



**Board of County  
Commissioners**  
**Pete Gerken**  
*President*  
**Tina Skeldon Wozniak**  
**Carol Contrada**

**Office of Support Services**  
Kelly Roberts  
*Director*  
Lynn DiPierro  
*Manager*

**Addendum #1 - Issued on November 26, 2012**

Regarding Bids for **Engineer Road Maintenance Building - MEP, Fire Protection, General Trades & Fueling System (ITB 12-032P)** for Lucas County Engineer Road Maintenance, bid opening scheduled for December 6, 2012 at 2:00 P.M. (local time).

This document becomes a fully incorporated part of the specifications, and this letter constitutes legal notice of this requirement.

The entire original Bid Packet including this addendum must be submitted prior to the Bid Opening Date and Time.

Please see attached documentation:

**ADDENDUM NO. 01**

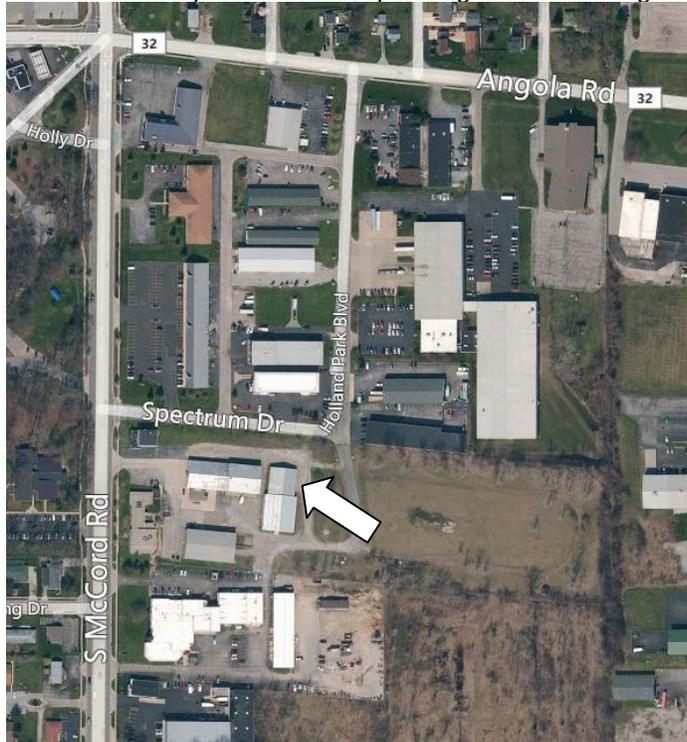
Lucas County Road Maintenance Building  
Bid Package #12-032P – Plumbing, Mechanical, Electrical, Fire Protection,  
General Trades and Fueling Station Packages  
Dated 11/26/2012

**Bidders on the above bid package shall note and respond to the following:**

**1. Questions:**

- a) (ALL) Question: Please clarify the location of the mandatory Pre-Bid Meeting?

*Answer: See Map shown below pointing to the meeting location.*



- b) (ALL) Clarification – Post-Bid Reviews

*Answer: All Bidders must be prepared to meet Friday December 7<sup>th</sup> the day after the Bid Opening Date. Lathrop will schedule Post-Bid Meetings following the Bid Opening.*

- c) (Plumbing) Question – Drawing P1.01 calls for a 2500 gallon oil interceptor. Drawing P2.02 calls for a 3500 gallon oil interceptor. What is required?

*Answer: The Plumbing Subcontractor shall furnish and install a 3500 gallon oil interceptor.*

- d) (Plumbing) Question – Bay 2 near column H9 shows  $\frac{3}{4}$  dcw from west where dcw enters building,  $\frac{3}{4}$ " South to HB/FWH and 2" North. Please clarify?

Answer: The DCW line that extends from the water meter setting, all the way out to the wash bay equipment connection, should be 2". This line is mislabeled on sheet P1.03 (1-1/2") and the short section as noted on sheet P1.02 (3/4"). 2" DCW all the way out.

- e) (ALL) Question – Clarify the manufacturer and subcontractor warranty requirements?

Answer: Product and pre-assembled or pre-engineered materials requiring an extended warranty and under "Part -2 PRODUCTS" in the specifications are manufacturer warranties. The 3 specific sections in question, Section 133200 "SALT STORAGE BUILDING", Item 2.2; Section 11140 "VEHICLE LIFT EQUIPMENT", ITEM I1 AND I2; and Section 084113 "ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS", item 1.6A are all manufacturer warranties.

- f) (Plumbing) Question – Where is 40 gallon WH-1 located at and what does it feed? Where does hot water come from for office area drawing P1.03?

Answer: 40 gallon water heater WH-1 is located on the mezzanine level, directly above the toilet rooms (P1.03-Mezzanine Plan). WH-1 serves the fixtures in the office area.

- g) (General Trades) Question – What is the budget for the General Trade package?

Answer: Reference Bid Documents section Instruction to Bidders item 2.6.3.

- h) (General Trades) Question – Spec Section 6.61 calls for the "specialties contractor" to furnish and install all toilet room accessories. Is this work supposed to be a part of the general trades package or is there going to be a future package for specialties?

Answer: The General Trades contractor shall be responsible to furnish and install all toilet room accessories as noted in item 6.6.1.

- i) (General Trades) Question – Spec Section 6.6.3; Is the interior signage work supposed to be a part of the general trades package or is there going to be a future package?

Answer: The General Trades contractor shall be responsible to furnish and install interior signage as noted in item 6.6.3. An Allowance of \$2,500 shall be included in your base bid proposal.

- j) (General Trades) Question –Spec Section 6.6.4 requires the general trade's contractor to provide dumpsters for the duration of the project. Does this mean just for the duration of the general trades work?

Answer: No, the General Trades Subcontractor shall provide the General debris dumpsters for the complete project duration not just the general trades scope of work duration. Reference project schedule included in the bid documents.

- k) (General Trades) Question – Spec Section 6.6.7 calls for the general trade’s contractor to provide temporary heat to thaw the subgrade. How deep should we assume the frost will be next year? Also can the permanent system be used? How about making this part of an allowance?

Answer: No permanent systems will be available. The General Trades Contractor shall provide an allowance of \$50,000 in their base bid proposal for the Temporary Heat required to thaw the subgrade. Temporary Heat work shall be coordinated through Lathrop’s Onsite Superintendent. All Allowance costs (including all invoices) must be submitted to Lathrop on a monthly basis. It is the General Trades Contractor’s responsibility to inform Lathrop’s Superintendent on current balance of the allowance on a regular basis. No cost above the \$50,000 allowance shall be accepted without written approval by The Lathrop Company. Allowance shall be used for items noted in 6.6.7.

- l) (General Trades) Question – Spec Section 6.6.10 calls for the general trade’s contractor to perform the fire protection work. Is this correct or is this fire protection a separate bid package?

Answer: The paragraph included a typo. The paragraph should have stated.

Provide all necessary equipment, labor and materials necessary to perform the **General Trades** work as shown on the drawings and specifications, including but not limited to furnishing and installing the following:

No changes to Items 6.6.10.1 thru 6.6.10.15

- m) (General Trades) Question – Please clarify PLA requirements for manufacturers.

Answer: Board of Lucas County Commissioners and the Northwestern Ohio Building & Construction Trades Council has come to an agreement as stated below.

That any construction work performed for the project off-site and not adjacent to the work site does not fall under this project labor agreement for the purposes of Article III of the Project Labor Agreement.

- n) (Plumbing) Question – Does the Oil interceptor need to be traffic rated?

Answer: Yes, must be traffic rated.

- o) (Plumbing) Question – Roof Boots for Gas Venting – Per the detail on P0.03 it shows the boots not darken can we assume that they are provided by the G.C.

Answer: The roof boots referenced on drawing P0.03 shall be furnished, installed and coordinated with the roofing subcontractor by the Plumbing Contractor.

- p) (Plumbing) Question – Will Coordination Drawings be required for the Plumbing items. If so do they have to be completed in Auto Cad?

Answer: No coordination drawings shall be required for the plumbing items. The Plumbing Subcontractor shall furnish, maintain and deliver to The Lathrop Company completed As-Built drawings as per the bid documents.

- q) (Plumbing, Mechanical, Fire Protection and General Trades) Question – Per scope it states that the Plumbing contractor is responsible for painting piping. Could you please provide more detail into where and what needs to be painted.

*Answer: The only piping that that needs to be painted as per the base bid of the proposal is the Fire Protection Piping. The Fire Protection Contractor shall furnish all fire protection piping materials to the General Trades Contractor five (5) working days prior to installation, for on-site cleaning (performed by the General Trades subcontractor) and painting of the piping materials as per the project specifications. Touch up painting of the fire protection piping will be by the General Trades Contractor after installation.*

*Alternates have been added for the painting of mechanical and plumbing piping as per the project specifications and a deductive alternate to eliminate the fire protection painting. Reference the revised Pricing Sheet included in this Addendum.*

- r) (Plumbing) Question – Per the Spec's it states we are to provide a water meter is this by the plumbing contractor or the owner?

*Answer: The Plumbing Contractor is responsible to provide the water meter.*

- s) (Plumbing) Question – Will Trap Primers be needed for the following Trench drains and Cb-1?

*Answer: Trap Primers are NOT required for trench drains and catch basins.*

- t) (Plumbing) Question – Could some sort of Detail be provided for the note on P1.02 that states for a 1" C.A. Down to below floor. What type of material will this needed to be to be routed under the floor?

*Answer: Provide 1" minimum, Schedule 40 steel pipe, extend to 18-inches above finished floor at control panel location.*

- u) (Plumbing) Question – Please provide some model # for the ¾" filter Regulators and the quick connections needed for the Compressed Air System.

*Answer: Air line regulators: diaphragm operated, bronze body, direct acting, spring-loaded manual pressure-setting adjustment, and rated for 200-psig minimum inlet pressure. Quick disconnects: Snap-Tite, Inc.; Quick Disconnect & Valve Division or TOMCO Products Inc.*

- v) (Plumbing and Mechanical) Question – On P0.03 Infrared Heater / Natural Gas connection Detail it shows a flexible stainless steel connection what trade is to provide this item the Plumbing or HVAC contractor?

*Answer: Plumbing Contractor shall provide the flexible stainless steel connection.*

- w) (Plumbing) Question – Please provides a spec on the EWH-2?

*Answer: Eemax model #EX55T, 5.5KW-240V-1ph with a 25% reduced output for 208V-1ph (4.2 KW).*

- x) (Plumbing) Question – Is the Detail on P0.03 for EWH-2 for EWH-1 or 2?

*Answer: EWH-1, 12-gallon electric. EWH-2 is a wall-mounted instantaneous unit for the eyewash only.*

- y) (Plumbing) Question – Are Mix valves required for all EEW or just the one noted to have one?

Answer: *Mixing valves are only required for the Emergency Eye Wash associated with EWH-2.*

- z) (Plumbing) Question – Will filter Regulators be required at the Lube/Oil Pump Header (4) Four Valve Locations?

Answer: *Plumbing Contractor shall provide regulator at the four (4) valve locations.*

- aa) (Plumbing) Question – Who is to provide the Concrete Pad for the WH-1?

Answer: *WH-1 is located on the Pre-cast concrete mezzanine that is furnished by others. No housekeeping pad for WH-1 will be required.*

- bb) (Plumbing) Question – Water Line feeding the Garage are 121 states to be a 1 ½" line dropping down to a ¾" line then it increase to a 2" line is that correct?

Answer: *Provide a 2" DCW from the water meter setting all the way out to the wash bay connection. The 1-1/2" and ¾" sections are incorrect.*

- cc) (General Trades) Question – The specs imply that the interior ¾" plywood wall sheathing is to be fire-rated, but the drawings do not. Is this material to be fire-rated?

Answer: *Fire-retardant-treated plywood is only required for fire-rated construction. Exposed plywood panels in Garage 121 do not require fire-resistant-treated plywood provide the product has a flame spread index of 76-200 and a smoke development index of 0-450.*

- dd) (All) Question – Drawing M1.02 note 9 refers to structural platform and refers to architectural plans. I do not see on architectural plans.

Answer: *The Architectural Drawings were included in the bid documents. Please reference Lucas County's website or Becker Impressions to re-download the drawings.*

**2. Due Date:**

- a) No change to the Original Bid Package Due Date (**December 6, 2012 at 2:00 PM**)

**3. Attachments Included in Addendum:**

- a) Revised Pricing Sheet
- b) C-011 Drawings, Sketches and Specifications
- c) Architect Write-up

All other terms and conditions of to the original bid package remain in effect. Please sign and submit this addendum with the Pricing Sheet on the Bid Package Due Date.

**ACCEPTED BY:**

\_\_\_\_\_  
Name of Contractor:

\_\_\_\_\_  
By (Signature):

\_\_\_\_\_  
Date

**PRICING SHEET**  
*REVISED – 11/26/2012*  
**Lucas County Road Maintenance Building**

Company Name \_\_\_\_\_  
Street Address \_\_\_\_\_  
City, State, Zip \_\_\_\_\_  
Mailing Address \_\_\_\_\_  
(If Different)  
Contact Name \_\_\_\_\_  
Phone No. \_\_\_\_\_  
Fax No. \_\_\_\_\_  
Email Address \_\_\_\_\_

**DUE: December 6, 2012 @ 2:00 PM LOCAL TIME**

**TO:** Lucas County Commissioners  
One Government Center, Suite 480  
Toledo OH 43604-2259

We, the undersigned, having carefully examined the Bid Documents agree to perform all work required by these documents heretofore submitted to bidder, as modified by any addenda listed herein.

**1.0 BASE BID**

Provide all necessary labor, material, supervision, taxes, insurance, cartage, storage, temporary protection, tools, equipment, layout, field engineering, and all things necessary or incidental to furnish, deliver and install complete in every detail the Work as defined by the drawings and specifications for the lump sum price of:

**BID ITEM:**

**1.1 Lucas County Road Maintenance Building – Plumbing Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.2 Lucas County Road Maintenance Building – Mechanical Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.3 Lucas County Road Maintenance Building – Electrical Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.4 Lucas County Road Maintenance Building – Fire Protection Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.5 Lucas County Road Maintenance Building – General Trades Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.6 Lucas County Road Maintenance Building – Fueling Station Package:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

**1.7 COMBINED BID – Lucas County Road Maintenance Building:**

Base Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

Check ALL of the Packages that are included in the above Combined Bid Amount:

- Plumbing Package [ ]
- Mechanical Package [ ]
- Electrical Package [ ]
- Fire Protection Package [ ]
- General Trades Package [ ]
- Fueling Station Package [ ]

2.0 MANDATORY ALTERNATES

General Trades

2.1 General Trades Package – Alternate 1 - Furnish and Install a 50,000# 4 Post Vehicle Lift in lieu of the Parallelogram Lift in the Base Bid as per the drawings and specifications.

Alternate Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

2.2 General Trades Package – Alternate 2 - Furnish and Install a 75,000# 4 Post Vehicle Lift in lieu of the Parallelogram Lift in the Base Bid as per the drawings and specifications.

Alternate Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

2.3 General Trades, Mechanical and Plumbing Package – Alternate 3 - The Mechanical and Plumbing Contractors shall furnish all piping materials to the General Trades Contractor five (5) working days prior to installation, for on-site cleaning (performed by the General Trades Contractor) and painting (performed by the General Trades Contractor) of the piping materials as per the project specifications. Touch up painting of the piping material will be by the General Trades Contractor after installation.

Alternate Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

2.4 General Trades and Fire Protection Package – Alternate 4 – Eliminate the Painting of Fire Protection Piping. Piping Material will not be painted by another package and shall be furnished as a finished product.

Alternate Bid Amount: \_\_\_\_\_  
\_\_\_\_\_ Dollars \$: \_\_\_\_\_

3.0 CONTRACTOR'S FEE

After the signing of the contracts for the work included for this project, in the event it becomes necessary to authorize changes to the Scope of Work included in the Base Bid, the following "fees" shall apply.

- a. For additional work performed by your own forces, a fee of eight percent (8) of the approved cost of the work.
- b. For additional work performed by Subcontractors, a fee of five percent (5) of Subcontractor's approved cost of the work.

The "fee" stated above shall be the total amount to be added to the "approved cost" of the extra work and shall include "Profit and Overhead".

Cost shall be limited to the following: Cost of materials, including applicable tax and cost of delivery, cost of labor and applicable fringe benefits including Social Security, and Unemployment Insurance (labor cost may include a pro rata share of foreman's time; Workmen's Compensation and other applicable insurance); rental value of power tools and equipment.

Profit and Overhead shall include the following: travel, supervision, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expense and all other expenses not included in "Cost". The cost as used herein shall include all items of labor, materials, and equipment.

Fee shall include all profit and overhead and shall include the following: Travel other than required by Labor Agreement for trades directly involved in the work, supervision, wages of timekeepers, field engineers and clerks, small tools, incidentals, general field and main office expense and all other expenses not included in "Cost".

#### 4.0 ADDENDA

In the event that addenda have been received during the bidding period covering changes to the bid documents, the undersigned bidder subscribes to the following statement:

The work described in the following addenda is included in this proposal:

Addendum No. \_\_\_\_\_, Dated \_\_\_\_\_      Addendum No. \_\_\_\_\_, Dated \_\_\_\_\_

Addendum No. \_\_\_\_\_, Dated \_\_\_\_\_      Addendum No. \_\_\_\_\_, Dated \_\_\_\_\_

#### 5.0 TIME OF COMPLETION

The undersigned bidder agrees to complete the work in accordance with the project schedule, as outlined in the Bid Documents.

#### 6.0 REJECTION OF BIDS

The undersigned bidder acknowledges that the Owner reserves the right to reject any or all proposals and to award the work to other than the low bidder.

**All bids will be opened publicly.**

#### 7.0 SITE INSPECTION

The undersigned bidder acknowledges that bidder has been afforded the opportunity to inspect the jobsite to arrive at a clear understanding of the conditions under which the work is to be done; to compare the site with the drawings and specifications; to satisfy bidder as to the condition of the premises; existing obstructions; condition, location, and size and configuration of buildings and areas allocated for construction purposes; location and availability of roads; location and availability of utilities, including the electrical characteristics of the available power; proximity and nature of Owner's existing operations; and any other conditions affecting the performance of the work.

No allowances or extra consideration on behalf of the undersigned bidder will be allowed by Owner by reason of additional costs, damages or other difficulties incurred by the undersigned bidder that could have been avoided had an adequate site inspection been undertaken by him.

8.0 EEO AND MBE

The undersigned bidder agrees to comply with all applicable local, state, and federal EEO and MBE goals and additional goals as set forth in the bid documents. See attached MBE Affidavit of Compliance and Bidder MBE Utilization Forms.

9.0 PRICE GUARANTEE

The undersigned bidder agrees that this proposal will remain firm for a period of not less than sixty (60) days and a maximum of \_\_\_\_\_ days.

10.0 LEGAL STATUS AND SIGNATURE OF BIDDER

Check one of the following:

- a. Bidder is an individual \_\_\_\_\_.
- b. Bidder is a corporation \_\_\_\_\_.
- c. Bidder is a partnership \_\_\_\_\_.

- 1) If Corporation -  
State of Corporation \_\_\_\_\_

States in which qualified to do business -

\_\_\_\_\_

- 2) If partnership, list names of all partners.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Name of Contractor

\_\_\_\_\_  
By (Signature)

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address of Bidder

C-011 Dated 11/26/2012

November 26, 2012

ADDENDUM NO. 001

To the Drawings and Specifications for:

**Lucas County Road Maintenance Building  
General Trades – MEP Package**

106049

**Lucas County Board of Commissioners**

Prepared By:

THE COLLABORATIVE INC  
Architects  
Landscape Architects  
Interior Designers  
500 Madison Avenue  
Toledo, Ohio 43604  
Telephone: (419) 242-7405  
Fax: (419) 242-7400

TO ALL BIDDERS:

This addendum supplements and amends the original drawings and specifications, and shall be taken into account in preparing proposals, and shall become a part of the contract documents. Receipt of this Addendum must be acknowledged in the Bid Form.

ADDENDUM NO. 001  
Lucas County Road Maintenance Building  
Lucas County Board of Commissioners

BID PACKAGE 003  
General Trades - MEP Package

## **GENERAL**

### **Questions:**

- A. Refer to bidder questions list published with this addendum from the Construction Manager.

### **Clarifications**

None

### **Specifications**

#### Section 08 4113 ALUMINUM-FRAMED PUNCHED OPENING WINDOWS (Not Re-issued)

- Item #1 Part 2, Section 2.2, Paragraph A, add item 6 under manufacturers:  
Capitol Aluminum and Glass Corporation.

#### Section 22 0000 PLUMBING SPECIFICATION (Re-issued)

- Item #1 Entire section is re-issued.

#### Section 23 0000 MECHANICAL SPECIFICATION (Re-issued)

- Item #1 Entire section is re-issued.

#### Section 26 0000 ELECTRICAL SPECIFICATION (Re-issued)

- Item #1 Entire section is re-issued.

### **Drawings**

#### **Architectural Drawings**

##### Sketch SKA-02 "Window Details – Office Areas"

- Item #1 Clarified window head return with gypsum board for all office area windows.  
Item #2 Clarified window jamb return with gypsum board for all office area windows.  
Item #3 Clarified window stool condition at all office area windows.

##### Sketch SKA-03 "Washbay Equipment Layout"

- Item #1 Location of bio-remediation system, air compressor and control (hose) stations for washbay equipment.

#### **Plumbing Drawings**

##### Drawing P0.03 Plumbing Details (drawing not reissued):

- Item #1 Clarification – EWH-1 is the 12-gallon electric water heater.

##### Drawing P1.01 First Floor Plan – Plumbing – Underground (drawing not reissued):

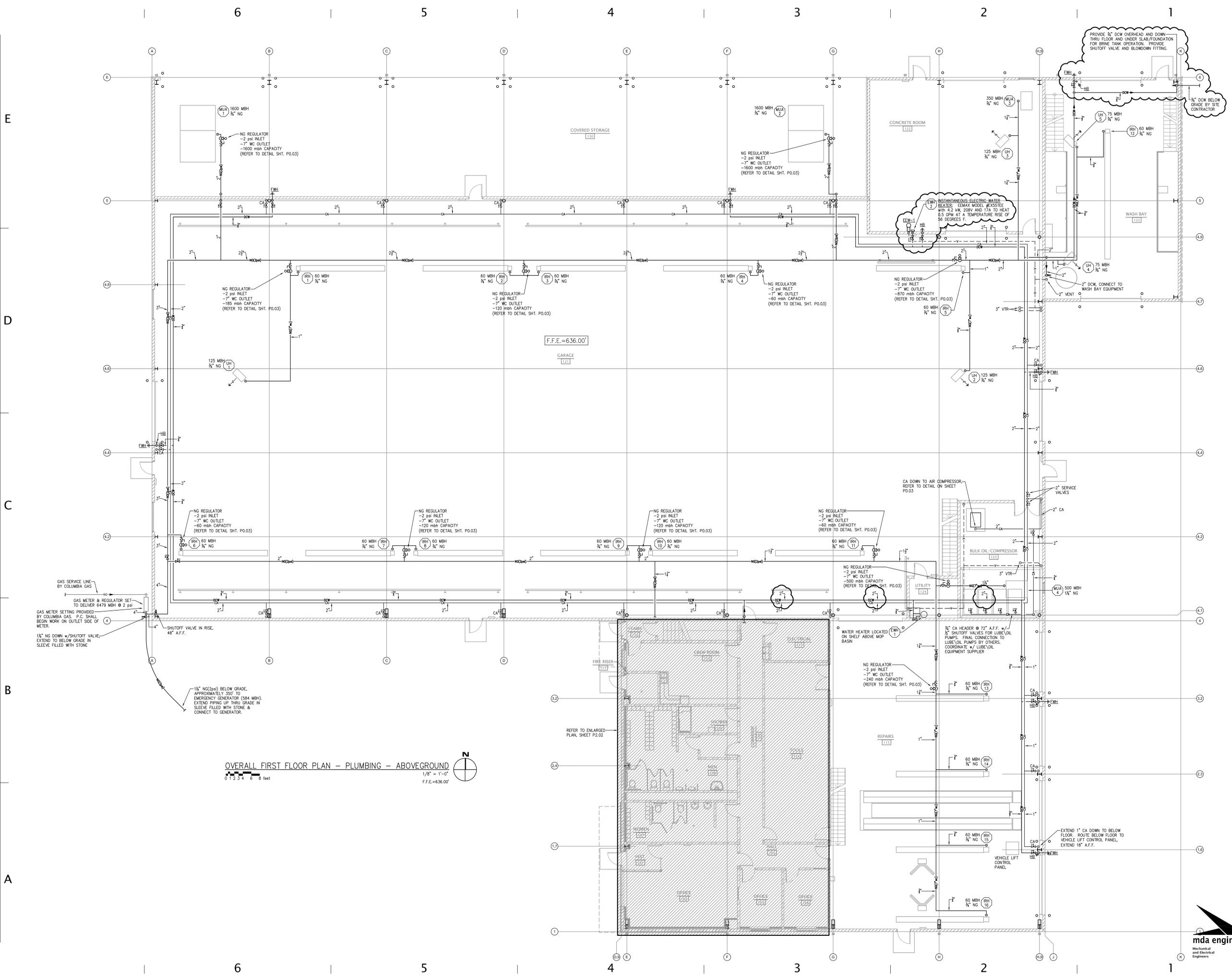
- Item #1 Clarification – 3500 gallon oil interceptor.

##### Drawing P1.02 First Floor Plan – Plumbing – Aboveground (drawing reissued):

- Item #1 Revised DCW piping.  
Item #2 Add ¾" DCW to serve Brine Tank.  
Item #3 Clarification: Instantaneous electric water heater EWH-2 serving emergency eyewash in concrete room.

C-011 Dated 11/26/2012

Drawing P1.03 Enlarged First Floor Plan – Plumbing (drawing reissued):  
Item #1 Revised DCW piping.



OVERALL FIRST FLOOR PLAN - PLUMBING - ABOVEGROUND  
 1/8" = 1'-0"  
 F.F.E.=636.00'

500 Madison Ave  
 Toledo, OH 43604  
 419.242.7405 fax  
 419.242.7400 fax  
 www.thecollaborativeinc.com  
 ts@thecollaborativeinc.com



ARCHITECTS  
 LANDSCAPE ARCHITECTS  
 INTERIOR DESIGNERS  
 PLANNERS



C-011 Dated 11/26/2012

PROJECT TITLE  
**Lucas County Road Maintenance Building**  
 1049 S. McCord Rd.  
 Holland, Ohio

Prepared for the  
**Lucas Co. Board of Commissioners**

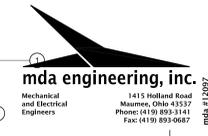
11.20.12	ADDENDUM 1
11.05.2012	PERMITS
10.25.2012	BIDDING
BID PACKAGE:	
GENERAL TRADES & MEP PACKAGES	

CHECKED MJK  
 APPROVED RJY

TCI JOB NO. 106049

SHEET TITLE  
**Overall First Floor Plan Plumbing Aboveground**

SHEET NO.  
**P1.02**



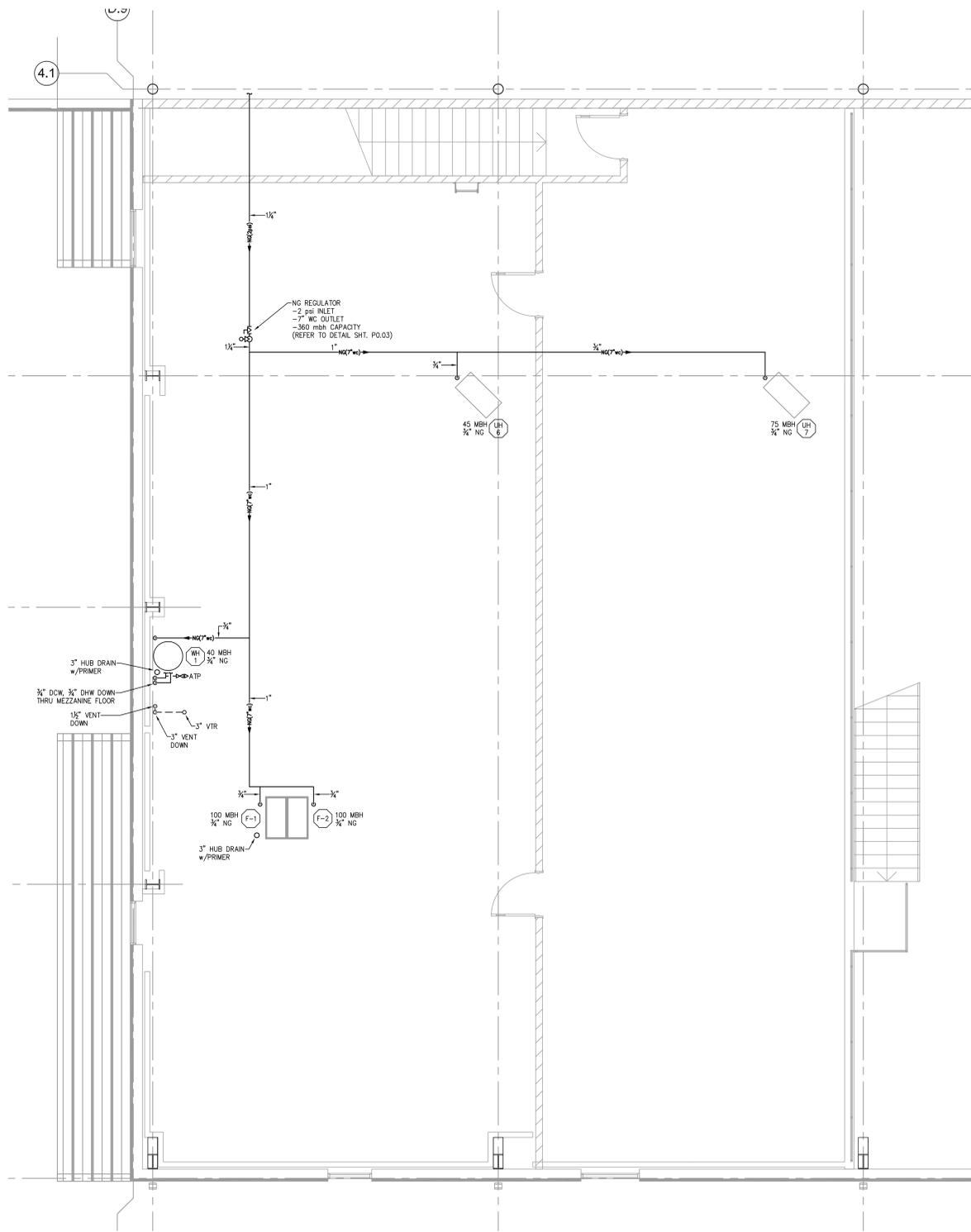
E

D

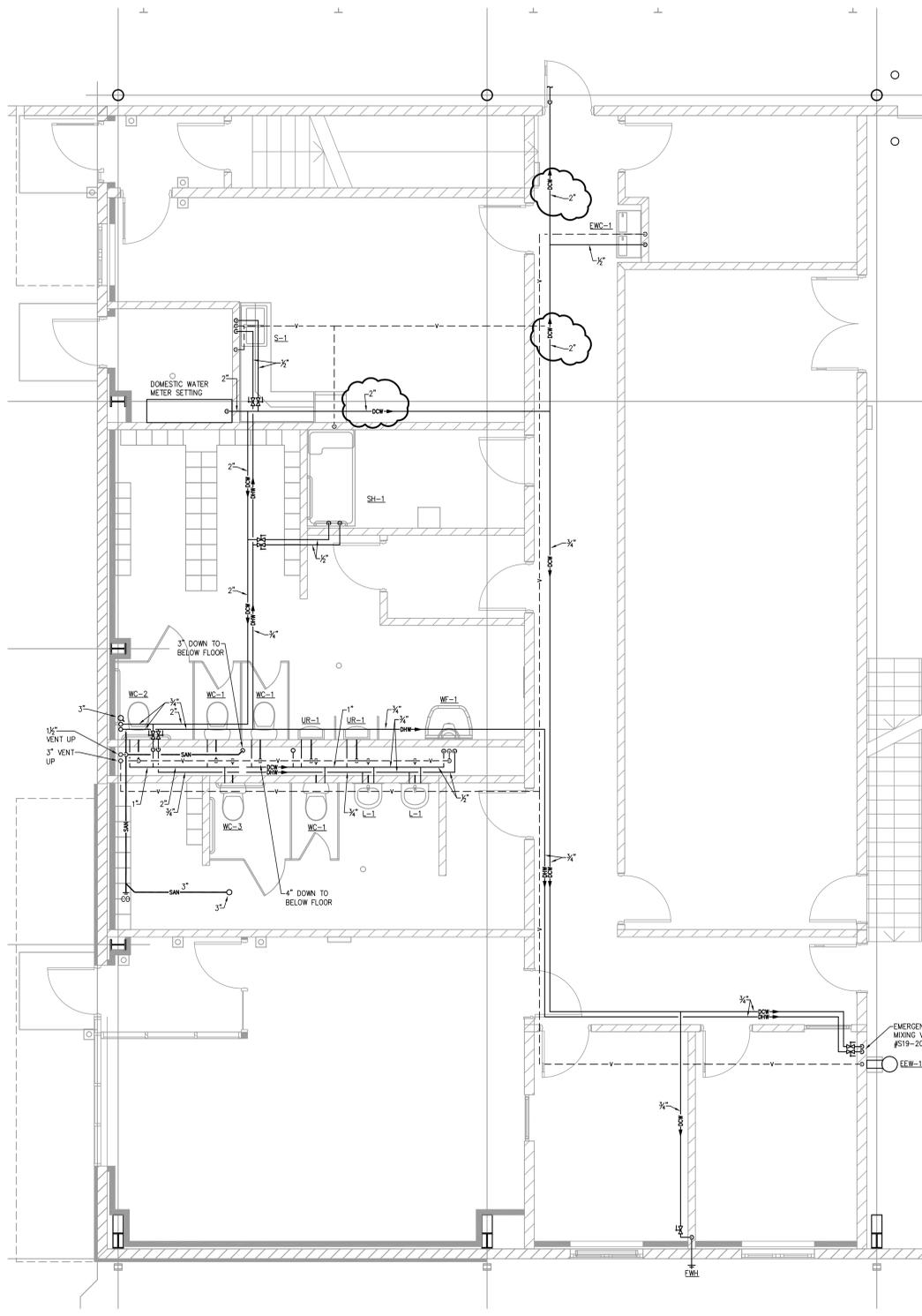
C

B

A



ENLARGED MEZZANINE PLAN - PLUMBING  
 1/4" = 1'-0"  
 0 1 2 3 4 feet



ENLARGED FIRST FLOOR PLAN - PLUMBING  
 1/4" = 1'-0"  
 0 1 2 3 4 feet

500 Madison Ave  
 Toledo, OH 43604  
 419.242.7405 tel  
 419.242.7400 fax  
 www.thecollaborativeinc.com  
 ts@thecollaborativeinc.com



ARCHITECTS  
 LANDSCAPE ARCHITECTS  
 INTERIOR DESIGNERS  
 PLANNERS



C-011 Dated 11/26/2012

PROJECT TITLE  
**Lucas County Road  
 Maintenance Building**  
 1049 S. McCord Rd.  
 Holland, Ohio

Prepared for the  
**Lucas Co. Board of  
 Commissioners**

11.20.2012 ADDENDUM 1  
 11.05.2012 PERMITS  
 10.25.2012 BIDDING  
 BID PACKAGE:  
 GENERAL TRADES & MEP PACKAGES

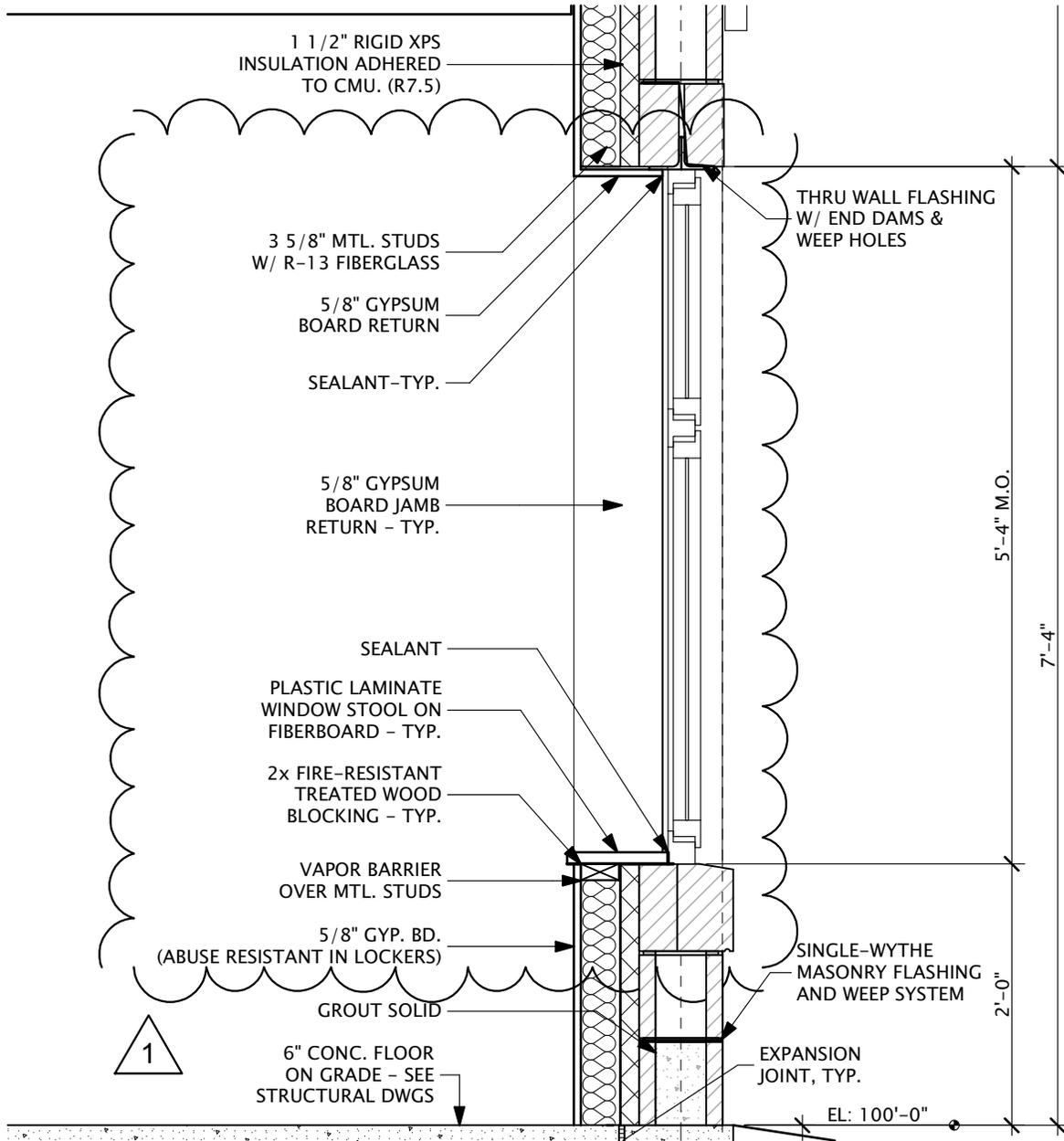
CHECKED MJK  
 APPROVED RJY

TCI JOB NO. 106049

SHEET TITLE  
**Enlarged Floor  
 Plans  
 Plumbing**

SHEET NO.  
**P1.03**





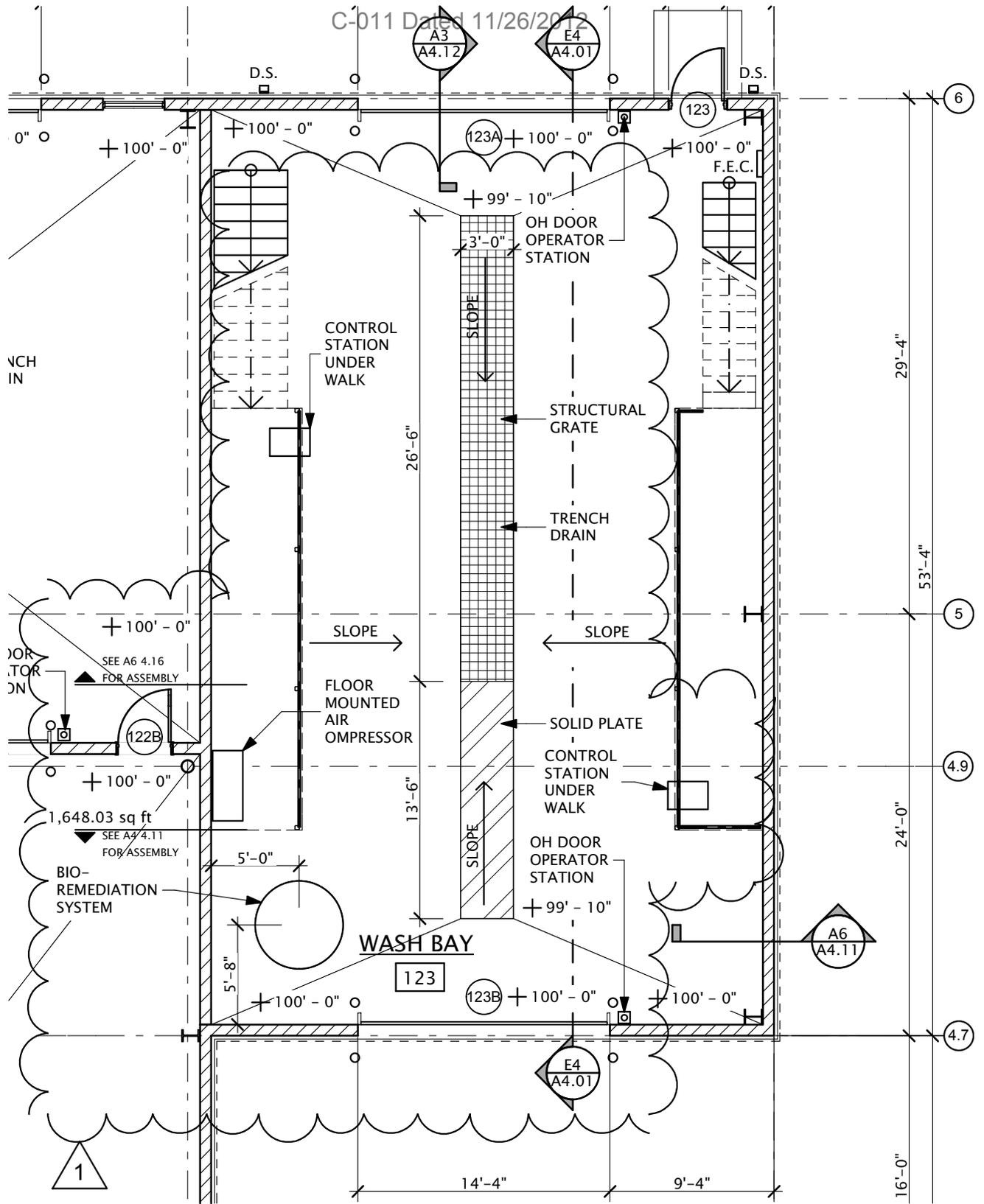
**1 WINDOW HEAD, JAMB & STOOL DETAIL**

1  
SKA-02

SCALE: 3/4" = 1'-0"

SHEET NO. <b>SKA-02</b>	SHEET TITLE Window Details - Office Areas	PROJECT TITLE <b>Lucas Co Engineer</b> Gen. Trades-MEP Addendum 001	 the COLLABORATIVE inc 500 Madison Ave Toledo, OH 43604 419.242.7405 tel 419.242.7400 fax www.thecollaborativeinc.com tci@thecollaborativeinc.com ARCHITECTS LANDSCAPE ARCHITECTS INTERIOR DESIGNERS PLANNERS

Printed 11/20/2012



Printed 11/20/2012

SHEET NO.  
**SKA-03**

SHEET TITLE  
**Washbay  
Equipment Layout**

PROJECT TITLE  
**Lucas Co  
Engineer  
Gen. Trades-MEP  
Addendum 001**



*the* **COLLABORATIVE** inc

500 Madison Ave  
Toledo, OH 43604  
419.242.7405 tel  
419.242.7400 fax  
www.thecollaborativeinc.com  
tci@thecollaborativeinc.com

ARCHITECTS  
LANDSCAPE ARCHITECTS  
INTERIOR DESIGNERS  
PLANNERS

## Division 220000 - Plumbing Specification

## 1.00 General

## 1.01 General Scope

- A. The work required under this specification shall consist of all labor, materials, tools, equipment, power, transportation, hoisting implements, etc. of every description necessary for the entire completion of the plumbing work of the contract, all as specified herein, shown on the drawings or reasonably implied by either, complete in every respect unless specifically excluded herein. The work included in this contract shall consist of the installation, test and guarantee of all work herein specified.

## 1.02 Inspection of Existing and General Conditions:

- A. The Contractor will be held to have personally inspected the site of the proposed work to arrive at a clear understanding of the conditions under which the work is to be performed, the extent of other Contractor's activities in the area, and to become fully acquainted with the receiving and storage spaces available. The Contractor shall be held to have compared the premises and site with the drawings and specifications, and shall be satisfied as to the conditions of the premises, the actual elevations, and any other conditions affecting the carrying out of the work, before the delivery of this proposal.
- B. No allowances or extra consideration on behalf of the Contractor will subsequently be allowed by reason of the Contractor's failure to have become familiar with site conditions, error or oversight on the part of the Contractor or due to interference's by the owner's or other Contractor's activities.
- C. Items specified on plumbing schedules and plans are the basis of design. Equality of other equipment shall be determined by the Owner and Engineer. Any modification to these documented methods that is made necessary by alternate equipment is the responsibility of the supplier of the alternate equipment.
- D. Contractor is directed to include all necessary over time and premium time (Saturday, Sunday, Holidays) required for the completion of the intended work to meet specified schedules.
- E. Do not scale plumbing drawings. For exact dimensions use dimensioned drawings or actual field conditions.

## 1.03 Codes, Permits and Compliance:

- A. Contractor shall obtain and pay for all permits, licenses and inspections required by laws of governing bodies. Comply with all applicable codes and ordinances and all legal requirements. No extra compensation will be allowed for any changes necessary for code compliance regardless of the method of installation shown on the drawings or specified.

- B. All plumbing work shall comply with current editions of all applicable state and local codes and ordinances.
  - C. All equipment, devices, and materials shall be the latest products of manufacturer and shall conform to the requirements noted on plans.
- 1.04 Workmanship:
- A. Workmanship shall be of the highest quality conforming to the best plumbing installation practice. Any work or material which is rejected must be removed immediately and replaced. No sub-standard work will be accepted.
  - B. The brevity of this specification shall not be construed as relieving the Contractor of his responsibility to perform all work in a first class workmanlike manner.
- 1.05 Submittals and Record Drawings:
- A. Submit shop drawings and catalog data for approval for all equipment and materials specified for this project prior to ordering or manufacture of such. Shop drawings not stamped with Contractor approval will be rejected.
  - B. The Contractor shall keep an accurate record of all deviations from the approved design documents and specifications which may occur in the work as actually constructed and shall submit same to the Engineer or Owner's representative at completion of the job.
  - C. Submittals shall be coordinated through the Architect.
- 1.06 Tests and Guarantee:
- A. All tests for various systems shall be performed as required, consistent with good general practice and in compliance with codes and authorities.
  - B. As a condition precedent to the final payment, the Contractor shall execute to the Owner a guarantee in a form approved by the Owner. Guarantee shall warrant that all work included in this division of the specifications will remain in serviceable and perfect condition (Ordinary wear and tear, abuse and causes beyond the control of the Contractor excluded) for a period of one year from date of final completion and acceptance of work, and that the Contractor will make good at his own expense, without cost to the Owner, any imperfections in whole or in part which may develop in this work during the period above specified, including any damage to other work caused by such imperfections or repairing of same.
  - C. All plumbing systems, devices and related items shall be tested. Replace any and all defective device items or systems before completion of the project.
- 1.07 Coordination:

- A. Field verify exact location of all new equipment with existing conditions and coordinate with the general and other Contractors prior to rough-in and/or installing any of this work.
  - B. Field verify all clearances and conditions prior to the start of any piping, fixtures, etc.; Verify locations of all piping, fixtures, equipment, devices, etc., with Architectural, HVAC, Fire Protection, Structural and Electrical drawings prior to rough-in. Report any discrepancies to the Engineer prior to proceeding with work.
  - C. All interruptions of services to existing or operable facilities shall be scheduled with the Owner a minimum 72 hours in advance. The Contractor shall not interrupt or restore services without prior consent of the Owner. The interruption shall be only for the specified scheduled time. The Owner or Electrical Contractor will be responsible for disconnecting and start-up of electrical or process systems.
  - D. Coordinate all power wiring, safety disconnect means, motor control and control wiring for plumbing equipment with the Electrical Contractor.
  - E. Refer to electrical drawings for work involving electrical power supply wiring from power source to unit connection points.
  - F. Locate and install all handicap devices as indicated in accordance with Americans with Disabilities Act Guidelines.
  - G. Prepare coordination drawings to a scale of one-quarter inch equals one-foot or larger; detailing major elements, components and systems of mechanical equipment and materials in relationship with other systems, installations, elevations, and building components. The Contractor assumes all responsibility for installation of all systems if coordination drawings are not prepared.
  - H. Coordinate final invert elevations of all sanitary and storm drainage piping with the Site Contractor/existing conditions prior to installation.
- 1.08 Identification:
- A. Install snap-on plastic or adhesive pipe markers with system identification and direction of flow on all piping systems.
  - B. Paint all piping with Owner's system identification color codes.
  - C. Install engraved plastic laminate sign or equipment marker on or near each major item of plumbing equipment.
  - D. Install valve tag on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, shut-off valves, faucets, convenience and lawn-watering hose bibbs, and similar roughing-in connections of end-use fixtures and units. List tagged valves in valve schedule mounted in each major equipment room.

## 1.09 Clean-Up, Protection and Touch-Up:

- A. This Contractor shall dispose of all materials generated from removal and installation of this work. Debris shall be removed from the project site weekly. This Contractor shall provide to the Owner any salvageable materials as directed by the Owner or Engineer.
- B. Upon completion of work, this Contractor shall thoroughly clean all apparatus furnished by this contract.
- C. All equipment, fixtures, items, devices and appurtenances shall be protected from debris and damage while stored at the site, and during and after installation.
- D. Scarred factory-finished mechanical equipment shall be touched up with factory furnished paint. Rusted or marred surfaces of plumbing equipment shall be cleaned and primed before painting.
- E. Cracked or chipped vitreous china plumbing fixtures will not be accepted.
- F. Patch finished surfaces and building components using new materials matching existing materials and experienced installers.
- G. All cutting and patching of roof, walls, floors, and slabs, etc. is the responsibility of this contractor unless specifically stated otherwise on the drawings.

## 1.10 Owner Furnished Items

- A. The Owner will provide selected items of equipment as noted on the drawings. This Contractor's work shall include all labor, etc., to receive, store, unload, unpack and disburse equipment items to point of use. Work shall also include installation of the equipment items including housekeeping pads, structural supports, fastenings, assembly, etc., including connections to each item.
- B. Owner will arrange and pay for delivery of Owner furnished items to coordinate with the Contractors construction schedule and will assume responsibility to inspect delivered items for quantities, damage, etc.
- C. If Owner furnished items are defective, damaged or deficient, the Owner will arrange for replacement or repair and will also arrange for manufacturers field services, warranty, bonds, etc., as required.
- D. Owner furnished equipment items will be complete with all necessary parts, lifting eyes, and associated appurtenances to render the equipment ready to install. Deficiencies shall be corrected by the owner.
- E. This Contractor is responsible for providing required delivery dates for each Owner furnished equipment item. Contractor shall provide necessary storage and protection from elements and shall assume responsibility to repair or replace damaged items as a result of his operations or failure to provide adequate protection.

## 1.11 Maintenance Manuals

- A. Prepare Maintenance Manuals. Provide a minimum of four copies to the Engineer for approval. Include the following information for equipment items:
1. Complete information on project equipment and services as was submitted during the course of the project. This information is solely intended to provide the Owner with accurate, usable information on how to care for his facility.
  2. Description of function, normal operating characteristics and limitations, performance curves, Engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
  3. Manufacturer's printed warranties.
  4. Manufacturer's printed operating procedures to include start-up, break-in and routing and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  5. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassemble; aligning and adjusting instructions.
  6. Servicing instructions and lubrication charts and schedules.

## 2.00 Basic Materials and Methods

### 2.01 Pipe and Equipment Insulation

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this section according to ASTM E 84, by a Testing and Inspecting Agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable Testing and Inspecting Agency.
1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
- B. Insulation Materials
1. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
    - a. Preformed Pipe Insulation: Comply with ASTM C 547, Type I, with factory-applied, all purpose, vapor-retarder jacket.
    - b. Blanket Insulation: Comply with ASTM C 533, Type II, without facing.

2. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type 1B, without facing and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil and vinyl film.
3. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 533, Type II, without facing and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
4. Flexible elastomeric thermal insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials. For concealed piping installations (in walls, below floors, or non-accessible chases only).
  - a. Adhesive: as recommended by insulation material manufacturer.
  - b. Ultraviolet-Protective Coating: as recommended by insulation manufacturer.
5. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

C. Field-Applied Jackets

1. General: ASTM C 921, Type I, unless otherwise indicated.
2. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant Kraft paper and aluminum foil.
3. PVC Jacket: High-impact, ultraviolet-resistant; 20 mil (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
4. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil (0.5 mm) thick, high-impact, ultraviolet-resistant PVC.

D. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping and equipment, including fittings, valves, and specialties.

E. Interior Insulation Application Schedule

1. These application schedules are for above ground insulation of piping and equipment systems inside the building.
2. Service: Domestic Hot Water, 60 to 140 Deg F.

Domestic Hot Water (60 to 140 Deg F)
--------------------------------------

Pipe Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field- Applied Jacket
1/2 To 1-1/4	Glass Fiber	1	No	None
1/2 To 1-1/4	Flexible Elastomeric	1/2	No	None

## 3. Service: Domestic Cold Water, 35 to 60 Deg F.

Domestic Cold Water (35 to 60 Deg F)				
Pipe Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field- Applied Jacket
1/2 To 1-1/4	Glass Fiber	1	Yes	None
1/2 To 1-1/4	Flexible Elastomeric	1/2	Yes	None
1-1/2 To 4	Glass Fiber	1	Yes	None
1-1/2 To 4	Flexible Elastomeric	3/4	Yes	None

## 4. Service: Exposed Sanitary Drains and Domestic Water Supplies and Stops for Fixtures for the Disabled.

Exposed Sanitary Drains and Domestic Water Supplies and Stops for Fixtures for the Disabled				
Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field- Applied Jacket
All	Pre-Manufactured PVC-Trap & Supply Covers	1/2	No	Std.

## F. Service: Interior Equipment Application Schedule

Interior Equipment Application Schedule					
Equipment	Temp.	Materials	Thickness In Inches	Vapor Barrier Req'd	Field Applied Jacket
Domestic Hot Water Tanks, Equip.	55 To 140 Deg F.	Flexible Elastomeric	1	No	None

## 2.02 Valves

## A. Gate Valves

1. Gate valves, 2 inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) cold working pressure (CWP), or Class 150, 300-psi (2070-kPa) CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, Teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

## B. Ball Valves

1. Ball valves, 4 inches (DN100) and smaller: MSS SP-110, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for plumbing applications; full port for HVAC application; blowout proof; bronze or brass stem; Teflon seats and seals; threaded or soldered end connections:
  - a. Operator: Vinyl-covered steel lever handle.
  - b. Stem Extensions: For valves installed in insulated piping.

## C. Plug Valves

1. Plug valves: MSS SP-78, 175-psi (1200-kPa) CWP, ASTM A 126 cast-iron body and bonnet, cast-iron plug, BUNA N, Vitron, or Teflon packing, flanged or grooved end connections:
  - a. Operator: Square head with 1 wrench for every 10 valves.

## D. Globe Valves

1. Globe Valves, 2 inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) CWP, or Class 150, 300-psi (2070-kPa) CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber bronze, or Teflon disc, silicon bronze-alloy stem, Teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

## E. Butterfly Valves

1. Butterfly Valves: MSS SP-67, 200-psi (1380-kPa) CWP, 150-psi (1035-kPa) Maximum pressure differential, ASTM A 126 cast-iron body and bonnet, extended neck, stainless-steel stem, field-replaceable EPDM or BUNA N sleeve and stem seals, wafer, lug, or grooved style:
  - a. Disc Type: Nickel-Plated Ductile Iron.
  - b. Disc Type: Aluminum Bronze.
  - c. Disc Type: Elastomer-Coated Ductile Iron.
  - d. Operator for Sizes 2 inches (DN50) to 6 inches (DN150): Standard Lever Handle.

## F. Check Valves

1. Swing Check Valves, 2 inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) CWP, or Class 150, 300-psi (2070-kPa) CWP; horizontal swing, y-pattern, ASTM B 62 cast-bronze body and cap, rotating bronze disc with rubber seat or composition seat, threaded or soldered end connections.
- G. Strainers: Y pattern, except where otherwise indicated, full size of connecting piping. Include type 304 stainless steel screens with 3/64 inch perforations except where other screens are indicated.
1. Pressure Rating: 125-psig minimum steam working pressure except where otherwise indicated.
  2. Sizes 2 inches and Smaller: Bronze body, with female threaded ends.
  3. Y-Type Strainers: Screwed screen retainer with centered blowdown.
    - a. Drain: Factory-or field installed, hose-end drain valve.
- H. Compressed Air Valves
1. Ball Valves, 2-inch NPS (DN50) and Smaller: MSS SP-110; 2-piece bronze body with blowout-proof stem; full port; chrome-plated, solid-brass or – bronze ball; threaded ends; and 600-psig (4140-kPa) minimum WOG pressure rating.
- I. Natural Gas Valves
1. Gas Valves, 2-inch NPS (DN50) and Smaller: 125 psig (860 kPa) WOG minimum, equivalent to ASME B16.33, lubricated, straightaway pattern, cast-iron or ductile-iron body. Include tapered plug, o-ring seals, square or flat head, and threaded ends conforming to ASME b1.20.1.
  2. Gas Valves, 2-1/2-inch NPS (DN65) and Larger: MSS SP-78, Class 125 or Class 175 WOG, lubricated-plug type, semi-steel body, wrench operated, with flanged ends.

## 2.03 Piping

- A. Regulatory Requirements: Comply with the provisions of the following:
1. ASME B 31.9 “Building Services Piping” for materials, products and installation.
  2. Safety valves and pressure vessels shall bear the appropriate ASME label.
  3. ASME “Boiler and Pressure Vessel Code”, Section IX, “Welding and Brazing Qualification” for qualifications for welding processes and operators.
  4. OBC Ohio Building Code.
  5. Ohio Plumbing Code.
  6. International Plumbing Code.

- B. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
1. Water Distribution Systems, Below Ground: 150 psig.
  2. Water Distribution Systems, Above Ground: 125 Psig.
  3. Soil, Waste, and Vent Systems: 10-Foot head of water.
  4. Natural Gas Systems, Above Grade: 150 Psig.
  5. Compressed Air Systems, Above Grade: 150 Psig.
- C. Storm and Sanitary Waste and Vent Piping Below Floor.
1. Poly Vinyl Chloride (PVC) plastic DWV pipe; ASTM D 2665, Schedule 40, plain ends with socket-type DWV fittings.
- D. Storm and Sanitary Waste and Vent Piping Above Floor.
1. Poly Vinyl Chloride (PVC) plastic DWV pipe; ASTM D 2665, Schedule 40, plain ends with socket-type DWV fittings. (Not permitted in HVAC return air plenums).
  2. Hubless cast iron soil pipe; plain ends, CISPI 301, with stainless steel, heavy-duty couplings for hubless cast-iron soil pipe and fittings, ASTM C 564 Neoprene sealing gasket, with Type 304 stainless-steel housing or shield and stainless-steel clamps tightened to 80 inch pounds of torque. Coupling shall be 3 inches wide in sizes 1-1/2 to 4 inches and 4 1/2 inches wide in sizes 5 to 10 inches.
- E. Domestic Water Service Below Floor
1. Soft Copper Tube; ASTM B 88, Type K, water tube, annealed temper, with wrought copper solder-joint pressure fittings ASME B16.22. Limit joints below floor.
  2. Ductile Iron Pipe; AWWA C115, Class 150 or 300, iron-alloy threaded flanges, AWWA C 104 cement-mortar lining with fittings as follows:
    - a. Ductile-Iron and Gray-Iron Gasketed Fittings: AWWA C110 standard pattern or ductile-iron AWWA C153 compact pattern, 250 psig minimum pressure rating, with AWWA C104 cement-mortar lining and AWWA C111 rubber gaskets.
    - b. Ductile-Iron and Gray-Iron Flanged Fittings: AWWA C110, 250-psig minimum pressure rating, with AWWA C104 cement-mortar lining.
  3. PEX Tube and Fittings: ASTM F 877, SDR 9 tubing.
    - a. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions. No fittings below floor.

## A. Domestic Water Service Above Floor.

1. Hard Copper Tube; ASTM B 88; Type L, water tube, drawn temper, with wrought copper solder-joint pressure fittings ASME B16.22.
2. Copper Pressure-Seal-Joint Fittings:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Elkhart Product Corporation; Industrial Division.
    - 2) NIBCO, INC.
    - 3) Viega; Plumbing and Heating Systems.
  - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
3. Grooved-Joint Copper-Tube Appurtenances:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Anvil International.
    - 2) Shurjoint Piping Products.
    - 3) Victaulic Company.

## B. Compressed Air Piping

1. ASME Code Compliance: Provide compressed-air piping components complying with ASME B31.9, "Building Services Piping."
2. Install flanges, unions, transition and special fittings, and valves with pressure ratings same or higher than system pressure rating used in applications below, except where otherwise specified.
3. 125 psi Air Piping and Less:
  - a. 2-inch NPS and Smaller: ASTM A53, Seamless, Grade B, Schedule 40, black steel pipe; threaded, malleable-iron fittings; and threaded joints.
4. Piping System Tests: Test new and modified parts of existing piping. Cap and fill compressed-air piping with oil-free, dry air, or gaseous nitrogen to pressure of 50 psig above system operating pressure, but not less than 150 psig. Isolate test source and let stand for 4 hours to equalize temperature. Refill system, if required, to test pressure and hold pressure for 2 hours with no drop in pressure.

## C. Natural Gas Piping

1. General: Flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating may be used in applications below, except where otherwise indicated.
2. Low-Pressure, 0.5 psig or less, Natural Gas Systems: Use the following:
  - a. 2-inch NPS and Smaller: Black steel pipe, ASTM A53, Seamless, Grade B, Schedule 40, malleable-iron threaded fittings, and threaded joints.
  - b. 2-1/2- to 4-inch NPS: Black steel pipe, butt-welding fittings, and welded joints.
3. Gas Service, above 5 psig, Natural Gas Piping at Gas Meters and Regulators: Steel pipe, butt-welding fittings, and welded joints.
4. Gas Service Piping, Underground: Use plastic pipe, plastic pipe fittings and fusion joints, coordinate with local utility company.
5. Exterior steel natural gas piping shall be painted per local gas utility standards.
6. Inspect, test and purge piping according to NFPA 54, Part 4 "Gas Piping Inspection, Testing and Purging" and requirements of authorities having jurisdiction.

#### D. Miscellaneous Fittings:

1. Bronze Flanges: ASME B16.24, Classes 150 and 300.
2. Copper Unions: ASME B16.18, Cast-Copper-Alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.
  - a. Threaded Ends: Threads conforming to ASME B1.20.1.
3. Malleable-Iron Unions: ASME B16.39, Classes 150 and 300, hexagonal stock, with ball-and-socket joint, metal-to-metal bronze seating surfaces, and female threaded ends having threads conforming to ASME B1.20.1.

#### E. Pipe Support

1. Install hangers with the following minimum rod sizes and maximum spacing or where more stringent, comply with local building code requirements:

Nom. Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Size-Inches
Up to ¾	7	5	3/8
1	7	6	3/8

1-1/4	7	7	3/8
1-1/2	9	8	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
3-1/2	13	11	1/2
4	14	12	5/8, 1/2 for Copper

Pipe Material	Horizontal in Feet	Vertical in Feet
Cast-Iron Soil Pipe	5	15
PVC Plastic Pipe	4	4

- F. Locations and Arrangements: Drawings (plans, schematics and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- G. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- H. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4" ball valve and short 3/4", threaded nipple and cap.
- I. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Check to verify that stress due to pressure at bottom of vertical runs do not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, code for pressure piping, "Building Services Piping." After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are not leaks. Prepare written report of testing.
- J. Cleaning
1. Clean and disinfect water distribution piping as follows:
    - a. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.

- b. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
- Flush piping system with clean, potable water until dirty water does not appear at outlets.
  - Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
  - Drain system or part thereof of previous solution and refill with water/chlorine solution contain at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
  - Flush system with clean, potable water until chlorine does not remain in water coming from system following allowed standing time.
  - Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.
2. Prepare and submit reports for purging and disinfecting activities.
3. Clean interior of piping system. Remove dirt and debris as work progresses.

### 3.00 Products and Execution

#### 3.01 Water Meters:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Badger Meter, Inc.; Hersey Products, Inc.; Neptune Water Division.
- B. General: Register in gallons except where registration in cubic feet is required. Confirm with local water department having jurisdiction.
1. Water Meters: AWWA C700, displacement (disc) type, with bronze main case.
  2. Water Meters: AWWA C701, turbine type.
  3. Water Meters: AWWA C702, compound type.
- C. Install water meter according to utility company's written installation instructions and requirements.
- D. Size meter and arrange piping and specialties to comply with utility company's requirements.

#### 3.02 Backflow Preventers:

- A. Manufacturers: Subject to compliance with requirements provide product by one of the following: AMES Company; Apollo, Conbraco Industries; Watts Regulator Company; Wilkins Regulator Division.
  - B. Reduced-Pressure-Principal Backflow Preventer: ASSE 1013, consisting of shut off valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous pressure application.
- 3.04 Water Tempering Valves
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Apollo, Bradley; Powers Process Controls; Lawler; Leonard; Armstrong, RADA; Watts; Zurn Industries.
  - B. System Water-Tempering Valves: Piston or discs controlling both hot-water and cold-water flow, capable of limited anti-scald protection and capacity at pressure loss. Include threaded inlets and outlet and temperature range or setting as indicated.
- 3.05 Hose Bibbs and Freezeproof Wall Hydrants:
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: J.R. Smith Manufacturing Company; MiFab, Wade; Watts Regulator Company; Woodford Manufacturing Company; Zurn Industries.
  - B. Refer to Plumbing Specialties Schedule on Construction Documents for hose bibb and freeze-proof wall hydrant types, model numbers, and applications.
  - C. Hose Bibbs (HB-1): Bronze body, with renewable composition disc, 3/4 inch threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, non-removable, drainable, hose-connection vacuum breaker.
    - 1. Finish: Rough brass.
    - 2. Operation: Operating key (handle). Provide 1 operating key.
  - D. Wall Hydrants (FWH-1): ASME A112.21.3M or ASSE 1019, non-freeze, automatic draining, anti-backflow type, key operation, with 3/4 inch threaded or solder-joint inlet, and ASME B1.20.7 garden-hose threads on outlet. Provide 1 operating key.
    - 1. Type: flush mounted.
    - 2. Finish: chrome finish on brass coating.
- 3.06 Trap Seal Primer Valves:
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: MiFab, Precision Plumbing Products, Inc.; J.R. Smith Manufacturing Company; Watts Regulator Company; Zurn Industries.

- B. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
1. 125-psig minimum working pressure.
  2. Bronze body with atmospheric-vented drain chamber.
  3. Inlet and outlet connections: 1/2-inch threaded, union, or solder joint.
  4. Gravity drain outlet connection: 1/2 inch threaded or solder joint.
  5. Finish: chrome plated, or rough bronze for units used with pipe or tube that is not chrome finish.
- 3.07 Thermometers:
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Marsh Bellofram, Terrice, Weksler.
  - B. Case: Plastic, 7 inches long.
  - C. Tube: Red or blue reading, mercury or organic-liquid filled, with magnifying lens.
  - D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.
  - E. Window: Glass or plastic.
  - F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.
  - G. Stem: Metal, for thermowell installation and of length to suit installation.
  - H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.
  - I. Scale Range:
    1. Cold: 0 – 100 deg. F
    2. Hot: 30 – 180 deg. F
- 3.08 Floor Drains:
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: J.R. Smith Manufacturing Company; Josam Company; MiFab, Wade; Zurn Industries, Watts Drainage Products.
  - B. Refer to Plumbing Specialties Schedule on Construction Documents for floor drain type, model number, and application.
  - C. Floor Drain Installation
    1. Install floor drains according to manufacturer's written instructions, in locations indicated.

2. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

### 3.11 Plumbing Fixtures:

- A. Refer to Plumbing Fixture Schedule on Construction Documents for fixture type and model number.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Water Closets: American Standard; Eljer; Kohler Company; Crane Products; Zurn Industries.
  2. Urinal: American Standard; Eljer; Kohler Company, Crane Products; Zurn Industries.
  3. Lavatories: American Standard; Eljer; Kohler Company, Crane Products; Zurn Industries.
  4. Stainless Steel Sinks: Dayton Products, Inc.; Elkay Manufacturing Company; Just Manufacturing Company.
  5. Water Coolers: EBCO Manufacturing Company; Elkay Manufacturing Company; Halsey Taylor; Oasis.
  6. Mop Basins / Service Sinks: Crane/Fiat Products; E.L. Mustee & Sons; Zurn Industries.
  7. Toilet Seats: Bemis Manufacturing Company; Beneke; Church Seat Company; Kohler Company; Olsonite Corporation; Zurn Industries.
  8. Flush Valves: Sloan Valve Company, Zurn Industries.
  9. Faucets: American Standard; Elkay Manufacturing Company; Kohler Company; Speakman Company; Zurn Industries.
  10. Sensor Faucets: Bradley Corporation; Chicago Faucets; Sloan Valve Company; Speakman Company; Zurn Industries.
  11. Lavatory Safety Kits: Brocar Products, Inc. (Trap Wrap); Truebro (Handi-Lav Guard); Zurn Industries.
  12. Miscellaneous Fittings (except faucets): Brass Craft; Central Brass Manufacturing; Dearborn

### 3.12 Plumbing Fixture Supports:

- A. Support Categories are:
  1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gage with carriers for wall-hanging water closets.
    - a. Wall-hanging water closets.
    - b. Wall-hanging fixtures supported from wall construction.
  2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.

- a. Wall-hanging urinals.
  - b. Wall-hanging lavatories and sinks.
  - c. Wall-hanging electric water coolers.
3. Chair Carriers, Heavy duty: Supports with rectangular steel uprights for wall-hanging fixtures.
- a. Accessible lavatories.
  - b. Fixtures where specified.

3.13 Electric Water Heaters:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: American Water Heater; Bradford White Corporation; Lochinvar Corporation; A.O. Smith Company; State Industries.
- B. Specified manufacturer's standard components and features are acceptable where specific product requirements are not indicated.
- C. Temperature Control: Adjustable thermostat, except for units where other arrangement is indicated or temperature is regulated by flow-control fittings.
- D. Safety Control: Automatic, high-temperature-limit cutoff device or system on commercial units and where indicated.
- E. Insulation: Fiberglass, polyurethane foam, or manufacturer's standard that is suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.
- F. Jacket: Steel, with baked-on enamel finish, except where otherwise specified.
- G. Anode Rods: Factory installed, magnesium.
- H. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.
- I. Heating Elements: Immersion type, size as indicated on drawings.

3.15 Tank-Type Fuel Fired Water Heaters – Power Vented:

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Bradford White Corporation; Lochinvar Corporation; A.O. Smith Company; State Industries.
- B. Specified manufacturer's standard components and features are acceptable where specific product requirements are not indicated.
- C. Temperature Control: Adjustable thermostat.

- D. Tank Insulation: Polyurethane foam, or manufacturer's standard that is suitable for operating temperature and required insulation material that surrounds entire except connections and controls.
- E. Tank Jacket: Steel, with baked-on enamel finish, except where otherwise specified.
- F. Burner: For use with power vent water heaters for natural –gas fuel.
- G. Pressure Regulator: ANSI Z21.18, factory or field installed, for gas appliances. Provide regulators with pressure rating, capacity, and pressure differential required for water heater and gas supply.
- H. Automatic Ignition: ANSI Z21.20, automatic hot-surface gas-ignition system and components.
- I. Relief Valve: ASME temperature and pressure relief valve, tank mounted.
- J. Venting: Power Direct Venting System for flue gas and combustion air:
  - A. Flue Material: PVC, CPVC or ABS.
  - B. Combustion Air Intake Material: PVC, CPVC or ABS.
  - C. Electrical: 110y-1ph-60Hz.

## Division 230000--Mechanical Specification

## 1.00 General

## 1.01 General Scope

- A. The work required under this specification shall consist of all labor, materials, tools, equipment, power, transportation, hoisting implements, etc., of every description necessary for the entire completion of the mechanical work of the contract, all as specified herein, shown on the drawings or reasonably implied by either, complete in every respect unless specifically excluded herein. The work included in this contract shall consist of the installation, test and guarantee of all work herein specified.

## 1.02 Inspection of Existing and General Conditions:

- A. The Contractor will be held to have personally inspected the site of the proposed work to arrive at a clear understanding of the conditions under which the work is to be performed, the extent of other contractor's activities in the area, and to become fully acquainted with the receiving and storage spaces available. The Contractor shall be held to have compared the premises and site with the drawings and specifications, and shall be satisfied as to the conditions of the premises, the actual elevations, and any other conditions affecting the carrying out of the work, before the delivery of this proposal.
- B. No allowances or extra consideration on behalf of the Contractor will subsequently be allowed by reason of the Contractor's failure to have become familiar with site conditions, error or oversight on the part of the Contractor or due to interference's by the Owner's or other Contractor's activities.
- C. Items specified on mechanical equipment schedules and plans are the basis of design. Equality of other equipment shall be determined by the Owner and Engineer. Any modification to these documented methods that is made necessary by alternate equipment is the responsibility of the supplier of the alternate equipment.
- D. Contractor is directed to include all necessary overtime and premium time (Saturday, Sunday, Holidays) required for the completion of the intended work to meet specified schedules.
- E. Do not scale mechanical drawings. For exact dimensions, use dimensioned drawings or actual field conditions.

## 1.03 Codes, Permits and Compliance:

- A. Contractor shall obtain and pay for all permits, licenses and inspections required by laws of governing bodies. Comply with all applicable codes and ordinances and all legal requirements. No extra compensation will be allowed for any changes necessary for code compliance regardless of the method of installation shown on the drawings or specified.

- B. All mechanical work shall comply with current editions of all applicable state and local codes and ordinances.
  - C. All equipment, devices and materials shall be the latest products of manufacturer and shall conform to the requirements noted on plans.
- 1.04 Workmanship:
- A. Workmanship shall be of the highest quality conforming to the best mechanical installation practice. Any work or material which is rejected must be removed immediately and replaced. No sub-standard work will be accepted.
  - B. The brevity of this specification shall not be construed as relieving the Contractor of his responsibility to perform all work in a first class workman like manner.
- 1.05 Submittals and Record Drawings:
- A. Submit shop drawings and catalog data for approval for all equipment and materials specified for this project prior to ordering or manufacture of such. Shop drawings not stamped with Contractor approval will be rejected.
  - B. The Contractor shall keep an accurate record of all deviations from the approved design documents and specifications which may occur in the work as actually constructed, and shall submit same to the Engineer or Owner's representative at completion of the job.
  - C. Submittals shall be coordinated through the Architect.
- 1.06 Tests and Guarantees:
- A. All tests for various systems shall be performed as required, consistent with good general practice and in compliance with codes and authorities.
  - B. As a condition precedent to the final payment, the Contractor shall execute to the Owner a guarantee in a form approved by the Owner. Guarantee shall warrant that all work included in this division of the specifications will remain in serviceable and perfect condition (ordinary wear and tear, abuse and causes beyond the control of the Contractor excluded) for a period of one year from date of final completion and acceptance of work and that the Contractor will make good at his own expense, without cost to the Owner, any imperfections in whole or in part which may develop in this work during the period above specified, including any damage to other work caused by such imperfections or repairing of same.
  - C. All mechanical systems, devices and related items shall be tested. Replace any and all defective device items or systems before completion of the project.

## 1.07 Coordination:

- A. Field verify exact location of all new equipment with existing conditions and coordinate with the General and other Contractors prior to rough-in and/or installing any of this work.
- B. Field verify all clearances and conditions prior to the start of any piping, ductwork, etc., verify locations of all piping, ductwork, equipment, devices, etc., with Architectural, Civil, Plumbing, Fire Protection, Structural and Electrical drawings prior to rough-in. Report any discrepancies to the engineer prior to proceeding with work.
- C. All interruptions of services to existing or operable facilities shall be scheduled with the Owner a minimum two (2) weeks in advance. The Contractor shall not interrupt or restore services without prior consent of the Owner. The interruption shall be only for the specific scheduled time. The Owner or Electrical Contractor will be responsible for shutdown and start-up of electrical or process systems.
- D. Coordinate all power wiring, safety disconnect means, motor control and control wiring for mechanical equipment with the Electrical Contractor.
- E. Refer to electrical drawings for work involving electrical power supply wiring from power source to unit connection points.
- F. Locate and install all required devices in accordance with American Disabilities Act Guidelines.

## 1.08 Identification:

- A. Install snap-on plastic or adhesive pipe markers with system identification and direction of flow on all piping systems.
- B. Paint all piping with Owner's system identification color codes.
- C. Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.
- D. Install valve tag on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, plumbing fixture supply stops, shut-off valves, faucets, convenience and lawn-watering hose bibs, and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in valve schedule mounted in each major equipment room.

## 1.09 Maintenance Manuals

- A. Prepare maintenance manuals. Provide a minimum of four copies with a single copy sent to the Engineer for approval. Include the following information for equipment items:

1. Complete information on project equipment and services as was submitted during the course of the project. This information is solely intended to provide the Owner with accurate, usable information on how to care for his facility.
2. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
3. Manufacturer's printed operating procedures to include start-up, break-in and routing and normal operating instructions; regulation, control, stopping, shutdown and emergency instructions; and summer and winter operating instructions.
4. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair and re-assemble; aligning and adjusting instructions.
5. Servicing instructions and lubrication charts and schedules.
6. MSDS for each chemical compound used in mechanical systems.

#### 1.10 Electronic Files

- A. If the Contractor chooses, MDA Engineering, Inc. will provide electronic files for the Contractors convenience and use in preparation of shop drawings related to the project subject to the following terms and conditions:
  1. MDA Engineering, Inc. will furnish the Contractor electronic files of drawing sheets specifically requested in writing by the Contractor. The reference background files must be obtained from the Architect.
  2. A service fee of \$300.00 (three hundred dollars) and \$30.00 (thirty dollars) per drawing sheet shall be remitted to MDA Engineering, Inc. prior to delivery of the electronic files.
  3. A cadd contract shall be signed by an officer of the contracting company prior to delivery of the electronic files.
  4. The Contractors shall, to the fullest extent permitted by law, indemnify and hold harmless MDA Engineering, Inc., from all claims, damages, losses and expenses, including Attorney's fees arising out of or resulting from your use of these electronic files.
  5. MDA Engineering, Inc. reserves the right to remove all indication of Ownership and/or involvement from each electronic display because of the potential that the information on the electronic files can be modified.

6. Any other use or reuse by the Contractor or by others will be at the Contractor's sole risk and without liability or legal exposure to MDA Engineering, Inc. and Owner.

## 2.00 Basic Materials and Methods

### 2.01 Duct Insulation:

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
  1. Insulation Installed Indoors: Flame-Spread rating of 25 or less and smoke-developed rating of 50 or less.
  2. Insulation Installed Outdoors: Flame-Spread rating of 75 or less and smoke-developed rating of 150 or less.
- B. Insulation Materials
  1. Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type 1B, without facing and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil and vinyl film.
  2. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from Kraft paper, reinforcing scrim, aluminum foil and vinyl film.
- C. Field-Applied Jackets
  1. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant Kraft paper and aluminum foil.
  2. PVC Jacket: High-impact, ultraviolet-resistant PVC; 20 mils (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
  3. Aluminum Jacket: Deep corrugated sheets manufactured from aluminum alloy complying with ASTM B 209 (ASTM B 209m) and having an integrally bonded moisture barrier over entire surface in contact with insulation.
- D. Apply insulation materials, accessories and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; and free of voids throughout the length of ducts and fittings.

## E. Indoor Duct and Plenum Application Schedule:

1. Service: round supply-air ducts, concealed: install mineral-fiber blanket insulation, 1 1/2 inches thick, single layer with foil and paper jacket and vapor retarder.
2. Service: round, return-air ducts, concealed: install mineral-fiber blanket insulation, 1 inch (25 mm) thick, single layer with foil and paper jacket and vapor retarder.
3. Service: rectangular and round, outside-air ducts, concealed: install mineral fiber blanket insulation, 2 inches thick, single layer with foil and paper jacket and vapor retarder. This includes all MUA unit inlet ductwork, all SF-1&2 inlet ductwork from exterior termination to damper.
4. Service: round and rectangular exhaust ductwork routed from exhaust grilles back to energy recovery unit: install mineral fiber blanket insulation, 1 1/2" inches thick, single layer with foil and paper jacket and vapor retarder.
5. Service: rectangular exhaust or relief air ductwork from exterior termination upstream to motorized damper or gravity backdraft damper: install mineral fiber board, 2 inch thick, single layer with foil and paper jacket and vapor retarder.

NOTE: Do not insulate ducts with internal liner. Refer to specification "Ductwork and Duct Accessories". Note that ductwork upstream of exhaust fans (except EF-6) and downstream of exhaust fan to damper get neither liner nor external insulation. All other ductwork is either insulated or lined.

## F. Indoor duct and plenum in unconditioned spaces (for jacket, refer to indoor duct and plenum application schedule) and outdoor duct and plenum application schedule.

1. Service: round, supply-air and return ducts: install mineral fiber blanket insulation, 2 inches thick, single layer with aluminum jacket with vapor retarder.
2. Service: rectangular supply-air and return-air ducts: install mineral-fiber board insulation, 2 inches thick, single layer with aluminum jacket and vapor retarder.

## 2.02 Pipe and Equipment Insulation

- A. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread rating of 25 or less and smoke-developed rating of 50 or less.
  2. Insulation Installed Outdoors: Flame-spread rating of 75 or less and smoke-developed rating of 150 or less.
- B. Insulation Materials
1. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
    - a. Pre-formed Pipe Insulation: Comply with ASTM C 547, Type I, with factory-applied, all purpose, vapor-retarder jacket.
    - b. Blanket Insulation: Comply with ASTM C 533, Type II, without facing.
  2. Flexible Elastomeric Thermal Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
    - a. Adhesive: As recommended by insulation material manufacturer.
    - b. Ultraviolet-Protective Coating: As recommended by insulation manufacturer.
- C. Field-Applied Jackets
1. General: ASTM C 921, Type I, unless otherwise indicated.
  2. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant Kraft paper and aluminum foil.
  3. PVC Jacket: High-Impact, ultraviolet-resistant; 20 mil (0.5 mm) thick; roll stock ready for shop or field cutting and forming.
- D. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping and equipment, including fittings, valves and specialties.
- E. Hangers and Anchors: Where vapor retarder is required, seal penetrations in insulation at hangers, supports, anchors and other projections with vapor-retarder mastic to prevent condensation on all surfaces.
1. Apply insulation continuously through hangers and around anchor attachments.
  2. For insulation application where vapor retarders are indicated, extend insulation of anchor legs at least 12 inches (300 mm) from point of attachment

to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

3. Install high density insulation insert materials between pipe and protection shields at hangers and supports and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install minimum 12 inch long, galvanized steel, shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.

#### F. Interior Insulation Application Schedule

1. These application schedules are for above ground insulation of piping and equipment systems inside the building.
2. Service: Condensate Drain Piping, 35 To 75 Deg. F.

Condensate Drain Piping (35 To 75 Deg F)				
Pipe Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field-Applied Jacket
1/2 To 1-1/4	Glass Fiber	1	Yes	None
1/2 To 1-1/4	Flexible Elastomeric	1/2	Yes	None
1-1/2 To 4	Glass Fiber	1	Yes	None
1-1/2 To 4	Flexible Elastomeric	3/4	Yes	None

3. Service: Refrigerant Suction And Hot-Gas Piping, 35 To 50 Deg F.

Refrigerant Suction And Hot-Gas Piping (35 To 50 Deg F)				
Pipe Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field-Applied Jacket
3/8 To 1-1/8	Glass Fiber	1	Yes	None
3/8 To 1-1/8	Flexible Elastomeric	1/2	Yes	None
1-3/8 To 4	Glass Fiber	1	Yes	None
1-3/8 To 4	Flexible Elastomeric	3/4	Yes	None

#### G. Exterior Insulation Application Schedule

1. These application schedules are for above ground insulation of piping and equipment systems outside the building.
2. Service: Refrigerant Suction, 35 to 50 Deg. F.

Refrigerant Suction (35 To 50 Deg F)				
Pipe Sizes (NPS)	Materials	Thickness In Inches	Vapor Barrier Req'd	Field- Applied Jacket
3/8 To 1-1/8	Glass Fiber	1-1.2	No	Alum.
3/8 To 1-1/8	Flexible Elastomeric	3/4	No	None
1-3/8 To 4	Glass Fiber	1-1/2	No	Alum.
1-3/8 To 4	Flexible Elastomeric	3/4	No	None

### 2.03 Piping

#### A. Regulatory Requirements: Comply with the provisions of the following:

1. ASME B 31.9 "Building Services Piping," ASME B 31.1 "Power Piping" and ASME B31.5 "Refrigerant Piping" for materials, products and installation.
2. Safety valves and pressure vessels shall bear the appropriate ASME label.
3. ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualification" for qualifications for welding processes and operators.
4. Boca Basic National Mechanical Code.
5. OBC Ohio Building Code.

#### B. Refrigerant Pipe Applications

1. Aboveground, within building: ASTM B 280 Type ACR drawn-copper tubing with copper fittings and brazed joints.
2. Install refrigerant piping according to ASHRAE 15.

#### C. Pipe Support

1. Install hangers with the following minimum rod sizes and maximum spacing or where more stringent, comply with local building code requirements:

Nom. Pipe Size	Steel Max. Span-Ft.	Copper Tube Max. Span-Ft.	Plastic Max. Span-Ft.	Min. Rod Size- Inches
1	7	5	6	3/8
1-1/2	9	8	6	3/8
2	10	8	7	3/8
3	12	10	8	1/2
3-1/2	13	10	8	1/2

4	14	12	9	5/8
5	16		9	5/8
6	17		9	3/4
8	19		10	7/8
10	22		11	7/8
12	23		12	7/8

- D. Locations and Arrangements: Drawings (plans, schematics and diagrams) indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, expansion, pump sizing, and other design considerations. So far as practical, install piping as indicated.
- E. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.
- F. Install drains to low points in mains, risers, and branch lines consisting of a tee fitting,  $\frac{3}{4}$ " ball valve and short  $\frac{3}{4}$ ", threaded nipple and cap.
- G. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve or other component in system under test. Check to verify that stress due to pressure at bottom of vertical runs do not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B 31.9, code for pressure piping, "Building Services Piping." After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components as appropriate, and repeat hydrostatic test until there are not leaks. Prepare written report of testing.

#### 2.04 Ductwork and Duct Accessories

- A. Construct rectangular ductwork to meet all functional criteria defined in Section VII of the SMACNA "HVAC Duct Construction Standards Metal and Flexible", 1985 Edition. All ductwork must comply with all local, state and federal code requirements.
- B. Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
- C. Static Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
1. Low Pressure Supply Ducts Including Down Stream of Air Terminals: 2-inch wg (500 pa).

2. Return Ducts: 2-inch wg (500 pa), negative pressure.
  3. Exhaust Ducts: 2-inch wg (500 pa), negative or positive pressure.
- D. Fabricate round ducts with spiral lockseam construction. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.
- E. Provide 1 inch thick, 3 pound density, internal liner on all rectangular supply and return air ductwork and as defined below, complete with all appropriate adhesives and other materials. All duct sizes indicated are net free areas. In particular provide 1", 3# liner for furnace F1&2 rectangular supply and return ducts; outside air and return air ductwork between ERV and furnaces including the bypass duct; Make up air unit MUA 1 thru 4 discharge supply air ducts.
- F. Seal duct joints and seams with duct sealant, tape or mastics.
1. Pressure Classification 2-inch wg (500 pa): Transverse joints.
  2. Pressure Classification 3-inch wg (750 pa): Transverse and longitudinal joints.
- G. Where indicated, provide factory-fabricated, insulated, round flexible duct, with an outer jacket enclosing 1-1/2 inch thick, glass fiber insulation around a continuous inner liner, steel-wire helix reinforcement encapsulated in the inner liner, and polyethylene film inner and outer jacket. Maximum length: 5 feet.
- H. Provide low-leakage standard galvanized volume control dampers, multiple (for dampers 12 inches in height and greater) or single-blade (for dampers under 12 inches in height), opposed blade design, low-leakage rating, with linkage outside of air stream and suitable for horizontal or vertical applications. Furnish with neoprene blade seals and aluminum jamb seals.
- I. Provide balancing dampers at all branch take-offs in all supply air, return air and exhaust air systems and where required to facilitate proper balancing of air systems.
- J. Construct all rectangular elbows with turning vanes. Comply with SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.
- K. Install U.L. Standard 555 labeled, fire dampers as indicated for installations. Provide 1-1/2 or 3 hour rating as indicated with Type A, Type B or Type C Frame, factory or field installed sleeve, roll-formed, galvanized steel blades and 165 deg. F., or 212 deg. F., replaceable fusible link. Install according to manufacturer's U.L. approved printed instructions.

## 3.00 Products and Execution

## 3.01 Indirect Fired Make-Up Air Units

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Reznor, Trane, Modine, Sterling, Mcquay, York, Carrier.
- B. Casing and Components: Weatherproof, galvanized steel casing, minimum 18 gauge, galvanized steel panels with enamel finish, formed to ensure rigidity and fastened with sheet metal screws or pop rivets; supported by galvanized steel channels or structural channel supports; with hinged access panels with cam-lock fasteners for burner and fan motor assemblies from both sides of unit; and with lifting lugs. Provide 1 inch, 2#, factory applied, Neoprene faced glass fiber insulation. Provide with 2 inch thick, pleated disposable filters. Furnish with louvered inlet plenum with bird screen. Exterior finish shall be heat resistant, baked enamel.
- C. Fuel Burning System: Natural Gas Burners: Capable of modulating turndown ratio of 25:1, including electric-modulating main gas valve, motorized shutdown valve, main and pilot gas regulators, pilot electric gas valve, manual shutoff valve and pilot adjustment valve. Provide IRI controls. Provide manual-reset, low and high-limit controls. Heat exchanger to be 409 stainless steel for both primary and secondary side. Provide induced draft vent.
- D. Fan and Motor: Rated according to AMCA 210; statically and dynamically balanced, galvanized steel, forward curved centrifugal fan mounted on solid steel shaft with heavy duty, self-aligning, pre-lubricated ball bearings and V-belt drive with matching motor sheaves and belts. Provide premium efficiency, TEFC motor, and disconnect switch.
- E. Controls: Factory-wired connection for power supply and field-wire unit to remote control panel.

Provide weather proof unit mounted local cabinet. Remote control panel shall have the following features: On-Off-Auto switch; summer-winter switch, supply-fan indicating light, exhaust-fan indicating light, pilot-operation indicating light, burner-operation indicating light, clogged-filter indicating light, safety-lockout indicating light, discharge supply air damper. Control system to be configured to allow remote DDC control of blower, burner, dampers and modulating gas valve and shall be able to communicate with non proprietary systems.

- F. Commissioning: Engage a factory-authorized service representative to perform startup service. Verify that equipment is installed and connected according to manufacturer's written instructions. Complete installation and startup checks according to manufacturer's written instructions. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- G. Accessories: Disconnect, discharge air temperature sensor, control voltage transformer. MUA-1&2 to be constructed for outdoor use. MUA-3&4 are for indoor use.

### 3.02 Furnaces

- A. Provide components that comply with NFPA 70 and that are listed and labeled by UL where available. Comply with AGA Z21.47, "Gas-Fired Central Furnaces"; and NFPA 54, "National Fire Gas Code."
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Bryant, Comfortmaker, Lennox, Trane, Carrier, York and Goodman.
- C. Gas-Fired High Efficiency Furnaces: Minimum 92 percent AFUE efficiency, factory assembled, piped wired and tested with indicated configuration, steel cabinet with glass-fiber interior insulation and baked enamel finish on external surfaces. Provide centrifugal fan with multi-speed fan motor. Aluminized steel primary heat exchanger and stainless steel secondary heat exchanger. Provide 24 volt automatic electric gas valve, electronic pilot ignition, with spark igniter, burner safety controls, power venting and solid-state board automatic controls. Provide 2 sets of 1 inch thick pleated filters.
- D. Thermostat: 24 VAC, solid-state, programmable, microprocessor-based, wall mounting unit with automatic switching from heating to cooling, preferential rate control, multiple temperature presets selectable by day and time, and battery back-up protection of program settings against power failure.
- E. Evaporator Coil: Conform to ARI 210/240, "Unitary Air Conditioning and Air Source Heat Pump Equipment." Match size with furnace and remote condensing unit. Include condensate drain pan with accessible drain outlet.
- F. Evaporator Coil Enclosure: As required to suit furnace and cooling coil. Steel cabinet with access panel and flanges for integral mounting at or on furnace cabinet.
- G. Refrigerant Line Kits: Annealed-Copper suction and liquid lines factory cleaned, dried, and sealed; with insulated suction line and flared fittings at evaporator end; no fitting at condenser end; length as required.
- H. Install furnaces and accessories according to manufacturer's written instructions.

### 3.03 Fuel Fired Heaters

- A. Codes and Standards: Comply with the following: Underwriters Laboratories, American Gas Association.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Engineered Air, Hastings, Industrial Air Systems, Reznor, Trane.

- C. Gas-Fired Unit Heaters: Provide factory assembled, piped, wired and tested unit heaters. Indoor construction, high efficiency indirect heater with 20 gauge 409 stainless steel tubes and headers, power vented and 100% shutoff with continuous retry ignition controller and solid state ignition system. 20 gauge aluminized steel cabinet with aluminum steel internal casing, single-stage, 24 VAC automatic gas valve. Provide auto reset high limit switch, time delay relay, control transformer, double width double inlet forward curved belt driven blower with 3 speed taps, mounting brackets, thermostat with summer/winter switch and guard, blower enclosure with filter rack, filters, belt guard, vibration isolation kit and 40 degree deflection nozzle.
- D. Unitary Infrared Heater: Provide complete functional assembly. Burner to be fully automatic direct spark, 100% shutoff ignition device with thermal overload motor protection, redundant gas valve, auto reset upon failure; low voltage thermostats with control voltage transformers; combustion air proving switch and viewing window. Tubing to be 4" diameter, 16 gauge aluminized steel joined with stainless steel wrap around couplings. Reflectors to be aluminum with end caps. Provide steel turbulators.
- E. Install heaters according to manufacturer's written instructions. Install and connect gas-fired heaters and associated fuel and vent features and systems, installed and connected according to NFPA 54, applicable local codes and regulations and manufacturer's printed installation instructions.

#### 3.04 Condensing Units

- A. Codes and Standards: ARI Standard 360, ASHRAE Standard 15, ASHRAE 90A, U.L.
- B. Manufacturers: Subject to compliance with requirements, provide condensing units manufactured by one of the following: BDP, Carrier, Lennox, Trane, York and Goodman.
- C. General: Factory-assembled and tested air-cooled condensing units, consisting of compressor, condenser coil, fan, motor, refrigerant reservoir, and operating controls. See schedule for capacity and electrical characteristics.
- D. Accessories:
  - 1. Head pressure control to modulate condenser fan motor speed for low ambient conditions.
  - 2. Hard start kit (single phase unit only).
  - 3. Anti-short cycle timer.
  - 4. Refrigerant line kits.

- E. Install condensing units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- 3.05 Energy Recovery Units
- A. Provide energy recovery unit with desiccant wheel. Casing to be of galvanized steel. Provide two blower/motor assembly with forward curved wheels mounted on neoprene isolators. Line housing with 1 inch, 3# density foil faced insulation. Provide single point power connection, rotation and wheel pressure drop sensors, outside air temperature sensor, frost control sequence with timer, energy wheel contactor, disconnect, control panel, motor starters and control transformer. Filters to be 2" MERV 8.
- 3.06 Power Ventilators
- A. Quality Assurance: Provide fans that are U.L. listed and labeled. Motors and electrical accessories shall comply with NEMA standards.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: Acme, Carnes, Penn, Cook, Greenheck, Jenn.
- C. General: Provide fans that are factory fabricated and assembled, factory tested and factory finished with indicated capacities and characteristics.
- D. Centrifugal/Axial Inline Acoustic Mixed Flow Fan: Belt-driven, centrifugal consisting of tubular housing welded and coated with 2-4 mils of polyester urethane electrostatic applied and baked. Provide welded steel vanes, access door, lifting lugs, belt guard, motor cover; welded, coated, steel airfoil impeller; extended lube lines, and bearings selected for a basic rating fatigue life (L-10) of 80,000 hours at max operating speed; disconnect, inlet/outlet flanges, mounting rails and spring hangers.
- E. Inline Ventilators: Centrifugal fan designed for installation with inline applications, consisting of housing, fan wheel, vibration isolation, motor cover, belt guard, and the following accessories:
1. Disconnect
  2. All aluminum construction for EF-3 and SF-1
- 3.07 Air Inlets and Outlets
- A. Manufacturer: Subject to compliance with requirements, provide air outlets and inlets of one of the following:
1. Diffusers, Registers and Grilles: Anemostat Products, Carnes, Krueger, Metal Aire, Price, Titus Products and Tuttle & Bailey.

- B. Except as otherwise indicated, provide manufacturer's standard grilles, register and diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
1. Finishes:
    - a. Grilles, Registers and Diffusers: As directed by architect.
- C. Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- 3.08 Control Equipment and Systems
- A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus and accessories connected to controllers to operate mechanical systems according to sequences of operation indicated or specified, and to provide complete, functional systems.
- B. Codes and Standards: Comply with the following: NFPA 90A, National Electric Code, Underwriters Laboratories, NEMA Federal Communications Commission, Electronics Industries Association Std. RS-232, IEEE, ANSI.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Thermostats
    - a. Honeywell.
    - b. Johnson Controls.
    - c. White Rodgers.
  2. Damper Actuators
    - a. Barber-Colman.
    - b. Honeywell.
    - c. Johnson Controls.
    - d. Belimo.
  3. Electric Control System and Components:
    - a. Siebe/Barber-Colman.
    - b. Honeywell.
    - c. Johnson Controls.
    - d. Landis & Gyr Powers.
    - e. Robertshaw.
    - f. Tour & Anderson.
- D. Installers: Installers of temperature control systems are limited to:

1. Electrical Temperature Control Systems
    - a. Johnson Controls.
    - b. Toledo Trane.
    - c. Wadsworth & Associates.
    - d. York.
    - e. Control Systems of Ohio
  2. Thermostats: 24 V A.C. solid-state, programmable, microprocessor-based wall mounting unit with automatic switching from heating to cooling, preferential rate control, multiple temperature presets selectable by day and time, and battery backup protection of program settings against power failure.
- E. Actuators: Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.
1. Permanent Split-Capacitor or Shaded-Pole Type: Equip Spring-Return Motors with integral spiral-spring mechanism in housing design for easy removal for service or adjustment of limit switches, auxiliary switches or feedback potentiometer.
  2. Spring-Return Motors for Dampers Larger than 25 sq. Ft. (2.3 sq. M): Size for running and breakaway torque of 150 inch-pounds (16.9 n x m).
- F. Automatic Carbon Monoxide and Nitrogen Dioxide Sensing and Control System
1. General: Provide a complete integrated carbon monoxide and nitrogen dioxide sensing and control system capable of the sensing limits and sequence of operation contained on the specifications and drawings. System shall consist of sensors, control panels and interconnection with ventilation equipment. Provide Owner training by qualified technician for complete operation and setup of system. There shall be 3 independent systems for the building: Garage, Wash Bay and Repair.
  2. Sensors Detectors: Multiple level detectors using electro chemical temperature and humidity compensating sensors with a 5 year minimum life; suitable over a temperature range of 32 to 120 degree F; with multiple factory calibrated alarm levels. CO sensor range to be 0-250ppm and NO2 to be 0-10ppm. Sensors shall be certified by the manufacturer to be accurate within plus or minus 5% and drift no more than 5% per year. Detector shall be ETL listed and conform to UL 3111-1 standards. Provide NEMA 1 enclosure of heavy polycarbonate plastic with splash guard. Detector shall be protected against static discharge and have liquid crystal display that continually displays the contamination level in ppm. The detector shall have separate color coded power, sensor active, low alert, high alert and alarm LEDs in display. Provide internal alarm with silence button, output relays, selectable detection levels and time delays.

3. Monitoring System: Provide a monitoring system with logic that automatically controls the ventilation equipment and checks for sensor failure. Upon detection of failure, the controller shall reset the ventilation to full operation and transmit an audio and visual alarm. Provide multi point analog system capable of monitoring multiple sensors and with multiple relay outputs for ventilation system control and have sets of contacts to actuate external alarms. System shall be capable of integration into non proprietary building automation system. Controller shall have an LED display capable of alternating indication of both CO and NO2 levels, have digital display with keypad that is password protected, allows, programming or changing of all system parameters, viewing all sensor readings, allow manual override of relay outputs, store last 15 faults with date and time stamps, programmable for multiple digital inputs and have a self test sequence.
- G. Install control equipment and systems as required, in accordance with system manufacturer's written instructions, and with recognized industry practices, and ensure that equipment complies with requirements. Comply with requirements of NEC, and applicable portions of NECA's "Standard of Installation" pertaining to general electrical installation practices.
- H. Install all raceway and wiring in accordance with all requirements of Division 16, Electrical Specifications.

### 3.09 Sequences of Operation

#### A. Furnace Systems

1. Provide seven-day programmable thermostat as located on the drawings.
2. Occupied Cooling Control: Furnace and condensing unit shall operate off packaged controls to maintain a 75 deg. F set point. Fan operation shall be continuous.
3. Unoccupied Cooling Control: Furnace and condensing unit shall operate off packaged controls to maintain an 85 deg. F. Set point fan shall cycle on/off on a call for cooling.
4. Occupied Heating Control: Furnace shall operate off its packaged controls to maintain a 72 deg. F set point. Fan operation shall be continuous.
5. Unoccupied Heating Control: Furnace shall operate off its packaged controls to maintain a 68 deg. F set point. Fan shall cycle on/off on call for heat.
6. Provide 24 V A.C. solid-state, programmable, microprocessor-based wall mounting thermostat with automatic switching from heating to cooling, preferential rate control, multiple temperature presets selectable by day and time, and battery backup protection of program settings against power failure.
7. Provide interlock controls between the indoor supply air fan and the condensing unit to enable the condensing unit to operate only after proof of airflow from indoor supply air fan.
8. During the occupied cycle, return air/outside air motorized bypass damper CD-2 is to be closed. During the unoccupied cycle, the damper CD-2 is to be open.

9. Furnace and condensing unit shall be de-energized upon detection of moisture in the secondary drain pan.

#### B. Make-Up Air Units/Exhaust Fans

1. Unit operates with factory controls. Control modulating gas valve with a discharge air sensor. Unit heating section to operate when outside air temperature is below discharge set point. Provide high and low limit discharge thermostats to deactivate unit and provide an audible alarm at the unit.
2. A remote mounted panel to contain auto-start, fan on – pilot on – burner on lights and discharge air setpoint controller. Mount panel in Utility 124. TCC is responsible for power and low voltage to panel.
3. Electrical contractor shall provide interlock to manual reset smoke detectors in supply air of units to stop fan on smoke in system. Detector will be provided and mounted by EC.
4. Interlock MUA-1 to energize upon activation of EF-2. EF-2 to be activated by gas detectors or summer ventilation switch. Control MUA to maintain 55 deg F adjustable discharge air temperatures. Interlock units with respective motorized dampers to open on system operation and close upon de-activation.
5. Interlock MUA-2 to energize upon activation of EF-1. EF-1 to be activated by gas detectors or summer ventilation switch. Control MUA to maintain 55 deg F adjustable discharge air temperatures. Interlock units with respective motorized dampers to open on system operation and close upon de-activation.
6. Interlock MUA-3 to energize upon activation of EF-3. EF-3 to be activated by gas detectors or summer ventilation switch. Control MUA to maintain 60 deg F adjustable discharge air temperature. Interlock units with respective motorized dampers to open on system operation and close upon de-activation.
7. Interlock MUA-4 to energize upon activation of EF-4. EF-4 to be activated by gas detectors or summer ventilation switch. Control MUA to maintain 60 deg F adjustable discharge air temperatures. Interlock units with respective motorized dampers to open on system operation and close upon de-activation.
8. Provide manual operation means of these systems by Owner for summer ventilation usage by wall mounted operational device in each of the 3 areas.

#### C. Energy Recovery Unit

1. Unit to operate on an occupied/unoccupied cycle in conjunction with F-1 & 2.
2. Provide unit with integral control center. Upon activation, outside air and exhaust air dampers CD-1&3 to open and CD-2 to be closed. Activate blowers and energize wheel. Close dampers when unit blowers are de-energized and open bypass damper CD-2.
3. Provide outdoor air temperature sensor and wheel pressure drop sensor. Timed exhaust frost control cycle shall be triggered by sensors. When frost is indicated, the outside air blower is to be de-energized on a timed cycle.

4. Provide visual alarm at unit to activate when rotation sensor indicated wheel has stopped unexpectedly.

D. Infra red heaters

1. Provide wall mounted space temperature sensor and remote set point controller with auto-on-off capability. Controllers to be located in Crew Room. Set point to be 55 deg F adjustable for garage and 60 deg F adjustable for Wash Bay and Repair.

E. Unit Heaters

1. Provide wall mounted thermostat with on-off-auto control. Adjustable setpoint to be 50 deg for Garage, 55 deg for Wash Bay and Bulk Oil and 60 deg for Concrete Room.

F. Ventilation Fans

1. SF-1 and 2 are to operate from respective wall on-off switches. Interlock system motorized dampers to open upon fan activation and close when fans are de-energized.

G. Gas Detection Systems: When any CO or NO2 sensor exceeds a threshold (all thresholds shall be adjustable) the following shall happen:

1. Threshold #1(low alarm level trip/setpoint) CO at 25 ppm, NO2 at 1 ppm: Activate EF-2 and MUA-1.
2. Threshold #2(medium alarm level trip/setpoint) CO at 75 ppm, NO2 at 2 ppm: Activate EF-1 and MUA-2.
3. Threshold #3 (high alarm level trip/setpoint) CO at 100 ppm, NO2 at 3 ppm: Activate audio and visual alarm.
4. If sensor fails or loses power, the system will go to Fail-Safe operation with all associated exhaust fans and make up air units in operation. The sensor shall automatically reset upon resumption of power.
5. For the EF-3/MUA-3 and the EF-4/MUA-4 ventilation systems, the control sequence shall be similar as described in item 1 thru 3 above.
6. Systems shall automatically reverse sequence upon fall of CO and NO2 levels.

3.10 Testing, Adjusting and Balancing

- A. Employ the services of an Independent Testing, Adjusting and Balancing Agency certified by the Associated Air Balance Council to test and balance the indicated systems. Submit six (6) copies of the report to the engineer for review.
- B. Obtain approval from engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, belts, etc., to accommodate fan speed changes.
- C. Provide the services of one of the following Test and Balance Contractors:
  1. Aerodynamics.
  2. Enviro-Aire, Inc.

3. R.H. Cochrane.
4. International Test and Balance.
5. Fluid Dynamics.
6. Engineer Approved Equal.

D. Test, adjust, and balance the following Mechanical systems:

1. Supply air and ventilation systems
2. Return air systems;
3. Exhaust air systems;
4. Verify temperature control system operation including CO and NO<sub>2</sub> ventilation control systems. A qualified gas control system service technician shall perform the following: Check equipment, cables, controllers, sensors and transmitters; Calibrate sensors; test each sensor for alarm setpoints; verify sequence of operation of detection/removal ventilation system; and verify operation of alarm devices. Provide written report for above items.

## Division 260000 - Electrical Specifications:

## 1.00 General

## 1.01 General Scope

- A. The work required under this specification shall include all labor, materials, tools, equipment, power, transportation, hoisting implements, etc., necessary for the completion of the electrical work of the contract: All as specified herein, shown on the drawings or reasonably implied by either, complete in every respect unless specified otherwise herein. The work included in this contract shall consist of the installation, test and guarantee of all work described on the plans and specifications.

## 1.02 Inspection of Existing and General Conditions:

- A. The Contractor will be held to have personally inspected the site of the proposed work to arrive at a clear understanding of the conditions under which the work is to be performed. The extent of other Contractor's activities in the area, and to become fully acquainted with the receiving and storage spaces available. The Contractor shall compare the premises and site with the drawings and specifications, and shall be satisfied as to the conditions of the premises, the actual elevations, and any other conditions affecting the scope or completion performance of the work, before the delivery of this proposal.
- B. No allowances or extra consideration on behalf of the Contractor will be allowed by reason of the Contractor's failure to become familiar with site conditions: Error or oversight on the part of the Contractor or due to interference's by the Owner's or other Contractor's activities.
- C. Items specified on electrical equipment schedules and plans are the basis of design. Equality of other equipment shall be determined by the Owner and Engineer. Any modification to these documented methods that is made necessary by alternate equipment is the responsibility of the supplier of the alternate equipment.
- D. Contractor is directed to include all necessary overtime and premium time (Saturday, Sunday, Holidays) required for the completion of the intended work to meet specified schedules.
- E. Do not scale electrical drawings. For exact dimensions, use dimensioned drawings or actual field conditions.

## 1.03 Codes, Permits, and Compliance:

- A. Contractor shall obtain and pay for all permits, licenses and inspections required by laws of governing bodies. Comply with all applicable codes, ordinances and all legal requirements. No extra compensation will be allowed for any changes necessary for code compliance regardless of the method of installation shown on the drawings or specified.

- B. All electrical work shall comply with current adopted editions of National Electrical Code, NFPA, the Life Safety Code and all applicable state and local codes and ordinances.
  - C. All electrical equipment shall be new and shall be labeled or listed by U.L. or a qualified testing organization.
  - D. All equipment, devices, and materials shall be the latest products of manufacturer and shall conform to the requirements noted on plans.
- 1.04 Workmanship:
- A. Workmanship shall be of the highest quality conforming to the best electrical installation practice. Any work or material, which is rejected, must be removed immediately and replaced. No sub-standard work will be accepted.
  - B. The brevity of this specification shall not be construed as relieving the Contractor of his responsibility to perform all work in a first class workmanlike manner.
- 1.05 Submittals and Record Drawings:
- A. Submit shop drawings and catalog data for approval for all new equipment and materials specified for this project prior to ordering or manufacture of such. Shop drawings not stamped with Contractors approval will not be reviewed.
  - B. The Contractor shall keep an accurate record of all deviations from the approved design and specifications which may occur in the work as actually constructed, and shall submit same to the Engineer or Owner's representative at completion of the job.
  - C. Submittals shall be coordinated through the Architect.
- 1.06 Tests and Guarantee:
- A. All tests for various systems shall be performed as required, consistent with good general practice and in compliance with codes and authorities.
  - B. As a condition precedent to final payment, the Contractor shall execute to the Owner a guarantee in a form approved by the Owner. Guarantee shall warrant that all work included in this specification will remain in serviceable condition (ordinary wear, abuse and causes beyond the control of the Contractor excluded) for a period of one year from date of final completion and acceptance of work. The Contractor agrees to correct, without cost to the Owner, any imperfections in whole or in part which may develop in this work, including any damage to other work caused by such imperfections or repairing of same.

- C. Electrical Contractor is responsible for proper direction of motor rotation. Damage to motors, equipment, or systems due to improper rotation shall be corrected at this Contractor's expense.
  - D. All electrical systems, devices and related items shall be tested. Replace any and all defective device items or systems before completion of the project.
- 1.07 Coordination:
- A. Field verify exact location of all new equipment with existing conditions and coordinate with the General and other Contractors prior to rough-in and/or installing any of this work.
  - B. Field verify all clearances and conditions prior to the installation of any conduit, cable tray, raceway, etc.; Verify locations of all outlet boxes, surface mounted devices, panelboard enclosures, fixture locations, etc., with Civil, Architectural, Structural and Mechanical drawings prior to rough-in. Report any discrepancies to the Engineer prior to proceeding with work.
  - C. All power outages to existing or operable facilities shall be scheduled with the Owner a minimum two (2) weeks in advance. The Contractor shall not interrupt or restore power without prior consent to the Owner. Any interruption shall be only for the specific scheduled time. The Owner or Mechanical Contractor will be responsible for shutdown and start-up of Mechanical or Process Systems.
  - D. Coordinate all power wiring, safety disconnect means, motor control and control wiring for mechanical equipment with the Mechanical Contractor. Electrical Contractor shall furnish and install all wiring to motor or equipment through starters and safety switch.
  - E. The Mechanical Contractor, Mechanical Equipment Supplier or Temperature Control Contractor will be responsible for all low voltage temperature control wiring required for the project. This Electrical Contractor shall install, terminate and label all power, control and interlock wiring detailed on these plans.
  - F. Locate and install all new devices and fixtures in accordance with American Disability Act Guidelines.
- 1.08 Identification:
- A. Furnish and install self-adhesive vinyl name plates with ½ inch letters indicating panel name and voltage on all panels and cabinets. Starters, pushbuttons and disconnect switches shall have phenolic plates with 3/8 inch high letters indicating name or item controlled. All nameplates shall be white surface with black letters and be UV, water and abrasion resistant.

- B. Install clear adhesive tape with black lettering on wiring device outlets defining source (panel) and circuit number identification.
  - C. Provide an arc flash hazard label for all electrical equipment including but not limited to switchboards, panelboards, industrial control panels, meter socket enclosures, disconnects and motor control centers. Labeling to be in accordance with N.E.C. 110.16 (flash protection). Labels to be Brady #99452 or equal.
  - D. Provide typed panel directories for all panelboards.
- 1.09 Removals, Clean-Up, Protection and Touch-Up:
- A. This Contractor shall dispose of all materials generated from installation of this work. Debris shall be removed from the project site weekly.
  - B. All equipment, items, devices and appurtenances shall be protected from debris and damage while stored at the site and during and after installation.
  - C. Upon completion of work this contractor shall thoroughly clean all apparatus furnished by this contract.
  - D. Scarred factory-finished electrical equipment shall be touched up with factory furnished paint. Rusted or marred surfaces of electrical equipment shall be cleaned and primed before painting.
  - E. Patch finished surfaces and building components using new materials matching existing materials and experienced installers.
- 1.10 Utility Company Backcharges
- A. Contractor shall be aware that all utility company backcharges for the “electrical service,” “telephone service” and “CATV” service as indicated on the plans will be paid directly by the Owner.
  - B. Contractor shall, as part of his project scope, assist with utility company contact, coordination of service location, timing of service energization, etc., without additional cost to the Owner.
  - C. Contractor to verify and perform work in accordance with all utility company installation standards.
- 1.11 Maintenance Manuals
- A. Prepare maintenance manuals. Provide a minimum of three copies with a single copy sent to the Engineer for approval. Include the following information for equipment items:

1. Complete information on project equipment and services as was submitted during the course of the project. This information is solely intended to provide the Owner with accurate, usable information on how to care for the facility.
2. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
3. Manufacturer's printed operating procedures.
4. Maintenance procedures for routine preventative maintenance and troubleshooting.

#### 1.12 Electronic Files

A. If the Contractor requests, MDA Engineering, Inc. will provide electronic files for the Contractors sole convenience and use in preparation of shop drawings related to the project subject to the following terms and conditions:

1. MDA Engineering, Inc. will provide electronic files of drawing sheets specifically requested in writing by the Contractor. The reference background files or permission to distribute such must be obtained from the Architect or other applicable party.
2. A service fee of \$300.00 (three hundred dollars) and \$30.00 (thirty dollars) per drawing sheet shall be remitted to MDA Engineering, Inc. prior to delivery of the electronic files.
3. A CADD contract provided by MDA Engineering, Inc. shall be signed by an officer of the contracting company prior to delivery of the electronic files.
4. The Contractors' shall, to the fullest extent permitted by law, indemnify and hold harmless MDA Engineering, Inc., from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from the use of these electronic files.
5. MDA Engineering, Inc. reserves the right to remove all indications of Ownership and/or involvement from each electronic display.
6. Any other use or re-use by the Contractor or by others will be at the Contractor's sole risk and without liability or legal exposure to MDA Engineering, Inc. and Owner.

#### 2.00 Basic Materials and Methods

##### 2.01 Fastening and Supports:

- A. All conduits and equipment shall be adequately supported, either suspended from the construction above or by means of struts to the construction below. Conduit, tray, fixtures, etc., shall not span flexible connections of air handling equipment, etc., and shall not be supported from ductwork or other trades' supports.

2.02 Raceways:

- A. All conductors shall be installed in raceway unless specifically noted otherwise.
- B. Unless otherwise noted, exterior exposed conduit shall be rigid galvanized steel (R.G.S.) with threaded and cast fittings.
- C. Unless otherwise noted, interior conduit shall be rigid galvanized steel (R.G.S.) with threaded and cast fittings. Minimum 3/4 inch trade size.
- D. Concealed interior conduit may be Electrical Metallic Tubing (EMT) with steel compression or set screw fittings 3/4 inch trade size minimum. Cast metal fittings are not acceptable.
- E. EMT conduit may be used in exposed applications above the 10 ft. level in interior unfinished areas through 2 inch diameter. Conduit below the above elevations or larger than 2 inch diameter shall be R.G.S.
- F. Unless otherwise noted, conduit below grade shall be Schedule 40 PVC with rigid steel elbows (greater than 30 degrees) and risers, concrete encased where indicated. Bury per N.E.C. minimum depth and install marker warning tape 6" below finished grade.
- G. Underground lighting circuits outside the building foundation walls may be run in either direct buried non-metallic flexible raceway, electrical listed high density polyethylene (HDPE) conduit (Schedule 40) or standard Schedule 40 rigid non-metallic conduit. Conduit shall be one inch (1") diameter minimum and shall be installed thirty-six inches (36") below grade, minimum.
- H. All conduit and wiring in finished areas shall be concealed in the construction.
- I. All raceways shall be routed within structural steel and furred spaces utilizing factory made elbows as good practice and workmanship allows. Install sleeves through structural concrete where penetrating structural floor decks.
- J. Raceways shall be capped until conductors are installed. Empty raceways shall each be tagged and include pull wire.
- K. Raceways 1 1/2 inch trade size and smaller shall be secured with one hole malleable straps or wall brackets. Trapeze supports shall be used for groups of parallel raceways with each secured to trapeze with proper clamps. Individual runs of raceway 2 inches and larger shall be supported with malleable iron hangers. Where

surface conduits are installed below 10 ft. level, use of "Mineralacs" for supports are prohibited.

- L. Install sleeves for all raceways 1 ½ inches and larger passing through masonry, concrete tile or gypsum wall construction. Sleeves shall be packed with thermafibre safing insulation with a fire rating equal to the wall, floor or roof ratings.
- M. All PVC raceways shall include an insulated equipment grounding conductor. Install the same for all raceways associated with circuits identified in grounding section.
- N. Install fire stopping where required by the building construction.
- O. Final connections to vibrating equipment (motors, transformers, etc.), process machinery and instrumentation devices shall be via flexible, "seal tite" conduit, maximum 42 inches in length. Provide flexible conduit connections to recessed light fixtures, maximum length 72 inches, ½ inch diameter trade size minimum.

#### 2.03 Outlet and Junction Boxes

- A. Outlet and Device Boxes for exposed applications and use with R.G.S. conduit shall be Cast FS/FD type with galvanized, stamped steel cover plates. Outlet and device boxes above the 10 ft. level may be Galvanized Pressed Steel.
- B. Flush mounted outlet device boxes and junction boxes in concealed or protected spaces shall be galvanized pressed steel.
- C. Surface type boxes for special systems such as fire alarm, paging, security, etc., shall be properly sized backboxes for the device as provided by the system vendor.

#### 2.04 Conductors (600V and below):

- A. Feeder and branch circuit conductors shall be stranded copper with 600V insulation. Sizes #12 through #2 shall be THHN/THWN. Sizes #1 and larger shall be XHHW-2.
- B. Minimum wire size for branch circuit conductors shall be #12 AWG, stranded, copper.
- C. All conductors shall be protected in accordance with NEC ART 240.4 and Ampacity shall be in accordance with NEC 310.15 based on 60 degrees C rating for sizes #2 and smaller and 75 degrees C for sizes #1 AWG and larger.
- D. Each branch circuit shall have an individual neutral. Each neutral shall be identified at all junction boxes and terminals the same as its corresponding branch circuit number.

#### 2.05 Grounding:

- A. Provide service entrance ground per NEC Article 250.50 with the following grounding electrodes.
1. Metal underground water pipe; bond around meter.
  2. Metal frame of the building or structure.
  3. Concrete-encased electrode "Ufer Ground".
  4. Individual ground rods.
  5. Other made and supplemental ground electrodes as detailed on the drawings.
- B. Grounding electrode conductors shall be bare, stranded 7-strand copper, sized per NEC table 250.66. Route in Schedule 40 P.V.C. for sleeving through concrete and masonry walls and floors. Ground rods shall be 3/4" dia. X 10'-0" copper clad steel. All connections to building steel and underground/exterior connection shall be exothermically welded.
- C. Bond exposed structural steel per NEC Article 250.104. Bonding jumpers shall be sized per NEC Table 250.66. Also bond metal roof decks, metal siding, fascias, and canopies.
- D. Bond metal piping and mechanical duct systems per NEC Article 250.104.
- E. Bond and ground all non-current carrying metal parts of the building and electrical system as required.
- F. Install insulated equipment grounding conductor in raceways with conductors for all feeder and branch circuits.
- G. Nonmetallic Raceways: Install an equipment copper grounding conductor in nonmetallic raceways unless they are designated for telephone, data or other low voltage system cabling.
- H. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location. Terminate grounding conductor on a 1/4 x 2 x 12 inch ground bar with 1/4" x 20 tapped holes at 1" O.C.
- I. Provide ground resistance test utilizing fall-of-potential method according to IEEE 81. Minimum ohm values for equipment rated 500 KVA to 1000KVA: 5 ohms, 1000 KVA and greater: 3 ohms.
- 2.06 Wiring Devices:

- A. All wiring devices shall be specification grade, heavy duty for side and back wiring convenience.

- B. Convenience receptacles shall be 20 Ampere, 125 volt, NEMA 5-20R, Specification grade, Hubbell #HBL 5352 equal.
- C. Wall switches shall be toggle type, 20 Ampere, 125/277 A.C., quiet type, Hubbell #HBL 1221 series or equal.
- D. All wiring devices shall have ivory (verify with Architect) body unless otherwise specified to match décor, etc. All wiring devices in unfinished spaces shall be gray.
- E. Cover plates in finished areas to be Smooth nylon or lexan color to match installed device.
- F. Device plates in unfinished areas shall be stamped, galvanized, sheet metal.

#### 2.07 Disconnects and Starters:

- A. Provide disconnects for all equipment as shown on the plans and starters for all equipment not provided with built-in control panels.
- B. Disconnects shall be heavy duty, multiple pole, quick-make, quick-break, H.P. rated, 250 volt or 600 volt in NEMA 1 enclosure (indoors) or NEMA 3R enclosures (outdoors).
- C. Disconnects shall be fusible or non-fused as noted and shall include class R rejection style fuse holders.
- D. Starters for motors ½ HP and less shall be manual starters, 120 volts, with built-in overloads and pilot light. Install flush in finished areas. Square D. Co., Class 2510 or equal by Allen Bradley. Contractor to determine final O.L. thermal element sized based upon final motor F.L.A.
- E. Starters for motors larger than ½ HP shall be combination fusible switch/magnetic motor starter, NEMA rated, 250 volt three-phase with 3 overloads, 120 volt C.P.T., cover mounted H-O-A selector switch, transformer type pilot light in cover and additional form contacts for auxiliary control functions.
- F. Coordinate all starters, disconnects, overloads, etc., with final motor and equipment items. Locate to maintain proper clearances.

#### 2.09 Fuses:

- A. All low voltage fuses shall be time delay, dual element, RK-1 rejection style 250 V or 600 V as appropriate and arranged in a coordinated selective system for overcurrent protection.
- B. All fuses shall hold a 500 percent overload for 10 seconds and be rated 300K A.I.C. minimum. Fuse sizes for individual motor loads shall be properly sized to actual

motor nameplate for motor branch circuit and short circuit protection per NEC 430.52.

- C. Fuses shall be rejection style, dual element Bussman low peak, 300 K or equal by Little Fuse or Mersen.
  - D. At project completion furnish a lockable spare fuse cabinet adjacent to main service and provide 3 spare fuses of each size and type utilized in the project. Provide inventory to engineer. Provide nameplate on cabinet.
- 3.00 Products and Execution
- 3.01 Panelboards (Lighting and Appliances):
- A. All new panelboards shall be UL listed and labeled.
  - B. Receptacle panelboards (RP) shall be 120/208 volt, 3 phase, 4 wire solid neutral with bolt-on breakers of the thermal magnetic type. Branch breakers to have a minimum of 10K A.I.C. short circuit rating for panelboards up to and including 225 Ampere. Receptacle panels shall be Square D NQ Series or equal by Siemens, General Electric or Cutler Hammer.
  - C. All panels to include number, size, type and rating of branch and main devices as noted. Provide main breakers where noted to obtain U.L. integrated equipment short circuit ratings.
  - D. Panelboards shall be installed with trim, front, door and flush lock, master keyed for the project site, painted ANSI-61 gray. Mount with top of panel at 6'-0" above floor.
  - E. All 2-pole and 3-pole breakers shall be common trip.
  - F. All breakers shall be bolt on. Lighting circuits shall be switch duty rated.
  - G. All panels shall have a copper equipment ground bus.
  - H. Phase and neutral bus bars shall be copper.
  - I. Furnish handle locking devices on all night light (NL), emergency (EM) and all fire alarm circuits (with red identification on breaker).
  - J. Install typed, descriptive, panel circuit directories to designate area and type of loads served by each circuit. Branch breaker numbering shall be as listed on the panelboard schedules and/or plan drawing circuit numbers.
- 3.02 Panelboards (Main Distribution Type):
- A. Furnish and install main distribution panels as shown or noted on the plans.

- B. Bus shall be copper and rated as noted on plans. Panels shall include solid neutral bus and equipment ground bus.
  - C. Distribution panels shall be wall mounted, with the number, size, type and rating of branch molded case thermal magnetic breakers as noted on plans.
  - D. Distribution panels shall be Square D I-line, Siemens or equal by General Electric or Cutler Hammer.
  - E. Panels shall be rated 120/208 volts - 3 phase - 4 wire as noted on plans.
  - F. Distribution panels shall include individual nameplates for each branch circuit device.
- 3.03 Lighting Control Panel/System:
- A. Install a programmable low voltage lighting control system consisting of relay panel, photocell and all associated wiring. The system includes a controller, photo control module/input and/or other low voltage control devices.
  - B. Modular relay panels shall be UL listed and consist of NEMA 1 enclosure that can accept an interior sized to accept up to 8 single pole relays, power supply transformer assembly with class 2 transformer and internal overcurrent protection with automatic reset. 120 or 240 VAC as required, 60 HZ +/- . Cover to be surface or flush as required, with captive screws in a hinged, lockable configuration.
  - C. Relays shall be momentary-pulsed mechanically latching contactors with plug in connector. Relays shall have mechanically latching contact with single moving part design for improved reliability. Relays to be Class 2 rated 120/277 VAC at 20 full load amps (ballast) with manual on/off button.
  - D. Panels shall accommodate up to eight low voltage switch inputs programmed for manual override of schedule lighting via low voltage switches.
  - E. Controller to have 4 line LCD display and shall be capable of 365 day programming, accommodate 48 time schedules and able to accept a minimum of 8 inputs. Warn before off feature with override capability. Programming capable at unit or via communications port.
  - F. A single photocell shall be mounted at the roof line facing north for measuring exterior light levels. The sensor shall connect to a photo control input on the controller. Replacing the astronomic control function on the clock, the photo control module shall measure the actual exterior light level.
  - G. Provide typed panel schedule on inside cover indicating load and branch circuit breaker number served.

- H. Install system per manufacturer instructions, provide factory authorized start-up and owner trainer. System and components shall have a one (1) year warranty with relays provided with a three (3) year warranty.
  - I. Lighting control panel/system shall be Lithonia Switchpak (SPAK) programmable lighting control panel or approved owner/engineer equal.
- 3.04 Generator Set:
- A. Natural gas fueled standby generator set, EPA-Certified, UL 2200 listed, rated 120/208 volts, three phase, four wire, 0.8 power factor, 40 kW, 50 kVA, at 1000 feet altitude, 105°F, 130°F standby temperature rise, 12 lead fast response permanent magnet (PM)-excited alternator capable of starting motor loads of 140 kVA inrush, with a maximum voltage dip of 35%. Provide all accessories required for a suitable installation including: Sound attenuated weather housing, nominal 69DBA @ 7 meters, with interior mounted critical silencer and exhaust plenum, block heater, rodent guards, 100% rated, electronic trip main circuit breakers, batteries, battery rack, 10 ampere float/equalize battery charger with alarms and digital programmable controller with keypad, timers, sensors, indicators and meters as required by local codes. The generator control logic shall be microprocessor based with inherent digital Modbus Communications capability. Provide all necessary start-up services including 4 hours of owner on-site training and standard one (1) year warranty. Generator shall be Kohler or equal by Cummins or Generac.
  - B. Generator system and components to meet the requirements of a level 1 system.
  - C. Provide remote annunciator to provide all required status/alarm conditions for a level 1 installation.
- 3.05 Automatic Transfer Switch(es):
- A. Microprocessor-based electrical controls for automatic transfer switch rated for ampacity listed on drawings, 3 poles, 4 wire 120/208volts at 60 hertz, 22KAIC, (Contractor responsible for providing proper upstream breaker to maintain interrupting rating or provide a fully rated transfer switch), UL1008 Listed, mounted in a NEMA 1 enclosure. Nonvolatile memory for retention of stored settings and setpoints. LCD display, touch key pad and LED indicators for user access to system information and settings. Load/no-load exercise functions, Nine (9) individual time delays for selected loads. Provide all sensors, indicators and timers as required by local code and monitors for in-phase transfer, phase rotation, single phase loss, low voltage, high voltage, low frequency and high frequency. The automatic transfer switch logic shall be microprocessor based with inherent digital Modbus communications capability. Provide all necessary start-up services including owner on-site training concurrent with generator training and standard one (1) year warranty. Transfer switch shall be Kohler or equal by Cummins or Generac.

## 3.06 Surge Protection Devices (SPD'S):

## A. General:

1. All SPD's shall be UL 1449 third edition and UL 1283 certified. A warranty covering all parts for a minimum of five (5) years. The connection means will be permanently wired for all SPD units described below.
2. SPD units will have led indicator lights for power and protection status, audible alarm with silencing switch and one set of dry contacts rated at 5 amps, 250 V AC.
3. All SPD units shall be fused protected with UL recognized 248-1 at 200 KAIC and have filter attenuation in compliance with NEMA LS1 standards.
4. All SPD units to be manufactured by Current Technology, Liebert Corp., United Power, Square D, Siemens, Cutler Hammer, General Electric, or approved equal by the engineer.

## B. Service Entrance Suppressors:

1. Peak single-impulse surge current rating: 240 kA per mode (L-N, L-G, N-G, L-L).
2. Clamping voltage for grounded Wye circuits with voltages of 208Y/120 – 3 phase, 4 wire circuits shall be 400V for 208Y/120 per mode (L-N, L-G, N-G).
  - a. The Service Entrance SPD unit shall be mounted with an integral disconnect and surface on wall or integrated in panelboard.

## 3.07 Lighting Fixtures:

- A. All new lighting fixtures shall bear the label of approval of the Underwriters Laboratories, Inc. All fixtures of each type shall be of one manufacturer.
- B. Ballasts for fluorescent and H.I.D. lamps shall be 120 or Multi-tap volt as indicated on the drawings, by panelboard voltage and branch circuiting.
- C. Fluorescent ballasts shall be electronic type, CBM Certified, 265 MA, 95 percent power factor, 10 percent THD for T8 series lamps. Ballasts shall be Motorola or equal by General Electric or Magnetek. Utilize multiple lamp ballasts to accommodate switching or circuiting as shown on the plans.
- D. Ballasts for double ended fluorescent fixtures shall contain a built-in disconnecting means in accordance with N.E.C. 410.73.

- E. LED fixture drives shall be 350ma minimum and include protection diodes for AC operation. All LED drivers to be treated in accordance with IESNA LM standards and provide a 5 year warranty.
  - F. Fluorescent lamps shall be TCLP compliant 265 MA, T8, instant start, color corrected, tri-phosphor lamps, rated 80 CRI, degree Kelvin as noted on drawings and shall be General Electric, SPX Series or equal by Osram/Sylvania or Phillips.
  - G. LED lamps shall be binned per ANSI C78 377A or greater standards as required.
  - H. LED lamp color temperature to be as scheduled.
  - I. Recessed fixtures shall be securely fastened to the ceiling framing member by means identified per NEC 410.36.
  - J. See schedule on plans for fixture descriptions, models, manufacturers, etc.
- 3.08 Raceways for Telecommunication Cabling for Voice/Data Systems:
- A. Furnish and install telecommunications backboards as indicated on the plans. Backboards shall be  $\frac{3}{4}$  inch plywood, painted fire retardant white and sized as shown. Firmly anchor to wall surface with appropriate fasteners.
  - B. Provide and install empty conduit stubs from each voice/data outlet location as indicated on the plans to nearest accessible ceiling space. Provide 90 degree sweep elbow and insulated bushing at each stub.
  - C. Conduit shall be 1 inch diameter minimum and shall be sized for 28% maximum fill per BICSI and EIA/TIA standards.
  - D. Voice/data flush outlet boxes shall be 4 inch square, 2  $\frac{1}{8}$  inch deep galvanized pressed steel with 1 gang plaster ring and blank finished cover plate.
  - E. Include a pull string in all empty raceways to facilitate future cabling by others.
  - F. Furnish and install empty raceway to size and type as indicated on the plans for backbone cabling. Include grounded insulating bushing on each end. Sleeve floors and walls with R.G.S. conduit and install fire stopping.
- 3.09 Sprinkler/Smoke Monitoring System (Addressable):
- A. Furnish and install a complete and operable local addressable sprinkler/smoke monitoring system as shown on the plans. System to include the following:
    - 1. D.C. control panel complete with built-in batteries, charger, D.C. notification appliance circuits, addressable device communication circuit, supervision circuitry, and other required control panel accessories.

2. Internal Digital Alarm Communication Transmitter (D.A.C.T.) to notify central station of individual zone alarm and supervisory conditions. Contractor to provide 1" conduit and 2-4 pair voice grade cables to telephone backboard for phone connection by others. D.A.C.T. to interface with standard telephone line furnished by the Owner.
  3. Single action, addressable, manual pull stations as indicated on the plans to sound an evacuation signal upon activation.
  4. Audible/Visual combination notification signals including D.C. audible horn device and an A.D.A. qualified visual strobe device as indicated on the plans to notify building occupants of an alarm condition.
  5. Ceiling mounted, addressable, photo-electric smoke detectors as indicated on the plans to detect the presence of smoke.
  6. Duct type, addressable, photo-electric smoke detectors as indicated on the plans to detect smoke in the air duct installed and initiate an evacuation signal upon activation. Interlock via form C contacts to shutdown the corresponding air handler. Duct smoke detectors above ceilings or not visible from the floor shall be equipped with a readily visible remote alarm indicator light.
- B. All sprinkler/smoke monitoring system wiring shall be color-coded, installed in metal raceway and installed by properly certified and licensed installers. Wiring above accessible, suspended, ceilings or horizontal runs along the roof structure in exposed areas, may be open, plenum rated, power limited, fire protection cables installed on bridle rings parallel to the structure. All vertical drops to devices in exposed areas to be in conduit
- C. Contractor shall obtain necessary permit(s) from the appropriate agency. Upon completion of project, sprinkler/smoke monitoring system shall be completely tested and documented, in the presence of the authority having jurisdiction and the project engineer. Provide 7 days advance notice of any tests.
- D. System shall be by Simplex or approved equal by E.S.T. or Notifier.