If you are currently a corporation, list the following:
    a. State of incorporation
    b. Date of incorporation
    c. President's name
    d. Secretary's name
    e. Treasurer's name
    f. Statutory agent's name

g. Name of shareholders, if less than 10

h. Principal place of doing business

6. If you are currently in a partnership, list the following:
   a. Name and address of all general and limited partners.

   b. Original name and date of organization's inception

7. If you are neither a corporation nor a partnership, please describe your organization and list principals.

8. Are you legally qualified to do business in the State of Ohio?

9. Are you legally qualified to do business in Cuyahoga County and licensed by the City of Cleveland?

10. Has your organization ever been (i) declared by a customer to be in default under a contractor and/or (ii) sued by a customer for failure to completely a contract or properly perform services in a timely manner? If yes, please state where, when, and why.

11. Has your organization ever been cited by a local, county, state, or federal authority for violation of a regulation or statute or failing to timely complete a contract in accordance with specifications? I yes, please state date, agency, and final disposition.

12. Has your organization ever filed for bankruptcy? If yes, please state where, when and why?

13. On a separate sheet, list the major customers for whom your organization has provided this type of equipment or service in the past five years. Include owner's name and type of work performed.

14. Has your organization ever been sued by a supplier for failure to timely pay for materials or equipment provided? If yes, please provide details.

15. What is the dollar limit of your firm's General (CLS) Liability Insurance?

    Name of insuring company: _____

Policy number: _____

16. What is the dollar limit of your firm's Automotive Liability Insurance?

    Owned vehicles_____

    Non-Owned vehicles_____

    Name of insuring company_____

    Policy number_____

17. List the name and address of every person having an interest in this ITB.

18. Has any federal, state or local government entity ever cited or taken any action against your organization or any of its principals for failure to pay or remit any taxes including but not limited to income, withholding, sales, franchise, or personal property taxes? If yes, please give name of agency, date and amount of taxes overdue and resolution of the issue.

19. Is your organization and its' principals current in payment of personal property taxes?

20. The prospective lower tier participant certifies, by submission of this ITB, that neither it nor its principals is presently debarred, suspended, proposed, for debarment or suspension, declared ineligible, or voluntarily excluded from participation in this transaction by any State and/or Federal Department or Agency.

21. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participants shall attach an explanation to this ITB.

Notarized Statement

_____being duly sworn and deposes says

that he/she is the _____of
(title)

_____, and answers to all the
(organization)

foregoing questions and all statements therein contained are true and correct.

_____
(signature)

Subscribed and sworn before me this _____day of _____, 20____

Notary Public:_____

My commission expires: _____

Sample: State Of Ohio Insurance

S A M P L E

STATE OF OHIO

DEPARTMENT OF INSURANCE

CERTIFICATE OF COMPLIANCE

As Superintendent of Insurance of the State of Ohio, I

do hereby certify that _____

a corporation located at _____

in the State of _____

with the laws of this state applicable to it, and is

authorized to transact in this state its appropriate

business of insurance as prescribed under Section 3941.02.

of Ohio, including Fidelity Insurance.

From _____ 20____, until _____

In witness whereof, I have hereunto
subscribed my name and caused my
seal to be affixed at Columbus, Ohio
this day and date.

Superintendent of Insurance of Ohio

Sample: Acord Certificate of Insurance

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:
	PHONE (A/C, No, Ext): / FAX (A/C, No):
	E-MAIL ADDRESS:

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A :	
	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$
	☐ COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence)	$
	☐ CLAIMS-MADE ☐ OCCUR						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$
	☐ POLICY ☐ PRO-JECT ☐ LOC						PRODUCTS - COMP/OP AGG	$
								$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	☐ ANY AUTO						BODILY INJURY (Per person)	$
	☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	☐ HIRED AUTOS ☐ NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	☐ UMBRELLA LIAB ☐ OCCUR						EACH OCCURRENCE	$
	☐ EXCESS LIAB ☐ CLAIMS-MADE						AGGREGATE	$
	☐ DED ☐ RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						☐ WC STATU-TORY LIMITS ☐ OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? ☐	N / A					E.L. EACH ACCIDENT	$
	(Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$
		☐	☐					

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

ACORD 25 (2010/05)

Section XI: Non-Collusion Affidavit

This Affidavit must be executed and shall accompany the proposal in order for the proposal to be considered.

NON-COLLUSION AFFIDAVIT
State of Ohio, Cuyahoga County

_____, being first duly sworn, deposes and says that

he/she is _____of _____

of the party making the foregoing proposal; that such proposal is genuine and not collusive or sham; that said proposer has not colluded, conspired, connived, or agreed, directly or indirectly, with any proposer or person, to put in a sham proposal, or that such other person shall refrain from proposing, and has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the proposal price of affiant or any other proposer, to fix any overhead, profit or cost element of said proposal price, or of that of any proposer, or to secure any advantage against the Board of Education of the Cleveland Metropolitan School District, or any person or persons interested in the proposal; and that all statements contained in said proposal are true; and further that such proposer has not, directly or indirectly, submitted this proposal, or the contents thereof, or divulged information or data relative thereto to any Association or to any member or agent thereof.

_____
Affiant

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

_____
Notary Public in and for Cuyahoga County, Ohio

My commission expires: _____

Section XII: Diversity Business Enterprise Program and Participation Forms

PROGRAM OVERVIEW

It is the goal of the Diversity Business Enterprise (DBE) program to ensure the firms owned and/or controlled by minorities and women have the opportunity to compete for any expenditure of funds including but not limited to contracts, lease purchase, requisitions, and all forms of equipment, work services, materials, construction, etc.

The DBE program shall make every good faith effort to ensure that certified DBE's in the relevant Cleveland Municipal School District geographic market have the maximum opportunity to proposal for contracts. The Cleveland Municipal School District geographic market is Cuyahoga, Summit, Lake, and Lorain counties.

The District has established goals for DBE participation in all contracts that it awards. The goals range from 15 to 30 percent and vary by the type of contract awarded:

- 15% Service Contracts
- 20% Goods and Supplies
- 30% Maintenance/Construction Repair

A Diversity Business Enterprise encompasses Minority Business Enterprises (MBEs) and Female Business Enterprises (FBEs)

A DBE is an enterprise in which minorities, African Americans, Native Americans, Hispanic or Latin Americans, Asian Pacific Islander Americans, and/or women own at least 51% of the shares of stock or controlling interest.

A FBE is a female-owned enterprise with at least 51% of the shares of stock or controlling interest, which is held by female.

A company may be in compliance with the District's DBE program although the applicable numerical goal is not met if a company makes a good faith commitment to comply with DBE regulations. The Purchasing Director determines whether a company has made a good faith commitment.

DBE requirements under certain circumstances can be waived by the district with convincing proof of good faith efforts.

TERMS AND CONDITIONS OF NOTICE AND REQUIREMENTS TO ENSURE DIVERSITY BUSINESS ENTERPRISE (DBE) OPPORTUNITY

Definition of DBE: A Diversity Business Enterprise (DBE)

"Small Diversity business concern" means a small business concern that is at least fifty-one (51) percent unconditionally owned by one or more individuals who are both socially and economically diverse, or a publicly owned business that has at least fifty-one (51) percent of its stock unconditionally owned by one or more socially and economically diverse individuals and that has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least fifty-one (51) percent unconditionally owned by an economically diverse Indian tribe or Native Hawaiian Organization, or a publicly owned business that has at least fifty-one (51) percent of its stock unconditionally owned by one of these entities, that has its management and daily business controlled by members of an economically diverse Indian

tribe or Native Hawaiian organization.

1. "Socially diverse individuals" means individuals who have been subjected to racial or ethnic prejudice or culture bias because of their identity as a member of a group without regard to their qualities as individuals.

2. "Economically diverse individuals" means socially diverse individuals whose ability to compete in the free enterprise system is impaired due to diminished opportunities to obtain capital and credit as compared to others in the same line of business who are not socially diverse. Individuals who certify that they are members of named groups (African Americans, Hispanic Americans or Latin Americans, Native Americans, Asian-Pacific Islander Americans, Subcontinent Asian Americans) are to be considered socially and economically diverse.

Definition of FBE: Female Business Enterprise (FBE)

"Female-owned small business concern" means a small business concern:

1. Which is at least fifty-one (51) percent owned by one or more women; or, in the case of any publicly owned business, at least fifty-one (51) percent of the stock of which is owned by one or more women and;

2. Whose management and daily business operations are controlled by one or more woman.

TERMS

1. DBE participation will be counted toward meeting the goals outlined in the notice as follows:
    a. The total dollar value of a correct contract or subcontractor indirect subcontract awarded toward a certified DBE will be counted toward the applicable goal.

    b. In the case of a joint venture, certified by the Cleveland Municipal School District, the portion of the total dollar value of the contract equal to the percentage of the ownership and control of the DBE partner in the join vendor will be counted toward the applicable goal. (PLEASE RETURN DBE FORM E)

    c. Only expenditures to DBE that perform a commercially useful function in the work of a contract or subcontract, or indirect subcontract will be counted toward DBE goals. A DBE is considered to perform a commercially useful function when it is responsible for execution of a distinct element of work of a contract or subcontract and carries out its responsibilities by actually performing, managing, and supervising the work involved. If a DBE contractor subcontracts a significantly greater portion of the work of the contract than would be expected on the basis of normal industry practices, the DBE is presumed not to be performing a commercially useful function. The DBE may present evidence to rebut this presumption.

    d. The total dollar value of materials and supplies obtained from DBE suppliers and manufacturers will be counted toward DBE goals if the DBE assumes the actual and contractual responsibility for the provision of the materials and supplies.

2. A proposer who fails or refuses to complete and return this Notice may be deemed a non-responsive proposer.

3. The contractor's goals as set forth in this Notice shall express the contractor's commitment to the

percentage of DBE utilization during the term of this contract. The contract shall be deemed to have met its commitment for DBE utilization if the DBE utilization rate of the contractor meets the goals established by this Notice.

4. The contractor must receive the approval of the District before making substitutions for any subcontractors listed in the Notice. Substitution of DBE is not allowed unless the contractor receives District approval.

5. The contractor's commitment to a specific goal is to meet the DBE objectives and is not INTENDED and shall not be used to discriminate against any qualified company or group or companies.

6. The contractor's commitment to a specific goal for DBE utilization as required by this Notice shall constitute a commitment to make every good faith effort to meet such goal by a subcontracting to or undertaking to joint venture with DBE firms. If the contractor fails to meet the goal, it will carry the burden of furnishing sufficient documentation as part of the proposal response of its good faith efforts to justify a grant of relief from the goals set forth in this Notice. Such justification will take the forms of a detailed report which will document at least the following information:
    a. Attendance at the pre-proposal meeting, if any, scheduled by the District to inform DBE's of Subcontracting opportunities under a given solicitation.

    b. Advertisement in general circulation media, trade association publications, and minority-focus media for at least twenty (20) days before bids or proposals are due. If twenty (20) days are not available, publication for a shorter reasonable time is acceptable.

    c. Written notification to DBE that their interest in the contract is solicited, and follow-up contact to determine whether the DBE's were interested.

    d. Efforts made to select portions of the proposed work to be performed by DBE in order to increase the likelihood of achieving the stated goals.

    e. Efforts to negotiate with DBE for specific sub-proposal, including at a minimum:

        i. The names, addresses, and telephone numbers of DBE's that were contacted.

        ii. A description of the information provided to DBE regarding the plans and specifications for portion of the work to be performed; and

        iii. A statement of why additional agreements with DBE were not reached.

        iv. Completion of (Form E) if DBE's are not involved in the ITB.

    f. Concerning each DBE the supplier/contractor contacted but rejected as unqualified, the reasons for the supplier's/contractor's conclusion.

    g. Efforts made to help the DBE's contacted that needed assistance in obtaining required bonding, lines of credit, or insurance.

    h. Use of the services of minority community organizations, minority contractor's groups, governmental minority business assistance offices, and other organizations that assist in the recruitment and placement of DBE's.

7. Suppliers/contractors that fail to meet DBE goals and fail to demonstrate sufficient good faith efforts are not eligible for contract awarded.

8. The District, through its Diversity Officer will review the contractor's minority business enterprise involvement efforts during performance of this contract. Such review will include, but not be limited to, contractor's quarterly statement of income from the District and what portion of said income went to the DBE enterprise(s) as evidenced by affirmation of the DBE enterprise(s) which the contractor hereby agrees to supply each quarter during the term of its contract with the District. If the contractor meets its goal or if the contractor demonstrates that every reasonable effort has been made to meet its goal, the contractor shall be presumed to be in compliance. Where the Diversity Officer finds that the contractor shall be presumed to be in compliance. Where the Diversity Officer finds that the contractor has failed to comply with the requirements of this Notice, said Diversity Officer shall inform the Purchasing Director who shall immediately notify the contractor to take corrective action. If the contractor fails or refuses to comply promptly, then the Purchasing Director, upon approval of the District, shall issue an order shopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made subject of claim for extension of time or for excess costs or damages by the contractor. When the District proceeds with such formal action it has the burden of proving that the contractor has not met the requirements of coming forward and showing that it has met the good faith requirements of the Notice, specifically including paragraph 7 hereof. Where the contractor is found to have failed to exert every good faith effort to involve DBE in the work provided, the District may declare that the contractor is ineligible to receive further District funds, whether as a contractor, subcontractor, or as a consultant, for a period of up to three (3) years.

9. The contractor will keep records and documents for three (3) years following performances of this contract to indicate compliance with this Notice. These records and documents, or copies thereof, will be made available at reasonable times and places for inspection by any authorized representative of the District upon request together with any other compliance information which such representative may require.

10. Proposers and contractors are bound by all requirements, terms and conditions of this Notice.

11. Nothing in this Notice shall be interpreted to diminish the present contract compliance review

1: DBE Form A

Name of Firm:_____

Address:_____

City, State, Zip Code:_____

Telephone Number: _____

Type of Business (Product or Service): _____

_____

Date of Proposed Contract Award: _____

Amount of Proposed Contract Award: _____

Diversity Business Enterprise Subcontractor(s):

_____

Dollar Amount Subcontract Award: _____

Percent of Subcontract Award: _____

D.B.E. Participation: _____ $_____

F.B.E. Participation: _____ $_____

Name of EEO Officer:_____

_____
(Signature of owner, partner, or authorized officer)

Name:_____ Dated:_____
(printed)

Title:_____

DO NOT COMPLETE BELOW THIS LINE

___Compliant ___Compliance Pending___Non-Compliant

Compliance Date: _____

_____ _____
(signature, DBE Department) (date)

2: DBE Form B

NOTICE OF REQUIREMENT TO ENSURE
DIVERSITY BUSINESS ENTERPRISE (DBE) OPPORTUNITY

Note: All eligible proposers for award of the contract should comply with the Requirements, Terms, and Conditions of this Notice.

The undersigned proposer hereby agrees that the goal it has established for DBE participation in this project through either subcontracting or entering into a joint Venture with DBEs in conformity with the Requirements. Terms and Conditions of this Notice is a goal of thirty (30%) percent for a construction/repair/ maintenance contract, twenty (20%) percent for a supply contract, and fifteen (15%) for a service contract of the total contract amount of this project. In no event will the absence of goals as stated above be deemed as compliance with the requirements, terms and conditions of this notice.

In addition, the undersigned will complete and attach hereto the DBE (Form C) Schedule for DBE participation, showing all DBE/FBE that will participate as subcontractors or joint ventures in this contract and a DBE (Form D), DBE Letter of Intent form for each DBE/FBE listed on the Schedule.

Proposer: _____

Date: _____

By: _____

Title: _____

Definition of DBE: A Diversity Business Enterprise (DBE)

"Small Diversity business concern" means a small business concern that is a least (51) percent unconditionally owned by one or more individuals who are both socially and economically diverse, or a publicly owned business that has at least (51) percent of its stock unconditionally owned by one or more socially and economically diverse individuals and that has its management and daily business controlled by one or more such individuals. This term also means a small business concern that is at least (51) percent unconditionally owned by an economically diverse Indian tribe or Native Hawaiian Organization, or a publicly owned business that has least (51) percent of its stock unconditionally owned by one of these entities, that has its management and daily business controlled by members of an economically diverse Indian tribe or Native Hawaiian Organization.

SCHEDULE MBE/FBE PARTICIPATION

Project Name:_____

Name of Non-DBE Contractor: _____

Identification Number:_____

Location:_____

Name of Minority Contractor: _____

Address:_____

City, State, Zip:_____

Type of work to be performed and work hours involved:

_____

Projected commencement and completion dates for work:

_____

Agreed price in dollars or percentage:

_____

The undersigned will enter into a formal agreement with DBE for work listed in this schedule conditioned upon execution for a contract with the Cleveland Municipal School District

TO BE RETURNED WITH THE PROPOSAL

_____
Signature of Non-DBE Prime Contractor

Date: _____

4: DBE Form D

DBE LETTER OF INTENT

To: _____
Non-DBE Prime or General Proposer

Project:_____

NON-DBE PRIME OR GENERAL PROPOSER
The Undersigned intends to perform work in connection with the above-referenced project as (check one):

☐ an individual ☐ a corporation ☐ a partnership ☐ a joint venture

DBE status of the undersigned is confirmed in the Cleveland Municipal School District's DBE file of bona fide enterprises with a certification date of: _____

The Undersigned is prepared to perform the following described work in connection with the above referenced project. Specify in detail particular work items or parts thereof to be performed:

_____

_____

_____

at the following price or percent of contract: $_____
You have projected the following commencement date of such work, and the undersigned is projecting completion of such work as follows:
Items _____
Projected Commencement Date _____
Projected Completion Date _____

_____% (percent) of the dollar value of the subcontract will be sublet and/or awarded to NON-DBE contractor (s) and/or NON-FBE SUPPLIERS. The undersigned will enter into a formal agreement for the above work with you conditioned upon your execution of a contract with the Cleveland Municipal School District.

_____ _____
Date **Name of DBE Firm (where applicable)**

_____ _____
Signature of DBE (where applicable) Signature of MBE Firm

(TO BE RETURNEDWITH ITB)

_____ _____
Name of FBE Firm **Signature of FBE Firm**

DBE Unavailability Certification

I, _____,_____
Name *Title*

Of _____, certify that on_____
Date

I contacted the following DBE to obtain a Proposal for work items to be performed on:

Board Project: _____

Minority Contractor: _____

Work Items Sought: _____

Form of Proposal Sought:_____

Female Contractor: _____

Work Items Sought: _____

Form of Proposal Sought: _____

To the best of my knowledge and belief said minority business enterprise was unavailable (exclusive of the unavailability due to lack of agreement on price) for work on this project or unable to prepare a proposal for the following reason (s):

_____
_____
_____

_____ _____
Signature, Non-DBE prime Proposer *Date*

_____was offered an opportunity to proposal on the above-referenced work on
_____ by _____
Date *Non-DBE Prime Proposer*

_____
Signature, Non-DBE Prime Proposer

The above statement is a true and accurate account of why I did not submit a Proposal on this project.

_____
Signature, Non-DBE prime Proposer

Non-Minority Prime Affidavit For DBE

STATE OF }
COUNTY OF } SS. AFFIDAVIT

The undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the items and operation of our subcontract and the intended participation by each party in the undertaking. Further, the undersigned covenant and agree to provide to the Cleveland Municipal School District current, complete, and accurate information regarding actual subcontract work and the payments thereof, and any proposed changes in any of the subcontract arrangements and to permit the audit and examination of the books, records and files of the subcontract or those of each party relevant to the subcontract, by authorized representatives of the Cleveland Municipal School District. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under federal and state laws concerning false statements.

Name of Firm:_____

Signature:_____

Name and Title:_____

Date: _____

STATE OF }
COUNTY OF } SS.

On this _____day of _____ 20_____, before me appeared _____

_____, to me personally known, who being duly sworn,

did execute the foregoing affidavit, and did state that they were properly authorized by _____

_____to execute the affidavit and did so as their free act and deed.

(Seal)

Notary Public_____

Commission expires_____

7: DBE Form G

This form need not be completed if all join venture firms are diversity business enterprises

1. Name of Joint Venture: _____
2. Address of Joint Venture: _____
3. Phone Number of Joint Venture: _____
4. Identify the firms which comprise this joint venture. (The DBE partner must complete DBE Form A or have current DBE Certification)

_____

_____

   a. Describe the roll of the DBE firm in the joint venture: _____

   _____

   b. Describe briefly the experience and business qualifications of each non-DBE Joint Venture:_____

   _____

5. Nature of Joint Venture's Business: _____

_____

6. Provide a copy of the Joint Venture Agreement.
7. What is the percentage of DBE Ownership? DBE_____% FBE_____%
8. Ownership of Joint Venture: (This need not be completed if described in the Joint Venture agreement provided in response to question 6).

   a. Profit and loss sharing: _____

   _____

   b. Capital contributions, including equipment: _____

   _____

   c. Other applicable ownership interest: _____

   _____

9. Control of and participation in this contract. Identify by name, race, and "firm" those individuals and their titles who are responsible for day-to-day management and policy decision making, including, but not limited to, those prime responsibility form:

    a. Financial decisions: _____

    _____

    b. Management decisions, such as:

        i. Estimating: _____

        ii. Marketing and Sales: _____

        iii. Hiring and firing of management personnel: _____

        _____

        iv. Purchasing of major items or supplies: _____

        _____

    c. Supervision of field operations: _____

    _____

Note: If after complete the DBE Form B and before the completion of the joint venture's work on any contract awarded, there is any significant change in the information submitted, the joint venture must inform the Cleveland Municipal School District, either directly or through the non-DBE prime subcontractor if the joint vendor is a subcontractor.

Non-Minority Prime Affidavit (Joint Venture)

STATE OF OHIO CUYAHOGA COUNTY AFFIDAVIT

The undersigned swear that the forgoing statements are correct and include all material information necessary to identify and explain the items and operation of our subcontract and the intended participation by each joint venture in the undertaking. Further, the undersigned covenant and agree to provide to the Cleveland Municipal School District current, complete, and accurate information regarding actual joint venture work and the payments thereof and any proposed changes in any of the subcontract arrangements and to permit the audit and examination of the books, records and files of the joint venture or those of each party relevant to the joint venture, by authorized representatives of the Cleveland Municipal School District. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under federal and state laws concerning false statements.

_____	_____
Name of Firm (Prime)	***Name of Firm (DBE)***
_____	_____
Signature	***Signature***
_____	_____
Name and Title	***Name and Title***
_____	_____
Date	***Date***

STATE OF] COUNTY OF]SS.

On this _____ day of _____ 20 ___ , before me appeared _____, to me personally known, who being duly sworn, did execute the foregoing affidavit, and did state that they were properly authorized by _____ to execute the affidavit and did so as their free act and deed.

(Seal)

_____
Notary Public

_____
Commission expires

Vendor Contract Compliance, Procedures and Guidelines

Note: Please read carefully all of the information contained in these documents.

Pursuant to the Affirmative Action Policy Adopted by the Cleveland Municipal School District, the following guidelines and procedures will be implemented to ensure that all vendors doing business with the District are in compliance with Equal Employment Opportunity Standards.

A. SUBMISSION OF VENDOR EMPLOYMENT PRACTICE REPORT

All vendors and contractors who propose to provide goods, services, supplies, and equipment through formal proposals, informal proposals, and contract term agreements are required to submit a Vendor Employment Practice Report with each Proposal. Approved status by the Vendor Employment Practice Report includes the following documents which must be completed in their entirety and returned with the proposal.

Please note, compliance approval consists of both DBE and Vendor Contract Compliance approval.

1. General Information Sheet (Form 1): Provides basic information on the vendor.

1a. SMSA/OR RECRUITMENT AREA: Indicates the relevant labor area in which your facility is located. Designate the Standard Metropolitan Statistical Area, county, or city from which the facility can draw applicants or recruit for most positions.

In making relevant labor area determinations, examine the statistics on racial, ethnic, and gender composition of the Standard Metropolitan Statistical Area, county, or city surrounding your organization, as well as other appropriate adjacent areas.

The relevant labor area should be the SMSA county or city with the highest population of minorities and women.

1b. DEFINITION: As defined by the U.S. Bureau of the Census, SMSA is: "Except in the New England States, a county or group of contiguous counties which contains at least one city of 50,000; in addition contiguous counties if they are socially and economically integrated within the central city; in the New England States towns and cities instead of counties. Each SMSA must include at least one central city."

2. **Compliance Declaration Form** (Form 2) - The Agreement indicating the vendor is in compliance with Equal Employment Opportunity requirements, will take affirmative action, and will comply with all Fair Labor Standard practices.

3. **Current Employment Data Form** (Form 3) – Current personnel data indicating employees in each job category classified by gender and race.

4. **Existing Affirmative Action Program** – If any and copies of any agreement between the vendor and the Equal Employment Opportunity Commission, Office of Federal Contract Compliance Program or court order pertaining to equal employment opportunity.

B. EVALUATION OF COMPLIANCE DATA

1. The Diversity Officer will evaluate data submitted by vendors who are recommended to receive District proposals and contracts. Vendors found in compliance with the District's Equal employment opportunity standards (Affirmative Action and DBE Program) will be placed on the approved vendor's list.

2. In the event that a vendor is found not in compliance with the District's equal employment opportunity standards, the Diversity Officer will inform the Purchasing Director of the Reason(s) and ask that the Purchasing Director not award the contract or proposal to the vendor pending compliance. The Purchasing Director of Manager of Diversity will inform the vendor of reason(s) for non-compliance. Vendors found not in compliance will be given ten (10) business days from the time of notification by the Purchasing Director or Manager of Diversity to submit an acceptable affirmative action program to the Diversity Officer.

3. If the vendor which has been found not in compliance submits an acceptable affirmative action plan to the Diversity Officer within ten (10) business days of notification, the vendor may be given conditional approval.

C. AFFIRMATIVE ACTION PLAN

1. Vendor found not in compliance with the District's equal employment opportunity standards are expected to develop and implement affirmative action programs if they expect to be eligible to successfully propose for District contracts.

2. While it is the vendor's responsibility to develop an affirmative action program which will result in equal employment opportunity for persons from all sectors of the community, the Officer in Charge of the Diversity Program may refer prospective proposers to resources which may be of assistance in developing affirmative action programs.

3. In the event that a vendor who has been awarded a District contract does not make satisfactory progress toward goals in the affirmative action program, the District will not negotiate a new contract until the vendor assures the Diversity Officer that significant progress will be made.

D. CONDITIONS UNDER WHICH PROPOSALS MAY BE REJECTED OR CONTRACTS TERMINATED ON EQUAL EMPLOYMENT OPPORTUNITY GROUNDS

1. Vendor fails to submit completed and signed EEO documents with proposal or other requested information in a timely manner.
2. The vendor is found not to be in compliance with EEO laws, regulations and District policy, and does not have an acceptable Affirmative Action Program, or if the vendor has an acceptable Affirmative Action Program but the Diversity Officer determines the vendor has not made satisfactory progress toward goals in the plan and shows no promise of achieving the goals.
3. Any inconsistencies of misrepresentation of the facts in any of the requested information designed to portray the vendor in a more favorable position with respect to Equal Employment Opportunity Compliance will be grounds for cancellation of the contract by the Purchasing Director upon recommendation by the Diversity Officer and confirmation by the Cleveland Municipal School District.

Form 1: Vendor Contract Compliance Form

Name of Firm:_____

Address:_____

City, State, Zip Code:_____

Telephone Number:_____

Standard Metropolitan Statistical Area: _____

Recruitment Area:_____

Type of Business (product or service): _____

Name of EEO Officer:_____

Signature of Owner, Partner, or Authorized Officer: _____

Name (type or print):_____

Date:_____ Title:_____

Do not complete below this line

Status of Vendor:

___ Compliance ___ Conditional Compliance

___ Non-Compliance ___Compliance Pending

Comments:_____

_____

Date:_____ Signature:_____

Form 2: Compliance Declaration

The following must be filled out completely:

It is the policy of _____that equal employment opportunity be afforded to all qualified persons without regard to race, religion, color, sex, national origin, age, or handicap.

In support of this policy, _____will not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, or handicap.

_____will take affirmative action to insure that applicants are employed and that employees are treated during employment without regard to race, color, sex, national origin, age, or handicap. Such action will include, but not be limited to:

Recruitment, advertising, or solicitation for employment, hiring, placement, upgrading, transfer or demotion, selection for training including apprenticeship rates of pay or other forms of compensation, layoffs or termination.

The undersigned company states that they are of current applicable requirement pertaining to Fair Labor Standards and Non-Discriminatory Practices of Federal, State, and Local Governments.

The undersigned further acknowledges that if the contract is awarded to the undersigned, that the undersigned will comply with all Fair Labor Standard Practice.

_____
(Name of Company)

_____ Date: _____

(Signature of Company Official)

STATE OF ( )
COUNTY OF ( ) SS.

BEFORE ME, a Notary Public in and for said County and State personally appeared the above-named Company _____by _____

It's_____, who acknowledged that they knowingly signed the aforesaid instrument, and that the same is their free act and deed duly authorized and the free act and deed of said company.

IN TESTIMONY WHEREOF, I have hereto set my hand and affixed seal at

_____, _____, this

day of _____, 20___.

DESCRIPTION OF JOB CATEGORIES

OFFICIALS, MANAGERS, AND SUPERVISORS
Occupations requiring administrative personnel who set District policies, exercise overall responsibility of the places, and direct individual departments or special phases of a firm's operations includes: officials, executives, middle management, plant managers, department managers, and superintendents, salaried supervisors who are members of management, purchasing agents, buyers, and kindred workers.

PROFESSIONALS
Occupations requiring either college graduation or experience of such kind and amount as to provide background. Includes: accountants and auditors, airplane pilots and editors, engineers, layers, librarians, mathematicians, natural scientists, personnel and labor relations workers, physical scientists, physicians, social scientists, teacher's and kindred workers.

TECHNICIANS
Occupations requiring a combination of basic scientific knowledge and manual skill which can be obtained through (about) two years of post-high school education, such as that which is offered in many technical institutes and junior colleges, or through equivalent on-the-job training. Includes: drafters, engineering aides, junior engineers, mathematical aids, nurses, photographers, radio operators, scientific assistants, surveyor of technical illustrators, technicians (medical, dental, electronic, physical sciences), and kindred workers.

SALES WORKERS
Occupations engaging wholly or primarily in direct selling. Includes: advertising agents and salespersons, insurance agents and brokers, real estate agents and brokers, stock bond salespersons, demonstrators, salespersons, sales clerks, and kindred workers.

OFFICE AND CLERICAL
Includes all clerical-type work regardless of level of difficulty, where the activities are predominantly non-manual, includes: bookkeepers, cashiers, collectors (bills and account), messengers and office clerks, office machine operators, shipping and receiving clerks, stenographers, typists and secretaries, telegraph and telephone operators and kindred workers.

CRAFTWORKERS (SKILLED)
Manual workers of relatively high skill level having a thorough and comprehensive knowledge of the process involved in their work, exercise considerable independent judgment, and usually receive an extension period of training. Includes: the building trades hourly paid foremen who are not members of management, mechanics and repairers, skilled machine operators, compositors and typesetters, electricians, engravers, job setters (metal), motion picture projectionists, pattern and model makers, stationary engineers, tailors and kindred workers.

OPERATIVE (SEMI-SKILLED)
Workers who operate machine or processing equipment or perform other factory-type duties of intermediate skill level which can be mastered in a few weeks and require limited training.

LABORERS (UNSKILLED)
Workers in manual occupations which generally require no special training. Perform elementary duties that may be learned in a few days and require the application of little or no independent judgment. Includes: garage laborers, car washers and greasers, gardeners (except farmers), ground-keepers, long-shore workers, craftsperson and stevedores, lumber's and woodchippers, laborers performing lifting, digging, mixing, loading, and pulling operations, and kindred workers.

SERVICE WORKERS
Workers in both protective and non-protective service occupations. Includes: attendants (hospital and other instruction, professional and personal service), barbers, and cleaners, cooks, guards, door keepers, stewards, janitors, police officers and detectives, porters, food services, and kindred workers.

APPRENTICES
Persons employed in a program including work training and related instruction to learn a trade or craft which is traditionally considered an apprentice, regardless of whether the program is registered with a Federal or State agency.

Form 3: Employment Data Form

Please note this data may be obtained by visual survey or post-employment record. Neither visual surveys nor post-employment records are prohibited by any federal, state or local law. All specified data is required to be filled in by District policy.

	All EMPLPOYEES			MALES					FEMALES				
Job Categories	TOALS MALES & FEMALES	MALES	FEMALES	WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGIN)	ASIAN AMERICAN OR PACIFIC ISLANDER	AMERICAN INDIAN OR ALSKAN NATIVE	HISPANIC	WHITE (NOT OF HISPANIC ORIGIN)	BLACK (NOT OF HISPANIC ORIGIN)	ASIAN AMERICAN OR PACIFIC ISLANDE	AMERICAN INDIAN OR ALSKAN NATIVE	HISPANIC
OFFICIALS, MGRS & SUPERVISORS													
PROFESSIONALS													
TECHNICIANS													
SALES WORKERS													
OFFICE/CLERICAL													
CRAFTWORKERS (SKILLED)													
OPERATIONS (SEMI-SKILLED)													
LABORERS (UNSKILLED)													
SERVICE WORKERS													
APPRENTICES													
TOTAL													

Additional information (optional):
Describe any other actions taken which show that all employees are recruited, hired, or trained or promoted without regard to their race, religion, color, sex, handicap, age or national origin. Use second sheet if additional space is needed:

The undersigned certifies that they are legally authorized by the proposer to make the statements and representations contained in this report, and that they have red all of the foregoing statements and representations which are true and correct to the best of their knowledge and belief.

FIRM OR CORPORATE NAME: _____ DATE: _____

SIGNATURE: _____ TITLE: _____

Section XIV: Supplier Contract Sample

SAMPLE ONLY

CMSD SUPPLIER CONTRACT

This agreement is made on this _____ day of _____ 202_, by and between

_____ _____

Supplier Name *Address, City, State, Zip*

("Supplier") and **THE CLEVELAND MUNICIPAL SCHOOL DISTRICT**, 1111 Superior Ave. E. Suite 1800, Cleveland, Ohio 44114 (the "District"), and is for the purpose described below.

1. **CONTRACT PURPOSE.** The purpose of this contract is:

(*State Purpose*)

_____

by providing the following: (*list all equipment, supplies, goods, services and deliverables to be provided*):

The District's request for proposal, and the Supplier's bid or proposal, are incorporated herein as if fully re-written.

2. **TERM.** This Agreement shall commence on the date executed by the second of the Parties to sign this instrument and shall terminate on acceptance of all equipment, supplies, goods, services and deliverables described above and no later than _____ *(Date)*; provided, however, that the District may terminate this Agreement without obligation and without cause by giving fourteen (14) days written notice to the Supplier under the Termination for Convenience clause below.

3. **COMPENSATION.** Subject to the terms and conditions of this Agreement, the District agrees to pay the Supplier an amount not to exceed:

_____ Dollars ($ _____).
spell out dollar amount *numeric dollar amount*

4. Payment for this contract shall be:

_____ Dollars ($ _____).
spell out dollar amount *numeric dollar amount*

payable as follows *(state payment terms)*:

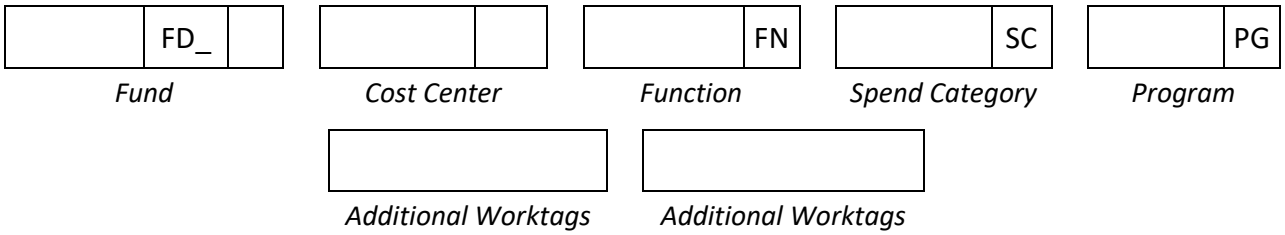
Payment rendered may be within ninety (90) days after the District receives an invoice from the Supplier together with a detailed summary of the equipment, supplies, goods, services and deliverables provided.

Supplier will submit periodic invoices describing any services, equipment, supplies, goods, and deliverables provided, the amount of each service or item, and any documentation and program reports requested by the District to prove that the service was actually provided. Failure to provide proof of the service actually being provided, upon the District's request, shall excuse the District of paying for the invoiced services.

Supplier is not entitled to payment of contract proceeds if equipment, supplies, goods, services and deliverables under this Agreement are no longer needed, required, requested, received, or should this Agreement be terminated by the District with or without cause.

The District's obligations as to payment remain conditioned upon Supplier providing equipment, goods, supplies, services and deliverables in accordance with this Agreement in a reasonably prudent manner. Should the Supplier fail to provide equipment, goods, services and deliverables in accordance with this Agreement either in full or in part, the District maintains the right to refuse future payments, as well as the right to recoup payments already tendered for any services that have been performed or any defective item provided. The District is not liable in any manner for expenses incurred by the Supplier through its utilization of third-party Suppliers or Contractors.

5. **FUNDING SOURCE.**



6. **INDEMNIFICATION AND HOLD HARMLESS.** The Supplier shall indemnify, defend, and hold harmless the District, all of its members, officers, employees, and agents, from and against any and all liability (whether real or asserted), claims, demands expenses, costs (including legal fees), and causes of action of any nature whatsoever for injury or death of persons, or damage or destruction of property which may result from or arise out of the negligence or intentional misconduct of the Supplier or its employees, officers, or agents, in the course of the Supplier's performance of this Agreement or the Supplier's failure to perform. This indemnification and hold harmless obligation survives the term of this Agreement. The parties acknowledge that the District is a political subdivision, and as such, is prohibited by law from entering into an indemnification agreement. Nothing contained within this Agreement is intended nor shall be construed to provide indemnification by the District.

7. **INDEPENDENT CONTRACTOR STATUS.** Supplier and the District acknowledge and agree that Supplier is an independent Contractor and has no authority to bind the District or otherwise act as a representative of the District. The District will provide **no** benefits such as health insurance, unemployment insurance, or worker's compensation insurance to Independent Contractor. Independent Supplier will be responsible for payment of all federal, state and local income taxes, unemployment and worker's compensation coverage's.

8. **AMENDMENT/MODIFICATION.** No amendment or modification of this Agreement, and no waiver hereunder, shall be valid or binding unless set forth in writing and signed by each party.

9. **CONFIDENTIALITY/OWNERSHIP.** The Supplier agrees that all financial, statistical or proprietary information provided by the District or any information that the Supplier may acquire, directly or indirectly, if any, which relates to the District will be kept confidential and not used by or released to any third party or parties without the prior written consent of the District. The Supplier further agrees that any written material, (e.g., report, study, etc.), developed for the District shall be property of the District, and the District shall be entitled to obtain copyrights or any similar such protection for any deliverables furnished by the Supplier under the terms of this Agreement, and that any such materials be considered a "work-for-hire."

10. **NO DAMAGES FOR DELAY.** The District shall not be held responsible for any loss, damage, costs, or expenses sustained by the Supplier as the result of any project delays, disruptions, suspensions, work stoppages, or interruptions of any kind, whether reasonable or unreasonable or whether occasioned by changes ordered in the work or otherwise caused by an act or omission of the

District, its agents, employees, or representatives, or by any cause whatsoever beyond the control of the Supplier.

11. **FINDINGS FOR RECOVERY/ DEBARMENT OR SUSPENSION.** [***ATTACH CERTIFICATION FROM AUDITOR OF STATE'S WEBSITE AND FEDERAL SYSTEM FOR AWARD MANAGEMENT (SAM) WEBSITE]*** ***(INCLUDE BOTH REPORTS)***

    https://ohioauditor.gov/auditsearch/Search.aspx (Microsoft Edge & Google Chrome)

    https://sam.gov/SAM/pages/public/index.jsf (Google Chrome) (If Unsupported, Click SAM icon).

    Supplier represents that it has no unresolved findings for recovery against it by the Ohio Auditor of State or any notice of debarment or suspension from any Federal Agency. The District may terminate this contract at any time if the Supplier or any of its directors or officers is found at any time to have any unresolved findings for recovery by the Auditor of State or any notice of debarment or suspension from any Federal Agency.

12. **CRIMINAL BACKGROUND CHECK.** Supplier agrees to successfully complete a criminal background check on any of its employees who provide services under this Agreement in the school district and who are required by Ohio Revised Code Section 3319.39, 3319.31 or 3319.392, as amended. A copy of all such background checks shall be provided by the Supplier to the District at the Supplier's expense.

13. **DISCRIMINATION.** Supplier certifies that it does not discriminate and covenants that it shall not discriminate on the basis of race, religion, marital status, color, national origin, sex, age, disability or any other classification protected under federal, state, or local law.

14. **PERSONNEL.** Upon the District's request, and in its sole discretion, Supplier shall replace personnel, if any, assigned by Supplier.

15. **LABOR DISPUTE.** If the Supplier has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the party shall immediately give notice, including all relevant information, to the District.

16. **PROMPT PAYMENT DISCOUNT.** If the Supplier offers a prompt payment discount on any other contract, public or private, then the District shall be extended the same discount on this contract and shall be so notified of the existence of the discount and the terms thereof.

17. **DAMAGE TO BUILDINGS, EQUIPMENT, AND VEGETATION.** The Supplier shall use reasonable care to avoid damaging existing buildings, equipment, and vegetation on the District premises. If the Supplier's failure to use reasonable care causes damage to any District property, the Supplier shall replace or repair the damage at no expense to the District as the District directs. If the Supplier fails or refuses to make such repair or replacement, the Supplier shall be liable for the cost, which may be deducted from the contract price.

18. **TIME.** Time is of the essence in the performance of this contract.

19. **NOTICE OF BANKRUPTCY.** If the event Supplier enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Supplier agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the District Office responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of District contract numbers and contracting offices for all District contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

20. **PAYMENT OF MONEYS DUE DECEASED SUPPLIER.** If the Supplier dies or is dissolved prior to completion of this Agreement, any moneys that may be due to Supplier from the District for services rendered prior to the date of death or dissolution shall be paid to Supplier's executors, administrators, heirs, personal representative, successors, or assigns or as may be directed by an order of a Probate Court.

21. **AVAILABILITY OF FUNDS.** The Parties acknowledge and agree that the District is a governmental entity and due to statutory provisions cannot commit to the payment of funds beyond its fiscal year (July 1, through June 30). If funds are not allocated for the Services that are the subject of this Agreement following the commencement of any succeeding fiscal year during which this Agreement may continue, the District may terminate this Agreement without liability for any termination charges, fees, or penalties, at the end of its last fiscal period for which funds were appropriated. The District shall be obligated to pay all charges incurred through the end of the last fiscal period for which funds were appropriated. The District shall give the Service Supplier written notice that funds have not been appropriated (a) within a reasonable time after the District receives notice of such non-appropriation; and, (b) at least fourteen (14) days prior to the effective date of such termination.

22. **RECORDS.** The Supplier shall maintain all records pertaining to this Agreement on file for not less than ten (10) years and until any audit issues are resolved and to make such records available to the District, or any other duly authorized representative, upon request except if this is a federally funded contract.

    If this is federally funded, the Supplier shall comply with all federally required records retention rules, regulations and laws and shall allow access as required by local, state or federal law, rules, regulations or ordinances.

23. **DEFAULT.** Any of the following events constitute default by the Supplier:

    a. Non-performance of any term, covenant, or condition of this Agreement by the Supplier within the time provided; or

    b. Any act of insolvency by the Supplier or the filing of any petition under any bankruptcy, reorganization, insolvency, receivership, or moratorium law, or any law for the relief of, or relating to debtors; or

c. The filing of any involuntary petition under any bankruptcy statute against the Supplier or the appointment of any receiver or trustee or to take possession of the property of the Supplier; or

d. Failure of the Supplier to pay a third party(ies) resulting in any claim(s) against the District or the filing of Liens on Public Funds; or

e. Failure to maintain the required insurance or equipment as well as failure to provide qualified/licensed personnel or quality and safe vehicles.

24. **EFFECT OF DEFAULT.** In the event of any default by the Supplier, the District may do any one or all of the following:

    a. Terminate the contract and withhold funds due, if any to satisfy any third-party claims;

    b. Sue for and recover all damages arising out of the Supplier's default;

    c. Cure the default and obtain reimbursement and cover from the Supplier.

    d. Exercise any other rights available to it in law or equity.

25. **WAIVER OF DEFAULT.** If the District consents to or waives the breach of any provision of covenant in this Agreement, such waiver shall not constitute a waiver of such provisions or covenant as to the future, and the District shall not be estopped from later enforcing any provision or covenant it may have previously waived or elected not to enforce; nor shall such waiver have any effect on the enforcement of any other provision of this contract.

26. **TERMINATION FOR CONVENIENCE OF DISTRICT.** The District may terminate this Agreement at its option without obligation upon fourteen (14) days written notice to the Supplier. The District may terminate this Agreement for any reason or no reason at all.

27. **EFFECT OF TERMINATION FOR CONVENIENCE.** If the District terminates this Agreement for its convenience, then the District shall only remit payment to the Supplier for work performed up to the date of termination. In no event shall the Supplier be entitled to lost or anticipatory profits.

28. **MISCELLANEOUS.**

    a. Supplier represents and warrants that she possesses the qualification and personnel, if required, to provide the services agreed to herein.

    b. Neither party may assign, modify, or sub-contract this Agreement, or any right or interest herein, without the prior written consent of the other party.

    c. This Agreement shall be binding upon and inure to the benefit of the Parties, their successors, and permitted assigns.

    d. To the extent that the terms of this Agreement materially conflict with or render ambiguous any provision of the Supplier's (Bid/Proposal), the terms of this Agreement shall govern.

e. The paragraph headings are for convenience only and shall not affect the interpretation of this Agreement.

f. This validity, construction of this Agreement shall be determined in accordance with the laws of the State of Ohio.

g. The Supplier and all subcontractors shall comply with all local, state and federal laws, rules, regulations and ordinances.

h. No travel expense reimbursement is authorized unless specifically stated in this contract. If so stated, the meals, travel, and lodging are reimbursable only in strict compliance with the Ohio Auditor of State Technical Bulletins, Guidance and Rules and Regulations and, if this contract is federally funded in whole or in part, in strict compliance with all rules, regulations and guidance of the U.S. Office of Management and Budget and any other federal office or agency having jurisdiction over federally funded contracts.

i. This Agreement contains the entire agreement between the parties with respect to the services to be provided hereunder, and there are no representations, understandings or agreements, oral or written, which are not included herein.

29. **CONFLICT OF INTEREST.** The Supplier represents that he/she is not an employee or board member of the Cleveland Municipal School District. The Supplier further represents that no employee or board member of the Cleveland Municipal School District has any ownership interest in or fiduciary duties to the Supplier or any of its parent affiliations and is not on the board of directors of the Supplier or hold any officer position with the Supplier. The District's signatory to this agreement represents that neither he/she or any family member have any ownership interest in or fiduciary duties to the Supplier or any of its parent affiliations and are not on the board of directors of the Supplier or hold any officer position with the Supplier.

CONTRACT MUST BE APPROVED BY CMSD LEGAL DEPARTMENT PRIOR TO SIGNATURE

Approved as to form:

_____
Law Department
Cleveland Municipal School District

DATE: _____

****

NOTICE TO SUPPLIERS

GOODS AND/OR SERVICES ARE NOT TO BE PROVIDED UNTIL AFTER THE CONTRACT HAS BEEN SIGNED BY A DULY AUTHORIZED REPRESENTATIVE OF THE DISTRICT AND A CERTIFIED PURCHASE ORDER AND/OR CONTRACT NUMBER HAS BEEN ISSUED TO THE SUPPLIER.

THE CLEVELAND MUNICIPAL SCHOOL DISTRICT IS NOT OBLIGATED TO PAY FOR GOODS AND/OR SERVICES PROVIDED PRIOR TO THE DATE THIS CONTRACT HAS BEEN SIGNED BY AN AUTHORIZED DISTRICT REPRESENTATIVE.

****

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by them or their authorized representatives as of the day and year first above written.

(SUPPLIER NAME)		**CLEVELAND MUNICIPAL SCHOOL DISTRICT**	
BY:	_____	BY:	_____
TITLE:	*Supplier*	TITLE:	_____
DATE:	_____	DATE:	_____

Section XIV: References

Include below three references of equal or larger size to this current ITB project. Public sector experience is preferred, but not required. Please attach relevant supporting documentation, such as project plans, scope of work.

Reference #1:
Company/School Name: _____

Address: _____

Type of Business: _____

Contact Person: _____

Telephone and Fax#: _____

Dates of Service: _____

Description of Services Provided: _____

_____

Reference #2:
Company/School Name: _____

Address: _____

Type of Business: _____

Contact Person: _____

Telephone and Fax #: _____

Dates of Service: _____

Description of Services Provided: _____

_____

Reference #3:
Company/School Name: _____

Address: _____

Type of Business: _____

Contact Person: _____

Telephone and Fax#: _____

Dates of Service: _____

Description of Services Provided: _____

PART III: GENERAL CONDITIONS, FORMS AND SPECIFICATIONS

RFP #21305

LUIS MUNOZ MARIN AC-5 REPLACEMENT DESIGN BUILD PROJECT

Design Build Standards

Cleveland Metropolitan School District (CMSD)
DESIGN-BUILD PROJECT STANDARDS

GENERAL

Purpose
The purpose of this document is to establish CMSD's owner-requested criteria to be used in the design, implementation and commissioning of each facility within the owner's jurisdiction, focused on the Balanced Total Life of the facility (construction/renovation, operation, maintenance).

Approach
Each design professional has the liberty to act with the owner's best interests in mind, based on the individual situations/boundaries presented before design begins and based on qualified professional experience. The criteria set forth is intended to be a guideline to limit the risks of dissatisfaction over the Balanced Total Life of each facility and to make the tasks associated with long-term owning/managing the facilities as effective as it can be, including the limitation of equipment/service providers to those listed.

Adherence (REINFORCED ACCEPTED VE)
All standards are to be strictly adhered to. Deviations for specific cases will be addressed during pre-design/pre-commissioning project functions.

Documentation
The owner will facilitate the storage of all project design/specification documentation and all project-specific management materials for each project. Each design professional will coordinate the provision for the specification/collection of these documented materials as appropriate for the project (with CMR/PM). Necessary documentation includes, but is not limited to:

- Construction Plans and Specifications
- Product Data and Submittals
- LEED Data and Documentation (Not Applicable for REFRESH Design-Build Projects)
- Coordination Drawings (prepared by Mechanical trades in all "congested" areas)
- Operation and Maintenance Manuals, includes Labeling keys (see labeling requirements below)
- System Startup and Commissioning Documents – Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.
- Training Schedules and documentation including videotaping – Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider
- Warranty Designations (see warranty requirements below)
- As-Built Plans (furnished by all trades at job completion)
- Closeout Procedures (Demonstrations/Training Sessions/Recorded Documents)

Design Coordination
The Design Professionals shall attempt to adequately & actively coordinate design elements between construction trades/activities during design, including the evaluation commentary done by the owner's Commissioning Authority (AGM). This shall include, but not be limited to:

- HVAC to General (fire walls, wall openings, equipment weights & servicing)
- HVAC to Electrical (voltages, starters/motor control, disconnects, smoke detectors)
- HVAC to Plumbing (gas piping, drains & vent locations, Water makeup piping)

- Plumbing to General (piping chases & access, equipment weights, servicing)
- Plumbing to Electrical (voltages, starters/motor control, disconnects, smoke detectors)
- Plumbing to HVAC (ventilation requirements, drain & vent locations)

Standards

The owner has set forth noted design elements, product quality, system procedures as follows, in order to establish fair competition at a desired level of results, and to keep the facilities as reasonably managed as possible. Any design elements not specifically addressed in the body of this document are expected to be dealt with using commonly-accepted practices and with the owner's benefit in mind.

PLUMBING

System Descriptions

Best Standard Practice approach to Plumbing Design shall prevail, bound by enforced/in-place Building Codes and CMSD-accepted OFCC Design Guidelines. Design Professional shall give adequate and specific consideration to:

- Constructability
- Serviceability
    - Include an alternate for an extended warranty for one additional year after the warranty expires. This warranty shall include parts and labor.
    - Include an alternate for maintenance of all equipment and accessories for a period of one year from receipt of Final Certificate of Occupancy for all work. All parts and labor shall be included in this scope of work. (Contractor to submit for review a detailed schedule of the maintenance activities prior to maintenance commencement)
- Replacement
- Vibration Isolation
- Acoustic Performance
- Domestic Hot Water Balancing – as applicable
- Building Systems Integration (BAS/Open Protocol) – Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.

Fixtures – Commercial quality, designed for use in School atmosphere

- Toilet Room Fixture Vendors: American Standard, Kohler (Water closets to be carrier type)
- Faucet Vendors: Chicago, Peerless, Kohler
- Mixing Valves Vendors: Speakman, Leonard, Zurn
- Drain Components: Smith, Watts, Zurn
- Pump/Specialties Vendors: Aurora, Bell & Gossett, Grundfos, Taco
- Water Heater Vendors: AO Smith, Lochinvar, Bradford-White, PVI

HVAC

System Descriptions

Best Standard Practice approach to HVAC Design shall prevail, bound by enforced/in-place Building Codes, including the current adopted version of ASHRAE STD 90.1& IES (Energy Code) and OFCC Design Guidelines. Design Professional shall give adequate and specific consideration to:

- Constructability
- Performance – Provide SEQUENCES of OPERATION for all building systems (Reference OSDM, Coordinate with Control Templates on Drawings and Systems Integration requirements)
    - DESIGN PARAMETERS: Indoor Temperature Set points – Occupied
        - Heating – 72 degrees F
        - Cooling – 74 degrees F
- Serviceability
    - Include provisions for Extended Warranty & Maintenance Services coverage for designated systems
        - Extensions to Product Warranties
            - Compressors
            - Heat Exchangers
        - Extensions to Installation/Performance Guarantees
            - HVAC Packaged Control Systems
                - Functional Performance
                - Training
        - Include an alternate for an extended warranty for one additional year after the warranty expires. This warranty shall include parts and labor.
        - Include an alternate for maintenance of all equipment and accessories for a period of one year from receipt of Final Certificate of Occupancy for all work. All parts and labor shall be included in this scope of work, including belts and filters. (Contractor to submit for review a detailed schedule of the maintenance activities prior to maintenance commencement)
- Equipment Replacement
- Vibration Isolation
- Acoustic Performance
- Temperature Control Zones – Internal, Perimeter, Heat Recovery Exchange for VRF Systems, etc.)
- Thermal Environmental Quality
    - Temperature
    - Humidity
    - Air Quality/Filtration
- Air, Water & VRF System Balancing
    - Ensure Devices are specified and that Performance Evaluations are performed and Documented
        - Note deficiencies found in evaluations
        - Note recommendations for eliminating and finding deficiencies
        - Prepare report/summary for use by Commissioning Agent
        - Include in the documents that the owner has the right to request up to 25% of all the balanced systems be verified during the warranty period.
- Testing of Critical Systems

- Ensure Devices are specified and that Performance Evaluations are performed and Documented
  - Generator Tests – Coordinate with Electrical Design & Team Contractors
  - Condensate Drain Alarms
  - Technology Room Temperature Alarms
  - Kitchen Equipment Temperature Alarms
  - Submersible Sump Pumps and Critical Drain Alarms – Coordinate with Plumbing Contractor
  - Fire Alarm Systems Alarms – Coordinate with Electrical Contractor
  - Fire Sprinkler Alarm Systems – Coordinate with Electrical/Fire Suppression Contractors
- Packaged HVAC Controls/Building Systems Integration (BAS/Open Protocol) – Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.

BASIC MECHANICAL ITEMS

Valves

Usual and customary practices for duty

- Ball valves in HVAC systems – full port, three-piece construction
- Drain valves – with cap/chain and hose end connection

HVAC Drives/Motors

Standard configurations, EPAct minimum efficiencies or premium efficiencies as required by procedures/designs

- Service Factor on belt-driven sets – 1.35 minimum
- Provide multiple V-belts on fan motors > 5 HP
- Vendors – Century, Lincoln, General Electric, Baldor, US Motor

Extra Filter Materials

- One set for construction
- One set for replacement at IAQ Testing
- One set at Project Turnover

Controls Systems Integration Design

- Complete documents showing Integration Coordination on Construction Documents – Use of Control Schematic Templates encouraged
- Include diagnostic points for utility exhaust fan status and control for building pressurization monitoring and sequences.
- Include Sequences of Operation on Construction Documents
- Include Integration into Lighting Design/Control Systems – Coordinate with Electrical Engineering functions.
- Include Integration into Main Power metering and Sub-Metering Systems – Coordinate with Electrical Engineering functions.

Labeling Guidelines

All labels to be ½" x 3" or larger plastic laminate with engraved letters 3/16" high and attached to the ceiling grid. The labels should have the mark number or valve tag number. The CMSD Standard colors are as follows

• VAVs, VRFs, Heat Pumps, etc.	Black/White letters	(VAV A – 01)
• HVAC Cold Water Valves	Green/White letters	(CWS – 01)
• HVAC Hot Water Valves	Green/White letters	(HWS – 01)
• Fire/Smoke Dampers	Red/White letters	
• Domestic Cold Water Valves	White/Green letters	(CW – 01)
• Domestic Hot Water Valves	White/Green letters	(HW – 01)
• Gas Valves	Yellow/Black letters	(Gas – 01)
• Compressed Air	Blue/White letters	(Air – 01)
• Fire Suppression Valves	White/Red letters	(Zone – A)

INTEGRATED DESIGN & MAJOR RENOVATION PROJECTS

Integrate Design elements according to established project programs/scopes/budgets at Schematic Phase.

- **PLACE DESIGN EMPHASIS ON**
  - Meters and Monitoring devices
    - Utilities : water, natural gas, electric
    - Ventilation: Outside Air, Exhaust Air
  - Energy Use Optimization
    - Systems Choices by Professional Evaluation and referenced CMSD Standards
    - Controls & System Design to support
      - Comfort – Thermal, Acoustical, Air Quality, Humidity
      - Efficiency – Combination of Unitary & System
      - Safety
- Place Documentation Emphasis
  - Forms and Templates
  - Energy Modeling and Reporting – as appropriate.
  - HVAC Packaged Unitary Controls/Building Automation Systems diagnostics and reporting – Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.

NEW CONSTRUCTION & MAJOR DESIGN-BUILD RENOVATIONS – AS APPLICABLE TO D-B PROJECT SCOPES

Main Air Handling Systems

Indoor Central Station Air Handling equipment with no specialized Sound-Attenuating equipment or vision windows in access doors

- Variable Air Volume (VAV) with variable speed Enthalpy Energy Recovery Wheel for classroom areas (referenced to current Energy Codes/OSDM requirements)
- Separate Variable Air Volume (VAV) for Administration Area
- Variable Air Volume (VAV) or Cafeteria/Dining/Gymnasium areas
- Constant Volume (CAV) for Laboratory/Shop areas
- Design layouts to allow proper air mixing in AHU's to eliminate nuisance Freeze – Stat problems
    - Extended Mixing Chambers
    - Use of Air Blender Devices
    - Design layouts to allow proper spacing/airflow for Airflow Monitoring/Measuring Stations
    - Construction – Double-wall insulated
    - Configuration – Modular for units with system design Total Static Pressures up to 5.9", Custom above 5.9" Total Static Pressure
    - Access – Sections for adequate maintenance access
    - Bearings – Upgraded quality
    - Control Dampers – Extruded aluminum, insulated, Ultra-Low Leakage
    - Fan Motor/Wheels – Energy efficient rated "premium", Direct-Drive Plenum (preferred)
    - Drain Pans – Stainless Steel
    - Filters – MERV 8 Pre-filters, MERV 13 After-filters
    - Acoustics – Limit Supply Fan outlet velocities at 2100 feet per minute or less
    - Modular AHU Vendors – Carrier, Daikin, Trane, York-JCI
    - Custom AHU Vendors – Air Enterprises, Buffalo Air Handling, Environmental Air Systems

Cooling Plant

Water Chillers - Option

- Greater than 300 net tons – water-cooled, multiple compressors
    - Unit IPLV's near 0.45 kw/ton, or less
    - Unit Acoustics near 80 dBA, Sound Power
- 300 net tons & below – air-cooled, multiple chillers
    - Unit EERs to meet ASHRAE 90.1, Premium Efficiencies
    - Unit Acoustics near 95 dBA, Sound Power
- Serial Interface – ModBus™ or BacNet™ (Preferred),
- Cooling Towers – Induced-draft (Baltimore Air Coil, Evapco, Marley)
- Fluid – Pre-mixed Glycol (30% propylene) with integral inhibitors for piping systems
- Pumps – All pumps to be lead lag in sequence (i.e. Main Secondary Loop Circ Pump, etc.)
- System – Primary (constant flow)/Secondary (variable flow), Chilled water only
- Less than 300 ton Unit Configurations – Utilize multiple smaller Scroll chillers in lieu of single Screw chiller and air – cooled condensing unit for Administrative Area AHU
- Sound – Coordinate design of barriers with architect to diffuse chiller sound
- Chiller Vendors – Carrier, Daikin, Trane, York-JCI.
- Pump/Specialties Vendors – Aurora, Bell & Gossett, Grundfos, Taco

Heating Plant

Natural Gas Hot Water Boilers, multiple units, each sized for 65% net load required, forced-draft burners

- High-efficiency Condensing (smaller systems)
- Flexible Water-Tube (larger systems)
- Fluid – Water with engineered water treatment systems
- Pump – All pumps to be lead lag
- System – Primary (constant flow)/Secondary (variable flow), Hot Water only
- Boiler Vendors – Cleaver-Brooks, Patterson-Kelley, Bryan, Hurst, Lochinvar, Raypak
- Serial Interface – ModBus™, or BacNet™ (Preferred).
- Pump/Specialties Vendors – Aurora, Bell & Gossett, Grundfos, Taco

Heating Terminals

Selected use of Hot Water equipment dependent upon layout of Electric Heaters in Decoupled systems (WSHP, VRF)

- Cabinet Heaters – Vestibules/Entryways - fan supported, exposed/recessed
- Unit Heaters - Utility Spaces
- Finned-Tube Radiation – Heavy duty covers (Modine, Sterling, Trane)
- Radiant Panels – Large glass surface exposures (Airtex, Modine, Sterling)
- Vendors – Carrier, Daikin, Sterling, Trane, York-JCI
- Electric Heat Vendors – Brasch MFG, Berko-Markey, Greenheck, Markel, Q-Mark

Technology Support/Computer Server Rooms

Refrigeration (R-410A) Low Ambient Heat Pump Split-Systems with Variable Speed Compressors

- Mini-Split Vendors – Daikin AC, Mitsubishi Electric, Hitachi
- Serial Interface – ModBus™ or BacNet™ (Preferred),
- Option for Ducted/Larger Critical Space HVAC Split-Systems when Mini-Split approach is not adequate for spaces – Liebert, APC-Stulz, United Coolair

Variable Flow Refrigerant-based Heat Pump Heat Recovery (VRF) Systems

Air cooled (standard outdoor mounted) or Condenser (Fluid cooler/boiler) water-cooled (standard indoor mounted) modular heat pump-condensers, indoor 2-pipe refrigerant-based Fan Coil Terminals (vertical, horizontal, ceiling, wall, floor), as integrated to D-B procedures/designs. Make Provisions that all above-ceiling filter locations are known to CMSD Maintenance personnel

- Refrigerant – R-410a
- Heat Recovery/Simultaneous Heat-Cool Operation – 3-Pipe Central Refrigeration Piping Network
- Zoning – Each classroom and major-use space to be chosen as location for Mode-Control Refrigerant switching terminals
- Instructional spaces – Larger Horizontal/Cassette-style VRF Fan Coil Terminals
- Option for Assembly Space Service – Conventional CV or VAV AHU w/coils served by Air-Cooled or Water-to-Water WSHP (chiller/boiler duty) – Allows economizer sequences
- Dedicated Outdoor Air Systems (DOAS) – Stacked indoor AHU with variable speed Energy Recovery Wheel w/coils served by W-T-W WSHPs in Mechanical Rooms and Condenser Water Reheat in AHU for dehumidification-reheat control.
- Option for Dedicated Outdoor Air System – Stacked/Side-by-Side indoor AHU with variable speed Energy Recovery Wheel w/integral WSHPs in Mechanical Rooms and Condenser Water Reheat/Heat Recovery in AHU for dehumidification-reheat control
- Controls – ModBus™ or BacNet™ (Preferred), Standard Open Protocol Interface

- VRF Vendors (air cooled) – Daikin AC, Hitachi/York-JCI, Mitsubishi Electric
- VRF Vendors (water cooled) – Daikin AC, Hitachi/York-JCI, Mitsubishi Electric
- DOAS Vendors (standard RTUs/ERV AHUs) – Carrier, Daikin, Trane, York-JCI, Valent Air.
- Customized Indoor Vendors (dehumidification/reheat) – Air Flow Equipment, Engineered Air, Innovent Air

Ductwork Systems

Insulated Galvanized Sheet Metal, SMACNA gauges

- Dishwasher Hoods/Locker Rooms – Aluminum
- Flexible Ductwork – Limited to 5 feet total length per device
- 0.5 inch liner in main Return Air Ducts
- Perforated Doublewall spiral ductwork for first 20 feet of supply duct from Air Handling Units

VAV Air Distribution Terminals

Series Fan-Powered VAV Terminals with Hot Water Reheat Coils. Single-duct VAV Terminals allowed in Student Dining/Auditorium/Gymnasium areas provided Night Setback heating terminals included. Provide with no specialized Sound-Attenuating equipment. Make provisions that all above-ceiling filter locations are known to CMSD Maintenance personnel. (See labeling requirements below)

- Vendors: Environmental Technologies, Price, Trane, Tuttle & Bailey

Air Distribution Devices

Aluminum construction, selected for best performance in spaces served.

- Vendors: Price, Titus, Tuttle & Bailey

Exhaust Fans

Selected for lower rpms and style appropriate for location in building

- Vendors: Loren Cook, Greenheck, Penn Ventilator

Variable Frequency Drives

IGBT-based VFDs with integral line reactors, electronic bypass and disconnect switch. Drives for Air Handling Equipment and Hydronic Equipment shall be the same manufacturer on each project.

- Serial Interface – BacNet™,
- Vendors – ABB, Danfoss, Square D

Airflow Measuring Stations

Integrated to building DDC system to achieve Sequences of Operation and help assure energy savings, accurate at very low velocities.

- Configurations: Duct-mounted w/access doors and unit-mounted
- Vendors – Dwyer Instruments, Ebtron, Tek-Air Systems.

Packaged Unitary/Building Temperature/Energy Management Controls

Direct Digital, Standard Open Protocol components, integrated to owner's host system/front-end operational, utility management and maintenance management software.

- Packaged Unitary/Device-Level platform: Niagara™Framework – BacNet™
- Vendors for DDC components: Not Applicable – Packaged Controls via HVAC Equipment Vendors.

RENOVATION PROJECTS – SPECIAL NOTES

Design Professional shall make evaluation with owner's input for best overall solution for each case. In general, the intent of the D-B Standards for new construction applies, but design and equipment modifications may be needed for best results per the application.

Applied Packaged Rooftop HVAC Units for RT Multizone Retrofits

Outdoor Applied Packaged Rooftop HVAC units (with ERWs as applicable) with Variable Air Volume System upgrades (terminal units, reheat evaluation, custom roof suports, zoning improvements, etc.).

- Condensing Section (Standard-staging with Scroll Compressors); Energy-enhanced Options under consideration by application (Demand-Controlled Ventilation, Condenser Fan Speed Controls, etc.).
- Packaged Rooftop Option Vendors: Carrier, Daikin, Trane, York-JCI

Conventional Unit Ventilators

Vertical or Horizontal configuration, 4 – pipe

- Vendors: Carrier, Daikin, Trane, York-JCI

Vertical Unit Ventilators

Vertical Exposed or Concealed configuration, 4 – pipe

- Vendors: ChangeAir, Temspec, United Coolair

Hydronic Fan Coil Units

4 – pipe, non-economizer configurations. Make Provisions that all above-ceiling filter locations are known to CMSD Maintenance personnel. ((See labeling requirements below)

- Vendors: Environmental Technologies, Carrier, Daikin, Trane, York-JCI

DOAS (Ventilation) Units for VRF/WSHP/FCU Retrofits

Indoor DOAS AHUs with ERWs (chilled water, split DX or WSHP), packaged DOAS Rooftop units with ERWs, or limited-specific use of VRF System Ventilation units.

- AHU Vendors: Carrier, Daikin, Trane, York-JCI
- Condensing Unit (Split DX option) Vendors (Standard-stages Scroll Compressors): Carrier, Daikin, Trane, York-JCI
- Packaged Rooftop Option Vendors: Carrier, Daikin, Trane, York-JCI, Valent Air

Interior Lighting Retrofits

Indoor Upgrades using current technologies for lamps/emitters for applications as required, targeted for LED-based improvements.

- Option: Keep Existing Fixtures – intended for sites with fixtures less than 15 years old.
    - Bulb replacement with Ballast removal – limited to areas where existing fixtures are in acceptable visual/operational condition and where existing lighting performance supports the direct-replacement approach (light levels, colors, control-switching).
    - Retrofit Kit with Ballast removal – recommended for areas where existing fixtures have remaining life/value but performance enhancements are required/desired (light levels, colors, control-switching).

- Option: New Fixtures – required for areas where existing fixtures have no/limited remaining life/value but performance enhancements are required/desired (light levels, colors, control-switching).
- Life Safety/Emergency Lighting Systems: upgrade all areas for current space function/layouts and District/Local code requirements.
- Lighting Control Upgrades – employ current & reasonable techniques and technologies (i.e. dimming, digital relay switching, occupancy, daylight harvesting, etc.) to allow updated lighting systems to be integrated into CMSD Control Networks - Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.
- Fixture Manufacturers: Cree, Cooper, Lithonia and equivalent per CMSD approvals.
    - Fixture/Bulb/Driver component Warranties: target greater than 5 years/superior protection.

<u>Exterior Lighting Retrofits</u>

Outdoor Upgrades using current technologies for lamps/emitters for applications as required, targeted for LED-based improvements. Intent of Exterior Upgrades to address “on-building” as well as remote-from-building”

- Option: Keep Existing Poles/Supports – intended for sites with fixture supports less than 15 years old.
    - Fixture replacement with Ballast removal – limited to areas where existing poles/supports are in acceptable visual/operational condition and where existing lighting performance supports the direct-replacement approach (light levels, colors, control-switching). For Building-mounted fixtures being upgraded, care must be taken to account for substrate changes and acceptance of decorative effects.
    - Recommended to prepare photometric study of exterior lamp coverage prior to final design choices.
- Option: New Fixtures with Poles/Supports – required for areas where existing fixtures have no/limited remaining life/value but performance enhancements are required/desired (light levels, colors, control-switching).
- Life Safety/Emergency Lighting Systems: upgrade all areas for current space function/layouts and District/Local code requirements.
- Lighting Control Upgrades – employ current & reasonable techniques and technologies (i.e. dimming, digital relay switching, local/master photocells, etc.) to allow updated lighting systems to be integrated into CMSD Control Networks - Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.
- Fixture Manufacturers: Cree, Cooper, Lithonia and equivalent per CMSD approvals.
    - Fixture/Bulb/Driver component Warranties: target greater than 5 years/superior protection.

COMMISSIONING - Contractors to coordinate with AGM Energy Services functioning as CMSD Systems Integrator & Commissioning Provider.

- Process
    - Pre-Design Conference
    - Schematic Design Review
    - Design Development Review
    - Construction Document Review
    - Pre-Construction Conference
    - Equipment Submittal Review (Concurrent with A/E Review)
        - Chillers
        - Boilers
        - Heat Pumps
        - Air Handling Equipment
        - Variable Refrigerant Flow Systems
        - Variable Speed Drives
        - Generators
        - Lighting Control Systems
        - Packaged Unitary Controls/Building Automation System Interfaces
        - Kitchen Equipment
    - Start Up Phase
    - Systems Integration Phase
    - Post-Construction Conference

IN-SERVICE/PROJECT TURNOVER

- Process
    - Pre-Commencement Conference – establish overall target dates for project
    - Contractor Checkout and Testing – allow CMSD Facilities to observe the following
        - Main Hydronic Fill
        - Packaged Unitary Controls and Automation/Integration checkout
    - Start Up Phase – allow CMSD Facilities to observe
    - Systems Integration Phase
    - Training Sessions & Documentation Turnover
        - Contractor Responsibilities
            - Coordinate functions, schedules & documentation with CMR/OA
            - Conduct In-Service/Turnover Meeting(s)
            - Provide As-Built Drawings
            - Provide Operation & Maintenance Documents

- 1 Hard Copy (Binder)
- 3 Electronic Copies
- Videotaped Training Sessions
- System Integration Components

- Provide Specific List of Procedures for project
  - Control Sequences of Operation
  - Maintenance Items and Intervals
  - Filter Matrix
  - Fan Belt Matrix
  - Items for major equipment
  - Critical Alarms
- Provide Specific Tools and Spare Materials as specified
  - Packaged Controls/BAS Programming Tools
  - Spare Filters and Belts
  - Acoustic Ceiling tiles as applicable

- Major Vendor Responsibilities: Demonstration for each system
  - Chillers
  - Boilers
  - VRF Systems
  - Packaged DOAS/RTU/H & V Units
  - Fluid Coolers/Condenser Water Towers
  - Emergency Generators
  - Lighting Control Systems
  - Packaged Unitary Controls/Building Controls and Integration
- Engineer-of-Record/Owner Representative Responsibilities: Overall Description of Design Intent

- Warranty Period and Guarantee Limits
  - Warranty Period Goals (with Qualified Factory-Authorized Start up)
    - Chiller Compressors – Five Years Parts/Two Years Labor
    - Heating Heat Exchangers – Ten years Parts & Labor
    - Water Source Heat Pump Compressors – Five Years Parts/Two Years Labor
    - VRF Heat Pump Compressors – Six Years Parts & Labor
    - VFDs – Two Years Parts & Labor
    - LED Lighting Fixtures/Systems
  - Guarantee Period Goals (Coverage of Costs by Contractor) – Does not include owner responsible maintenance. Refer to project specific documents for Extended term requirements.
    - Basic Functional HVAC System (pipes, ducts, pumps, equipment & operational controls) – One Year Basic
      - Controls/System Walkthru and Issue List examination at Eleven Months post In-Service/Turnover date
- Owner Responsibilities (Maintenance & Documentation)
  - Attend All In-Service/Turnover functions
  - Participate in Procedures established by the OA/Cx/A-E Criteria/OFCC for reporting & logging post-construction issues
  - Perform and Document (Self or Contracted) all noted & agreed to maintenance functions according to coordinated documents

Overview – Overall Specifications

SECTION 102326 – OVERALL SPECIFICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Instructions to Proposers, Overall Scopes of Work descriptions, published Supplemental Drawings/Documents and general provisions of the Turn-Key Contract, including General and Supplementary Conditions and Documents of Owner Requirements apply to this Section.
   1. Refer to Original and subsequent RFQ/RFP Documents issued by District's Consultants.
   2. Scope of Work: General – [Base & ALT Option Scope]
      a. Mechanical Upgrades.
         1) Replace Existing Roof-mounted Packaged Multizone HVAC RTU (tagged AC-5), including provision/install of RTU System Unitary Controls [Base].
         2) Complete Demolition of existing equipment/piping/wiring not required to remain in service for complete install of replacement HVAC RTU/controls. Owner retains First Right of Salvage for all removed items.
         3) Install Zoned Electric Reheat VAV Air Terminal Units for AC-5 System [Base].
         4) Testing, Adjusting & Balancing: Provide Measuring/Balancing Services for the following: Replaced AC-5 System.
         5) Provide Three-year Extended Maintenance Agreement [ALT].
         6) Replace Existing Ceiling & Lighting Systems in affected areas as noted [ALT].
         7) Install New Controls (provided by the Owner/MSI as noted and Integrated by The District's Master Systems Integrator/Commissioning Services Provider) for enhanced/non-Unitary AC-5 System control. [Base].
         8) Provide/Install New Energy-use Meter Devices (provided by the Contractor and Integrated by The District's Master Systems Integrator/Commissioning Services Provider) as noted for Main Services and sub-metered for AC-5 System [Base].
      b. A District-administered Integration (Provided by AGM Energy Services – Master Systems Integration/Commissioning Services Provider) to new Vendor-Controls of new HVAC RTU System and Upgraded BAS is a part of the Project, but not included in the Performance Specification Scope performed by this Contractor, beyond what is explicitly noted.
         1) JACE Controller(s) with applicable updates – provided by Owner, installed by Contractor, programmed by MSI.
         2) Miscellaneous applicable Enterprise-level programming, schedule setting, graphical interface, etc. by the MSI.
   3. Targeted Schedule – refer also to published Front-end Documents:
      a. Proposals due July 24, 2020.
      b. Final Selection/Notice of Intent by July 30, 2020.
      c. Final Coordination Complete by end-August 2020.
      d. Construction Substantially-complete (obtain applicable Certificates of Occupancy) by December 31, 2020 – allows for District Cleaning schedule prior to classes commencing January 2021.

e. Final Commissioning (by District's Master Systems Integrator/Commissioning Provider) complete by middle of December 2020.
f. Construction Final Completion by December 31, 2020.

1.2 SUMMARY

A. The purpose of this Overall Specification Section is to describe the project's main intent, to establish main boundaries of responsibilities, and to reasonably narrow the not-yet-made choices of the proposers according to Owner-driven Criteria & Project intents:
1. Basic Form of Contract – Performance Specification Turn-Key Contractor proposal, with District-issued Purchase Order/Vendor Contract upon choice/award (refer to supplemental documents for additional legal requirements and clarifications). Mechanical/Plumbing/Electrical including necessary Structural/General is primary under a Performance-Based Agreement using Owner-furnished schematic design/criteria and certain Owner-evaluated equipment and services as noted.
2. Schedule: Coordinate Proposed activities to allow project completions to coincide with target completions of this Scope of Work, based upon published schedules in criteria documents:
   a. AC-5 HVAC Heating System fully operational: November 20, 2020.
   b. AC-5 HVAC System fully operational: December 31, 2020
3. Demolition: Proposer is responsible for the demolition of materials/equipment affecting the Scopes of Work. The Owner requires the Contractor to coordinate, monitor & perform ALL Asbestos-related abatements required, (not anticipated).
   a. Coordinate Salvage Rights of Owner with Owner's designated representative prior to removals and disposals. Items not claimed by Owner through this process shall be completely removed and properly disposed.
      1) Contractor shall provide a complete (by official Transmittal to & Signed-off by Owner) Inventory of Demolished materials/items designated as "Salvaged-Retained-by-Owner", including but not limited to: Descriptions, Make/Model Numbers, Serial Numbers, Quantity, etc.
4. General Trades Scope of Work – furnished by Proposer as appropriate for the work. This may include, but is not limited to:
   a. Complete Final Design and Supportive Coordination for intended Scopes of Work noted in schematic documents and descriptions, both Base and Alternates.
      1) Both Engineering Design and Means & Methods for all General Trades items required by the new mechanical systems Scope are a part of the Performance-Based proposal. General Trades Sub-Contractor(s) will use Mechanical Contractor's HVAC equipment/systems choices in the proposal and evaluate the building system re-works/new components that are required, coordinated with schematic plans/documents published. Specific items to note include, but are not limited to:
         a) Provision for necessary/beneficial Re-Work of existing Ceiling Systems in affected work areas; Interiors Sub-Contractor to assess and evaluate best options for performing the targeted Base Mechanical Scopes with "Updated" Ceiling Systems in mind. The Ceiling System "Updates" are identified in Alternate Pricing and coordinated with applicable Electrical Trades (Lighting Replacement) Scopes of Work.
         b) Provision for necessary/beneficial Re-Work and/or installation of new partitions/floor-patching as required by new Mechanical/Electrical

installations, (i.e. Soffits, Plenums, Panel Supports, enclosures for exposed ductwork/piping, etc.), completed to match existing décor as reasonable as possible for the application.

b. Existing Roofing/Curbing modifications required by intended Scope of Work (rails, curb/roofing, etc.): No New Work intended beyond that which affects the new mechanical equipment/systems supports and routing paths - Return to Existing Conditions unless noted otherwise.

c. Structural Support modifications/additions (miscellaneous decking/shoring and structural steel): modify existing infrastructure and add new support as required to properly install New Mechanical Equipment/Systems. Refer to specific details on OPR Drawing documents, supporting photos/notes and Hi-Efficiency HVAC Rooftop Unit Specification Section.

1) Both Engineering Design and Means & Methods for all structural items required by the new mechanical systems Scope are a part of the Performance-Based proposals.

d. Roofing modifications required by intended Scope of Work (flat roofs, sloped roofs, etc.): No New Work intended, beyond that which affects the new mechanical equipment/systems locations, modify existing infrastructure as required to support New Mechanical Equipment and/or piping modifications.

1) Both Engineering Design and Means & Methods for all Roofing items required by the new mechanical systems Scope are a part of the Performance-Based proposal. Coordinate Roofing resources utilized with known provider/product warranties that may be in-place.

e. Site modifications required by intended Scope of Work (lawns, planters, pavement, etc.): No New Work intended, Return to Existing Conditions unless noted otherwise.

5. Plumbing Trades Scope of Work – furnished by Proposer as appropriate for the work. This may include, but is not limited to:

a. Complete Final design and build and applicable Project Coordination for intended Scope of Work noted in schematic documents and descriptions, including, but not limited to: the preparation of drawings (support-pertinent-trades) for the purpose of obtaining a valid Occupancy condition for the Owner (permit, inspections, approvals, etc.)

b. Coordination with Owner/Owner's Representative teams on Project Schedule and Work Progress Plans (locations, areas, tie-ins, etc.).

c. Complete Installation (materials and labor) of both Owner-preferred Equipment and Systems and Plumbing Sub-Contractor-furnished items.

6. Mechanical Trades Scope of Work – furnished by Proposer as appropriate for the work. This may include, but is not limited to:

a. Complete Final design and build and Overall Project Coordination for intended Scope of Work noted in schematic documents and descriptions, including, but not limited to: the preparation of drawings (All-pertinent-trades) for the purpose of obtaining a valid Occupancy condition for the Owner (permit, inspections, approvals, etc.).

1) Both Engineering Design and Means & Methods for all Mechanical items required by the new mechanical systems Scope are a part of the Performance-Based proposal. Mechanical Contractor's HVAC equipment/systems choices in the proposal will be shared & coordinated with each sub-trade both prior to and subsequent to the final Proposal, referenced to schematic plans/documents published. Post-Proposal and after award of Turn-Key contract(s), the Proposer shall also share the design

choices with the Owner's Master Systems Integrator/Commissioning Provider (MSI) for coordination and planning functions.

b. Coordination with Owner/Owner's Representative teams on Project Schedule and Work Progress Plans (locations, areas, tie-ins, etc.).

c. Complete Installation (materials and labor) of both Owner-preferred/furnished Equipment and Systems and Mechanical Sub-Contractor-furnished items.

7. Electrical Trades Scope of Work – furnished/coordinated by Proposer as appropriate for the work. This may include, but is not limited to:

a. Complete Final Design and Supportive Coordination for intended Scopes of Work noted in schematic documents and descriptions, both Base and Alternates.

1) Both Engineering Design and Means & Methods for all Electrical items required by the new mechanical systems Scope are a part of the Performance-Based proposal. Electrical Contractor will use Mechanical Contractor's HVAC equipment/systems choices in the proposal and evaluate the electrical power system re-works/new components that are required, coordinated with schematic plans/documents published. Specific items to note include, but are not limited to:

a) Re-Work of existing Main Power Feed to affected Mechanical Equipment. Field-coordinate Electrical power locations and unitary components to allow for proper installations/performance based on wiring distance/routing and locations of required terminations.

b) Include provisions for additional disconnect/safety switches/controls required for HVAC Units and electrical Accessories provided with Mechanical Equipment, (Operational Controls & Safeties, Metering and Flow Control devices, etc.).

c) Provision for New (Local-to-affected-work-areas) Electrical Power Sub-Panels required to serve added power loads and connections (i.e. Electric Reheat VAV Air Terminals).

d) Provision for necessary/beneficial Re-Work of existing Lighting Systems in affected work areas; Electrical Contractor to assess and evaluate best options for performing the targeted Base Mechanical Scopes with "Updated" Lighting Systems in mind. The Lighting System "Updates" are identified in Alternate Pricing and coordinated with applicable General Trades (Ceiling Replacement) Scopes of Work.

2) Both Engineering Design and Means & Methods for all Electrical items required by the new HVAC Equipment option(s) is a part of the Performance-Based proposal [Base/ALT]. Electrical Sub-Contractor will use documents in the OPR and field information and evaluate the electrical power system re-works that are required, coordinated with schematic plans/documents published.

3) Both Engineering Design and Means & Methods for all newly-affected Fire Alarm System items required by the new mechanical systems Scope are a part of the Performance-Based proposal. Electrical Sub-Contractor will use Mechanical Sub-Contractor's HVAC equipment/systems choices in the proposal and evaluate the existing system re-works that are required, coordinated with schematic plans/documents published. No New Work intended beyond that which affects the required re-integration of new mechanical equipment/systems and routing paths into the existing FA System - Return to Existing Conditions unless noted otherwise.

b. Coordination with Project Team on Project Schedule and Work Progress Plans (renovation locations, areas, tie-ins, etc.).
c. Complete Installation (materials and labor) of both Owner-preferred/furnished Equipment and Systems and Mechanical Contractor-furnished items. New Work only as required to update/modify existing electrical power infrastructure to accommodate New Mechanical Renovations and upgrades [Base & ALT].
    1) Conduit/wiring penetrating from ceiling spaces thru occupied floor spaces should be located to minimize interruption to use of prime floor space and finished to match the current décor in the spaces chosen for the pathways.

8. Temperature Control Systems – Main system is furnished by Owner via District's Master Systems Integrator (MSI) and installed by Proposer's Mechanical/Electrical Sub-Contractors, unless specifically noted otherwise on schematic drawings. Items furnished by Proposer and installed by Proposer's Electrical Sub-Contractor to include, but not be limited to:
    a. Packaged Unitary Controls (components/installation of Packaged RTU Systems NOT Factory-installed by RTU manufacturer) and final System Sequences of Operation as part of the Contractor-selected Vendor equipment/system, with provisions for OPEN Systems Integration as noted.
    b. Temperature-Pressure Sensors/Relays, control valves and necessary operational components for each System in the Scope of Work.

    Items furnished by Electrical Sub-Contractor and installed by Electrical Sub-Contractor to include, but not be limited to:

    c. Low Voltage wiring for Applied/Unitary-provided systems (i.e., HVAC RTU-Base and ALT Systems, etc.) and for any specifically noted OPEN Systems Integration components (BacNet™/Serial Communications cabling and cable/raceways for low voltage components required).
    d. Physical installation of Applied Control/OPEN Systems components provided by owner as noted (Main OPEN Architecture Controllers, Air Terminal Unit Controllers, etc.)

    Items furnished by Owner and installed/Commissioned by Owner to include, but is not limited to:

    e. Main Computer & Energy Management Software/Graphics, Integration/Programming to Applied and Unitary Controls (vendor-provided-level) and set-up of Natural Gas meter/Electrical Power Monitoring meters, etc. to complete the designed OPEN Systems Architecture and Integration.
9. Fire Alarm Systems – No New Work expected beyond the Contractor's HVAC-focused Scope noted, with applicable items furnished and installed by Contractor (alarm devices, RTU devices, controls, etc.), unless noted otherwise.
10. Sprinkler Systems – Applicable items furnished and installed by Proposer (water sprinklers, piping, controls, etc.). No New Work intended beyond that which affects the new mechanical equipment/systems and routing paths - Return to Existing Conditions unless noted otherwise.

1.3 RELATED SECTIONS

A. The equipment and systems designated as Owner-preferred may have specification sections supplemental to this section. The Intent of any supplemental specification sections offered is to enhance the descriptions of these equipment and services items so that each Performance-Based Proposer has reasonable information to consider in preparing his Scope/Design/pricing. Actual Completed Designs and Installations proposed are to be fully compliant with applicable

customary standards, industry best practices, written installation instructions offered by the manufacturers of the equipment installed, and applicable local, state and national code regulations. Related sections include, but are not limited to:

1. Open Temperature Control Systems – limited to Installation Requirements of Owner-furnished Temperature Control equipment (panels, conductors, raceways, communication cable, etc.).
2. Master Systems Integration Services – published for reference only.
3. High-Efficiency HVAC Rooftop Units.
4. HVAC Airflow Measuring Systems.
5. Variable Frequency Drives & Motors.
6. Air Terminal Units.
7. Ductwork Systems & Accessories.

1.4 SUBMITTALS

A. Pre-Award Phase: At time of Turn-Key Proposal and in addition to any Proposal/Bid/Clarification Forms required, provide the following documents to aid the evaluation of Proposals meeting the Criteria:
   1. Schedule of Construction: timeline and expected area sequence of actions.
   2. High Efficiency HVAC Rooftop Unit Preliminary Submittal.
   3. Air Terminal Unit Preliminary Submittal.

B. Post-Award/Construction Phase: Prior to/after the completion of the Pre-Construction Meeting, provide the following documents to aid the evaluation of Proposals meeting the Criteria established:
   1. REVISED Schedule of Construction: timeline and expected area sequence of actions – to be continually updated for plans and progress and then shared with Construction Team.
      a. During Construction, approximately by 11/1/20, an updated Left-to-Do Schedule shall be published to CMSD with critical Timeline schedule or all remaining items to complete.
   2. Final Product Data Submittals – refer to individual sections for Submittal requirements, but include as a minimum:
      a. Final HVAC Equipment & Accessories.
      b. Accepted supplemental Scope Product/System Data-information:
         1) Ceiling Systems
         2) Lighting Systems
      c. Coordination Drawings/Plans as noted in HVAC Equipment specification sections.
      d. Final ALT Scopes of Work components/systems.
   3. Inventory of Salvage-Rights Materials/Items – for Owner Review.
   4. Final Plan Approval/Permit and Coordination Drawing documents for applicable Scopes.
   5. Service Ticket/Work Order Reporting Documents: Provide industry-standard forms for each product/system being maintained to include in emergency, operation, and maintenance manuals.
      a. Include a SPECIFIC Summary of completed maintenance items for each unit/system, complete with pertinent part numbers and frequency of actions taken.

C. Product Data: For each product component proposed, not Owner-furnished: Include standard documentation for the purposes of Owner-review and recordkeeping. Included in this group, but not limited to the group, are the following items:

1. Warranty terms and associated project documentation.
2. Maintenance and Operation data, for inclusion in master job O & M manuals.

D. Operation and Maintenance Data: For each product/system provided to include in emergency, operation, and maintenance manuals.
1. Include a SPECIFIC Summary of required maintenance items for each unit/system, complete with pertinent part numbers and frequency of actions recommended.

E. Closeout Documentation: Provide complete documents as required by the Scope of Work, transmitted to the Owner's Consultants as requested, including, but not limited to:
1. Complete Startup Documentation for each System affected Equipment in Scope of Work.
2. Testing, Adjusting & Balancing Reports.
3. Final Pay Applications and Waivers.
4. Clarification that Punch Lists and Issues Logs are fully completed.
5. Operations & Maintenance Manuals/Data as specified.
6. Training Documents.
7. Warranty Documents.
8. Systems Manuals.
9. Extended Maintenance Documents.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain only first-quality components.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. NFPA Compliance: Select and furnish components of installation meeting applicable sections of the current NFPA regulations.

D. Product Rating Certifications: Select and furnish components of installation meeting applicable sections of the current industry standard rating/listing/labeling regulations.

1.6 COORDINATION

A. Coordinate with all trades the placement, support and utility requirements for each major equipment item. This includes, but is not limited to:
1. Substrate elements – Roof curbs, Concrete Pads, structural steel, louver locations/lintel sizes, wall sleeves, mechanical room/closet structures.
2. Existing Walls/Ceilings – coordinate with Owner/Owner's Representative team any proposed disturbances of existing Asbestos materials.
3. Piping – mechanical/plumbing service and drain piping - coordinate with Owner/Owner's Representative team any proposed disturbances of existing Asbestos materials.
4. Ductwork – planned routing from unit connections.
5. Electrical – line/low voltage power wiring, including means of disconnect (at main switch/distribution panel and new/upgraded local-to-device distribution panels) and planned location/sources of power for replaced equipment.

a. Provide complete installation with NEC/Local Authority panel Clearances as required.

6. Vendor-based Controls – location of components/accessories not factory-mounted or Owner-provided.

B. Provide Coordination and cooperation services to Criterion Engineering teams for purposes of filing for public utility incentives. AGM Energy Services-Palmer has created pre-approval files for the Scope of Work, according to the requirements published in the OPR. The Contracting team shall provide timely responses and paperwork required to fully execute these functions.

1.7 PRE-COMMISSIONING CRITERIA

A. Coordinate layout and installation of each System component and suspension system with other construction elements that are set on roofs or penetrate walls/ceilings or is supported by them, including ceiling systems, light fixtures, HVAC equipment, natural gas piping systems, fire-suppression systems, and partition assemblies.

B. Note operating condition of all existing systems prior to replacements & coordinate with Owner, including describing any known deficiencies in existing performance and making provisions for temporary services including, but not limited to Temporary Heating/Cooling for periods between scheduled demolition and energizing of the new HVAC Unit/Systems.

1.8 WARRANTY

A. Unit/Equipment warranty: Manufacturer's standard forms in which manufacturer agrees to repair or replace components of furnished equipment that fails in materials or workmanship. Submit a written warranty signed by furnished equipment manufacturer and installer agreeing to furnish labor and parts for failures within a warranty period of one (1) year from the date of substantial completion/documented Start-up.

1. Descriptions of Extended Warranties required can be found in the specific equipment/systems specification sections.

1.9 EXTRA MATERIALS/ATTIC STOCK

A. Furnish total sets of materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Touch-up Paint: Quantity of complete containers to be used by Owner to maintain corrodible surfaces after construction is completed
   a. Paint containers: One (1) for each system/equipment employed.

2. Mechanical Unit Belts: Three (3) complete sets of new spare belts for each unit affected.

3. Filters: Extra sets for each Bank of Filters furnished.
   a. Pre-Filters, Primary HVAC Terminal Filters: Two (2) extra for each terminal, rounded to even Full-BOX quantity as commonly distributed.
   b. Final/After Filters: One (1) extra set for each Bank.

4. Ceiling Pads: Quantity of complete cartons of new spare ceiling pads used to return spaces to pre-construction conditions after construction:
   a. BASE Scope: 1 (One) Carton.
   b. ALT Scope: 2 (Two) Cartons.

5. New LED Lighting Fixtures: Three (3) TOTAL complete new spare LED Fixtures of each major type per Project to be used to periodically upkeep updated conditions after construction.

1.10 PREVENTATIVE MAINTENANCE SERVICES

A. Purpose of this section is to allow the Contractor/ Proposers an opportunity to offer the school district (CMSD) a flexible option(s) for annual contracting of manufacturer/System-based full-coverage Maintenance Services for the installed and operating **HVAC Equipment & Systems** affected in this project:
   1. High-Efficiency HVAC Rooftop Units, including Variable Frequency Drives/Heat Exchangers.
   2. Air Terminal Units.

B. The District reserves the right to accept, reject or modify-and-accept the conditions returned in this Manufacturer-based Maintenance Services proposal.

C. Interviews and/or Scope of Services reviews may be subsequently held to clarify inclusions, exclusions and creative options prior to making any formal decisions on agreements.

D. Basic Terms & Conditions for Preventative Maintenance Services Scopes of Work:
   1. Commencement and Duration of Maintenance Agreement:
      a. Start – begins at dates stated/agreed-to by CMSD and consultant (AGM Energy Services).
      b. Documents: Scheduled activity Reporting & Project Completion Sign-Off Forms, including applicable WARRANTY documents, dates and Terms & Conditions.
      c. Duration of Manufacturer's Recommended Service Maintenance Agreement: **Overall THREE Years with One-Year Annual Term Agreement updates**
   2. Sign-in & Access:
      a. Contractor will sign in at the beginning of each day.
      b. Keys & access cards are to be obtained at the CMSD Facilities Main office on Ridge Road.
   3. Work Order/Tickets:
      a. Start & end labor times for each day/project are to be reported for each workorder.
   4. Notifications:
      a. Maintenance Services Contractor will notify CMSD Facilities Management Team monthly to review service over previous month and discuss the following month's planned maintenance.
      b. Maintenance Services Contractor will also notify CMSD consultant/Systems Integration Provider **(AGM Energy Services)** at same time to review equipment/maintenance services performed over previous month and discuss the following month's planned maintenance & potential Integration impacts to overall operations of the systems.

c. A phone number must be provided for 24/7 service and the employ of same maintenance technicians is preferred on all PM services calls to the designated site(s), both regular maintenance and any applicable emergency services agreed-to.

5. Billing Procedures:
   a. After Services are Rendered Complete per schedules, Contractor will bill quarterly the agreed upon contracted sums.
   b. Any Approved Work completed beyond the contract is to be billed following the completion of the project.
   c. All repairs (including both labor & materials) that are not covered in this contract will be approved prior to commencement.
6. Service Personnel:
   a. Contractor will perform all work in a timely and workmanlike manner, using only qualified maintenance technicians with a minimum of 5 years of experience with equipment types in contract, and will adhere to all code standards:
      1) Journeyman-level training on all functions, less filter media changing.
      2) Local organization and/or manufacture-recommended certifications for refrigeration-based PM Services.
      3) Similar/same personnel shall be used per site/equipment to build reliability of the PM services & operations.
7. Preventative Maintenance Services Warranty:
   a. All work performed under this contract will carry a minimum thirty-day warranty on labor and the manufacturer's customary warranty on any materials.

E. Basic Specifications for administration of Preventative Maintenance Services:
1. All customary Preventative Maintenance work/repairs during normal working hours are included at no additional cost.
2. All customary Preventative Maintenance work/repairs outside normal working hours are included at no additional cost.
3. Any additional cost to perform Preventative Maintenance work or repairs by other companies (subs) is included within this proposal.
4. All Preventative Maintenance required repair parts, including valve actuator motors & heating/cooling valves, are to be addressed under the base PM Services.
5. All HVAC equipment affected, including Packaged Rooftop HVAC & VAV Systems and VFD services to be proposed per manufacturer's recommendations, similar to those noted as guidelines herein.
6. One inspection per season of each system, or packaged unit listed (some units may run 24/7). Contractor to follow quarterly scope of services as detailed in subsequent sections.
7. Packaged Rooftop HVAC Units/VFD Packaged Control systems Preventative Maintenance to be performed on a quarterly basis.
8. All units listed with this service plan will have service within four hours of trouble call instigated by CMSD. Service provider to stock adequate parts to ensure seamless operation.
9. All fan belts and drive belts on all listed equipment will be replaced a minimum of once per year.
10. Change or wash air/Water screens/filters as recommended.
11. Cleaning of all air-cooled condensers to improve system efficiency is included, per manufacturer's recommendations, but as a minimum performed each spring & fall.
12. Provide electronic annual report of all Preventative Maintenance per unit/system.
13. It is the sole responsibility of the service provider to maintain the unit/s at their highest efficiency at all times.

14. The goal of this program is to eliminate HVAC mechanical equipment breakdowns and repairs before they occur through proper and manufacturer recommended preventative maintenance measures. However, if repairs on equipment become necessary, it will be expected that the service (parts and labor) be accomplished at no additional cost to the owner. Repairs due to events outside of the contractor's control will be reviewed individually by CMSD as required for compensation beyond the scope of this project. Examples of events outside the contractor's control include natural weather phenomena, vandalism, power surges, etc. that cause damage to systems under this program. No such claims are expected.

1.11 ALLOWANCES

A. Bidders are to include an Allowance amount of $10,000.00, for use in addressing unforeseen conditions/repair-level work discovered during project execution. The Owner, via AGM Energy Services, has the sole direction that these funds may be used for the project, including justification documentation as required. The Allowances for each bid Item are therefore:
   1) ITEM 1: Munoz Marin AC-5 RTU Replacement = $10,000.00

PART 2 - PRODUCTS & SCOPE CRITERIA

2.1 DESIGN CRITERIA

A. Provide Complete Design for noted project Scope of Work utilizing schematic-phase/Criteria documentation included from Owner.

1. Building Code: Current version adopted in City/County.
2. Environmental (space/zone) conditions: Current version of applicable ASHRAE/IEEE standards.
3. CMSD Standards: reference current version and apply as applicable to intent of Scope of Work.
4. Intent: Each design professional utilized in Proposer's proposal has the liberty to act with the Owner's best interests in mind, based on the individual situations/boundaries presented before design begins and based on qualified professional experience. The criteria set forth in this specification is intended to be a guideline to limit the risks of dissatisfaction over the Balanced Total Life of this facility/project and to make the tasks associated with long-term owning/managing the facilities as effective as it can be, including the limitation of equipment/service providers to those noted as being Owner-preferred and/or listed within these specifications.
   a. The merits/selection-award of this Proposal are not dependent on specific savings in operating energy.
   b. The merits/selection-award of this proposal with reference to matching of intended Scope, Construction Schedules anticipated, energy savings and/or operational improvements are key factors in consideration.

2.2 SITE WORK

A. Return any disturbed grounds areas (lawns, pavement, sidewalks, etc.) to pre-construction conditions.

2.3 STRUCTURAL STEEL, CONCRETE AND METAL FABRICATIONS

A. Provide appropriate Design & Materials for support of affected equipment according to applications required using industry standard means-and-methods and common best practices. Refer to specific details on OPR Drawing documents, supporting photos/notes and High-Efficiency Rooftop HVAC Unit Specification Section.
   1. Pre-bid investigation of existing equipment, wiring/piping Support & Rigging Access.
   2. Professional evaluation of support/installation modifications required for new equipment chosen/selected for the replacements and related security & safety provisions.
   3. All proper Final Design & submittal Documentation required by the Scope of Work for a Complete, serviceable and safe installation.

2.4 INTERIOR FINISHES

A. Provide materials for returning interior surfaces to existing conditions according to applications required using industry standard means-and-methods and common best practices.

2.5 BASIC DESIGN AND INSTALLATION REQUIREMENTS

A. Provide required actions, documents and fees for applicable plan creation and approvals, and all subsequent construction-phase inspections (rough-in, finals, etc.). Coordinate requirements with Proposer's team Contractor(s) & Owner's Agent.

2.6 BASIC MATERIALS AND METHODS

A. General: Provide materials for completing mechanical and electrical installations according to applications required (including architectural/general trades finishes) using industry standard means-and-methods and common best practices. This provision applies to, but is not limited to:

   1. Hangers and Supports.
   2. Vibration Controls for moving equipment/Pipe Expansion
   3. Equipment/Piping Tagging and Identifying – Black Stencil Markings or per CMSD Stds.
   4. Valves – for duty of system served.
   5. Meters and Gauges.
   6. Worker Safety & Safety Signage.

2.7 DUCTWORK SYSTEMS

A. General: Provide materials for completing mechanical installations according to applications required (including applicable material choices and finishes) using industry standard means-and-methods and common best practices. This provision applies to, but is not limited to:
   1. Ductwork for Supply and Return Air Systems - SMACNA Gauge and Sealing by duty.

2. Accessories for complete systems (Balancing, Labeling, etc.)
3. Gas Appliance Flues – Per Manufacturer's instructions.

2.8 PIPNG

A. General: Provide materials for completing mechanical installations according to applications required using industry standard means-and-methods and common best practices. This provision applies to, but is not limited to:

1. Condensate Drains – Copper on indoor to match existing materials, approved PVC/CPVC outdoors or per manufacturer's recommendations.
2. Natural Gas – (Approved-painted) Steel to match existing, with applicable fittings & valves.

2.9 INSULATION

A. Provide Insulation for each mechanical system, unless otherwise noted. Provide Insulating products/ services using industry standard means-and-methods and common best practices. This provision applies to, but is not limited to:

1. Indoor drain piping.
2. Concealed Ductwork Systems.

2.10 MECHANICAL EQUIPMENT

A. Owner-Evaluated/preferred Equipment and Systems include:

1. High-Efficiency Packaged Rooftop HVAC Units and Applied/Unitary Variable Frequency Drive motor starters and controls.
2. Air Terminal Units.
3. OPEN Systems Controls for Contractor-installed Applied System Ancillary Control Devices, Energy Metering Equipment, (Natural Gas, Electric, etc.).

B. Ancillary Equipment coordinated with Targeted Scopes of Work, chosen for duty intended/submitted for review and coordination:

1. Controls Components – Provide all items required for operation of Contractor-installed Unitary System Controls (Temperature/Pressure/Airflow Sensors, Sensor Wells, Relays). Coordinate component selections and exact locations with District's Master Systems Integrator during submittal phase.
2. Ceiling Systems: Refer to Product Data Sheets included with OPR as a reference to targeted replacement/upgrade Scopes.
3. Lighting Systems: Refer to Product Data Sheets included with OPR as a reference to targeted replacement/upgrade Scopes.

2.11 ELECTRICAL

A. General: Provide materials for completing electrical installations according to applications required using industry standard means-and-methods and common best practices. This provision applies to, but is not limited to:

1. Panelboards.
2. Transformers.
3. Raceways.
4. Conductors.
5. Grounding.
6. LED Lighting Fixtures and Retrofit Luminaires:
    a. Performance – select relamp devices/new fixtures for providing equivalent/improved results (includes analysis for color, light levels, reflectors, lenses, etc).
    b. Product Registry: Design Lights Consortium (DLC) QPL listed or Energy Star Rated.
    c. Certifications: RoHS compliant
    d. Lumen Life L70:
        1) Minimum 20,000 hrs rated for CFL-replacement LED luminaires.
        2) Minimum 50,000 hrs rated for standard LED luminaires.
        3) Minimum 75,000 hrs rated for Hi-Bay LED luminaires.
    e. Efficacy:
        1) Minimum 65 lumens/watt on Halogen replacement /PAR LED luminaires.
        2) Minimum 120 lumens/watt on standard LED luminaires.
        3) Minimum 130 lumens/watt on Hi-Bay LED luminaires.
    f. Color Rendering Index (CRI):
        1) Minimum 80 CRI on standard LED luminaires.
        2) Minimum 90 CRI and Minimum 50 R Value on Halogen replacement LED luminaires (track/display lighting, etc.).
    g. Distribution:
        1) Minimum 120° beam angle for TLED.
        2) Batwing distribution for Hi-Bay fixtures.
    h. Fixture/Emitter Warranty Period: Minimum 5 years.
    i. Driver Limits: 100% or less of standard ratings.
    j. Controls: Dimmable and integratable into occupancy/timing sensors, per Proposer’s design or based on existing space control configuration.
    k. New Fixture applications - All proposed new fixtures and luminaire retrofits shall meet requirements:
        1) Overall conformation to standards in the Ohio Facilities Construction Commission Ohio Schools Design Manual (OSDM).
        2) Photometric Design – refer to OSDM for coverage and light level requirements.
        3) Correlated Color Temperature (CCT) – refer to published District standards for conformation. Contractor shall ensure that only one standard TLED CCT is provided for all buildings. 3500K – 5000K, or as recommended in the current OSDM edition.
    l. Aesthetic finish and representation – Use only first-quality components. Existing re-used fixtures/lenses are to be wiped clean after retrofit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Proposers are responsible for field-verifying all existing conditions for how they may impact/relate to providing the new Scopes of Work. No post-proposal compensation is expected to cover costs of reasonably-accessible and known existing conditions.
   1. Make provisions to properly remove the existing HVAC Units/piping and Electrical Power and make safe for installation/set of the new equipment. Determine exact locations for ductwork, piping and electrical connections before demolition scope. This includes any hazardous material removals/fluid pumpdowns required by the existing Packaged Rooftop HVAC unit.
   2. Make provisions to properly remove the existing Ceiling & Lighting Systems and make safe for installation/set of the new Systems. Coordinate exact locations for new ceiling framework/Lighting Systems with existing/new ductwork, piping, IT Systems, Public Address, etc. and electrical connections before demolition scope. This includes any hazardous material removals required by the existing substrate systems.

B. Arrange installations to provide access space around equipment for service, protection and maintenance. Install so that all access doors/panels are fully operable.

3.2 CONNECTIONS

A. Piping connections are per the Schematic Scope of Work Drawings/submittals which indicate general arrangement of piping, fittings, and specialties.

B. Schematic Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections as applicable.

C. Electrical: Comply with applicable requirements of local codes and best practices.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Coordinate/Engage factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections.

   1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 STARTUP SERVICE

A. Coordinate/Engage a factory-authorized service representative to perform startup service as per manufacturer’s instructions and recommendations. Provide applicable documentation to Owner.

3.5 FINAL COMMISSIONING

A. After completion of installations, fully Test, Adjust, and Balance each system to ensure proper design and operation, coordinating efforts with Temperature Control Systems Installers/Programmers and District's Master Systems Integrator/Commissioning Provider. Document results.

1. The Intent for this function is to assure Owner that the existing/upgraded controls & new AC-5 VAV Systems (new HVAC RTU and Air Terminal Units) are capable of delivering the expected Sequences and Airflows to the existing spaces being renovated: It is intended to Test, Adjust & Balance the overall AC-5 System components for flow performance.

3.6 CLEANING

A. Clean equipment internally and externally, on completion of installation, according to manufacturer's written instructions. Clean equipment interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils entering air face of HVAC-coil units.

B. After completing system installation and testing, adjusting, and balancing of equipment and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

A. Coordinate/Engage a factory-authorized service representative to demonstrate/train Owner's maintenance personnel to adjust, operate, and maintain equipment & systems installed, including an agreed-to procedure for post-construction service during the Warranty period.

3.8 PREVENTATIVE MAINTENANCE IMPLEMENTATION GUIDELINES

A. General: the following paragraphs are intended as Service Guidelines that should be understood and applied to EACH HVAC Equipment/System item in the Scope of Work in order to quantify/qualify the nature of Manufacturer-based care for the subject equipment. Service Providers are responsible to review what is actually recommended/published for each item furnished & covered in the Preventative Maintenance Scope of Work.

B. Comprehensive Quarterly Maintenance Guidelines for HVAC Equipment:

1. General Instructions – in conjunction with Manufacturer's PUBLISHED Recommendations:
   a) Inspect for visual leaks and report leak check results.
   b) Repair minor leaks as required (e.g. valve packings, flare nuts & pipe joints).
   c) Calculate fluid loss rate(s) and report to the customer, as applicable.
   d) Brush clean coils, louvers/fill & heat exchangers.
   e) Verify electric motor starter(s) and auxiliary electric control device(s) operation.
   f) Check refrigerant charge - not applicable.
   g) Verify smooth operation of any burners, compressors and fans.
   h) Change Filter media as applicable.
   i) Review operating procedures with operating personnel.

j) Provide a written report of completed work, operating log, and indicate any uncorrected deficiencies detected.

2. Controls and Safeties
   a) Test the operation of any Unitary Controls & Safety devices, including installed loose accessories and components (space & system temperature/pressure devices, damper/valve controls, unit-provided interfaces to Fire Alarm systems, etc). Calibrate, if applicable, and record setting.
3. Lubrication
   a) Lubricate motor bearings, if applicable.
   b) Check oil level in the compressor(s), not applicable.
   c) Check oil for acid content and discoloration. Make recommendations to the customer based on the results of the test - not applicable.
4. Electric Components, Motors and Starters
   a) Clean the starter and cabinet.
   b) Inspect wiring and connections for tightness and signs of overheating and discoloration.
   c) Check the contactors for free and smooth operation.
   d) "Meg" any major-service motor(s) and record readings.
   e) Verify the tightness of the major motor terminal connections.
   f) Verify the operation of the basin heater(s) and pipe heat tracing, if applicable.

END OF SECTION 10 23 26

SECTION 230900 – OPEN TEMPERATURE CONTROL SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. The Project's Owner's Project Requirements (OPR) documents provide additional graphical schematics to delineate responsibilities for Technical Services provided by the Owner's Master Systems Integrator (MSI) and the Proposer/Contractor's Installation teams for Temperature control-related Scopes of Work.

1. Refer to Section 230940 for Descriptions of Master Systems Integration Services being provided to the Owner via the Master Systems Integration & Integrated Commissioning Provider, (AGM Energy Services). These services include, but are not limited to:

    a. Systems Integration equipment: Supervisory Computers, OPEN-platform Controllers (JACE™ & Enterprise-level Controllers), Application Specific Controllers – as noted, Energy-use Meters – as noted, Lighting Control Panels – as noted, System/Network Computers, Workstation peripherals, etc.
    b. Integration-specific Software: OPEN System/Network-based, Lighting Control, IT Plug Load Management, Digital Signage interfaces, etc.
    c. Programming: Master level, Scheduling, Alarm Console, Energy Data & Graphing, Analytic Functions, etc.
    d. IT Systems Communication: Coordinating OPEN Control & Unitary Control interfaces with Owner's Network(s).
    e. Graphical Screens: Operational Screens & Human-Machine Interface setups, etc.
    f. Training: Specific to OPEN Integration (non-Unitary) portions of Network.
    g. Commissioning Services: Evaluation, Assurance & Documentation that intended integrations from Unitary Controls by Proposer/Contractor are reporting and functioning as intended at Master Network/Supervisory-level.

2. Refer to published Systems Architecture Diagrams for Scope of Work clarifications and specific delineations between 230940 Master Systems Integration Scopes and Temperature Control System Scopes described herein.
3. Refer to published MSI-furnished Product Data sheets/Submittals for available specifics on devices/systems being furnished for field installation by this Contractor.

C. Cleveland Metropolitan School District's published Design Guide and Standards Documents, current versions.

1.2 SUMMARY

A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Temperature Control System (TCS), utilizing Unitary-coordinated Direct Digital Controls and fully coordinating with the District's Master Systems Integrator (MSI) as shown on the drawings and as described herein. Drawings are diagrammatic only.

1. PROJECT CONTROLS FOCUS: Provide Energy-use Meter Equipment and installation of unitary-provided control & components (furnished with Contractor-selected & furnished HVAC Equipment as required to meet design/functional intent, i.e. space sensors, duct sensors, etc.) and other miscellaneous control components required to meet the project's design intent.
2. The programming tool for any specified BAS control products provided as a part of this Section must use Tridium's Niagara™ software as the host programming environment. Any programming tools that will not launch and run solely in Niagara are disqualified. Owner shall be provided with a minimum of six copies of the programming tool for the BAS controllers provided, and tool shall have a permanent license that never expires.
3. All data points in specified Scopes of Work described in this Section will be exposed by the Designing/Installing TCC to the BAS Graphical User Interface (Niagara™) to permit integration into the Owner's OT network by the Master Systems Integrator (MSI).
4. This Section includes the necessary labor and materials to comply with the Cx Commissioning efforts as required (communication coordination & Functional Testing). TCS supplier's commissioning activities are to be included in this specification section's activities and are non-compensable and cannot be a cause for delay claims.
5. This Section includes the necessary labor and materials to completely install equipment provided by Owner to the Proposer/Contractor via the Master Systems Integration Services (MSI) provider.

B. All labor, material, equipment and software not specifically referred to herein or in the OPR documents that are required to meet the functional intent of the OPR Documents/this specification, shall be provided without additional cost to the Owner.

1.3 SYSTEM DESCRIPTION

A. The entire Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital logic controllers communicating via current BacNet™ communication protocols to a Java Application Control Engine (JACE) N4 platform provided under division 230940 MASTER SYSTEMS INTEGRATION SERVICES (By AGM Energy Services to the Owner via direct contract).

1. Refer to OVERALL Specifications & schematic Diagrams for additional Work-Scope and Project intent descriptions.
2. Refer to Owner's published Standards for accompanying requirements related to ancillary control systems components.

1.4 MANUFACTURERS

A. Manufacturers, General: Products must be available for purchase from at least two wholesale distributors in the state of Ohio, and Owner must have direct ability to purchase products outside the contractor relationship.

B. Manufacturers: Subject to compliance with Specified requirements, provide major-standard UNITARY (specific to HVAC Rooftops) Controls-related products and services by one of the following, Installed & Serviced by current manufacturer-designated branch:

1. Carrier – BacNET™ Product Platform – Unitary OPEN DDC Controllers.
2. Johnson Controls/York BacNET™ Product Platform – Unitary OPEN DDC Controllers.
3. Trane - BacNET™ Product Platform – Unitary OPEN DDC Controllers.

1.5 OPEN TEMPERATURE CONTROL SYSTEM PROVIDERS/INSTALLERS

A. Providers/Installers, General: the Intent is to provide HVAC Rooftop Equipment manufacturer-qualified field installation of System UNITARY Control components and related MSI/TCS/Metering cable-communications for the noted Scopes of Work.

1.6 SUBMITTALS

A. Coordinated with Project Requirements, properly-named electronic copies of shop drawings/product data of the entire OPEN Temperature Control System/Systems Architecture/components shall be submitted/transmitted and shall consist of a complete list of equipment and materials, including manufacturer's catalog data sheets and installation/maintenance instructions. Shop drawings shall also contain complete wiring and schematic diagrams, software descriptions, calculations, and any other details required to demonstrate that the system has been coordinated and will properly function as an "OPEN System". Terminal identification for all control wiring shall be shown on the shop drawings. A complete written Sequence of Operation shall also be included with the submittal package, as applicable.

B. Submittal shall also include a complete Point List of all connected points to the provided DDC TC System in the format as indicated in the temperature control system diagrams located on the drawings. This includes, but is not limited to:

1. BACnet™ Registers – coordinated with associated equipment.
2. Applicable PICS documentation.
3. Applicable Software Licensing documentation.
4. Naming Conventions (Points, Communications, etc.) as established by the Owner, in English TABLE form

C. In addition to above submittals, the commissioning (Cx) submittal requirements as outlined shall be included as part of this specification section requirement.

D. Upon completion of the work, provide a complete set of 'as-built' submittals/drawings on properly-labeled current magnetic media or compact disc/storage all licensed to the Owner/end user. Drawings shall be provided as AutoCAD™ or Visio™ compatible files, in addition to current Adobe PDF versions. Two "hard" copies of the 'as-built' drawings shall be provided (in addition to the documents on flash drive media or compact disc). Also provide at Final-Acceptance/Completion of the Work:

1. Applicable Warranty Conditions documentation.
2. Verification of final Training/Plans for additional training.
3. Signed certificates of Completion (coordinated with MSI/Commissioning provider).

1.7 DIVISION OF WORK

A. The Section 230900 (TCC) Contractor shall be responsible for all field labor for mounting & wiring designed/specified Building Automation System (BAS)/TCS components, (including specified Enterprise-level devices, Distributed Application Specific Controllers, & Lighting Control System devices being furnished by the Owner's Master Systems Integration Services Provider under Section 230940), coordination with the MSI-components as specifically noted, coordination with HVAC/Electrical Unitary Controllers provided with Contractor-selected & furnished Equipment/Systems, ancillary control devices, required fabricated control panels, any unitary/Distributed/Applied controller programming not factory or MSI-furnished, unitary/non-applied controller programming software, labeled controller input/output and power wiring, labeled controller network wiring and (BAS)/TCS-based BACnet™ network wiring & connections to the Java Application Control Engine (JACE) N4 Networks, (applies to ALL required wiring scopes). SPECIFIC Equipment furnished under this section includes:

1. MAIN ENTERPRISE System Applied Controls: None – provide conduit, conductors and field wiring Scopes only – refer to MSI Schematics published in OPR.
2. Applied Distributed Temperature Controls: None – Controllers are furnished by the MSI, provide conduit, conductors and field wiring Scopes only – refer to MSI Schematics published in OPR.
3. HVAC/Electrical Equipment: Coordinate provision & installation with Contractor-chosen Unitary System Controllers as part of a factory-fabricated unit/systems. This Scope includes, but is not limited to:
    a. Packaged Heating Equipment.
    b. Packaged Cooling Equipment.
    c. Packaged Airflow Measuring Stations not furnished with Packaged HVAC Equipment.
4. Energy-use Meters: as noted in OPR, specified in section 230940, furnish, install & wire for power/communications for Listed Components below:
    a. Natural Gas Flow – Main/Sub Service only, provided by Contractor as noted.
    b. Electric Power (Demand & Consumption) – Ensure Integration to Main & Sub-Services provided by Contractor as noted.

B. The Section 230940 (MSI) Master Systems Integration Services provider shall be responsible for the Java Application Control Engine (JACE) N4 components & software and programming of the JACE's, graphical user interface software (GUI), development of all graphical screens, setup of schedules, logs and alarms, BacNet(tm) network management as required to interface the JACE to the Proposer/Contractor's TCS network/energy meters/lighting control systems, global supervisory control applications, general system integration of BACnet/Modbus devices as shown, integration and coordination and connection of the JACE to the local or wide area network. The Owner's Master Systems Integrator will provide the JACE(s) to the Proposer/Contractor for field installation and utility meter/monitor(s) when specifically designated. SPECIFIC Equipment furnished under section 230940 includes:

1. Main Supervisory Computer Equipment.
2. Main JACE (N4) Network Controllers.

3. VAV Air Terminal Controllers – as SPECIFICALLY Noted in OPR.
4. Lighting Control System Controllers only as SPECIFICALLY Noted in OPR.

1.8 RELATED WORK SPECIFIED ELSEWHERE

A. Division 260000 Line & Low Voltage Electrical scopes, via Proposer/Contractor's TCC and Electrical Power/low-voltage (Systems) subcontractors:

1. Providing motor starters and disconnect switches (unless otherwise noted).
2. Power wiring and conduit (all line and low voltage unless otherwise noted).
3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
4. Providing labor and material for physically mounting each JACE controller, loose sensor(s) and metering/monitoring component of the Integrated System.
5. Providing labor and material for generator network, lighting controller network and power monitoring network connections to the JACE (unless noted in other equipment sections).
6. Providing labor and material for; intranet, internet, BACnet, Modbus, etc. networking to the JACE from other systems or facility or global wide area networks.

1.9 AGENCY AND CODE APPROVALS

A. All products of the BAS shall be provided with the following and applicable-related agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. UL-916: Energy Management Systems.
2. UL-854: Smoke Control Systems.
3. ASHRAE Standard 135: BACnet™ Communication Protocol.
4. NFPA: Applicable Life Safety and Risk-Loss Provisions.
5. ULC; UL - Canadian Standards Association
6. FCC: Part 15, Subpart J, Class A Computing Devices

1.10 SOFTWARE LICENSE AGREEMENT

A. The Owner shall sign a copy of any TCS manufacturer's standard Unitary-Control-based software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

B. Software license shall not expire or utilize any sort of protection hardware device for its use.

C. A software license information form describing the manufacturer's policies and implementation shall be provided to the Owner before the job is complete.

1.11 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.12 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the OPR/Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.13 WARRANTY

A. TCS warranty: Provider/Manufacturer's standard form in which provider/manufacturer agrees to repair or replace components of TCS wiring & equipment that fails in materials or workmanship. Submit a written warranty signed by the TCS provider and installer agreeing to furnish labor and parts for failures within a warranty period of one (1) year from the date of substantial completion/documented Start-up.

B. Extended warranty: Provider/Manufacturer's standard form in which TCS provider/manufacturer agrees to furnish parts and labor for Proposer/Contractor installed non-Integration-based TCS failures within an extended warranty period:

1. Term: Two (2) years (TOTAL) from the date of substantial completion.

2. Condition: The Second year of P & L coverage begins with final acceptance of TCS beneficial operation confirmed at 11-month TCS Walkthru with Owner's Master Systems Integrator/Commissioning Provider & Owner's representative.

1.14 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

BAS	Building Automation System
TCS	Temperature Control System
JACE	Java Application Control Engine (Tridium/Vykon N4)
Cx/CxP	Commissioning/Commissioning Services Provider
IBC	Interoperable BACnet Controller
MSI	Master Systems Integrator
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OPR	Owner's Project Requirements
OOT	Object Oriented Technology
PICS	Product Interoperability Compliance Statement
TCC	Temperature Control Contractor
TAB	Test, Adjust and Balance "Contractor/Report"

PART 2 MATERIALS

2.1 GENERAL

A. The Temperature Control System (TCS) shall be comprised of a network of interoperable, stand-alone digital controllers specified and/or provided by the Owner's Master Systems

Integrator (AGM Energy Services) for installation by this section sub-contractor and other control elements & devices provided and installed as required by this section sub-contractor as specified herein to achieve a fully-operational and energy-efficient facility operations OPEN Temperature Control/Building Automation System.

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-1995 BACnet technology communication protocols (MSTP/IP). The BAS is to be delivered by the noted combination of the Owner's Master Systems Integrator (AGM Energy Services) and Proposer/Contractor/TCC provided field/unitary control components via selected Vendors/Mechanical Contractor/Electrical Contractors.

1. The Main TCS/BAS Platform furnished, installed & implemented in this project will be equal to a current-version Distech or Johnson Controls, Inc. Facility Explorer™ System, engineered to be fully (certifiable) "OPEN" on the Tridium Niagara™ Framework.

a. Main Distributed Controller elements: "Distech/ Johnson-FX80" (furnished by the MSI under 230940).

b. Distributed Application Specific Controller elements: "OPEN" (Niagara N4, BACnet™) Series (furnished by the MSI under 230940 as specified).

2. The software licensing required shall have no restrictions on which brand of JACE, Supervisor or System Programming tools can interact with the system. Station Compatibility must = ALL and Tool Compatibility must = ALL.

B. All components and controllers supplied under this contract shall be true "peer-to-peer" communicating devices. Components or controllers requiring "polling" by a host to pass data shall not be acceptable.

2.3 ANCILARY CONTROL SYSTEM HARDWARE ELEMENTS

A. Local Control Panels: Unitized NEMA 1 cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.

1. Fabricate panels of 0.06-inch thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish.
2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.
4. Provide ON/OFF power switch with over-current protection for control power sources to each local panel.

5. Provide/mount “lamacoid”/similar engraved label for each major subpanel/enclosure containing TCS devices coordinated with TCS Submittals and Design/Submittal documentation issued.

B. Sensors:

1. Electronic Temperature Sensors: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
2. Resistance Temperature Detectors: Platinum, thermistor, or balco.
    a. Accuracy: Plus or minus 0.2 percent at calibration point; thermistors shall have a maximum 5 year drift of no more than .225°F maximum error of no more than .36°F
    b. Wire: Twisted, shielded-pair cable
    c. Insertion Elements in Ducts: Single point, 6 inches long; use where not affected by temperature stratification or where ducts are smaller than 4 sq. ft.
    d. Averaging Elements in Ducts: 60 inches, long, flexible for use where prone to temperature stratification or where ducts are larger than 4 sq. ft.; 264 inches long, flexible for use where prone to temperature stratification or where ducts are larger than 16 sq. ft; length as required.
    e. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches.
    f. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
    g. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.
3. Humidity Sensors: Bulk polymer sensor element.
    a. Accuracy: 2 percent at 10-90% RH with linear output.
    b. Room Sensors: Range of 0 to 100 percent relative humidity
    c. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.
4. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
    a. Accuracy: +/- 1 percent of full scale with repeatability of 0.5 percent.
    b. Output: 4 to 20 mA, 0-5 vDC, 0-10 vDC.
    c. Building Static-Pressure Range: -.1 to .1, -0.25 to 0.25, -.5 to .5, -1.0 to 1.0 IN WC., jumper selectable.
    d. Duct Static-Pressure Range: 0 to 1, 0 to 2.5, 0 to 5, 0 to 10 IN WC., jumper adjustable
5. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

C. Equipment operation sensors as follows:

1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 IN WC.
2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.

3. Status Inputs for Electric Motors: Current-sensing relay with current transformers, adjustable trip point, split core with an integral LED for trip indication and set to 175 percent of rated motor current.

D. Electronic Valve/Damper Position Indication: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

E. Water-Flow Switches: Pressure-flow switches of bellows actuated mercury or snap-acting type, with appropriate scale range and differential adjustment, with stainless steel or bronze paddle. For chilled water applications, provide vapor proof type.

F. Carbon-Monoxide Detectors: Single or multi-channel, dual-level detectors, using solid-state sensors with 3-year minimum life, maximum 15-minute sensor replacement, suitable over a temperature range of 23°F to 130°F, calibrated for 50 and 100 ppm, with maximum 120-second response time to 100-ppm carbon monoxide.

G. Carbon-Dioxide Sensor and Transmitter: Single detectors, using solid-state infrared sensors, suitable over a temperature range of 23°F to 130°F, calibrated for 0 to 2 percent, with continuous or averaged reading, 4 to 20 mA output, and wall mounted.

H. Oxygen Sensor and Transmitter: Single detectors, using solid-state zircon cell sensing, suitable over a temperature range of -32°F to 1100°F, calibrated for 0 to 5 percent, with continuous or averaged reading, 4 to 20 mA output, and wall mounted.

I. Refrigerant Detectors: Dual-level detectors, using solid-state sensors, with alarm preset for 300 ppm, alarm indicator light, alarm silence light and button, alarm test light and button, and trouble light. Provide auxiliary relay preset for 150 ppm.

J. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment, for flush mounting

K. Non-Unitary Thermostats:

1. Combination Thermostat and Fan Switches: Line-voltage thermostat with two-, three-, or four-position, push-button or lever-operated fan switch.
2. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on two-gang switch box.

L. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater.

M. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.

1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break ungrounded conductors.
2. Dead Band: Maximum 2°F.

N. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.

2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches, with electrical ratings required by application.
6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

O. Fire-Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75°F above normal maximum operating temperature, with manual reset with control circuit arranged to directly shutdown appropriate equipment and provide remote annunciation at the GUI.

P. Room Thermostat Cover Construction:

1. Set-Point Adjustment: Concealed or exposed
2. Set-Point Indication: Concealed or exposed
3. Thermometer: Optional
4. Color: Neutral
5. Orientation: Vertical or horizontal

Q. Room thermostat accessories include the following:

1. Insulating Bases: For thermostats located on exterior walls.
2. Thermostat Guards: As specified in tamper prone areas
3. Adjusting Key: As required for calibration and cover screws.
4. Set-Point Adjustment: 1/2-inch diameter, adjustment knob.

R. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

S. Electric High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or above set point.
1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

T. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig., and cast housing with position indicator and adjusting knob.

2.5 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action under all environmental conditions (temperature,

low power voltage fluctuations, tight seal damper design, maximum air and water flow forces).

1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
2. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2": Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
3. Spring-Return Motors for Valves Larger Than NPS 2-1/2": Size for running and breakaway torque of 150 in. x lbf.
4. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running torque of 150 in. x lbf and breakaway torque of 300 in. x lbf.
5. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft.: Size for running and breakaway torque of 150 in. x lbf.

B. Electronic Damper and Valve Actuators: Direct-coupled type non hydraulic designed for minimum 100,000 full-stroke cycles at rated torque. The actuator shall have rating of not less than twice the thrust needed for actual operation of the damper or valve.

1. Coupling: V-bolt and V-shaped, toothed cradle.
2. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
3. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on non-spring-return actuators.
4. Actuators shall have the ability to be tandem mounted.
5. All spring-return actuators shall have a manual override. Complete manual override shall take no more than 10 turns.
6. Power Requirements (Two-Position Spring Return): 24V ac or dc, Maximum 10VA.
7. Power Requirements (Modulating): Maximum 15 VA at 24V ac.
8. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
9. Temperature Rating: -22°F to 140ºF.
10. Run Time: 200 seconds open, 40 seconds closed.
11. All actuators shall have a 5 year warranty
12. Valves: Designed & Selected for application/duty designated.
    a. Size for torque required for valve close-off at maximum pump differential pressure (regardless of water loop system pressures).
    b. Valve and Actuators shall come from the factory fully assembled.
    c. Spring Return Manual Override shall come with a 10 Degree Valve Preload to assure tight close off.
13. Dampers: Designed & Selected for application/duty designated.
    a. Size for running torque calculated as follows:

       i. Parallel-Blade Damper with Edge Seals: 7 inch-pounds/sq. ft. of damper.
       ii. Opposed-Blade Damper with Edge Seals: 5 inch-pounds/sq. ft. of damper.
       iii. Parallel-Blade Damper without Edge Seals: 4 inch-pounds/sq. ft. damper.
       iv. Opposed-Blade Damper without Edge Seals: 3 inch-pounds/sq. ft. of damper.
       v. Dampers with 2 to 3 Inches wg. of Pressure Drop or Face Velocities of 1000 to 2500 FPM Multiply the minimum full-stroke cycles above by 1.5.
       vi. Dampers with 3 to 4 Inches wg. of Pressure Drop or Face Velocities of 2500 to 3000 FPM Multiply the minimum full-stroke cycles above by 2.0.

b. Spring Return Manual Override actuators shall a factory set 5 Degree Damper Preload.

2.6 CONTROL VALVES

A. General: Control valves shall be 2-way or 3-way pattern as shown constructed for tight shutoff and shall operate satisfactorily against system pressures and differentials. Two-position valves shall be 'line' size. Proportional control valves shall be sized for a maximum pressure drop of 5.0 psi at rated flow (except as may be noted on the drawings). Valves with sizes up to and including 2 inches shall be "screwed" configuration and 2-1/2 inch and larger valves shall be "flanged" configuration. Electrically controlled valves shall include spring return type actuators sized for tight shut-off against system pressures and furnished with integral switches for indication of valve position (open-closed). Two/Three-way butterfly valves, when utilized, shall include a separate actuator for each butterfly segment. Control valves for fan powered boxes and VAV boxes do not need to be of the spring return type.

PART 3 EXECUTION

3.01 GENERAL

A. All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians/electricians qualified for this work and in the regular employment of the temperature control system installer. The installing office shall have a minimum of five years of installation experience with similar Scopes of Work and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the selected component manufacturer(s). Supervision, calibration and checkout of the system shall be by the employees of the local installer contracting field office. Intent is to install & wire (power and Communications) Contractor and Owner-Furnished components/systems (coordinated with Master Systems Integrator AGM Energy Services) including, but not limited to (refer to accompanying OPR documents & designated Product Data/IOMMs/Cut Sheets):

a. Distributed OPEN JACE Controllers, Meters, Sensors, communication cabling and auxiliaries.

b. Distributed OPEN Application Controllers, sensors, communication cabling and auxiliaries.

c. Electric Power Monitoring equipment – Coordinate functionality of existing meters.

d. Natural Gas Metering equipment - Coordinate functionality of existing meters.

e. Digital-Integrated Lighting Control Panels/equipment.

B. Install system and materials in accordance with acceptable industry methods & procedures, local standards and manufacturer's instructions, and as outlined/detailed in the project drawing set/OPR documents.

C. Drawings of temperature control systems in the OPR are diagrammatic only and any apparatus not shown, such as relays, accessories, etc., but required to make the system operative to the complete satisfaction of the Owner/Criterion Engineers shall be furnished and installed without additional cost.

D. Install equipment level and plumb.

E. Install/implement software in Unitary control units and assure interface(s) to Owner's operator workstation(s), Coordinated with the Systems Integration Provider. Implement all features of programs to specified requirements and as appropriate to Sequences of Operation.

F. Connect and configure equipment and software to achieve Sequences of Operation specified.

G. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate all to ADA standards/level above the floor. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

H. Install guards or tamper proof enclosures on thermostats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

I. Install automatic dampers according to manufacturer's listed instructions.

J. Install damper actuators on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

K. Install labels and nameplates to identify control components.

M. Install hydronic instrument wells, valves, and other accessories according to manufacturer's listed instructions"

N. Install refrigerant instrument wells, valves, and other accessories according to manufacturer's listed instructions.

O. Install duct volume-control dampers according to according to manufacturer's listed instructions.

P. Install electronic and fiber-optic cables according to manufacturer's listed instructions and NEC requirements.

3.02 JOB SITE CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It is the TCC/Proposer-Contractor's responsibility to check the Contract Documents for possible conflicts between this Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural feature.

3.03 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to manufacturer's listed instructions and NEC requirements.

B. Install building wire and cable according to manufacturer's listed instructions and NEC requirements.

C. Install signal and communication cable according to manufacturer's listed instructions and NEC requirements.

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.

4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

F. Where Serial Communication/BAS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to machine to allow service and maintenance.

B. Ground equipment. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL/FINAL CHECKOUT OF TCS

A. Installer's Field Service: Engage a qualified service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing. Calibration and test electric/electronic thermostats by disconnecting input sensors and stimulating operation with compatible signal generator.

1. Notify Owner/Project Construction Administration Team no less than TWO Weeks prior to scheduling the Final Checkout of EACH Major Area/Portion of the OPEN Temperature Control System and allow an Owner’s Representative(s) to observe any of the scheduled Final Checkout procedures planned by the factory-TCC to achieve the Field Quality Control directives of this Specification; document results and transmissions.

B. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

C. Verify Unitary (manufacturer designed & factory/field-installed) DDC as follows:

1. Verify software including automatic restart, control sequences, alarms, scheduling, reset controls, and occupied/unoccupied cycles.
2. Verify local control units including self-diagnostics.

D. Cooperate & Coordinate with Testing & Balancing services providers to achieve Sequences of Operation specified/final-designed.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control systems and components.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Provide operator training on data display, alarm and status descriptors, requesting data, executing commands, calibrating and adjusting devices, resetting default values, and requesting logs. Include a minimum of 20 hours (“banked”) dedicated instructor time on-site.
4. Review data in maintenance manuals.
5. Schedule training with Owner, through Criterion Engineer, with at least seven days' advance notice.

3.07 ON-SITE ASSISTANCE

A. Occupancy Adjustments: Within one year of date of Substantial Completion, provide for three Project site visits, when requested by Owner, to adjust and calibrate components and to assist Owner's personnel in making program changes and in adjusting sensors and controls to suit actual conditions.

1. Two of the after-completion Project Site Visits will be noted as SEASONAL with intent of making Entering Heating and Entering Cooling System assessments.
2. The Third after-completion Project Site Visit will be at the time where Eleven months has elapsed from the date of Final Project Acceptance with intent of assessing the status of the original Warranty Period and current operating conditions.

3.08 WARRANTY EXECUTION

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance as defined in 3.10 D.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) repaired or replaced by the Division 230900 provider at no expense to the Owner.

3.09 WARRANTY ACCESS

A. The Owner may grant to qualified Mechanical Service contractors, reasonable access to the TCS during the warranty period.

3.10 ACCEPTANCE TESTING

A. The Division 230900 provider shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications. The Division 230900 contractors and 230940 services provider are to coordinate the checkout of the system such that each Division has a representative present during system checkout.

B. The Division 23900 provider shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system

operation. The Division 230940 provider shall have a representative present during system checkout by the Division 230900 provider.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: is defined as the 230900 supplier and Proposer/Contractor having completed all of the testing and demonstration activities as required by the MSI/Cx (Commissioning Services Provider – AGM Energy Services) commissioning plan including prefunctional and functional testing and bi-seasonal testing and receiving an acceptance letter issued by the OWNER/Cx for this specification section. The Proposer/Contractor & Owner will determine the date of Functional Completion after reviewing the Commissioning Provider's recommendation for Functional Completion. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

END OF SECTION 230900

SECTION 230916 - VARIABLE FREQUENCY DRIVES & MOTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes matched HVAC-duty motors and Variable Frequency Drives (VFD) with open standard protocol capabilities for both applied-in-field components and Packaged HVAC systems and Equipment.

B. Related Sections include the following:

1. Division 23 Section "OPEN Temperature Control Systems" contains requirements that relate to this Section.
2. Division 23 Section "Master Systems Integration Systems" contains requirements that relate to this Section.
3. Division 23 Section "High-Efficiency Packaged HVAC Rooftop Units" contains requirements that relate to this Section.
4. Overall Specification Section contains requirements relating to general intent of coordinating design/selection for Updated HVAC & Electrical Systems.

1.3 SUBMITTALS

A. General: As coordinated with Packaged HVAC Equipment Submittal requirements, submit each item in this Article according to the Conditions of the Contract.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection.

D. Shop Drawings containing the following information for each control system:

1. Diagrams for all required electrical wiring (matched motor & VFD Starter). Clearly differentiate between factory-installed and field-installed wiring.
2. Details of control panel faces, including controls, instruments, and labeling.
3. System graphics.
4. System configuration.

5. Software description and sequence of operation.

E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Maintenance data for motors/variable frequency drives to include in the operation and maintenance manuals specified. Include the following:

1. Maintenance instructions and applicable spare parts lists.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

G. Field Test Reports: Procedure and certification of variable frequency drive system.

H. Harmonic Testing: Compliance to IEEE 519 - harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion.

1. The VFD manufacturer shall provide calculations, specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with IEEE standard 519 (latest version), guide for Harmonic Control and Reactive Compensation for Static Power Converters. The acceptance for this calculation must be completed prior to VFD installation.
2. Prior to installation, the VFD manufacturer shall provide the estimated total harmonic distortion (THD) caused by the VFDs. The results shall be based on a computer aided circuit simulation of the total actual system, with information obtained from the power provider and the user.
3. If the voltage TDH exceeds 5%, the VFD manufacturer is to recommend the additional equipment required to reduce the voltage THD to an acceptable level.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Wiring installation shall be accomplished by a licensed electrician.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing variable frequency drive & matched motor replacement systems similar to those indicated for this Project and that have a record of successful in-service performance. It is required that the drive manufacturer have an existing sales representative exclusively for HVAC products, with expertise in HVAC systems and controls and must have an independent service organization within a 50 mile radius of the project site. The drive and all necessary controls, as herein specified, shall be supplied by the drive manufacturer. The manufacturer shall have been engaged in the production of VFDs for a minimum of ten (10) years.

C. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of local representative of variable frequency drives.

D. Comply with NFPA 90A.

E. Comply with NFPA 70.

F. Comply with UL 508C, including all Bypass and accessory components.

G. Comply with IEEE Standard 519-1992, Guide for Harmonic Content and Control.

H. Comply with NEMA ICS 7.0 AC Adjustable Speed Drives.

I. Comply with IEC 16800 Parts 1 and 2.

J. Testing:
1. All printed circuit boards shall be completely tested and burned-on before being assembled into the completed VFD. The VFD shall then be subjected to a computerized systems test (cold), burn-in, and computerized system test (hot). The burn-in shall be at 104 deg. F. (40 deg. C), at full rated load.
2. All testing and manufacturing procedures shall be ISO 9001 certified.

K. Failure Analysis:

1. VFD manufacturer shall have an analysis laboratory to evaluate the failure to any component. The failure analysis lab shall allow the manufacturer to perform complete electrical testing, x-ray of components, and decap or delaminate of components and analyze failures within the component.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

1.6 WARRANTY

A. Warranty shall be 24 months from the date of certified start-up. The warranty shall include all parts, labor, travel time and expenses.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide original manufactured/non-branded products by one of the following:

1. ABB – base models and engineered branded.
2. Danfoss – base models and engineered/branded
3. Johnson Controls/Eaton.
4. Yaskawa HVAC.

2.2 HVAC MOTORS

A. General: Comply with usual & customary requirements for application of VFD-driven, HVAC-duty Motors.
   1. Choose Motors based on Field Verification for Replacement efforts (Size, Voltage, Fan/Pulley/Drive Arrangements, Service Access, etc.).
   2. Provide Grounding Shaft Ring for VFD duty applications.

B. Noise Rating: Quiet.

C. Efficiency Rating: Premium.

2.3 VARIABLE FREQUENCY DRIVES (VFDs)

A. The Variable Frequency Drives (VFDs) shall be solid state, with a Pulse Width Modulated (PWM) output waveform utilizing insulated gate bipolar transistors (IGBT's). The VFD package specified herein shall be completely assembled in a NEMA 1 enclosure and tested by the manufacturer. The drive efficiency shall be 97% or better at full speed and full load and the fundamental power factor shall be 0.98 at all speeds and loads.

B. General Requirements: VFDs and options shall be UL Listed as a complete assembly. All items in this specification must be adhered to strictly. Any deviations must be submitted and approved in writing ten working days prior to the bid date.

C. All VFDs utilized in field-applied or Packaged HVAC equipment shall have the following standard features:

   1. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be used for local control, for setting all parameters and for stepping through the displays and menus. The keypad shall be removable, capable of remote mounting, and shall have its own non-volatile memory. The keypad shall allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs. Provide integral time clock with 10-year backup battery and four (4) separate & independent settable timer functions, for both weekday and weekend time periods.
   2. The VFDs shall utilize plain English digital display (code numbers and letters are not acceptable). All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of an installation manual or cross-reference table. VFDs utilizing codes are not acceptable.
   3. The keypad shall include Hand-Off-Auto membrane selections. When in the "Hand" position, the VFD will be started and the speed will be controlled from the up/down arrows. When in the "Off" position, the VFD shall be stopped. When in the "Auto" position, the VFD shall start via an external contact closure and the VFD speed will be controlled via an external speed reference. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Auto" and "Hand" modes and vice-versa.
   4. The VFDs shall have impedance line reactors to meet IEEE Standard 519 at no greater than 5% total harmonic voltage distortion.
   5. The VFDs shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all

parameters and customer interfaces for a particular application to reduce programming time.

6. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable.
7. The VFD shall be capable of stating into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start). The VFD shall also be capable of DC injection braking at start to stop a reverse spinning motor prior to ramp.
8. The VFD shall be equipped with an automatic extended control power ride-through circuit, which will utilize the inertia of the load to keep the drive powered. Typical control power ride-through for a fan load shall be 2 second minimum.
9. If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.
10. The customer terminal strip shall be isolated from the line and ground.
11. The drive shall employ current limit circuits to provide trip free operation:
    a. The Slow Current Regulation limit circuit shall be adjustable to 150% (minimum) of the VFD's normal duty current rating. This adjustment shall be made via the keypad, and shall be displayed in actual amps, and not as percent of full load.
    b. The Current Switch-off limit shall be fixed at 350% (minimum, instantaneous) of the VFD's normal duty current rating.
12. The overload rating of the drive shall be 110% of its normal duty current rating for one minute in every ten minutes.
13. The VFD shall have integral Input Reactor(s) with a minimum of 3% impedance in the form of AC or DC reactors. DC reactors shall be located on both the positive and negative bus rails to reduce the harmonics to the power line and to increase the fundamental power factor.
14. The VFD shall be capable of sensing a loss of load (broken belt/no water in the pump) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.
15. The VFD shall allow feedback to BAS over serial communication bus when “loss-of-load” signal is received and provide for programmable actions:
    a. stop-and-display fault.
    b. Run at pre-programmed speed.
    c. Hold last speed.
    d. Issue Warning.
16. The VFD shall have programmable "Sleep" and "Wake-up" functions to allow the drive to be started and stopped from the level of a process feedback or follower signal.
17. VFD heat sinks shall be cooled by an integral cooling fan sized for the application of VFD. Locate cooling fan at exterior of unit to allow service maintenance to be performed without an internal teardown of the VFD.

D. All VFDs shall have the following adjustment capabilities:

1. Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.

2. Two (2) PID Setpoint controllers shall be standard in the drive, allowing a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 mA of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. The auxiliary power supply shall have overload and over current protection. the PID setpoint shall be adjustable from the VFD keypad, analog inputs, or over the communications bus.
3. Two (2) programmable analog inputs shall accept a current or voltage signal for speed reference, or for reference and actual (feedback) signals for PID controller. Analog inputs shall include a filter; programmable from 0.01 to 10 second to remove an oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0-20 ma and 0-10 Volts. Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60Hz, without lowering the drive maximum frequency below 60Hz. Process variables shall be modifiable by math functions such as multiplication and division between the two signals (fan tracking), high/low select, as well as inverted follower.
4. Six (6) programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoker interlocks (Enable). Upon customer reset (reclosure of interlock) drive is to resume normal operation.
5. Two (2) programmable analog outputs proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.
6. Three (3) programmable digital relay outputs. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC: Continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable. Relays shall be capable of programmable on and off delay times.
7. Seven (7) programmable preset speeds.
8. Two independently adjustable accel and decel ramps. These ramp times shall be adjustable from 1 to 1800 seconds.
9. The VFD shall Ramp or Coast to a stop, as selected by the user.
10. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on the actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
11. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and reduce audible motor noise.
12. The VFD shall include routines for password protection against unauthorized parameter changes.

E. The following operating information displays shall be standard VFD digital display. All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of two operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words:

Output Frequency
Motor Speed (RPM, % or Engineering units)
Motor Current
Calculated Motor Torque
Calculated Motor Power (kW)
DC Bus Voltage

Output Voltage
Heatsink Temperature (F)
Analog Input Values
Analog Output Value
Keypad Reference Values
Elapsed Time Meter (resettable)
kWh meter (resettable)
mWh meter
Digital input status
Digital output status

F. The VFD shall have the following protection circuits. In the case of a protective trip, the drive shall stop, and announce the fault condition in complete words (alphanumeric codes are not acceptable).

Overcurrent trip 350% instantaneous (170% RMs) of the VFD's variable torque current rating
Overvoltage trip 130% of the VFD's rated voltage
Undervoltage trip 65% of the VFD's rated voltage
Overtemperature +90 deg. C, Heatsink Temperature
Ground Fault either running or at start
Adaptable Electronic Motor Overload (I2T). The Electronic Motor Overload protection shall protect the motor based on speed, load curve, and external fan parameter. Circuits, which are not speed dependent, are unacceptable. The electronic motor overload protection shall be UL Listed for this function.

G. Speed Command Input shall be via:

1. Keypad.
2. Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal.
3. Floating point input shall accept a three-wire input from a Dwyer Photohelic (or equivalent type) instrument.
4. Serial Communications – coordinate with Packaged HVAC Equipment designs and/or Owner’s Master Systems Integrator/Controls provider.

H. Serial Communications

1. The VFD shall have a BacNET™ certified bus Serial Interface connection for capability with supporting an HVAC industry accepted open standard protocol for communications.
2. The VFD shall be able to communicate with PLC's, DCS's and DDC's.
3. Serial communication capability shall include, but not be limited to, Power consumed, run-stop control; speed set adjustment, proportional/integral/derivative PID control (Set Point) adjustments, current limit, and accel/decel time adjustments. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed/frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), relay outputs, digital inputs and diagnostic warning and fault information. Additionally, remote (LAN) VFD fault reset shall be possible. A minimum of 15 field parameters shall be capable of being monitored.
4. The VFD shall allow the DDC to control the drive's digital and analog outputs via the serial interface. The serial communications interface shall allow for DO (relay) control and AO (analog) control without being tied to a VFD function. In addition, all drive digital and analog inputs shall be capable of being monitored by the DDC system.

5. The VFD shall have the capability of accepting fiber optic cables for connection to standard fieldbus adapter. Communications between the drive and fieldbus adapters shall be a 1 Mega Baud.
6. The VFD HMI shall be capable of operating, programming, monitoring the drive as well as diagnosing faults.

2.3 VFD CONFIGURATION FEATURES & ACCESSORIES

A. General: Features shall be furnished and mounted by the drive manufacturer. All features shall be ETL/UL Listed by the drive manufacturer as a complete assembly.

1. Customer Interlock Terminal Strip - provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external safety interlocks shall remain fully functional whether the system is in Hand, Auto, Drive or Bypass modes.
2. Fast acting semi-conductor fuses exclusive to the VFD - fast acting semi-conductor fuses allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection, maintaining bypass capability.

B. Provide VFDs with NEMA 12 Enclosures in applications where the installed environment is subject to excessive conditions and/or as noted on the plans.
C. Panel-accessible Disconnect Switch, padlockable in the "Off" position.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to units. Verify that wiring is adequately provided before proceeding with installation.
B. Field Verify conditions for installation of both HVAC Motors and matched VFD Motor Starters.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions and proper reconnection to each existing parameter (Fan shafts, Fire Alarm interface, etc.).

B. Connect and configure equipment to achieve the sequence of operation specified.

C. Install labels and nameplates to identify control components according to Sections specifying mechanical identification.

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to NEC and electrical specifications.

B. Install line voltage wire and cable according to NEC and electrical specifications. Install control signal (low voltage) and communication (BacNET) cable according to NEC and electrical specifications.

1. Conceal cable routings to be protective.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where a number of cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
6. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

C. Connect electrical components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

3.4 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start VFDs.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.5 DEMONSTRATION

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
2. Schedule training with Owner with at least 7 days' notice.
3. Provide operator training on data display, alarm and status descriptors, requesting data, execution of commands, and request of logs. Include a minimum of four (4) hours dedicated instructor time on-site.

END OF SECTION 230916

SECTION 230919 – HVAC AIRFLOW MEASURING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes components for accurate measurement and/or control of airflow streams in HVAC ducts, plenums and unit enclosures.

B. Related Sections include the following:
   1. Division 23 Section “OPEN Temperature Controls” for basic installation elements of Airflow Measuring systems components in HVAC systems.
   2. Division 23 Section “High-Efficiency Rooftop HVAC Units” for application of Airflow Measuring systems components in HVAC systems.

1.3 SUBMITTALS

A. Product Data: For each type of airflow measuring system indicated/required. Include the following:

   1. Component product data sheets (probes, tranducers, monitors) for designer’s review.
   2. Wiring Diagrams: Power, signal and control wiring.
   3. Installation Diagrams: Clearance designations, mechanical installation, minimum recommended performance criteria for specified duty.
   4. Point List Registers for Serial Communications Interface capability.

B. Coordination Drawings: Submit with Shop Drawings. Show layout and relationships between airflow measuring systems components and the HVAC systems/mechanical elements they serve. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.

C. Maintenance data and requirements shall be included in the operation and maintenance manuals specified.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain airflow measuring systems through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with the following references:

1. NEMA – Control panel enclosures.

1.5 PRE-COMMISSIONING CRITERIA

A. Coordinate size and location of airflow measuring probes with HVAC ductwork, plenums and/or equipment.

1. Verify that manufacturer's recommendations for installation addressing serviceability and operational accuracies are achieved by jobsite conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dwyer Instruments.
2. Ebtron.
3. Greenheck.
4. Paragon.
5. Ruskin.
6. Tek-Air Systems.

2.2 AIRFLOW MEASURING SYSTEMS

A. Configuration: Provide integrated system of components to reliably and accurately measure HVAC airflows. As a minimum, system to include:

1. Airstream-mounted probe(s)
2. Differential pressure/temperature signal transducer.
3. Microprocessor-based airflow monitor.
4. Accuracy of System: +/- 5% in range of 200 to 2000 feet per minute velocity.
5. Accuracy of System: +/- 10% in range of 75 to 200 feet per minute velocity.

B. Probe: Engineered-shape PVC probe designed to create accurate differential pressure signal. Include high pressure chamber, low pressure chamber, high and low pressure pick-up ports and adjustable mounting hardware suitable for duct/plenum/HVAC unit installation. PVC probe to meet UL94-5VB standard for flame spread rating. Provide probes with the following minimum capabilities:

1. Air velocity range (Discharge of intake louver): 75 to 750 feet per minute.
2. Air velocity range (Free airflow, before damper): 100 to 1000 feet per minute.

C. Transducer: Provide transducer to measure both temperature and pressure. Include the following features and specifications:

1. Enclosure: NEMA 4, weatherproof.
2. Operational Temperature range: -40 deg F to 120 deg F.
3. Thermal Span-shift eliminator: integral heater.
4. Pressure pick-up ports: Brass, high and low, ¼ inch barb fittings.
5. Transducer drift eliminator: auto zeroing device.
6. Transmitting cable: Integral, weatherproof, for remote mounting.

D. Monitor: Microprocessor-based monitor suitable to receive input differential pressure and temperature signals from probe(s) and transducer and continuously calculate airflow quantities in the HVAC airstream being measured. Provide monitor with plexiglas viewing window to monitor. Include the following features/specifications:

1. Enclosure: NEMA 4, weatherproof. Operational Temperature range: 30 deg F to 110 deg F.
2. Display: (4)-20 line, Backlit digital with pushbutton keys.
3. Fan-status Input signal: Dry-contact.
4. Functional Output signals: 4-20 ma, linear and proportional, time-averaged for windy conditions.
   a. Airflow (in CFM)
   b. Temperature (in deg F)
5. Alarm Output signals: SPDT, dry-contact, 0.5a
6. Power source: 24 VAC, isolated.
7. Power range: 19-31 VAC
8. Setup Programming: Password-protected routines designed for air balancer, controls contractor and owner.

E. Serial Communications: Provide Systems/components fully-integrateable to applied HVAC Airflow Measuring Systems as specified:
1. BACnet ™

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 INSTALLATION

A. Install HVAC airflow measuring systems in accordance with system manufacturer’s published installation instructions.

1. Mount probes in HVAC ducts and/or plenums as indicated and required for airflow measuring.
2. Mount transducer and monitor in locations acceptable to project conditions.
3. Coordinate installation to include Access Doors in ductwork for servicing.

B. Arrange installation of systems to provide access space around components for service and maintenance.

C. Electrical: Comply with applicable requirements of NEC and in Electrical specification Sections for power wiring, switches, and motor controls.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-installed components installation, including piping and electrical connections.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC airflow measuring systems.

END OF SECTION 230919

SECTION 230940 – MASTER SYSTEMS INTEGRATION SERVICES (for Reference)

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

B. The Owner's Project Requirement (OPR) documents provide additional Specification and graphical schematics (Drawings) to delineate responsibilities for Technical Services provided by the Owner's Master Systems Integrator (MSI) and the Contractor's Installation teams.

C. The Owner's Project Requirement (OPR) documents provide additional Product Data information (Cut Sheets) to demonstrate the types of equipment provided by the Owner's Master Systems Integrator (MSI) and for the Contractor's Installation teams to field-install.

1.2 SUMMARY

A. This section describes the Master Systems Integration & Integrated Commissioning Services scope of work for the project. This section also coordinates the responsibilities of the Mechanical and Electrical trades (Contractor Team) contractors pertaining to control products or systems, furnished by each trade that will be integrated by this Services Provider.

1.3 MASTER SYSTEMS INTEGRATION SERVICES PROVIDER (MSI)

A. AGM Energy Services, LLC is the Owner's Master Systems Integrator (MSI) for this project. All MSI-related Services, as described in the OPR Documents, including this specification, will be covered under direct contract with the Owner in conjunction with all other related Scopes of Work/Contractors. <u>This section is provided for reference and coordination of the Scope of Work.</u>

1. AGM will coordinate the Owner's STANDARDS for the following related functions:

a. Information Technology systems design & implementation, beyond that clearly noted as Installation scopes of Work by the Contractor.

b. Point List Naming conventions – TCC will provide English language Table-form data information for this coordination effort.

c. Graphic Screens & Navigation.

d. Programming Stations and Software functions.

e. End-of-Project Commissioning, Closeout & Training efforts specified/provided for in other MSI-related Sections.

f. Post-Project Warranty-period procedures as specified/provided for in other MSI-related Sections.

1.4 SYSTEM DESCRIPTION

A. The Building Automation and Control System (BAS) shall be comprised of Java Application Control Engine(s) (JACE) within each facility, as designed & provided by the MSI. The JACE (N4) shall connect to the Owner's local or wide area network, depending on configuration. Access to the system, either locally in each building, or remotely from a central site or sites, shall be accomplished through standard Web browsers, via the Internet and/or local area network. Each JACE (N4) shall communicate to BACnet (Interoperable BACnet Controllers) components provided under Division (230900) Temperature Controls Installation Contractor & associated HVAC/Electrical Equipment specification sections (Integrations to Unitary Controllers).

1.5 SUBMITTAL

A. Submittal shall consist of a JACE detail drawing depicting communications network and protocols between the JACE and HVAC Equipment, generators, lighting controllers, power monitoring modules and Owner's internet bridge locations with a description of the communication type, media and protocol.

B. Upon completion of the work, provide a complete set of 'as-built' JACE detail drawings and application software on flash disk media or compact disc. Drawings shall be provided as AutoCAD™ or Visio™ compatible files. Multiple copies of the 'as-built' drawings shall be provided in addition to the documents on flash disk media or compact disc. Division (230900) Temperature Controls Contractor (TCC) and effective (260000) Electrical Systems Contractor (ESC) shall provide as-builts for their portions of work, via the Installation-focused contract. Division (230940) Master Systems Integration Provider (MSI) shall be responsible for as-builts pertaining to overall BAS architecture and network diagrams.

1.6 SPECIFICATION NOMENCLATURE

A. Acronyms used in this specification are as follows:

BAS	Building Automation (& Control) System
TCS	Temperature Control System
JACE (N4)	Java Application Control Engine (Vykon N4)
MSI	Master Systems Integrator
IBC	Interoperable BACnet Controller
GUI	Graphical User Interface
WBI	Web Browser Interface
POT	Portable Operator's Terminal
PMI	Power Measurement Interface
DDC	Direct Digital Controls
LAN	Local Area Network
WAN	Wide Area Network
OOT	Object Oriented Technology
Cx/CxP	Commissioning/Commissioning Provider
TCC	Temperature Control Contractor
MSI	Master Systems Integrator
OPR	Owner's Project Requirements
PICS	Product Interoperability Compliance Statement

1.7 DIVISION OF WORK

A. The Section 230900 (TCC) contractor shall be responsible for all field labor & applicable materials for mounting & wiring designed/specified Building Automation System (BAS)/TCS components, (including specified Energy Metering & Lighting Control System devices, Distributed Application Specific Controllers-less programming (as specifically noted), ancillary control devices, required fabricated control panels, any unitary/non-applied controller programming not factory-provided, unitary/non-applied controller programming software, labeled controller input/output and power wiring, labeled controller network wiring and (BAS)/TCS-based BACnet™ network wiring & connections to the Java Application Control Engine (JACE) N4 Networks, (applies to ALL required wiring scopes).

B. The Section 230940 (MSI) Master Systems Integration Services provider shall be responsible for the Java Application Control Engine (JACE) N4 and Distributed Application Specific Controllers/components & software, programming of the JACE/Controllers, graphical user interface software (GUI), development of all graphical screens, setup of schedules, logs and alarms, BacNet(tm) network management as required to interface the JACE to the Contractor's TCS network/energy meters/lighting control systems, global supervisory control applications, general system integration of BACnet/Modbus devices as shown, integration and coordination and connection of the JACE to the local or wide area network. The Owner's Master Systems Integrator will provide the JACE(s) to the Contractor for field installation and utility meter/monitor(s) when specifically designated. SPECIFIC Equipment furnished under this section includes:

1. Main Supervisory Computer Equipment.
2. Main JACE Network Controllers.
3. Energy-use data-collecting Metering Equipment – Integration only, Components by Contractor.
4. Application Specific Distributed Controllers (Terminal Units, etc.) – As Noted/Shown within published Construction (OPR) Documents.
5. Applicable Lighting Control Equipment.
6. Data Analytics "CSV" Drivers.
7. Other elements as referenced in the OPR Documents/Systems Architecture Diagrams, including but not limited to:
    a. Specific Emergency Power Systems/Equipment.
    b. Specific Plumbing Systems/Equipment.
    c. Specific Smoke Control/Airflow Management Systems/Equipment.
    d. Specific Laboratory-focused Ventilation/Safety Systems/Equipment.

1.8 RELATED WORK SPECIFIED ELSEWHERE

A. Division (230900) Temperature Controls Contractor.

1. Providing control devices and systems including but not limited to:
    a. Unitary-System/Equipment-based (Applied) Control panels, devices and wiring.
    b. Local controller and Temperature control device sensors/networks required for coordinated interface to unitary controllers provided by the Electrical/Mechanical Contractor via the Contractor.

c. TCC BACnet network connections to the JACE (N4) Controllers, Energy-use Meters, Lighting Controllers, VAV Terminal Controllers, Packaged Air-Cooled Condensing Units, VFDs etc.

B. Division 260000, Electrical (as coordinated by the Contractors TCC/Sub-contractors):

1. Providing motor starters and disconnect switches (unless otherwise noted).
2. Power wiring and conduit (unless otherwise noted).
3. Provision, installation and wiring of smoke detectors (unless otherwise noted).
4. Providing labor and material for; generator network, lighting controller network and power monitoring network connections to the JACE (unless noted in other equipment sections)
5. Providing labor and material for; intranet, internet, BACnet, LON, Modbus, etc. networking to the JACE from other systems or facility or global wide area networks.

1.9 AGENCY AND CODE APPROVALS

A. All products of the BAS shall be provided with the following agency approvals. Verification that the approvals exist for all submitted products shall be provided with the submittal package. Systems or products not currently offering the following approvals are not acceptable.

1. UL-916; Energy Management Systems
2. ULC; UL - Canadian Standards Association
3. FCC, Part 15, Subpart J, Class A Computing Devices

1.10 SOFTWARE LICENSE AGREEMENT

A. Software licensing for the JACE or Supervisor shall give the Owner the capability to control their system and determine which contractors can collaborate/engineer/apply within their system.

B. It shall be possible to ensure the Owner can prevent unauthorized partners from accessing the system for engineering changes.

C. Software licensing shall have the capability to individually manage authorized parties and independent parties.

D. The software licensing shall have no restrictions on which brand of JACE, Supervisor or System Programming tools can interact with the system. Station Compatibility must = ALL and Tool Compatibility must = ALL.

E. The Owner shall accept the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

1.11 DELIVERY, STORAGE AND HANDLING

A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons through shipping, storage, and handling as required to prevent equipment damage. Store equipment and materials inside and protected from weather.

1.12 JOB CONDITIONS

A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to ensure that the Work will be carried out in an orderly fashion. It is the MSI/Cx Services Provider's responsibility to check the Contract Documents for possible conflicts between this Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural feature.

PART 2 MATERIALS

2.1 GENERAL

A. The Building Automation System (BAS) shall be comprised of a network of interoperable, stand-alone digital controllers specified and/or provided by the Owner's Master Systems Integrator (AGM Energy Services) for installation by the 230900 TCS section sub-contractor. The TCS/Proposer-Contractor will also provide & install other control elements & devices as required by the intent of the BAS/OPR as specified herein to achieve a fully-operational and energy-efficient facility operation OPEN Temperature Control/Building Automation System. The BAS will also include: a computer system, graphical user interface software, printers, network devices and other devices as specified herein. Focus of the system will be to serve the specific building/facility where installed but be OPEN connected via the Owner's network for global access & management.

B. The installed system shall provide secure password access to all features, functions and data contained in the overall BAS.

2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES

A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate both the ANSI/ASHRAE Standard 135-1995 BACnet technology communication protocols (MSTP/IP). The BAS is to be delivered by the noted combination of the Owner's Master Systems Integrator (AGM Energy Services) and Contractor/TCC provided field/unitary control components via selected Vendors/Mechanical Contractor/Electrical Contractors.
   1. The Main TCS/BAS Platform furnished, installed & implemented in this project will be Tridium Niagara™ Vykon-OPEN System or Johnson Controls, Inc. Facility Explorer™ System, engineered to be fully (certifiable) "OPEN" on the Tridium Niagara™ Framework.
   2. Main Distributed Controller elements: Vykon "JACE 8000 Series", Distech Application Specific Controllers and/or JCI "FX80" Controllers.
   3. The software licensing required shall have no restrictions on which brand of JACE, Supervisor or System Programming tools can interact with the system. Station Compatibility must = ALL and Tool Compatibility must = ALL.

B. The supplied computer software shall employ object-oriented technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including ANSI / ASHRAE™ Standard 135-1995, BACnet and LonMark to assure interoperability between all system components is required. For each LonWorks device that does not have LonMark certification, the device supplier must provide an XIF file for the device. For each BACnet device, the device supplier must provide a PICS document showing the installed device's compliance level. Minimum compliance is Level 3; with the ability to support data read and write functionality. Physical connection of BACnet devices shall be via Ethernet/Ethernet IP and MS/TP.

C. All components and controllers supplied under this contract shall be true “peer-to-peer” communicating devices. Components or controllers requiring “polling” by a host to pass data shall not be acceptable.

D. The supplied system must incorporate the ability to access all data using standard Web browsers without requiring proprietary operator interface and configuration programs. An Open DataBase Connectivity (ODBC) or Structured Query Language (SQL) compliant server database is required for all system database parameter storage. This data shall reside on a supplier-installed server for all database access. Systems requiring proprietary database and user interface programs shall not be acceptable.

E. A hierarchical topology is required to assure reasonable system response times and to manage the flow and sharing of data without unduly burdening the customer’s internal Intranet network. Systems employing a “flat” single tiered architecture shall not be acceptable.

1. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for network connected user interfaces.
2. Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 60 seconds for remote or dial-up connected user interfaces.

2.3 NETWORKS

A. The Local Area Network (LAN) shall be a 10/100 Megabits/sec Ethernet network supporting BACnet, Java, XML, HTTP, and CORBA IIOP for maximum flexibility for integration of building data with enterprise information systems and providing support for multiple Java Application Control Engine (JACE) N4, user workstations and, if specified, a local server.

B. Local area network minimum physical and media access requirements, as coordinated with Owner’s Informational & Operational Technology Departments:

1. Ethernet; IEEE standard 802.3
2. Cable; 10 Base-T, UTP-8 wire, category 5E
3. Minimum throughput; 10/100 Mbps

2.4 NETWORK ACCESS

A. Remote Access.

1. For Local Area Network installations, provide access to the LAN from a remote location, via the Internet. The Owner shall provide a connection to the Internet to enable this access via high-speed cable modem, asynchronous digital subscriber line (ADSL) modem, ISDN line, T1 Line or via the customer’s Intranet to a corporate server providing access to an Internet Service Provider (ISP). Customer agrees to pay monthly access charges for connection and ISP.

2.5 DATA COLLECTION AND STORAGE

A. The JACE shall have the ability to collect data for any property of any object and store this data for future use.

B. The data collection shall be performed by log objects, resident in the JACE that shall have, at a minimum, the following configurable properties:

1. Designating the log as interval or deviation.
2. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
3. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
4. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
5. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

C. All log data shall be stored in a relational database in the JACE and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.

D. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

E. All log data shall be available to the user in the following data formats:

1. HTML
2. XML
3. Plain Text
4. Comma or tab separated values

F. Systems that do not provide log data in HTML and XML formats at a minimum shall not be acceptable.

G. The JACE shall have the ability to archive its log data either locally (to itself), or remotely to a server or other JACE on the network. Provide the ability to configure the following archiving properties, at a minimum:

1. Archive on time of day
2. Archive on user-defined number of data stores in the log (buffer size)
3. Archive when log has reached it’s user-defined capacity of data stores
4. Provide ability to clear logs once archived.

2.6 AUDIT LOG

A. Provide and maintain an Audit Log that tracks all activities performed on the JACE(N4). Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the JACE), to another JACE (N4) on the network, or to a server. For each log entry, provide the following data:

1. Time and date
2. User ID
3. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

2.7 DATABASE BACKUP AND STORAGE

A. The JACE shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.

B. Copies of the current database and, at the most recently saved database shall be stored in the JACE. The age of the most recently saved database is dependent on the user-defined database save interval.

C. The JACE database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

2.8 GRAPHICAL USER INTERFACE SOFTWARE

A. Operating System**:** The GUI shall run on Microsoft Windows current applicable version for the BAS.

B. The GUI shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

C. Real-Time Displays. The GUI, shall at a minimum, support the following graphical features and functions:

1. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the GUI shall support the use of scanned pictures.
2. Graphic screens shall have the capability to contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
3. Graphics shall support layering and each graphic object shall be configurable for assignment to one a layer. A minimum of six layers shall be supported.
4. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
    a. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
    b. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
5. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
6. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.

D. System Configuration. At a minimum, the GUI shall permit the operator to perform the following tasks, with proper password access:

a. Create, delete or modify control strategies.
b. Add/delete objects to the system.
c. Tune control loops through the adjustment of control loop parameters (If exposed in controller to LON or BacNET).
d. Enable or disable control strategies (If exposed in controller to LON or BacNET).
e. Generate hard copy records or control strategies on a printer.
f. Select points to be alarmable and define the alarm state.
g. Select points to be trended over a period of time and initiate the recording of values automatically.
h. Configure trends for all system devices as coordinated with CWRU for event analysis and troubleshooting.

E. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.

F. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.

G. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.

H. Alarm Console

1. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.
2. When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms. Alarm notification windows or banners that can be minimized or closed by the operator shall not be acceptable.

2.9 WEB BROWSER CLIENTS

A. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer™ or Google Chrome™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, or manufacture-specific browsers shall not be acceptable.

B. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the BAS, shall not be acceptable.

C. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.

D. The Web browser client shall support at a minimum, the following functions:

1. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.
2. Graphical screens developed for the GUI shall be the same screens used for the Web browser client. Any animated graphical objects supported by the GUI shall be supported by the Web browser interface.
3. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.
4. Storage of the graphical screens shall be in the Java Application Control Engine (JACE), without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.
5. Real-time values displayed on a Web page shall update automatically without requiring a manual “refresh” of the Web page.
6. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:
    a. Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
        1. Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
        2. Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.
    b. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
    c. View logs and charts
    d. View and acknowledge alarms
    e. Setup and execute SQL queries on log and archive information
7. The system shall provide the capability to specify a user’s (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.
8. Graphic screens on the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link.

2.10 SUPERVISORY SOFTWARE AND HARDWARE

A. A central server located at the designated Owner's Facility shall be provided/upgraded/integrated to with each application brought on-line into the Owner's OPEN BAS Network. The server shall support all Java Application Control Engine(s) (JACE) connected to the Owner's network whether local or remote.

B. Local connections shall be via an Ethernet LAN. Remote connections can be via ISDN, ADSL, or T1 connections.

C. It shall be possible to provide access to all Java Application Control Engine (JACE) via a single connection to the server. In this configuration, each Java Application Control Engine (JACE) can be accessed from a remote Graphical User Interface (GUI) or from a standard Web browser (WBI) by connecting to the server.

D. The server shall provide the following functions, at a minimum:

1. Global Data Access: The server shall provide complete access to distributed data defined anywhere in the system.
2. Distributed Control: The server shall provide the ability to execute global control strategies based on control and data objects in any JACE in the network, local or remote.
3. The server shall include a master clock service for its subsystems and provide time synchronization for all Java Application Control Engine (JACE)
4. The server shall accept time synchronization messages from trusted precision Atomic Clock Internet sites and update its master clock based on this data.
5. The server shall provide scheduling for all (JACE) and their underlying field control devices.
6. The server shall provide demand limiting that operates across all Java Application Control Engine (JACE). The server must be capable of multiple demand programs for sites with multiple meters and or multiple sources of energy. Each demand program shall be capable of supporting separate demand shed lists for effective demand control.
7. The server shall implement the BACnet Command Prioritization scheme (16 levels) for safe and effective contention resolution of all commands issued to Java Application Control Engine (JACE).
8. Each Java Application Control Engine (JACE) supported by the server shall have the ability to archive its log data, alarm data and database to the server, automatically. Archiving options shall be user-defined including archive time and archive frequency.
9. The server shall provide central alarm management for all Java Application Control Engine (JACE) supported by the server. Alarm management shall include:

    a. Routing of alarms to displays, mobile voice devices, printers, email accounts and pagers as applicable/designated.
    b. View and acknowledge alarms.
    c. Query alarm logs based on user-defined parameters

10. The server shall provide central management of log data for all Network Area Controllers Java Application Control Engine (JACE) supported by the server. Log data shall include process logs, runtime and event counter logs, audit logs and error logs. Log data management shall include:

    a. Viewing and printing log data.
    b. Exporting log data to other software applications.
    c. Query log data based on user-defined parameters

E. Server Hardware Requirements (For Reference Only, as typical Main Server components are existing/already provided) The server hardware platform shall have the following requirements:

1. The computer shall be equal to a Dell 2600 series PowerEdge series computer with the following specifications;

   a. Intel Xeon 3.06GHz processor.
   b. 400MHz side Buss.
   c. 512K L2 cache.
   d. 6 DDR SDRAM DIMM sockets supporting 6GB of main memory.
   e. 7 expansion slots 2x64-bit/133MHz PCI-X, 4x64-bit/100MHz PCI-X, 1x32-bit/33MHz PCI.
   f. LSI Logic 53C1030 Dual Integrated PCI Ultra320 LVD SCSI controller.
   g. Raid Controllers – PERC4/Di, PERCC3/DC, PERC3/QC.
   h. Drive Bays – Standard internal hard drive bays to support up to six 1" or Ultra320 SCSI hard drives.
   i. 32X Combo CD-RW/DVD-ROM Drive.
   j. Hard Drives Up to 8x1 hot plug SCSI Drives, 10,000 and 15,000 PRM (Future).
   k. Provide Internal Storage 1.168TB Internal Storage in base equipment.
   l. Internal Tape Backup PowerVault 100T DDS.
   m. Dual Universal Serial Bus (USB) Ports.
   n. 20" Flat Monitor 2000FP

2. The server operating system shall be current/best Microsoft Windows Professional and Include current/equivalent Microsoft Internet Explorer or Google Chrome.
3. Connection to the BAS network shall be via an Ethernet network interface card, 10/100 Mbps.
4. As noted/specified for dedicated alarm printing, provide a compatible ink jet type printer, either 80 or 132 column width. The printer shall have a HSB/parallel port interface.

2.11 SYSTEM PROGRAMMING

A. The Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by the system administrator.

B. A library of control, application, and graphic objects shall be provided to enable the creation of all applications and user interface screens. Applications are to be created by selecting the desired control objects from the library, dragging or pasting them on the screen, and linking them together using a built in graphical connection tool. Completed applications may be stored in the library for future use. Graphical User Interface screens shall be created in the same fashion. Data for the user displays is obtained by graphically linking the user display objects to the application objects to provide "real-time" data updates. Any real-time data value or object property may be connected to display its current value on a user display. Systems requiring separate software tools or processes to create applications and user interface displays shall not be acceptable.

C. Programming Methods

1. Provide the capability to copy objects from the supplied libraries, or from a user-defined library to the user's application. Objects shall be linked by a graphical linking scheme by dragging a link from one object to another. Object links will support one-to-one, many-to-one, or one-to-many relationships. Linked objects shall maintain their connections to other objects regardless of where they are positioned on the page and shall show link identification for links to objects on other pages for easy identification. Links will vary in color depending on the type of link; i.e., internal, external, hardware, etc.
2. Configuration of each object will be done through the object's property sheet using fill-in the blank fields, list boxes, and selection buttons. Use of custom programming, scripting language, or a manufacturer-specific procedural language for configuration will not be accepted.
3. The software shall provide the ability to view the logic in a monitor mode. When on-line, the monitor mode shall provide the ability to view the logic in real time for easy diagnosis of the logic execution. When off-line (debug), the monitor mode shall allow the user to set values to inputs and monitor the logic for diagnosing execution before it is applied to the system.
4. All programming shall be done in real-time. Systems requiring the uploading, editing, and downloading of database objects shall not be allowed.
5. The system shall support object duplication within a customer's database. An application, once configured, can be copied and pasted for easy re-use and duplication. All links, other than to the hardware, shall be maintained during duplication.

2.12 SERIAL NETWORK MANAGEMENT

A. The Graphical User Interface software (GUI) shall provide a complete set of integrated BACnet/LonWorks network management tools for working with BACnet/LonWorks networks. These tools shall manage a database for all BACnet/LonWorks devices by type and revision and shall provide a software mechanism for identifying each device on the network. These tools shall also be capable of defining network data connections between LonWorks devices, known as "binding". Systems requiring the use of third party LonWorks network management tools shall not be accepted.

B. Network management shall include the following services: device identification, device installation, device configuration, device diagnostics, device maintenance and network variable binding.

C. The Network configuration tool shall also provide diagnostics to identify devices on the network, to reset devices, and to view health and status counters within devices.

D. These tools shall provide the ability to "learn" an existing BACnet/LonWorks network, regardless of what network management tool(s) were used to install the existing network, so that existing BACnet/LonWorks devices and newly added devices are part of a single network management database.

E. The network management database shall be resident in the Java Application Control Engine (JACE), ensuring that anyone with proper authorization has access to the network management database at all times. Systems employing network management databases that are not resident, at all times, within the control system, shall not be accepted.

2.13 OBJECT LIBRARIES

A. A standard library of objects shall be included for development and setup of application logic, user interface displays, system services, and communication networks.

B. The objects in this library shall be capable of being copied and pasted into the user's database and shall be organized according to their function. In addition, the user shall have the capability to group objects created in their application and store the new instances of these objects in a user-defined library.

C. In addition to the standard libraries specified here, the supplier of the system shall maintain an on-line accessible (over the Internet) library, available to all registered users to provide new or updated objects and applications as they are developed.

D. All control objects shall conform to the control objects specified in the BACnet specification.

E. The library shall include applications or objects for the following functions, at a minimum:

1. Scheduling Object. The schedule must conform to the schedule object as defined in the BACnet specification, providing 7-day plus holiday & temporary scheduling features and a minimum of 10 on/off events per day. Data entry to be by graphical sliders to speed creation and selection of on-off events.
2. Calendar Object: The calendar must conform to the calendar object as defined in the BACnet specification, providing 12-month calendar features to allow for holiday or special event data entry. Data entry to be by graphical "point-and-click" selection. This object must be "linkable" to any or all scheduling objects for effective event control.
3. Duty Cycling Object. Provide a universal duty cycle object to allow repetitive on/off time control of equipment as an energy conserving measure. Any number of these objects may be created to control equipment at varying intervals
4. Temperature Override Object. Provide a temperature override object that is capable of overriding equipment turned off by other energy saving programs (scheduling, duty cycling etc.) to maintain occupant comfort or for equipment freeze protection.
5. Start-Stop Time Optimization Object. Provide a start-stop time optimization object to provide the capability of starting equipment just early enough to bring space conditions to desired conditions by the scheduled occupancy time. Also, allow equipment to be stopped before the scheduled un-occupancy time just far enough ahead to take advantage of the building's "flywheel" effect for energy savings. Provide automatic tuning of all start / stop time object properties based on the previous day's performance.
6. Demand Limiting Object. Provide a comprehensive demand-limiting object that is capable of controlling demand for any selected energy utility (electric, oil, and gas). The object shall provide the capability of monitoring a demand value and predicting (by use of a sliding window prediction algorithm) the demand at the end of the user defined interval period (1-60 minutes). This object shall also accommodate a utility meter time sync pulse for fixed interval demand control. Upon a prediction that will exceed the user defined demand limit (supply a minimum of 6 per day), the demand limiting object shall issue shed commands to either turn off user specified loads or modify equipment set points to affect the desired energy reduction. If the list of sheddable equipment is not enough to reduce the demand to below the set point, a message shall be displayed on the user's screen (as an alarm) instructing the user to take manual actions to maintain the desired demand. The shed lists are specified by the user and shall be selectable to be shed in either a fixed or rotating order to control which equipment is shed the most often. Upon suitable reductions in demand, the

demand-limiting object shall restore the equipment that was shed in the reverse order in which it was shed. Each sheddable object shall have a minimum and maximum shed time property to effect both equipment protection and occupant comfort.

F. The library shall include control objects for the following functions. All control objects shall conform to the objects as specified in the BACnet specification.

1. Analog Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. Allow high, low and failure limits to be assigned for alarming. Also, provide a time delay filter property to prevent nuisance alarms caused by temporary excursions above or below the user defined alarm limits.
2. Analog Output Object - Minimum requirement is to comply with the BACnet standard for data sharing.
3. Binary Input Object - Minimum requirement is to comply with the BACnet standard for data sharing. The user must be able to specify either input condition for alarming. This object must also include the capability to record equipment run-time by counting the amount of time the hardware input is in an "on" condition. The user must be able to specify either input condition as the "on" condition.
4. Binary Output Object - Minimum requirement is to comply with the BACnet standard for data sharing. Properties to enable minimum on and off times for equipment protection as well as interstart delay must be provided. The BACnet Command Prioritization priority scheme shall be incorporated to allow multiple control applications to execute commands on this object with the highest priority command being invoked. Provide sixteen levels of priority as a minimum. Systems not employing the BACnet method of contention resolution shall not be acceptable.
5. PID Control Loop Object - Minimum requirement is to comply with the BACnet standard for data sharing. Each individual property must be adjustable as well as to be disabled to allow proportional control only, or proportional with integral control, as well as proportional, integral and derivative control.
6. Comparison Object - Allow a minimum of two analog objects to be compared to select either the highest, lowest, or equality between the two linked inputs. Also, allow limits to be applied to the output value for alarm generation.
7. Math Object - Allow a minimum of four analog objects to be tested for the minimum or maximum, or the sum, difference, or average of linked objects. Also, allow limits to be applied to the output value for alarm generation.
8. Custom Programming Objects - Provide a blank object template for the creation of new custom objects to meet specific user application requirements. This object must provide a simple BASIC-like programming language that is used to define object behavior. Provide a library of functions including math and logic functions, string manipulation, and e-mail as a minimum. Also, provide a comprehensive on-line debug tool to allow complete testing of the new object. Allow new objects to be stored in the library for re-use.
9. Interlock Object - Provide an interlock object that provides a means of coordination of objects within a piece of equipment such as an Air Handler or other similar types of equipment. An example is to link the return fan to the supply fan such that when the supply fan is started, the return fan object is also started automatically without the user having to issue separate commands or to link each object to a schedule object. In addition, the control loops, damper objects, and alarm monitoring (such as return air, supply air, and mixed air temperature objects) will be inhibited from alarming during a user-defined period after startup to allow for stabilization. When the air handler is stopped, the interlocked return fan is also stopped, the outside air damper is closed,

and other related objects within the air handler unit are inhibited from alarming thereby eliminating nuisance alarms during the off period.

10. Temperature Override Object - Provide an object whose purpose is to provide the capability of overriding a binary output to an "On" state in the event a user specified high or low limit value is exceeded. This object is to be linked to the desired binary output object as well as to an analog object for temperature monitoring, to cause the override to be enabled. This object will execute a Start command at the Temperature Override level of start/stop command priority unless changed by the user.
11. Composite Object - Provide a container object that allows a collection of objects representing an application to be encapsulated to protect the application from tampering, or to more easily represent large applications. This object must have the ability to allow the user to select the appropriate parameters of the "contained" application that are represented on the graphical shell of this container.

G. The object library shall include objects to support the integration of devices connected to the Java Application Control Engine (JACE). At a minimum, provide the following as part of the standard library included with the programming software:

1. BACnet/LonMark/LonWorks devices. These devices shall include, but not be limited to, devices for control of HVAC, lighting, access, and metering. Provide BACnet/LonMark manufacturer-specific objects to facilitate simple integration of these devices. All network variables defined in the BACnet/LonMark profile shall be supported. Information (type and function) regarding network variables not defined in the BACnet/LonMark profile shall be provided by the device manufacturer.
2. For devices not conforming to the LonMark standard, provide a dynamic object that can be assigned to the device based on network variable information provided by the device manufacturer. Device manufacturer shall provide an XIF file and documentation for the device to facilitate device integration.
3. For BACnet devices, provide the following objects at a minimum:

    a. BACnet AI
    b. BACnet AO
    c. BACnet BI
    d. BACnet BO
    e. BACnet Device

4. For each BACnet object, provide the ability to assign the object a BACnet device and object instance number.
5. For Modbus devices, provide the ability to interface to specific "data registers" as documented and supplied by the equipment vendor. Such as;

    a. Modbus GenericBI
    b. Modbus GenericBO
    c. Modbus GenericAI
    d. Modbus GenericAO
    e. Modbus 6xRecord
    f. Modbus BitsToRegister
    g. Modbus PresetCoil
    h. Modbus PresetRegister

i. Modbus RegisterToBits.

2.14 ENTERPRISE-LEVEL CONTROLLERS - Java Application Control Engine (JACE)

A. The Division (230940) Master Systems Integration Contractor shall supply one or more Java Application Control Engine (JACE), as part of this contract – directly to the Owner. Number of area controllers required is dependent on the type and quantity of devices provided under Divisions (230900) Temperature Controls and (260000) Electrical Systems. It is the responsibility of the Division (230940) Master Systems Integration Services provider to coordinate with the Division (230900) Temperature Controls Contractor and (260000) Contractors to determine the quantity, type and designated location of the Enterprise-level Controller devices.

B. The Java Application Control Engine (JACE) shall provide the interface between the LAN or WAN and the field control devices and provide global supervisory control functions over the control devices connected to the JACE (N4). It shall be capable of executing application control programs to provide:

1. Calendar functions
2. Scheduling
3. Trending
4. Alarm monitoring and routing
5. Time synchronization
6. Integration of LonWorks controller data and BACnet controller data
7. Network Management functions for all LonWorks based devices

C. The Java Application Control Engine (JACE), Vykon N4 platform must provide the following hardware features as a minimum, or as appropriate for the application:

1. Two Ethernet Port – 10/100 Mbps
2. Two RS 485 ports (BACnet MSTP compatible)
3. One USB port
4. Four option card slots/capacity
5. NRIO port (RS485 and/or IO16 or IO34 module local IO compatibility)
6. Designed for DIN rail mounting
7. Standard drivers include BacNet™, LonWorks™.
8. One LonWorks Interface Port – 78KB FTT-10A (via option card)
9. Provide Modbus Capability
10. SRAM data / memory backup
11. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity).
12. The JACE must be capable of operation over a temperature range of -20 to 60°C.
13. The JACE must be capable of withstanding storage temperatures of between -40 and 85°C.
14. The JACE must be capable of operation over a humidity range of 5 to 95% RH, non-condensing.

D. The JACE shall provide multiple user access to the system and support for ODBC or SQL. A database resident on the JACE shall be an ODBC-compliant database or must provide an ODBC data access mechanism to read and write data stored within it.

E. The JACE shall support standard Web browser access via the Intranet/Internet.

F. Event Alarm Notification and actions

1. The JACE shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The JACE shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:

    a. To alarm
    b. Return to normal
    c. To fault

4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object "runtime" and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.

G. Control equipment and network failures shall be treated as alarms and annunciated.

H. Alarms shall be annunciated in any of the following manners as defined by the user:

1. Screen message text
2. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:

    a. Day of week
    b. Time of day
    c. Recipient

3. Mobile Voice Devices via coordinated services that initiate a text-message upon receipt of call/email message.
4. Graphic with flashing alarm object(s)
5. Printed message, routed directly to a dedicated alarm printer
6. Audio messages

I. The following shall be recorded by the JACE for each alarm (at a minimum):

1. Time and date
2. Location (building, floor, zone, office number, etc.)
3. Equipment (air handler #, accessway, etc.)
4. Acknowledge time, date, and user who issued acknowledgement.
5. Number of occurrences since last acknowledgement.

J. Alarm actions may be initiated by user defined programmable objects created for that purpose.

K. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.

L. A log of all alarms shall be maintained by the JACE and/or a server (if configured in the system) and shall be available for review by the user.

M. Provide a "query" feature to allow review of specific alarms by user defined parameters.

N. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

O. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

2.15 DDE DEVICE INTEGRATION

A. The Java Application Control Engine (JACE) shall support the integration of device data via Dynamic Data Exchange (DDE), over the Ethernet Network. The Java Application Control Engine (JACE) shall act as a DDE client to another software application that functions as a DDE server.

B. Provide the required objects in the library, included with the Graphical User Interface programming software, to support the integration of these devices into the BAS. Objects provided shall include at a minimum:

1. DDE Generic AI Object.
2. DDE Generic AO Object.
3. DDE Generic BO Object.
4. DDE Generic BI Object.

2.16 INTEROPERABLE OPEN BACnet™ APPLICATION SPECIFIC CONTROLLERS

A. Distributed-level Controls shall be microprocessor-based OPEN Interoperable BACnet (programmable) Controllers in accordance with the ANSI/ASHRAE Standard 135-1995. Controllers shall be provided for: Air Handlers, Heating Plants, Cooling Plants, Unit Ventilators, Fan Coils, Heat Pumps, Variable Air Volume (VAV) Terminals and all applications as shown on the OPR documents/drawings to meet the intentions of Distributed Systems Architectures for reliability and system functionality/Sequences of Operation. The application control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. The system supplier must provide a PICS document showing the installed systems compliance level to the ANSI/ASHRAE Standard 135-1995.

B. The OPEN Distributed Controllers shall communicate with the Enterprise-level controller via an Ethernet connection at a baud rate of not less than 10 Mbps or via the RS485 connection at a baud rate of not less than 38 kbps.

C. The Controller Sensor(s) shall connect directly to the Controller and shall not utilize any of the I/O points of the controller. The Controller Sensor(s) shall provide a two-wire connection to the controller that is polarity and wire type insensitive. The Controller Sensor(s) shall provide a communications jack for connection to the BACnet communication trunk to which the Controller is connected. The Controller Sensor(s), the connected Controller, and all other devices on the BACnet bus shall be accessible by a compatible Portable Operators Terminal.

D. All Controllers shall be fully application programmable and shall at all times maintain their BACnet Level 3 compliance. Controllers offering application selection only (non-programmable), require a 10% spare point capacity to be provided for all applications. All control sequences within or programmed into the Controller shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.

E. The MSI will formulate/summarize & document the distributed application specific Controllers layout and intended function for each device, with the following information at a minimum:

1. BACnet Device; MAC address, name, type and instance number.

2. BACnet Objects; name, type and instance number.

F. The MSI shall supply a working, licensed copy of the programming software for all controllers to the Owner – refer to SUBMITTALS section for details.

G. It is the responsibility of the MSI to ensure that the proper BACnet objects are provided in each Controller, as required by the Sequences of Operation/Point Listings in the OPR/drawings.

2.17 ENERGY-USE METERING DEVICES – ELECTRIC POWER

A. General: Each Power Measurement Interface (PMI) device shall include the appropriate current and potential (voltage) transformers. The PMI shall be certified under UL-3111. The PMI shall perform continuous true RMS measurement based on 32 samples-per-cycle sampling on all voltage and current signals. The PMI shall provide outputs to the FMCS based on the measurement and calculation of the following parameters: (a) current for each phase and average of all three phases, (b) kW for each phase and total of all three phases, (c) power factor for each phase and all three phases, (d) percent voltage unbalance and (e) percent current unbalance. These output values shall be hard-wired inputs to the FMCS or shall be communicated to the FMCS over the open-protocol LAN (BacNet or Modbus).

2.18 ENERGY-USE METERING DEVICES – NATURAL GAS

A. General: NG flow meters shall be a thermal mass style flow meter, which translates gas flow into electronic output signals proportional to the flow sensed for input into the JACE/Facility Management Control System (FMCS). Flow meters shall be in-line or insertion type as required by the specified application. Accuracy shall be +/- 2% of actual reading.

PART 3 EXECUTION

3.1 INSTALLATION

A. All work described in this section shall be performed by the Owner's Master System Integrators or qualified sub-contractors that have a successful history in the design and implementation of integrated control systems.

B. Coordinate implementation of system and materials in accordance with manufacturer's instructions, and as detailed on the project drawing set.

C. Drawings of BAS network are diagrammatic only and any apparatus not shown but required to make the system operative to the complete satisfaction of the Owner shall be furnished and installed without additional cost.

D. Line and low voltage electrical connections to control equipment shown specified or shown on the BAS/control diagrams shall be furnished and installed as noted by the Contractor via his pre-qualified Division 230900 Temperature Control Installer in accordance with the specifications in Divisions 230000 and 260000.

3.2 WIRING

A. All electrical control wiring and power wiring to the JACE, computers and network components shall be the responsibility of the Contractor via his pre-qualified Division 230900 Temperature Control Installer and in accordance with the specifications in Divisions 230000 and 260000. Coordination of this implementation is provided by the (230940) MSI contractor (AGM Energy Services).

B. All wiring shall be in accordance with the Project Electrical Specifications (Division 260000), the National Electrical Code and any applicable local codes. All BAS wiring shall be installed in the conduit types specified in the Project Electrical Specifications (Division 260000) unless otherwise allowed by the National Electrical Code or applicable local codes. Where BAS plenum rated cable wiring is allowed it shall be run parallel to or at right angles to the structure, properly supported and installed in a neat and workmanlike manner.

3.3 WARRANTY

A. Equipment, materials and workmanship incorporated into the work shall be warranted for a period of one year from the time of system acceptance.

B. Within this period, upon notice by the Owner, any defects in the work provided under this section due to faulty materials, methods of installation or workmanship shall be promptly (within 48 hours after receipt of notice) reviewed/coordinated by the MSI.

3.4 WARRANTY ACCESS

A. The Owner shall grant to the Division (230940) MSI contractor, reasonable access to the BAS during the warranty period. The Owner shall allow the contractor to access the BAS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

3.5 ACCEPTANCE TESTING

A. Upon completion of the installation, the Division 230940 (MSI) shall load all system software and start-up the system. The Division 230900 (TCC) contractor shall perform all necessary calibration, testing and de-bugging and perform all required operational checks to ensure that the system is functioning in full accordance with these specifications. The Division 230940 (MSI) and Proposer/ Contractor via his pre-qualified Division 230900 Temperature Control Installer are to coordinate the checkout of the system such that each Division has a representative present during system checkout.

B. The Division 230900 (TCC) contractor shall perform tests to verify proper performance of components, routines, and points. Repeat tests until proper performance results. This testing shall include a point-by-point log to validate 100% of the input and output points of the DDC system operation. The Division 230940 (MSI) contractor shall have a representative present during system checkout by the Division 230900 (TCC) contractor.

C. Upon completion of the performance tests described above, repeat these tests, point by point as described in the validation log above in presence of Owner's Representative, as required. Properly schedule these tests so testing is complete at a time directed by the Owner's Representative. Do not delay tests so as to prevent delay of occupancy permits or building occupancy.

D. System Acceptance: is defined as the 230940 Master Systems Integration provider having completed all of the testing and demonstration activities as required by the Cx's (Commissioning Agent) commissioning plan including prefunctional and functional testing and bi-seasonal testing and receiving an acceptance letter issued by the Owner's Commissioning Agent (Cx) for this specification section. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.6 OPERATOR INSTRUCTION, TRAINING

A. During system commissioning and at such time acceptable performance of the BAS hardware and software has been established the Temperature Control sub-contractor shall provide on-site operator instruction to the Owner's operating personnel. Operator instruction shall be done during normal working hours and shall be performed by a competent representative familiar with the system hardware, software and accessories.

B. The Division 230940 (MSI) contractor shall provide 12-30 hours of instruction to the Owner's designated personnel on the operation of the BAS and describe its intended use with respect to the programmed functions specified. Operator orientation of the BAS shall include, but not be limited to; the overall operation program, equipment functions (both individually and as part of the total integrated system), commands, systems generation, advisories, and appropriate operator intervention required in responding to the System's operation.

C. The training shall be in three sessions as follows:

1. Initial Training: One day session (2-8 hours) after system is started up and at least one week before first acceptance test. Manual shall have been submitted at least two weeks prior to training so that the Owner's personnel can start to familiarize themselves with the system before classroom instruction begins.

2. First Follow-Up Training: One/Two days (8-16 hours total) approximately two weeks after initial training, and before Formal Acceptance. These sessions will deal with more advanced topics and answer questions.

3. Warranty Follow Up: One day (2-6 hours total) in no less than 2 hour increments, to be scheduled at the request of the Owner during the one year warranty period. These sessions shall cover topics as requested by the Owner such as; how to add additional points, create and gather data for trends, graphic screen generation or modification of control routines.

3.7 CLOSEOUT SUMMARY & INTEGRATED COMMISSIONING

A. The Division 230940 (MSI) Services Provider shall refer to & coordinate Items addressed in sections included in 230000 and with section 230900 (TCC) to determine what level of control the Java Application Control Engine (JACE) must provide, which is the responsibility of this OPEN Master Systems Integrator. It is the responsibility of the 230940 (MSI) Services Provider to coordinate control functions, such as scheduling and supervisory-level global control with the Contractor via his pre-qualified Division 230900 Temperature Control Installer(s).

END OF SECTION 230940

SECTION 23 31 13 - METAL DUCT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Related Sections "Overall Specifications - Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Related Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
3. Related Section "Air Terminal Units" for Variable Air Volume Box equipment descriptions.

1.2 PERFORMANCE REQUIREMENTS

A. Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
1. Factory- and shop-fabricated ducts and fittings.
2. Fittings.
3. Seam and joint construction.
4. Equipment installation based on equipment being used on Project.

5. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Coordination Drawings (For information only): Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

1.4 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2007, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Linx Industries Inc.
b. EHG Air Distribution Systems
c. McGill AirFlow LLC.
d. SEMCO Incorporated.
e. Sheet Metal Connectors, Inc.
f. Spiral Manufacturing Co., Inc.
g. SET Duct
h. Lapine Metal Products

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M G90.
1. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL. The entire perimeter of all joints shall be sealed.
1. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

C. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal

flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
2. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
3. Unconditioned Space, Exhaust Ducts: Seal Class C.
4. Unconditioned Space, Return-Air Ducts: Seal Class B.
5. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
6. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
7. Conditioned Space, Exhaust Ducts: Seal Class B.
8. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

A. Clean duct systems after installation and before testing, adjusting, and balancing as required so that entire air distribution system is free of dirt and debris.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.

3.7 START UP

A. Air Balance: Comply with requirements in Related OPR Sections covering "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Duct dimensions shown are free inside dimensions and shall be followed unless job conditions require alterations. Duct size revisions shall be based on the equal friction method.

B. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

C. Supply Ducts:

1. Ducts Connected to Air Terminal Units and Constant Volume Air Handling Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 12

2. Ducts Connected to Variable-Air-Volume Air-Handling/Rooftop Units:

a. Pressure Class: Positive 4-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.

D. Return, Outdoor Air, and Exhaust Ducts:

1. Ducts Connected to Terminal Units, Air Handling/Rooftop Units, or Fans:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.

E. Intermediate Reinforcement shall match duct material.

F. Liner:

1. Supply Air Ducts or Plenums: Fibrous glass, Type I, 1-1/2 inches thick.
2. Return and Exhaust Air Ducts or Plenums: Fibrous glass, Type I, 1 inch thick.
3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304.

D. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 DAMPERS – BACKDRAFT, VOLUME, CONTROL, FIRE, SMOKE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Pottorff
5. Ruskin Company.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Description: Gravity balanced.

B. Maximum Air Velocity: 3000 fpm.

C. Maximum System Pressure: 2-inch wg.

D. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners.

E. Blades: Multiple single-piece blades, maximum 6-inch width with sealed edges.

F. Blade Action: Parallel.

G. Return Spring: Adjustable tension.

H. Bearings: Provide end bearings on all dampers. On multiple blade dampers bearing shall be oil-impregnated nylon or sintered bronze.

I. Accessories: Provide as required for the application and as-noted on OPR scope documents:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Material: Galvanized steel.
6. Screen Type: Bird.
7. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

1. Damper and blade material to match ductwork material
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

    a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Rectangular dampers shall be single blade type in ducts up to 11" high and shall be opposed blade type in ducts 12" high and above.
    b. Round dampers shall be single blade type.
    c. Stiffen damper blades for stability.

6. Provide end bearings on all dampers. On multiple blade dampers bearing shall be oil-impregnated nylon or sintered bronze.

7. Provide locking indicating quadrant regulators on all dampers. Where rod lengths exceed 30-inches, provide a regulator at both ends.

8. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

9. Jackshaft:
    a. Size: 1-inch diameter.
    b. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
    c. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

10. Damper Hardware:
    a. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
    b. Include center hole to suit damper operating-rod size.
    c. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Frames:

1. Galvanized-steel channels, 0.064 inch thick.
2. Mitered and welded corners.

B. Blades:

1. Multiple blade with maximum blade width of 8 inches.

2. Opposed-blade design.
3. Galvanized steel.
4. 0.064 inch thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

C. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

D. Bearings:

1. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
2. Thrust bearings at each end of every blade.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

B. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches

2.9 DUCT ACCESS PANEL ASSEMBLIES

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

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0428-inch stainless steel.

D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Materials: Flame-retardant or noncombustible fabrics.

B. Coatings and Adhesives: Comply with UL 181, Class 1.

C. Material shall be crimped into a metal edging strip and shall be approximately 3 inches wide.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Minimum Tensile Strength: 500 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 FLEXIBLE DUCTS

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

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.

B. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; fire resistive vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 175 deg F.
4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1-2007.

D. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; fire resistive vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2007.

E. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with hex screw to tighten band with a worm-gear action or Nylon strap in sizes 3 through 18 inches, to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. Maximum **75-foot** spacing.
8. Upstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.

6. Body plus Ladder Access: 25 by 17 inches.

I. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Install flexible connectors to connect ducts to equipment.

K. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

L. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

M. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

N. Connect flexible ducts to metal ducts with draw bands plus tape.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 23 33 00

SECTION 233616 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies Air Terminal Units intended to direct-replace existing Rooftop Multizone Duct Systems and includes the following anticipated choices:

1. Single-duct air terminal units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, furnished specialties, sound-power ratings, and accessories for designer's review.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.

1. Include a schedule showing unique model designation, room location, model number, size, performance criteria and accessories furnished.
2. Wiring Diagrams: Power, signal, and control wiring.
3. Acoustic Performance Ratings: include a schedule showing BOTH specific 8-band decibel-based ratings and common-use Noise Criteria (NC) ratings for each air terminal unit according to most recent published rating criteria at submitted (designed) operation point. Clarify criteria used for submitted ratings (ceiling factors, inlet pressures, acoustic linings, etc.). Provide Common-use NC ratings data for both Radiated and Discharge.
4. Acoustic Performance Calculations: Provide logarithm-based Acoustical Analysis prepared by a manufacturer's factory-authorized engineer to estimate the acoustical performance for each proposed air terminal unit. Issue reports to demonstrate compliance with expected acoustical performance based on actual acoustic performance of unit(s) submitted and actual conditions for the installation in the building (including estimated effect of installed ceiling/walls/partitions).

C. Coordination Drawings: Reflected ceiling plans, drawn to scale for areas affected, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Noted locations of each terminal above the ceiling with controls/utility "handing" shown.

2. Ceiling suspension assembly members.

3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

D. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Overall Specification Sections include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of air terminal units and are based on the specific system indicated.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ETL Listing: Provide Air Terminals with ETL listing and labeling.

D. NFPA Compliance: Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

1.5 PRE-COMMISSIONING CRITERIA

A. Coordinate layout and installation of air terminal units and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 AIR TERMINAL UNITS

A. Manufacturers: Provide specified Air Terminal Units from one of the following manufacturers:

1. Environmental Technologies, Inc.
2. Price.
3. Carrier.
4. Trane.
5. Tuttle & Bailey.

B. Configuration:
1. Single Duct: Volume damper assembly inside unit casing with control components positioned inside a protective metal shroud.

a. Power Connection: Single Point with Master Disconnect/Transformer for Heat and Controls.

C. Casing: 22-gauge steel with G60 zinc coating.

1. Casing Lining: 3/4-inch-thick, coated, dual-density fibrous-glass duct liner complying with ASTM C 1071; secured with adhesive. Cover liner with nonporous foil.
2. Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections for a singular rectangular outlet.
4. Access: Removable panels for access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.
5. Sound data: Refer to scheduled drawing values for maximum sound power criteria.

D. Volume Damper: 22-gauge galvanized steel with peripheral gasket and self-lubricating bearings with internal stops for full-open and full-closed position.

1. Maximum Damper Leakage: ARI 880 rated, 1 percent of nominal airflow at 3-inch wg inlet static pressure.
2. Velocity sensors: Differential-pressure multi-point array utilizing equal cross sectional area method for determining air volumes. Provide 2.5 amplification of pressure signal to terminal controller.

E. Electric Resistance Heating Coil: Manufacturer-engineered and installed electric coil with airflow switch, high temperature limit safeties, and temperature controls for integrated heating system at designated terminal units.
1. Capacity Control: SCR Modulation.

F. Factory-Mounted and -Wired Controls: Electrical components shall be mounted in control box with removable cover. Incorporate single-point electrical connection to power source.

1. Power/Control Transformer(s): Factory-mounted for Main Power/control voltage on electric and electronic control units with terminal strip in control box for field wiring of temperature sensor and power source.
2. Wiring Terminations: Fan and controls to terminal strip, and terminal lugs shall match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box that is sized according to NFPA 70.
3. Disconnect Switch: Factory-mounted, toggle-switch type.

G. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit.

H. DDC Controls Coordination: Air terminal unit manufacturer shall take receipt of the DDC temperature control system components (furnished by District's controls supplier) for the air terminal unit manufacturer and factory-mount these components. The manufacturer's factory-installation of the temperature control components shall be compatible with industry standard temperature controls procedures for Air Terminals with all applicable published Controls-integration drawings and associated Sequences of Operation.

I. DDC Controls (furnished by District's Systems Integrator): Integral/Bidirectional damper operator and microprocessor-based controller with integral airflow transducer and remote room

sensor shall be compatible with standard Air Terminal Unit temperature controls and shall have the following features:

1. Proportional, plus integral control of room temperature, with matched sensor/thermostat – fan speed control.
2. Modulating/Three-stage-point reheat-coil control.
3. Occupied and unoccupied operating mode.
4. Remote reset of airflow or temperature set points.
5. Adjusting and monitoring with portable terminal.
6. Communication with temperature-control system via BacNET™.

J. Accessories: Provide the following options and accessories for each Air Terminal device:
   1. Foil-faced insulation.
   2. Acoustic Linings and sound-trap devices to meet scheduled acoustic (multi-band dB) performance parameters scheduled & qualified on drawings/schedules.
      a. Select for Effective Radiated limit of 39 NC.
      b. Select for Effective Discharge limit of 36 NC.
   3. Integral-casing Sound Attenuator (Single Duct Terminals as required to achieve specified levels).

2.2 SOURCE QUALITY CONTROL

A. Identification: Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

B. Verification of Performance: Rate and label air terminal units according to AHRI 880.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units level and plumb. Maintain sufficient clearance for recommended service and maintenance.

B. Install air terminal units with damper/controller sections accessible for routine maintenance. Provide designation markers/labels below ceiling tiles for each air terminal unit in concealed location.
   1. Make provisions to properly install the new VAV Terminal units and make safe for installation/set of the new equipment. Determine exact locations for ductwork, piping and electrical connections before final install scope.
   2. Wire/Label Heating Coils from engineered locations/new/existing service panels as required for the application.

3.2 CONNECTIONS

A. Piping/Wiring installation requirements are specified in Overall Specification Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install connections to air terminal units to allow manufacturer specified service and maintenance.

C. Connect ducts to air terminal units according to manufacturer’s recommendations and usual & customary installation standards/means & methods.

D. Connect wiring to air terminal units according to manufacturer’s recommendations and usual & customary installation standards/means & methods.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions and do the following:

a. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
b. Verify that controls and control enclosure are accessible.
c. Verify that power and control connections are complete.
d. Verify that nameplate and identification tag are visible.
e. Verify that heat/controls respond to inputs as specified.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units. Refer to Overall Sections for Closeout Procedures.

END OF SECTION 233616

SECTION 237319 – HIGH EFFICIENCY ROOFTOP HVAC UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Configuration and Setup: This Section includes Packaged High-Efficiency Rooftop HVAC Units for outdoor installations as shown on layout drawings. Provide unit(s) in the following Configuration(s)/ Controls Setup(s):
   1. Variable Air Volume (VAV)
      a. Direct Expansion Multi-circuit Cooling with Low-Load Capacity Control.
      b. Indirect-fired Natural Gas Heating (65 deg F Leaving Air Temperature).
      c. Direct Expansion Dehumidification-Reheat capability.
      d. Exhaust-Return Fan with Integral Building Pressure, Demand Ventilation & Economizer Control.

B. High-Efficiency Rooftop HVAC Unit manufacturer is responsible for the unit housing (walls, floors, roof) and provision for the specified Mechanical/Electrical equipment as shown. Items pertaining to the High-Efficiency Rooftop HVAC Units that are NOT both furnished and installed by the High-Efficiency Rooftop HVAC Units manufacturer include:
   1. Support curb-steel/Ground-Pad supports – furnished and installed by Mechanical Contractor/General Trades Sub-Contractors.
   2. Support Roof Curb – New (matched-to-Unit) Pre-Fabricated Full-Perimeter Roof Support Curb furnished by Rooftop Unit manufacturer and installed by Mechanical Contractor.
   3. HVAC, Plumbing and Fire Protection piping/installation – provision of general supports for piping and piping systems are to be done in field by the trade contractors in a coordinated effort.
   4. Electrical Power – High-Efficiency Rooftop HVAC Unit manufacturer provides internal raceways and conductors for noted 120 volt receptacles & lighting. Mechanical Contractor/Electrical Sub-Contractor field-provides all final electrical connections, external power wiring, raceways, labeling, etc.
   5. Temperature Control Systems (loose components & systems integration) – installed by Mechanical Contractor, unless specifically noted otherwise on layout drawings/schedules (Airflow Control Monitor devices, etc.)
   6. Fire Alarm Systems – furnished and installed by Electrical Contractor (alarm devices, smoke detectors, controls, etc.)

1.3 RELATED SECTIONS

A. The equipment manufactured under the descriptions noted in this specification section is integrally-related to other building systems and the proposer/manufacturer of the High-

Efficiency Rooftop HVAC Unit equipment/systems is responsible for complying to and coordinating with the related sections. Any construction costs required by manufacturers that do not meet the specified requirements herein are the responsibility of the Mechanical contractor/proposer. Related sections include, but are not limited to:

1. Basic Mechanical Materials and Methods (pipe supports, labeling, etc.)
2. Fire Protection Sprinkler Systems (piping, valves, controls, etc.)
3. HVAC Ductwork, Piping and insulation systems.
4. Motors/Motor Starters (specific motor/VFD requirements not specified herein).
5. External-to-unit Vibration Isolation Devices.
6. Airflow Monitoring Stations (specific AFMS requirements not specified herein).
7. Integration-based Temperature Control Equipment NOT unit-furnished (panels, devices, raceways, etc.)
8. Fire Alarm Systems (controls, devices, raceways, conductors, smoke detectors, etc.)

1.4 SUBMITTALS

A. Product Data: For each type of High-Efficiency Rooftop HVAC Unit indicated, include documentation on the following:

1. Fan-performance curves with system operating conditions indicated.
2. Fan/Unit-sound power ratings.
3. Unit Static Pressure Calculation.
4. Vibration Isolation Devices.
5. Heat Exchanger/Coil-performance ratings with system operating conditions indicated.
6. Compressor/condenser components with system efficiencies and operating conditions indicated, including information on refrigerant.
7. Motor ratings, electrical characteristics, and motor and fan accessories.
8. Material gages and finishes (walls, floors, roof) with leakage rate performance noted.
9. Piping components and internal unit arrangements – valves, flow measuring devices, refrigerant piping specialties, etc.
10. Filters/accessories with performance characteristics.
11. Control Dampers.
12. Louvers & hoods.
13. Pre-Fabricated Roof Support Curbs.
14. Control System components and accessories, indicating which items are furnished in the factory and what is field-installed by others, including Airflow Monitoring Systems.
15. Unitary Control Programming and Sequences of Operation.
16. BacNet™ PICS Statement-documentation.
17. Unit factory Certification Reports – as applicable.
18. Unit factory testing Reports.
19. Warranty terms and associated project documentation
20. Maintenance and Operation data, for inclusion in master job O & M manuals.

B. Control System (BAS) Interface Data: Provide complete Serial Communication Point List information for chosen control integration interface (BACNet™). This includes, but is not limited to, PICS statements and Open Standard Protocol PROFILEs.

C. Shop Drawings:

1. Dimensioned drawings of equipment, clearly noting shipping pickup points and Access Door/Panel locations.
2. Base/footprint drawings, coordinated and dimensioned for structural support means.
3. Roof Curb drawings specifically matched to unit.
4. Piping/equipment support layouts.
5. Unit-furnished electrical wiring layouts
6. Unit-furnished Temperature Control Devices/System, both unit-mounted in factory and field-mounted by installers.

D. Operation and Maintenance Data: For each type of High-Efficiency Rooftop HVAC Unit, include in emergency, operation, and maintenance manuals:
1. Include a SPECIFIC Summary of required maintenance items for each unit, complete with pertinent part numbers and frequency of actions recommended.
2. Include Specified Start-up/Training and Turn-over/Commissioning-related Documents.

E. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain High-Efficiency Rooftop HVAC Units through one source from a single manufacturer.

B. Experience: Provide High-Efficiency Rooftop HVAC Units from a manufacturer with a minimum experience level:
1. Five (5) years

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of High-Efficiency Rooftop HVAC Units and are based on the specific system indicated.
1. Seismic Certifications: Provide Packaged Units as required to meet applicable local “seismic” design standards/certifications with regards to ratings/components necessary for compliance.
2. Wind-Load Certifications: Provide Packaged Units as required to meet applicable local “wind load resistance” design standards/certifications with regards to ratings/components necessary for compliance.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Insulation: Provide High-Efficiency Rooftop HVAC Units with internal insulation products/methods meeting NFPA 90A and 90B with regards to flame spread and smoke developed safety ratings.

F. ARI/AHRI Certification: High-Efficiency Rooftop HVAC Units shall have their applicable components be factory tested according to current standards, including, but not limited to: ARI/AHRI 410, "Central-Station Air-Handling Unit Coils," and ARI/AHRI 1060 “Energy Recovery Ventilators” and shall be listed and labeled by ARI/AHRI.

G. ETL Listing: Provide labeled units subject to the requirements of ETL.

H. ASHRAE 90.1 Compliance: Provide High-Efficiency Rooftop HVAC Units and equipment tested and rated to achieve SPECIFIED system efficiencies according to the latest version of the energy standard.

I. Sound Performance: Provide High-Efficiency Rooftop HVAC Units with sound performance established by the procedures in the applicable AHRI/ANSI Standard.

1.6 COORDINATION

A. Coordinate with all trades the placement, support and utility requirements for each High-Efficiency Rooftop HVAC Unit. This includes, but is not limited to:
   1. Substrate elements – Roofs, Roof curbs, structural steel, louver locations/lintel sizes, wall sleeves, mechanical room/closet structures.
   2. Proximity to existing Plumbing System & HVAC Exhaust Vents.
   3. Piping – mechanical service and drain piping.
   4. Ductwork – planned routing from unit connections.
   5. Electrical – power wiring, including means of disconnect.
   6. Controls – location of components/accessories not factory-mounted.

1.7 PRE-COMMISSIONING CRITERIA

A. Coordinate layout and installation of High-Efficiency Rooftop HVAC Units and suspension systems with other construction elements that penetrate ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 HIGH-EFFICIENCY ROOFTOP HVAC UNIT STARTUP

A. Startup for High-Efficiency Rooftop HVAC Units must be performed by Factory-trained personnel experienced in working with specified equipment and Controls/Sequences. Coordinate integrated functions with District's Master Systems Integrator.

1.9 WARRANTY

A. Basic Unit warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of High-Efficiency Rooftop HVAC Unit equipment that fails in materials or workmanship. Submit a written warranty signed by the High-Efficiency Rooftop HVAC Unit manufacturer and installer agreeing to furnish labor and parts for failures within a warranty period of one (1) year from the date of substantial completion/documented Start-up.

B. Packaged Unitary Controls Extended warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of High-Efficiency Rooftop HVAC Unit Controls equipment that fails in materials or workmanship. Submit a written warranty signed by the High-Efficiency Rooftop HVAC Unit manufacturer and installer agreeing to furnish labor and parts for failures within a warranty period of two (2) years from the date of substantial completion/documented Start-up.

C. Compressor Extended warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace compressor(s) that fail in materials or workmanship. Submit a written warranty signed by the High-Efficiency Rooftop HVAC Unit manufacturer and installer agreeing to furnish parts and labor for compressor failures within a warranty period of five (5) years from the date of substantial completion/documented Start-up.

D. Heat Exchanger Extended warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace heat exchanger(s) that fail in materials or workmanship. Submit a written warranty signed by the High-Efficiency Rooftop HVAC Unit manufacturer and installer agreeing to furnish parts and labor for heat exchanger failures within a warranty period of ten (10) years from the date of substantial completion/documented Start-up.

E. Motor Control/VFD Extended warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace Variable Frequency Motor Controller(s) that fail in materials or workmanship. Submit a written warranty signed by the High-Efficiency Rooftop HVAC Unit manufacturer and installer agreeing to furnish parts and labor for motor controller failures within a warranty period of two (2) years from the date of substantial completion/documented Start-up.

1.10 EXTRA MATERIALS/ATTIC STOCK

A. Furnish total sets of materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Touch-up Paint: Quantity of complete containers to be used by Owner to maintain corrodible surfaces after construction is completed
   a. Paint containers: One (1) for each system/equipment employed.

2. Mechanical Unit Belts: Three (3) complete sets of new spare belts for each unit affected.

3. Filters: Extra sets for each Bank of Filters furnished.
   a. Pre-Filters: Two (2) extra for each terminal, rounded to even Full-BOX quantity as commonly distributed.
   b. Final/After Filters: One (1) extra set for each Bank.

PART 2 - PRODUCTS

2.1 HIGH-EFFICIENCY ROOFTOP HVAC UNIT MANUFACTURERS

A. Intent: The intent of below-listing specific names of manufacturers is NOT to pre-qualify compliance with the following specifications.
   1. Should a manufacturer's name/product be so listed, it is a requirement in the proposing process that any/all specification items NOT met are fully-disclosed at the time the offer is made.
   2. For any manufacturers not listed by name, proposer must submit to Owner's agent ten (10) days prior to closing date, a full submittal describing the product/system being proposed – refer to items in Part 1.4 of this specification.

B. Manufacturers: Subject to compliance with requirements, provide engineered High-Efficiency Rooftop HVAC Units by one of the following:

1. Carrier
2. Daikin
3. Lennox
4. York-Johnson Controls
5. Trane

2.2 MANUFACTURED UNITS

A. High-Efficiency Rooftop HVAC Units shall be factory assembled and consist of fans, motor and drive assemblies, coils, heat exchangers, dampers, plenums, filters, condensate pans, mixing dampers, full-perimeter pre-fabricated roof support curb and accessories as specified herein/Related Sections and as noted on the layout drawings.
   1. High-Efficiency Rooftop HVAC Unit manufacturer shall fully-assemble and run-test entire unit prior to shipment.
      a. Refrigerant Circuit Run Test.
      b. Unit Controls Systems checkout.
      c. Refrigerant Leak Test.
   2. Configuration, as specified and described on the design/OPR drawings & selected for Application(s) noted:
      a. Outdoor – DIRECT Replacement for existing Multizone unit.
      b. Packaged.
      c. Direct-Expansion Cooling.
      d. Natural Gas Heating – for VAV Duty only/35 deg. F Delta-T rise
      e. Return/Relief Fan.

2.3 CABINET

A. Materials: Formed and reinforced double-wall insulated panels, designed & fabricated to allow removal for access to internal parts and components, with joints between sections/panels sealed.

   1. Unit Panel (Walls, Floors, Roof Partition) Assembly: nominal 1 inch thick (minimum), Thermal-break doublewall assembly, injected with foam insulation for minimum R-value of R-7 (wall), non-condensing on all surfaces for design stated.
   2. Outer Panel – G-90 Galvanized Steel
   3. Outer Panel Finish – Smooth, Pre-painted Enamel Finish (Std. color), meeting ASTM B117, 750 hours, capable of field-applied paint finish.
   4. Inner Panel – 22 Ga. G-90 Solid Galvanized Steel.
   5. Inner Panel Finish – Smooth Solid
   6. Cabinet Pressure Design: 5.0 inches w.c.

B. Roof System: Sloped frame structure over unit roof partition panels, one-half inch overhang minimum.

C. Curb-Ready Rail: Entire unit shall have a full perimeter Curb-ready base rail for structural rigidity and condensate trapping. Provide the required height of the baserail to allow for adequate drainage.

D. Pre-Fabricated Roof Curb: Provide full perimeter structural Roof Curb "Matched" & ready to receive base rail of unit. Provide a minimum height of 18 inches, or as required to result in OA intakes above the expected moisture intake limit and as required to allow required supply and return ductwork transitions to be field installed (to new and existing duct/VAV Systems). Options to be reviewed in preparing Performance Specification Proposals:
1. Modified Full-Perimeter layouts: Rail & Curb options can be utilized as field-investigations and dimensional verifications allow.
2. Custom Adaption Curbs: only permitted as field conditions and dimensional/integrity-of existing-materials verifications allow; not anticipated).

E. Access Panels and Doors: Same materials and finishes as cabinet, complete with full-height non-corrosive hinges, latches, and continuous-perimeter corrosion-resistant compression gaskets. Inspection and access panels and doors shall be sized and located to allow periodic maintenance and inspections. Provide access panels and doors in the following locations:

1. Fan Section.
2. Coil/Heat Exchanger Sections.
3. Control Panel & Motor Control Sections.
4. Filter Section: Doors to allow periodic removal and installation of filters.

F. Condensate Drain Pans: Provide pans of non-corrosive materials complying with requirements found in ASHRAE 62. Fabricate pans with slopes in three planes to collect condensate from cooling coils (including coil piping connections) when units are operating at maximum catalogued face velocity across cooling coil.

1. Insulated Construction: Provide non-condensing construction and seal moisture tight.
2. Drain Connections: One end of pan, threaded.

2.4 FAN SECTIONS

A. Fan-Section Components: Double Width Double Inlet (DWDI) Belt-driven Steel blade or Single Width Single Inlet (SWSI) Direct-drive aluminum blade fans consisting of wheel, fan shaft, bearings, motor/drive assembly (conventional or ECM-type) and support structure and equipped with slide-out channel base for integral mounting of fan, motor, and access for fully safe servicing.

B. Fan Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower. Perform Trim Balance prior to unit being shipped from factory.
1. Vibration Isolation: provide equivalent performance to 2" Spring isolation on each unit fan/assembly.

C. Modulation Control: Provide Supply fan capable of modulation from 30% to 100% of scheduled design airflow, without surge at any point of operation.

D. Fan-Section Source Quality Control:

1. Sound Power Level Ratings: Fans shall bear AMCA-certified sound ratings seal.

2.5 MOTORS

A. General: Provide Unit-mounted/matched VFD or totally enclosed Electrically Commutated motor (ECM) that is speed controlled by Rooftop unit unitary controller. Include:
   1. Thermal Overload Protection.
   2. Phase Failure Protection.

B. Noise Rating: Quiet.

C. Efficiency Rating: Premium.

2.6 COILS

A. Coil Sections: Common or individual, insulated, galvanized-steel casings for heating and cooling coils. Design and construct to facilitate removal and replacement of coil for maintenance and to ensure full airflow through coils.

B. Refrigerant Coils: Main Cooling and Hot Gas Reheat Coils designed for use with specified compressor/condensing unit, fabricated according to AHRI 410, connected with brazed fittings.

   1. Tubes: Copper.
   2. Frames: Galvanized steel, channel frame.
   3. Configuration: Draw-thru.
   4. Main Cooling Rows: Minimum 3-rows, or as scheduled on drawings.
   5. Circuiting: multi-circuit interlaced.
   6. Control: Standard/Electronic-controlled Expansion Valve with Hot Gas Reheat System.
   7. Ratings: Design tested and rated according to ASHRAE 33 and ARI/AHRI 410.

2.7 CONDENSING UNIT SECTION – AIR-COOLED

A. General: Provide condensing section open on the sides and bottom to provide access and to allow airflow through the coils. Condenser coils shall be all-aluminum Microchannel-type or multi-row coils fabricated from 3/8” high efficiency rifled copper tubing mechanically bonded to high efficiency aluminum fins. Each condenser coil shall be factory leak tested with high-pressure air under water. Each refrigerant circuit shall include a subcooling circuit to provide 15 degrees of liquid subcooling.

B. Condenser Fans: Provide Hi-efficiency PSC Motor or Electrically Commutated Motor (ECM), direct drive, propeller type fans designed for low tip speed (Low Sound Energy), vertical air discharge, and include service guards. Fan blades shall be constructed of composite material. Condenser fan motors shall be heavy-duty, inherently protected, three-phase, non-reversing type with permanently lubricated ball bearing and integral coated-steel guard.
   1. Provide Thermal Overload Protection.
   2. Provide Phase Failure Protection.

C. Temperature Operation: Units shall have condenser fans controlled to maintain positive head pressure. Integral controls shall allow the refrigeration system to operate at 25º F ambient.

D. Compressors: Each unit shall have multiple, R-410a heavy-duty scroll compressors. Each compressor shall be complete with gauge ports, suction and discharge service valves, crankcase heater, oil-level adjustment, anti-reversal protection, motor overload protection, high & low pressure limit controls, and a time delay to prevent short cycling and simultaneous starting of compressors following a power failure. Compressors shall be isolated with resilient rubber isolators to decrease noise transmission.

E. Refrigerant Circuiting: Each unit shall have multiple and easily serviceable independent refrigeration circuits designed for (VAV) Cooling and Dehumidification Sequences noted and to operate compressor tandems efficiently and reliably.

F. Capacity Control: Refrigeration capacity control shall be accomplished by manufacturer-designed automatic staging of the unit's multiple compressors and use of Hot Gas Bypass circuiting as required to provide reliable compressor & discharge air temperature control at lower load conditions. All compressor capacity control staging shall be controlled by the factory installed main unit control system.
   1. Low Load Design Expectations: 20% of maximum cooling tonnage at 30% of maximum Supply Air volume.

2.8 HEAT EXCHANGERS

A. Natural Gas-fired Heat Exchanger: A natural Indirect gas-fired furnace shall be installed in the unit heat section. The heat exchanger shall include a stainless steel tubular design with in-shot gas burners. The furnace section shall be positioned downstream of the supply air fan and include initial start-up and operating safety controls.

B. Burner: The burner shall be specifically designed to burn natural gas and shall include a microprocessor-based flame safeguard control, induced-draft fan, combustion air proving switch, pre-purge timer and spark ignition. The gas train shall include gas control valves, shutoff cock, pilot gas valve, pilot pressure regulator, and pilot cock.
   1. Gas Pressure Regulator:
      a. Provide as required for Natural Gas service pressure available.
   2. Module/Burner Turndown Ratio, full-modulation:
      a. 8:1 over 40 deg Temperature Rise.

2.9 DAMPERS/HOODS - ECONOMIZER

A. General: Damper leakage rate, according to AMCA 500, "Laboratory Methods for Testing Dampers for Rating," shall not exceed 2 percent of air quantity at 2000-fpm face velocity through damper and 4-inch wg (1000-Pa) pressure differential. Refer to drawings for configuration of unit openings and damper locations.

B. Economizer Configuration: Parallel blade dampers with jamb seals for proper mixing and control of Outside Air, Return Air and Exhaust Air.
   1. Actuators for OA/RA: Modulating, spring-return, controlled by RTU packaged unit controller.

2. Temperature Control: Comparative Enthalpy.
3. Ventilation Control: Sub-Minimum setting with Demand-Controlled Sequence override and Building Pressure Sequence interlocks.
4. Hood(s): Prepainted Steel to match unit finish, factory-mounted with bird screen and moisture eliminator/design for no-carryover inlet velocities.

2.10 FILTER SECTION

A. Filters: Comply with NFPA 90A.

B. Filter Section: Provide filter holding frames arranged for flat orientation, with access doors as shown on drawings.

C. PRE-Filters - Extended-Surface, Disposable Panel Filters: Factory-fabricated, dry, extended-surface filters with holding frames.

1. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
2. Media and Media-Grid Frame**:** Nonflammable cardboard, Galvanized steel, or Fire-retardant, 3/4-inch (20-mm) particleboard with gaskets.
3. Thickness: 2 inches.
4. MERV Rating: 8.

D. AFTER-Filters - Extended-Surface, Disposable Panel Filters: Factory-fabricated, dry, extended-surface filters with holding frames, 4 inch deep.

1. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
2. Media and Media-Grid Frame**:** Nonflammable cardboard, Galvanized steel, or Fire-retardant, 3/4-inch (20-mm) particleboard with gaskets.
3. Thickness: 4 inches.
4. MERV Rating: 13

2.11 AIR SOURCE HEAT PUMP SECTION (Value Option)

A. General: Provide integrated refrigerant controls to allow air source heat pump operation, including 4-way Reversing Valve, pump-down controls and electronic expansion valve on outside condenser coil. Provide integral controls to sequence operation with natural gas heat section as applicable.

2.12 UTILITY CONFIGURATIONS

A. Outside Air Inlet: Provide sections with Inlet Hoods to minimize inlet velocities.

1. Provide for Outdoor Airflow Measurement Device at unit Inlet: to be utilized in Demand-Controlled Ventilation sequences.

2.13 AUXILLIARY ELECTRICAL COMPONENTS

A. Provide GFCI receptacle in Fan/Control section. Factory wire devices to a junction box and on-off switch mounted on the outside of the cabinet for each specified electrical device. Final Main Unit connections are provided by field electrician.

2.14 CONTROLS

A. Manufacturer must provide a stand-alone programmable digital control system for complete temperature & humidity control of the delivered supply air and relative building pressure. The manufacturer will provide a standard sequence of operation for the type of equipment provided per this specification. The controller will be manufacturer-programmed to control:
   1. Supply Air temperature.
   2. Supply Air Volume.
   3. Ventilation Air volumes.
   4. Zone Building Pressure (Relative Local).
   5. Zone temperature – only as specifically noted beyond Air Terminal Controls.
   6. Zone/Area humidity.
   7. Monitoring & Alarms:
      a. Return Air Temperature & Humidity.
      b. Unit/Setpoint Faults.
      c. Smoke Detectors.

B. STAND ALONE DDC CONTROLLER**.** Controller shall be provided with required sensors and custom programming for the specified VAV configurations (air handling unit, duct pressure/fan speed, air source heat pump, etc.). Controller shall be factory programmed, mounted, and tested. Controller shall have a user terminal with LCD readout for changing set points and monitoring unit operation. Functional capabilities for the unitary DDC controller shall include, but not be limited to, the following:

   1. Mixing Box Damper Modulation, based on Supply Air Temperature.
   2. Cooling Modulation, based on Supply Air Temperature.
   3. Economizer with applicable lockout control & related Enhanced Sequences specified.
   4. Occupied/Unoccupied Mode control.
   5. Fan Enable/Disable.
   6. Fan Speed VFD/ECM control.
   7. Remote Control Interface/Integration: BacNet™
   8. Filter Pressure Drop.
   9. Alarms.
   10. Smoke Detection input (redundant).

C. SEQUENCES OF OPERATION: The Stand-alone DDC controller shall perform the following basic control sequence:
   1. Unit OCCUPIED Command
      a. Outside air/Mixing Box damper actuators are powered.
      b. DDC controller confirms damper end switch status.
      c. Supply fan starts after damper is open (minimum of 120sec delay, adjustable).
      d. Heating, cooling, economizer operation per below.
   2. Unit UNOCCUPIED Command
      a. Supply fan is de-energized.

b. Outside air damper actuator is de-energized, dampers spring return closed.
c. Dampers are closed after the fans are de-energized

3. OCCUPIED Mode – Base (Opposite for UNOCCUPIED Mode)
   a. Supply fan ON, Exhaust/Return Fan ON/Ready.
      1) VAV Control sequence to meet Supply Air Temperature Control w/ Reset, Optimizations & Limits, Duct Static Pressure w/ Reset, Optimization & Limits, Ventilation Air Setpoints and Building Pressure balance.
   b. OAD is open to sub-minimum, executing Demand-Controlled Ventilation as required (minimum, then increase on CO2 sensor).
   c. UNOCCUPIED DEHUMIDIFICATION Mode: On a call for dehumidification (room %RH – differential, 70%RH-5%RH=65%RH) supply fan cycles on, and the cooling decreasing the Zone-Area %RH. Unit cycles off when room humidity reaches the unoccupied set point 50%RH, adjustable)
4. Re-Heating Mode:
   a. Lockout: The heating will be locked out when the outside air is > 70ºF + 2ºF hysteresis, adjustable
   b. Heat Stage 1: The heating (HGRH Option) is controlled to maintain the Discharge supply temperature set point (Dehumidifcation mode Reheat).
   c. Heat Stage 1: The heating (Heat Pump Option) is controlled to maintain the Discharge supply temperature set point
   d. Heat Stage 2: The heating (Gas Heat Exchanger) is controlled to maintain the Discharge supply temperature set point.
5. Cooling Mode
   a. Lockout: The cooling will be locked out when the outside air is < 55ºF - 2ºF hysteresis, adjustable
   b. Temperature Control: The cooling is controlled to maintain the supply temperature set point
   c. Dehumidification Control: The cooling/hot gas reheat coil is controlled to maintain the supply dew point temperature set point.
6. Safeties
   a. SAFETIES:
      1) (OA PRE-FILTER) DIRTY FILTER SWITCHES. If the outside air or return air filter differential pressure rises above the switch set point (adj.), the differential pressure switch shall signal the DDC to activate an alarm
      2) SUPPLY DISCHARGE LOW LIMIT. If the supply discharge temperature drops below 40°F (adjustable), the DDC shall de-energize the unit after a preset time delay
      3) HIGH DUCT STATIC PRESSURE. If the supply duct differential pressure rises above the switch set point (4" w.c., adj.), the differential pressure switch shall signal the DDC to de-energize the unit
      4) LOW DUCT STATIC PRESSURE. If the return duct differential pressure falls below the switch set point (-4" w.c., adj.), the differential pressure switch shall signal the DDC to de-energize the unit
      5) ALARM INDICATION. DDC shall have one digital output for remote indication of an alarm condition. (i.e. Blower current/differential pressure switch, damper end switches, freeze stat, fire stat, smoke, dirty filters…)
      6) HEATPUMP ALARM INDICATION. The heatpump management board shall have one digital output for remote indication of a heatpump alarm condition. (i.e. pressure trip, overheat, fluid flow, etc.)

2.15 ACCESSORIES

A. Provide the following accessories for High-Efficiency Rooftop HVAC Units:
   1. Non-fused Disconnect Switch.
   2. Provisions for Outdoor Air Measurement System (DCV) – field/factory-installed as applicable.
   3. Carbon Dioxide Sensor (DCV) – field-installed as applicable.
   4. Return Air Smoke Detector(s) – field-installed as applicable.
   5. Building Pressure/Space Static Pressure Sensor(s) – field-installed as applicable.
   6. Pre-fabricated Roof Curb – minimum to provide 18 inches clear above roof surface & required clearances for Outdoor Air Intakes and as required to allow required supply and return ductwork transitions to be field installed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Proposers are responsible for field-verifying all existing conditions for how they may impact/relate to providing the new Scopes of Work. No post-proposal compensation is expected to cover costs of reasonably-accessible and known existing conditions.
   1. Make provisions to properly remove the existing HVAC Units/piping and Electrical Power and make safe for installation/set of the new equipment. Determine exact locations for ductwork, piping and electrical connections before demolition scope. This includes any hazardous material removals/fluid pumpdowns required by the existing Packaged Rooftop HVAC unit.

B. Install High-Efficiency Rooftop HVAC Units with the vibration devices as applicable for the application.

C. Arrange installation of units to provide access space around High-Efficiency Rooftop HVAC Units for service and maintenance and to avoid proximity to existing HVAC & Plumbing System Vents.

D. Install High-Efficiency Rooftop HVAC Units on equipment supports or pre-fabricated roof curbs as specified.
   1. Install Curbs per manufacturer's instructions/recommendations for the application.
   2. Complete preparations of existing roof decks and roofs to properly accept new equipment, piping ans ductwork systems.
   3. Install Sound-dampening materials in base of pre-fabricated roof curbs prior to setting of unit: two layers of thin dense absorbing material and one thicker layer of less-dense absorbing material.

3.2 CONNECTIONS

A. Piping connections noted on the Drawings which indicate general arrangement of piping, fittings, and specialties – all to be field-verified prior to actual final design & installations.

B. Install and properly label piping adjacent to equipment to allow service and maintenance.

C. Complete installation of all drain pan piping, with traps per manufacturers recommendations.

D. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections.

E. Electrical: Connect Power and Controls wiring according to manufacturer's documented instructions and applicable/Overall specification means and methods.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including external piping and electrical connections.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service as per manufacturer's instructions and recommendations. Coordinate activities with Owner's Commissioning Services provider.
1. Complete installation and startup checks according to manufacturer's written instructions and do the following, as a minimum:
   a. Notify Owner's personnel of scheduled Check-Test-Start activities and allow personnel to witness all procedures.
   b. Verify that inlet duct connections are as recommended by High-Efficiency Rooftop HVAC Unit manufacturer to achieve proper performance.
   c. Verify that condensing sections are properly installed and charged with refrigerant.
   d. Verify that controls and control enclosure are accessible.
   e. Verify that control connections are complete & all factory-programmed/(field adjusted) unitary-based VAV sequences are met.
   f. Verify that nameplate and identification tag are visible.
   g. Verify that controls respond to inputs as specified – coordinate directly with District's Master Systems Integrator.

B. Document installation and startup checks according to manufacturer's written instructions.

C. Provide basic RTU System Testing, Measuring & Adjusting/Balancing services to assure installed components deliver expected performance results; with documentation accompanying As-Builts. Refer to Overall Specification Section - Testing, Adjusting, and Balancing for High-Efficiency Rooftop HVAC Unit testing, adjusting, and balancing.
1. The Intent for this function is to assure Owner that the existing/upgraded controls & new AC-5 VAV Systems (new HVAC RTU and Air Terminal Units) are capable of delivering the expected Sequences and Airflows to the existing spaces being renovated: It is

intended to Test, Adjust & Balance the overall AC-5 System components for flow performance.

3.5 CLEANING

A. Clean High-Efficiency Rooftop HVAC Units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils entering air face.

B. After completing system installation and testing, adjusting, and balancing High-Efficiency Rooftop HVAC Units and air-distribution systems, clean filter housings and install new filters.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain High-Efficiency Rooftop HVAC Units. Coordinate activities with Owner’s Commissioning Services provider.
   1. Document Training procedures completed.
   2. Document Start-up & Coordinate Commissioning activities with Owner’s Commissioning Services Provider.
   3. Document Warranty Provisions & Responsibilities.
   4. Document Warranty-Period/Termed Maintenance Provisions & Responsibilities – as applicable.

END OF SECTION 237319

Bid Form

Bid Form

BID FORM

1.01 BID/PROPOSAL SUBMITTED BY:

_____
(Contractor/Proposer)

DATED: _____

1.02 DELIVER TO:

Cleveland Metropolitan School District
Board of Education
1111 Superior Avenue E., Suite 1800
Cleveland, OH 44114
RFP # 21305 Luis Muñoz Marin AC-5 RTU Replacement 2020

1.03 Having viewed the OPR/Contract Documents and read the Specifications for the Project entitled:

CMSD – Munoz-Marin AC-5 RTU Replacement 2020
and having also received, read and taken into account the following Addenda:

Addendum No. _____, dated _____;

Addendum No. _____, dated _____;

Addendum No. _____, dated _____;

Addendum No. _____, dated _____;

Addendum No. _____, dated _____;

and likewise having inspected the site and the conditions affecting and governing the Project and confirmed the location of the site utilities and all existing structures, as applicable, the undersigned hereby proposes to furnish all materials and to perform all labor, as specified and described in the said Specifications and/or as shown on the said Drawings for all work necessary to complete the Project on a timely basis and in accordance with the OPR/Contract Documents regardless of whether expressly provided for in such Specifications and Drawings.

1.04 Before completing the Bid Form, the undersigned represents that it has carefully reviewed the Notice to Bidders, Instructions to Bidders, Bid Form, Form of Bid Guaranty and Contract Bond, Contractor's Affidavit (ORC 5719.042), Owner-Contractor Agreement, General Conditions of the Contract (AIA A201-1997 edition) (as modified), OPR/Project Specifications, and the Project Schedule, if any. Failure to comply with provisions of the Bidding Documents may be cause for disqualification of the bid.

1.05 BONDS AND CONTRACT:

If the undersigned is notified of bid acceptance, it agrees to furnish required bonds as indicated in Instructions to Bidders.

1.06 COMPLETION OF WORK:

In submitting a bid, the undersigned agrees to execute the Owner-Contractor Agreement in the form included in the OPR/Contract Documents and to substantially complete its work as required by the OPR/Contract Documents.

NOTE A: The wording of the Bid Form shall be used throughout, without change, alteration, or addition. Any change may cause it to be rejected.

NOTE B: Bidder is cautioned to bid only on the "Brands" specified.

NOTE C: See published OPR documents for description of Alternates, if any.

NOTE D: Proposers are required to submit the Technical Proposal contents as listed in Section 102326 and the Pre-Proposal Meeting Agenda.

2.01 BID/PROPOSAL:

All final design, labor and material are included for the contracts listed below. Bidder is to fill in all blanks related to the Bid Package for which a bid is being submitted. If no bid is submitted for an item, leave the item blank or insert "NO BID" in the blank. For alternate items, indicate whether the amount stated is in addition to or a deletion from the base bid amount. Submit Technical Proposal separately. Include Two (2) hard copies of each and one (1) "media" copy of Technical Proposal.

Guaranteed Maximum Price (GMP) Proposal Contents:

Proposal Envelope and Cover Sheet, if applicable
Proposal Form
Extended Maintenance Services Proposal
Proposer Letterhead with Notes/Clarifications/Exclusions affecting this Proposal

Technical Proposal Contents:

Proposal Envelope and Cover Sheet, if applicable
Proposal Planned Construction Schedule and Conditions Statement(s)
Proposer Letterhead with Notes/Clarifications/Exclusions affecting this Proposal
Technical Selections/Pre-Submittal for each solution offered – refer to Overall/Equipment specifications

ITEM 1: **Basic Mechanical Services Upgrades**
Base Proposal Scope of Work: Complete Design-Build installation of **CMSD Munoz-Marin AC-5 RTU Replacement 2020**. Bidder agrees to perform all the work necessary, as described in the OPR/Contract Documents, including Project Coordination for the sum of:

_____ ($_____)

(*Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern*.

Base Proposal Expected Project Schedule:

Proposer offers to furnish the above BASE Scope complete by: _____

ALTERNATE No. 1: General/Electrical Ceiling & Lighting Replacement Services
ALT-2 Scope of Work: Complete provision of **General/Electrical Ceiling & Lighting Replacement Services**. Bidder agrees to perform all the work necessary, as described in the OPR/Contract Documents, including Project Coordination for the ADD/DELETE sum of:

_____ ($_____)

(*Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.*

Proposer offers to furnish the above ALT-1 Scope complete by: _____

ALTERNATE No. 2: Mechanical/Electrical Extended Maintenance Services – THREE Years
ALT-2 Scope of Work: Complete provision of **Mechanical/Electrical Extended Maintenance Services – THREE Years**. Bidder agrees to perform all the work necessary, as described in the OPR/Contract Documents, including Project Coordination for the ADD/DELETE sum of:

_____ ($_____)

(*Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.*

Proposal responses shall include all noted ALLOWANCES, final design, labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished Scope of Work.

3.01 INSTRUCTIONS FOR SIGNING

A. The person signing for a sole proprietorship must be the sole proprietor or his authorized representative. The name of the sole proprietor must be shown below.

B. The person signing for a partnership must be a partner or his authorized representative.

C. The person signing for a corporation must be the president, vice president or other authorized representative; or he must show authority, by affidavit, to bind the corporation.

D. The person signing for some other legal entity must show his authority, by affidavit, to bind the legal entity.

4.01 BIDDER CERTIFICATIONS. The Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. The Bidder has read and understands the OPR/Contract Documents and agrees to comply with all requirements of the OPR/Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

2. The Bidder represents that the bid contains the name of every person interested therein and is based upon the Standards specified by the OPR/Contract Documents.

3. The Bidder has visited the Project site, become familiar with local conditions and has correlated personal observations about the requirements of the OPR/Contract Documents. The Bidder has no outstanding questions regarding the interpretation or clarification of the OPR/Contract Documents.

4. The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a bid by joint venture, each member thereof certifies as to such member's entity, under penalty of perjury, that to the

best of the undersigned's knowledge and belief: (a) the Base Bid, any Unit Prices and any Alternate bid in the bid have been arrived at independently without collusion, consultation, communication or agreement, or for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate bid with any other Bidder; (b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate bid; (c) no attempt has been made or will be made by the Bidder to induce any other Person to submit or not to submit a bid for the purpose of restricting competition; and (d) the statements made in the Bidder's Affidavit are true and correct, to the best of the Bidder's knowledge and information.

5. The Bidder will execute the form of Owner/Contractor Agreement in the form included with the OPR/Contract Documents, if a Contract is awarded on the basis of this bid, and if the Bidder does not execute the Contract Form for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable as provided in the Instructions to Bidders.

6. The Bidder certifies that the upon the award of a Contract, the Contractor will make a good faith effort to ensure that all of the Contractor's employees, while working on the Project site, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.

7. The Bidder agrees to furnish any information requested by the Architect or the Owner's authorized representative to evaluate that the Bidder is responsible and that the bid is responsive to the specifications.

8. The Bidder agrees to furnish the submittals required by the Instructions to Bidders for execution of the Owner/Contractor Agreement within 10 days of the date of the Notice of Intent to Award.

9. The Bidder certifies that it has no unresolved findings for recovery issued by the Auditor of State.

NOTE: The Bidder should review the OPR/Contract Documents and the site and conditions under which the Work will be performed so that he can give the acknowledgments contained above.

LEGAL NAME OF BIDDER: _____

BIDDER IS: _____
(sole proprietor, partnership, corporation, limited liability company or other legal entity)

NAME OF PERSON LEGALLY AUTHORIZED TO BIND BIDDER TO A CONTRACT:

_____
(print)

SIGNATURE: _____

TITLE: _____

ADDRESS: _____

_____

TELEPHONE: _____

FAX: _____

FEDERAL
TAX I.D. # _____

DATE SIGNED _____

When the Bidder is a partnership or a joint venture, state name and address of each partner in the partnership or participant in the joint venture below:

_____	_____
_____	_____
Name	
	_____
	Address
_____	_____
_____	_____
Name	
	_____
	Address
_____	_____
_____	_____
Name	
	_____
	Address
_____	_____
_____	_____
Name	
	_____
	Address
_____	_____
_____	_____
Name	
	_____
	Address

BIDDER'S CHECK SHEET

Complete and check Items A through F before sealing envelope:

CHECK ITEMS

A. PROJECT: **CMSD – Munoz-Marin AC-5 RTU Replace 2020**

B. BID DUE DATE – **1:00 p.m. local time July 24, 2020** _____

C. INVITATION TO BID/RFP – READ _____

D. ADDENDA READ IF ISSUED:
ADDENDUM #1 _____

ADDENDUM #2 _____

ADDENDUM #3 _____

E. REQUIRED DOCUMENTS FOR BID OPENING:

1. CMSD REQUIRED SUBMITTAL DOCUMENTS (Part II) _____
   a. Section XII - DBE Program Participation Forms (Community Inclusion Form) – Completed and Signed _____

2. BID/PROPOSAL FORM - COMPLETED & SIGNED _____

3. BID SECURITY as required by Ohio Revised Code Section 153.54 in the form of either:
   a. BOND in the full amount of the Bid (include Power of Attorney) or
   b. Certified check, cashier's check, or letter of credit in the amount of 10% of the Bid _____

F. REQUIRED DOCUMENTS SHALL BE ENCLOSED IN A SEALED OPAQUE ENVELOPE AND ENDORSED WITH THE FOLLOWING TYPED ON THE EXTERIOR OF THE ENVELOPE:

PROJECT NAME: **CMSD – Munoz-Marin AC-5 RTU Replace 2020**

BID DUE DATE: **1:00 pm local time on July 24, 2020**

BID PACKAGE: **MECHANICAL TRADES/DESIGN-BUILD**

BIDDER'S NAME _____

BIDDER'S ADDRESS _____

"BIDDERS CHECK SHEET" SHALL BE ATTACHED TO EXTERIOR OF ENVELOPE