KETCHIKAN GATEWAY BOROUGH
INVITATION FOR BID

KETCHIKAN INTERNATIONAL AIRPORT
BIOMASS BOILER INSTALLATION

Addendum No. 2

ADDENDUM DATE: **July 8, 2015** **THIS IS NOT AN OFFER**

This addendum forms a part of and modifies the Invitation for Bid (IFB) as follows. Failure to acknowledge the addendum in the space provided in the proposal may result in a rejection of your bid.

THE INVITATION FOR BID IS HEREBY MODIFIED AS FOLLOWS:

DRAWINGS:

Item No. 1 **Sheet E2.0 – SITE PLAN, Detail 1. Add** a 12"x12"x6" junction box marked NEW on the interior northwest wall of the Boiler Building. The 1-1/2" conduit from the Terminal Building and the 1" conduit from the Mounting Board shall both terminate at this junction box.

Item No. 2 **Sheet E2.0 – SITE PLAN, Detail 1. Add** two CAT5e cables, which shall run in the 1-1/2" conduit from the Telecom Room in the Terminal Building to the Mounting Board in the Boiler Building.

Item No.3 **Sheet E2.1 – FLOOR PLAN – POWER, Detail 1. Relocate** Panel L to the southwest wall in the boiler room, between pumps P-07 and P-04.

SPECIFICATIONS:

Item No. 1: **Section 15950, Subsection 1.8, Subsubsection A.1.** (pages 5 and 6 of section 15950 or pages 229/230 of the IFB); Meridians Systems, Inc. is added as an approved control vendor.

ADDITIONAL INFORMATION:

The items below should be incorporated into and made part of this addendum as follows:

- *35 Requests for Information (RFI) and answers.*
- Haight & Associates Memo regarding RFI's No. 23 and 24
- Revised Price Proposal Form
- Revised Section 15110 Piping and Valves
- Revised Section 15995 Mechanical Systems Commissioning
- RL 1600 Weight Module Detail
- SL 4800 Legend Series Digital Weight Indicator Detail

By: _____
Dan Bockhorst
Borough Manager

RFI Responses for Ketchikan Airport Biomass Project
Issued July 7, 2015

1) Regarding the Biomass boiler and equipment to be furnished by Fink Machine Inc., I understand they are not furnishing the Silo? but they are supplying the auger system to transfer pellets to the boiler. Are there shop drawings available on this auger system that will allow us to confirm it will mate up with the Silo we supply and to allow us to estimate the resources required to install?

Winning bidder is to fabricate a steel chute for transition from silo into auger. Connection between silo and auger must include a non-rigid (fabric) section for the optimal function of the load cells. This is to be a waterproof fabric or canvas material. Final design will be by contractor via submittal.

2) The current bid schedule of 8 line items referencing mechanical specifications does not line up with actual bid items/requirements of the project. It is not at all clear where we should put the dollars for demolition, electrical, building remodel, etc. Can we get some clarification on the bid line items?

The dollars for the items mentioned above should be included in the following price proposal line items:

1. Architectural drawings - includes building remodel
2. Structural drawings – includes all interior and exterior concrete work plus structural elements required for building remodel
3. Mechanical drawings - includes all boiler and related equipment installation, piping, controls, etc.
4. Electrical drawings - All electrical work should be included here
5. **Demolition [new price proposal line]**

3) What is the completion date for the work?

The airport buildings will need to have, at minimum, one of the new boiler systems (biomass or new oil backup) installed and functioning before the heating season begins in September. It is expected that the overall project should be substantially complete by November 1.

4) The Fink supply quote is dated May 12, 2015 and states it is good for 30 days and requires a 30% deposit. Have these terms been met? When we assume the contract for the boiler equipment will it have been paid in full or do we need to assume any monetary consideration as well? When will the equipment be delivered?

The Owner will pay for the boiler 100% and it will be provided to the contractor by end of August.

5) Our Subcontractors and suppliers have asked if the bid date can be extended due to the 4th Holiday as they are already experiencing personnel "attrition" and are concerned with their ability to quote these items?

A one week extension has been approved. New due date is July 14, 2015.

6) What is the weight of the old oil-fired boilers?

We estimate the weight of each of the old oil-fired boilers to be 10,000-12,000 pounds, empty of all water and exclusive any appurtenances.

7) The pipe insulation on the old boilers is circa 1969? Has it been tested for asbestos?

The asbestos content of the existing pipe insulation is unknown. Bidders may exclude any asbestos abatement costs in their bids. Bidders may include asbestos testing in their bids. If asbestos is found, a change order for the necessary abatement can be issued at the beginning of construction.

8) Plan sheet A2.1 shows a fire retardant fabric curtain. Where is the specification for this fabric? Are there approved suppliers? and what are the dimensions?

See attached one page specification with acceptable products/manufacturers. The size is approximately 15' x 22'.

9) What is the finish on the new viewing area concrete?

The finish shall be a standard exterior sidewalk sealer with light broom finish.

10) Do the interior purlins receive the same paint as the columns?

Yes. As do the beams, girts and any other metal framing that is to remain.

11) There appears to be a number of duplicated sheets in the plans set (M1.0 thru M4.0). Are these indeed duplicates or are there sheets that have been omitted?

These duplicates are due to the Equipment Pre Purchase M series sheets being included in the final bid set. The Final M set of drawings in the bid set is titled 5. KIA Biomass Boiler Mechanical Stamped Drawings 05.15.15.

12) What is the composition of the existing roof requiring demolition?

The existing roofing is metal with vinyl-coated batt insulation. Typical metal building construction.

13) After the old boilers are removed how is the resultant hole supposed to be patched? Do we replace the vent, sheetrock, or…?

The new wall section should match the adjacent building material.

14) On Sheet M1.0, Control Device Schedule, it states that LC-001 is a point that "shall be paralleled to the Direct Digital Controls system. If this is not possible then the controls vendor shall add devices/ points as required to get the value into the Direct Digital Controls system" per sheet note (1). Would you please provide specifications for the LC-001 device as well as who is responsible for providing these devices?

LC-001 is the point for the load cells. The cut sheets for the four (4) load cells (RL1600) and the indicator (SL_480) are attached to this response. The winning contractor is responsible for providing these devices.

15) 15250 3.8 Insulation schedule requires varying thickness of insulation dependent upon the operational temperature of a system. It appears water from B 01 & B 02 has operational temperature limits set at a minimum of 40 & 212 degrees. For the purpose of determining insulation thickness shall I consider the system will not operator at more than 250 degrees?

The hot water will not exceed 250 degrees and should be insulated in the 201-250 degree range.

16) 15250 3.3 G – Is it the intent to additionally jacket all exposed piping in mechanical equipment rooms or only piping within 10 feet of the finished floor regardless a mechanical room or finished space?

Here is the relevant section:

For exposed piping in mechanical equipment rooms and exposed piping within 10 feet of the finished floor in finished spaces, finish with Manville Zeston 2000 PVC jacket and fitting covers.

All piping in a mechanical room is to be jacketed. In a finished (non-mechanical) room, everything within 10 feet of finished floor is to be jacketed.

17) Is the piping insulation ACM? What is the weight of the old boilers?

The old boilers are 10,000-12,000 pounds each. The asbestos content is unknown. Bidders may exclude any asbestos abatement costs in their bids. Bidders may include asbestos testing in their bids. If asbestos is found, a change order for the necessary abatement can be issued at the beginning of construction.

18) Looking at the Boiler installation guide it appears there is a requirement for compressed air for a "pneumatic cleaning system"- typically this CA is provided with a solenoid valve to "blow out" ash build up in the fire tubes. I cannot see any compressed air piping nor reference to a compressor in either the specifications, plans nor as an add-on package provided with the PP contract. Please confirm.

See amended Piping Specification for compressed air piping.

> *a) Your quote shows that you will provide the compressor and soot blowers, can you please confirm that you will provide the compressed air PIPING between your air compressor and the soot blowers?*

The compressor is included but not the piping between compressor and the soot blower.

> *b) Do you want the local mechanical to provide cold water piping to the stoker auger? Or will you provide this?*

The winning bidder must provide this.

19) Appears that the boiler feed auger requires a cold water line for potential burn back protection. Please clarify if this is correct and what needs to be provided for in our pricing (piping of a CW line to the auger mechanism)

See above, and see amended Piping Specification section.

20) 15110 2.19 Identification C. "Paint: All piping in the new Plant (bare or insulated) will be painted…" Please verify the Owner desires to have insulated piping systems

painted. This seems to be a high cost item with little benefit to the owner?

The piping is to be painted to color-code to a plaque or drawing outside so viewers can follow the process. Colors will be coordinated with Owner when plaque is designed.

21) 15110 3 Execution 3.1 Accessibility and Visibility B. "…- the general arrangement of the piping as shown on the project plans was designed to illustrate it's function to viewers. Do Not deviate from the general arrangement without approval from A/E"

> *a. M2.1 "Boiler Building Mechanical Plan" does not show any piping. Only sheet indicating piping is M3.0 "Piping and Instrumentation diagram". What piping design should we be referencing our piping installation to fulfill the above requirement?*

The piping will be in view of the public, and all piping shop drawings submitted for review will be examined not only for conformance to the P&ID on M3.0, but with an eye towards a clean, efficient layout with minimal elbows and offsets.

22) Who is responsible for providing the commissioning Agent? Does this fall under the owner or the Construction team? Section 15995 is unclear who is responsible for hiring the commissioning agent.

The project Owner (KGB) is responsible for hiring a commissioning agent.

23) Commissioning. Section 15995 1.1 B. "Contractor and all sub-contractors are required to participate in this process and provide the commissioning agent all necessary assistance including…." Question; will commissioning be required of the electrical systems as well? If so, the Electrical Specification don't appear to include commissioning.

See attached file: H&A Memo – RFI No. 23 and 24 Responses.

24) Heat trace requirements. Sheet note on sheet M3.0 indicates "Heat trace exterior piping to protect against OAT down to -15 degrees". There is no indication of Heat trace on the electrical prints that I can find an no specification for heat trace in either Mechanical nor Electrical specifications. We request that specifications be provided for product required.

See attached file: H&A Memo – RFI No. 23 and 24 Responses.

25) "Curtain Wall" & Electrical Panel L location Grid 2. A2.1 is indicating that this separating "Wall" along grid 2 is a "New fire retardant dividing curtain". E3.0 is indicating Panel L located on a dividing wall separating the Boiler mechanical area and the remainder of the building.

Please clarify if this is a curtain wall and if so provide a specification for desired product. If this is a Curtain wall where should panel L and switches be relocated to?

Addendum from electrical engineer states that panel L is to be relocated. See Addendum.

26) Balancing is referenced in Section 15995 (1 General 1.1 Work included A.) but no Specification section for Testing, Adjusting and Balancing exists. Please provide a Specification or requirements for this scope.

See revised Commissioning Specifications.

27) Please provide size information for the Expansion tank ET-01 noted on M3.0, not included on the equipment Schedule.

The system contains a total of 573 gallons, and the temperature range is between 50 and 210 degrees F. This indicates that the expansion tank should have a minimum acceptance of 24 gallons. See attached calculations.

28) Please provide information on the CFT-01 (Chemical feed tank, or Pot feeder?) noted on M3.0, not included on the equipment schedule nor in specifications.

A 5-gallon, leg mounted, Chemical Pot Feeder with Safety Bar closure (or equivalent), rated for minimum 150 psig at 250 degrees F. Minimum four ports: drain, water in, water out, and spare, as well as 4" opening for chemical loading. Griswold DB series or equal.

29) Please see the attachment included here from the Installation manual. Can we have the Mechanical engineer of record confirm that these items have been accounted for in the design? Specific to; Boiler pump and mixing valve (for maintaining minimum return water temps), Thermal Run off safety valve, Expansion tank for safety heat exchanger

The system contains a total of 573 gallons, and the temperature range is between 50 and 210 degrees F. This indicates that the expansion tank should have a minimum acceptance of 24 gallons. See attached calculations.

M20 and TS131 are included with Biomass Boiler. No expansion tank is required for the

safety heat exchanger.

30) We have a question on the two boiler flues. Sheet M5.0 has a sheet note stating "On Exterior Chimney Components use Selkirk Ultra-Temp components or better, on interior chimney components use Selkirk Galva-temp Galvanized Exterior components or better." Question; No sizing requirements are available for either boiler flue, please provide for each.

The boiler flues must be 10" ID for each boiler.

31) Specific to the Biomass Boiler. It appears that the boiler itself is equipped with a draft inducing fan (outlet of the boiler connecting to the De-dusting (cyclone)), and the De-dusting (cyclone) again has a power draft inducing fan. We believe both these sections of flue need to be pressure rated because of the fan driven exhausts. See notations below from installation manual.

There is only one induced draft fan located at the exit of the deduster.

32) Will this entire flue package for the biomass boiler need to be pressure rated stack with a stainless inner liner?

The flue gas pipe specification for the biomass boiler has been upgraded to Model PS from Selkirk, which is a pressure rated pipe.

33) We request that " Reliable Controls " be added to spec section 15950 2.1E as an acceptable Manufacturer/Vendor as this would provide a higher quality control system as well as creating a more competitive bidding atmosphere.

This is not an acceptable Manufacturer/Vendor.

34) Concerning the data comm conduit, on page E2.0 it shows a 1-1/2 conduit and on page E2.2 it says to use a 1" conduit, please clarify. Also what kind of data comm cable is to be used?

See addendum attached: Addendum July 7 2015

35) Is the Panel L disconnect shown on Page E2.1 located inside or outside the building?

The panel is located on the outside of the building.

HAIGHT & ASSOCIATES
CONSULTING
ELECTRICAL
ENGINEERS

MEMORANDUM

To: Andrew Haden

Date: July 7, 2015

From: Kyle Drapeaux

H&A Job#: 175-282

Regarding: KIA Heating Mod RFI Nos. 23 and 24 Responses

Message:

Responses to RFI Nos. 23 and 24 are as follows:

RFI No. 23: Commissioning. Section 15995 1.1 B. "Contractor and all sub-contractors are required to participate in this process and provide the commissioning agent all necessary assistance including…." Question; will commissioning be required of the electrical systems as well? If so, the Electrical Specification don't appear to include commissioning.

Response: No commissioning is required for electrical systems.

RFI No. 24: Heat trace requirements. Sheet note on sheet M3.0 indicates "Heat trace exterior piping to protect against OAT down to -15 degrees". There is no indication of Heat trace on the electrical prints that I can find and no specification for heat trace in either Mechanical nor Electrical specifications. We request that specifications be provided for product required.

Response: Provide heat trace cable for both 3" heating pipes between the airport terminal and the boiler plant. The heat trace cable shall be powered at 120 VAC, with a minimum output of 5 watts per foot when energized. The cable shall be self-regulating with semi conductive material between two conductors with a braided metallic shield and fluoropolymer outer jacket. Fasten to the pipe with glass tape. The heat trace cable shall be controlled with a line voltage pipe thermostat, which shall energize the heat trace cable when the pipe temperature drops below 50 degrees Fahrenheit. Provide circuit No. L-16 with a 20/1 GFI (30mA) circuit breaker, 2 No. 12 AWC conductors, and 1 No. 12 AWC grounding conductor.

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REVISED
PRICE PROPOSAL FORM

KETCHIKAN INTERNATIONAL AIRPORT
BIOMASS BOILER INSTALLATION

Contract Documents which are the basis for the proposal:

1. This IFB and any and all Addenda.

The Owner reserves the right to award any or all portions of this contract.

	Subtotal Amount
1. Architectural Drawings and Specifications A1.0 (12 pages)	**$**_____
2. Structural Drawings and Specifications S0.01 (10 pages)	**$**_____
3. Mechanical Drawings M0.0 (12 pages) and Specifications (68 pages)	**$**_____
4. Electrical Drawings and Specifications E1.0 (9 pages)	**$**_____
5. Demolition	**$**_____

_____ $_____
Total in Written Words Total in Dollars

By signing below, I acknowledge my understanding that the biomass boiler equipment will be furnished by the Owner and its purchase price is not included in this bid. This bid does include installation of the Owner-furnished biomass boiler equipment.

_____ _____
Company Date

_____ _____
Signature and Title Printed Name

1. GENERAL

1.1. RELATED SECTIONS

A. The general conditions of the contract, supplementary conditions, and general requirements are a part of and apply to this section. Consult them for additional conditions and requirements pertaining to this section.

B. The Mechanical General Provisions, section 15010, are a part of and apply to this section. Consult them for additional provisions and requirements pertaining to this section.

1.2. SECTION INCLUDES

A. Basic materials and methods applicable to each division 15 section.

1.3. CONTENT SUMMARY

A. Anchors

B. Cleaning and sterilization of piping

C. Duplex basket strainers

D. Flow measuring devices

E. Hangers and supports

F. Identification

G. Instrument connections

H. Piping

I. Pressure gauges

J. Pressure and temperature plugs

K. Pressure and temperature relief valves

L. Strainers

M. Testing

N. Thermometers

O. Unions

P. Valves

1.4. SUBMITTALS

A. Comply with section 15010.

B. Product data:

1. Anchors
2. Flow measuring devices
3. Hangers and supports
4. Pressure gauges
5. Pressure and temperature plugs
6. Duplex basket strainers
7. Piping
8. Pipe markings, ID, and paint
9. Strainers
10. Thermometers
11. Valves

C. Shop Drawings:

1. Mechanical Piping Diagrams

2 PRODUCTS

2.1 PIPING

A. General: Pressure Ratings„ Provide components with minimum pressure rating of 125 psig working pressure.

B. Manufacturers

1. Steel Pipe„ U. S. Steel, Sharon Tube, Vision Metals (formerly Quanex), CSI, Maruichi American (Mac Pipe), and National.
2. Copper Tubing„ Cerro, Mueller, Wolverine, [Cambridge Lee Brass].
3. Steel Pipe Fittings„ Anvil International, Mill Iron Works, Hackney, Ward, Phoenix, Allied, Nibco, Tube Forgings of America (TFA), Vogt, Bonney Forge, Stockham.
4. Copper Tube Fittings„ NIBC6¼, Mueller, Elkhart.
5. Gaskets„ Crane, Garlock, U. S. Rubber, Anchor, Flexitallic.
6. Shaped Nipples„ Allied, Bonney Forge.

C. Steel Pipe

1. Pipe„ Black steel, Schedule 40, standard weight for 10 inch and smaller and 0.375 inch wall for 12 inch and larger, ASTM A 53, Grade A or B, or ASTM A 106, Grade A, B, or C.

2. Fittings
   a. 2 Inch and Smaller„ 150 pound WSP, black malleable iron, screwed, ASME B16.3 and ASTM A 197; 3000 pound forged steel socket weld, ASME B16.11 and ASTM A 105 II.
   b. 2-1/2 Inch and Larger„ Standard weight, seamless steel, butt welding, ASME B16.9, Grade WPB.

3. Unions, 2 inch and Smaller„ 150 pound WSP, black malleable iron, screwed, ASME 16.39, brass seat.

4. Pipe Nipples„ Same piping material as connecting piping; Schedule 80 for 1-1/2” unthreaded length with pipe sizes less than 1-1/4”. Close nipples not acceptable.

5. Flanges
   a. 2 Inch and Smaller„ 125 pound WSP, cast iron screwed, ASME B16.1 and ASTM A 126, Class B; 150 pound forged steel weld neck or slip-on, ASME B16.5 and ASTM A 181, Grade I; 150 pound forged steel socket weld, ASME B16.5 and ASTM A 181, Grade I.
   b. 2-1/2 Inch and Larger„ 150 pound forged steel weld neck or slip on, ASME B16.5 and ASTM A 181, Grade I. Flanges facing flat faced cast iron flanges with flat face finish.

6. Gaskets„ 1/16 inch thick compressed non-asbestos material selected for applicable temperature and pressure of systems installed. Full face gaskets for flat faced flanges.

7. Joint Compound„ Teflon tape.

D. Copper Tubing

1. Tubing, Above Grade„ Type L copper water tube, hard-drawn, ASTM B 88.

2. Tubing, Underground„ Type K copper water tube, soft-drawn, ASTM B 88.

3. Tubing, Flexible„ Soft copper tubing, flexible stainless steel hose, or approved. Rated for design working pressure of application. For natural gas piping, refer to Section 22 1123.

4. Fittings„ Wrought copper solder fittings and screwed adapters, ASME B16.22; cast bronze solder joint fittings and screwed adapters, ASME B16.18.

5. Unions„ Wrought copper solder joint unions, ASME B 16.22; cast bronze solder joint fittings, ASME B 16.18.

6. Flanges and Flanged Fittings„ Cast bronze, 125 pound Class, ASME Standards.

7. Gaskets„ 1/16 inch thick compressed non-asbestos material selected for applicable temperature and pressure of systems installed. Full face gaskets for flat faced flanges.

8. Joint Compound„ Teflon tape.

9. Solder Material„ 95 percent tin, 5 percent antimony solder or 96 percent tin 4 percent silver conforming to ASTM B 32. J.W. Harris “Bridgit”, Hardy & Harman, Allstate or approved.

E. Specialty Piping Specific to Biomass Boiler

1. Compressed air to soot blower
   a. Contractor to provide compressed air piping from the air compressor to the point of connection with the soot blowers on the biomass boiler
   b. Piping shall be Type L copper.

2. Non-potable water to fuel auger for burn-back protection
   a. Connect to the non-potable line anywhere downstream of the last isolation valve at the RPBD / PRV assembly.
   b. Route piping to point of connection at fuel auger, line size to be equal to the connection size at the auger (Bidder to confirm)
   c. Type L copper shall be used.
   d. Provide a dielectric union if the connection at the auger is steel.

2.2 HANGERS AND SUPPORTS

A. Two inches and smaller: Standard swivel loop hanger

1. Michigan 100

B. 2-1/2 inches and larger: Standard clevis hanger

1. Michigan 401

C. Thermal hanger shields: 360 degree insert of high density, 100 PSI, waterproofed calcium silicate encased in a 360 degree galvanized sheet metal shield with vapor barrier jacket. Calcium silicate shall be color coded indicating non-asbestos bearing composition.

D. Acceptable manufacturers:

1. Hangers and Supports:
   a. B-line
   b. Elcen
   c. Fee and Mason
   d. Grinnell
   e. Mason Industries, Inc.

f. Super Strut, Inc.
g. Unistrut
h. Nibco
i. Powerstrut
j. Sammys

2. Thermal hanger shields:
a. Pipe Shields, Inc.
b. Insulshield
c. Uni-Grip
d. Value Engineered Products, Inc.
e. Mechanical Pipe Shield

2.3 VALVES (ACCEPTABLE MANUFACTURERS)

A. Valves in each classification shall be the product of the same manufacturer.

B. Acceptable manufacturers:

1. Globe and Swing Check Valves:
a. Crane
b. NIBCO
c. Jenkins
d. Hammond
e. Milwaukee
f. Powell
g. Stockham

2. Spring-loaded Check Valves:
a. Daniel
b. Crispin
c. Mission
d. Marlin
e. Muessco

3. Ball Valves:
a. Appollo Conbraco
b. Crane
c. Milwaukee
d. NIBCO
e. Jenkins
f. Stockham
g. Jamesbury

4. Butterfly Valves:
a. Centerline
b. Crane
c. NIBCO
d. Demco
e. Dezurik
f. Continental

g. Jenkins
h. Milwaukee
i. Stockham
j. Norris
k. Keystone

5. U.L., F.M. Approved or Listed Valves:
   a. Demco
   b. GEM
   c. Grinnell
   d. Kennedy
   e. Mission
   f. Mueller
   g. NIBCO
   h. Pratt
6. Stop and Drain and Drain Valves:
   a. Prier
   b. United Brass
7. Bronze Pressure-rated Valves:
   a. Crane
   b. Hammond
   c. Jenkins
   d. Lunkenheimer
   e. Milwaukee
   f. NIBCO
   g. Powell
   h. Stockham
   i. Walworth
8. Iron Body Pressure-rated Valves:
   a. Crane
   b. Jenkins
   c. Kennedy
   d. Lunkenheimer
   e. Mueller
   f. NIBCO
   g. Powell
   h. Stockham
   i. Walworth

C. Valves shall conform to the Manufacturers' Standardization Society of the Valves and Fittings Industry where standards have been established for the type valves specified.

2.4 GATE VALVES

A. 2 inches and smaller: Bronze, solid wedge disc, inserted bonnet, rising stem 125 SWP, 200 WOG.

1. Threaded ends: Milwaukee 148

2. Solder ends: Milwaukee 149

B. 2-1/2 inches and larger: Iron body, bronze trim, solid wedge disc, rising stem, O S and Y, 125 SWP, 200 WOG

1. Flanged ends: Milwaukee F-2885-M.

2.5 BUTTERFLY VALVES

A. Lug type, cast iron body, extended neck, bronze alloy disc, stainless steel shaft, cartridge style EPDM seat and seal, teflon or nylatron bearings, 200 WOG.

1. 6 inches or smaller: Infinite position lever-locking handle
2. 8 inches or larger: Worm gear actuator

B. Manufacturers:

1. Milwaukee Cl-123-E
2. Keystone 100
3. Centerline LT
4. DeZurik 660

2.6 BALL VALVES

A. 2 inches and smaller: Bronze, swing-away design, full port, chrome-plated bronze ball with teflon seats, 150 SWP, 600 WOG.

1. Threaded ends: Milwaukee BA-300
2. Solder ends: Milwaukee BA-350.

B. 2-1/2 inches and larger: One piece carbon-steel cast body, blow-out-proof stem, stainless steel lever, chrome-plated brass ball, reinforced teflon seats, adjustable packing gland, 150 SWP, flanged ends.

2.7 GLOBE VALVES

A. 2 inches and smaller:

1. Bronze regrinding plug disc, inserted bonnet, 125 SWP, 200 WOG
   a. Threaded ends: Milwaukee 502
2. Bronze, teflon disc, union bonnet, 150 SWP, 300 WOG
   a. Solder ends: Milwaukee 1590-T

B. 2-1/2 inches and larger: Iron body, bronze trim, bolted bonnet, 125 SWP, 200 WOG

1. Flanged ends: Milwaukee F-2981-M

2.8 BALANCING COCKS

A. Tight close off, adjustable memory, 150 PSIG.

1. 1-1/4 inches and smaller: Illinois series 4000
2. 1-1/2 inches through four inches: Illinois series 5000

2.9 SPRING-LOADED CHECK VALVES

A. Wafer type, cast iron body, bronze disc and seats, Monel or stainless steel springs, Buna-N seals

1. Milwaukee 1400.

2.10 SWING CHECK VALVES

A. 2 inches and smaller: Bronze, renewable bronze disc, 175 WOG.

1. Threaded ends: Milwaukee 509
2. Solder ends: Milwaukee 1509

B. 2-1/2 inches and larger: Iron body, bronze trim, 175 WOG

1. Flanged ends: Milwaukee F-2974-M

2.11 FAUCETS, HOSE BIBBS, AND HOSE END VALVES

A. Sill Faucet: Full-flow with stuffing box, 100 pound WWP, 200 degree Fahrenheit

1. Solder to hose: Hammond figure 1025
2. Female IPS to hose: Hammond figure 1030

B. Hose Bibb: Renewable composition disc, T-handle, 100 pound WWP, 200 degrees Fahrenheit.

1. Male IPS to hose: Hammond figure 2002

C. Boiler Drain: Full-flow with stuffing box, 100 pound WWP, 200 degrees Fahrenheit

1. Male IPS to hose: Hammond figure 710
2. Female IPS to hose: Hammond figure 712
3. Solder to hose: Hammond figure 711

2.12 STRAINERS

A. 2 inches and smaller: Y-type, bronze body, threaded or solder ends, removable 20 mesh stainless steel or Monel screen, 250 PSIG working pressure.

B. 2-1/2 inches and larger: Y-type, cast-iron body, flanged, removable stainless steel or brass or Monel screen, 125 PSI WSP or 200 WOG.

1. 3 inches and smaller: 3/64-inch perforations
2. 4 inches and larger: 1/8-inch perforations

C. Acceptable manufacturers:

1. Crane
2. Boylston
3. Grinnell
4. AW Cash
5. Armstrong
6. ITT
7. Sarco
8. Keckley
9. Hoffman
10. Mueller

2.13 DUPLEX BASKET STRAINERS

A. Duplex basket strainer, see drawings for size

B. Flow diversion shall be a via a plug-style divertor that isolates one chamber from the other with a 90 degree swing of the handle. Inlet and outlet shall be in line.

C. Materials:

1. Wetted parts: bronze
2. Baskets: monel, with 0.062” perforations

D. Acceptable manufacturers:

1. Mueller
2. Approved equal

2.14 UNIONS

A. 2 inches and smaller: Malleable iron, AAR type with ground joints, brass to iron seats, 250 pound

B. 2-1/2 inches and larger: Flanged, 150 pound, ground joints, brass to iron seats, slip on welding flanges

C. Dielectric unions: 150 PSI pressure rating, standard gasket rated for 210 degrees Fahrenheit, steam rated gasket for 286 degrees Fahrenheit, 54 PSI, EPCO

2.15 PRESSURE AND TEMPERATURE RELIEF VALVES

A. Bronze or iron body, bronze trim, bronze lifting gear, ASME rated.

B. Acceptable manufacturers:

1. Kunkle
2. Farris
3. Bell and Gossett
4. Watts

2.16 COMBINATION FLOW-MEASURING AND BALANCING DEVICES

A. Multi-turn globe style

B. 100 percent rated shut-off capability, tamper-proof memory device, integral pressure and temperature taps, bronze construction with sweat or threaded ends, 125 PSI, 250 degrees Fahrenheit.

C. Insulated enclosure preformed to shape of valve.

D. Acceptable manufacturers:

1. Tour and Anderson
2. Armstrong

2.17 THERMOMETERS

A. Die cast case with baked enamel finish, red-reading mercury-filled tube, 9-inch linear scale, adjustable multi-angle housing, brass separable socket equivalent to Duro 9EZ.

1. For chilled water or make-up systems: 0-100 degree Fahrenheit scale with one-degree subdivisions
2. For heating water systems: 100-250 degree Fahrenheit scale with two-degree subdivisions

B. Acceptable manufacturers:

1. Duro Instrument Corporation
2. Albert A. Weiss & Son, Inc.
3. H.O. Trerice Company
4. U.S. Gage
5. Weksler
6. Mueller
7. American Industrial

2.18 PRESSURE GAUGES

A. Phenolic turret case, 4-1/2 inch dial with suitable range, phosphorus bronze Bourdon tube, corrosion resistant movement, adjustable stainless steel pointer, 2 percent of full scale accuracy, 1/4-inch NPT brass connection.

1. Duro series 800

B. Furnish with each gauge:

1. 1/4-inch brass needle valve: Hammond IB-415
2. Pressure snubber: Ray model 1, Operating and Maintenance Specialties

C. Standard Scale

D. Acceptable manufacturers:

1. Duro Instrument Corporation
2. H.O. Trerice Company
3. Ametek, U.S. Gage Division
4. Weksler
5. Crosby
6. Dwyer
7. Ashcroft

2.19 PRESSURE AND TEMPERATURE TEST PLUGS

A. Brass combination pressure and temperature test plugs with neoprene valve covers. Suitable for vacuum to 600 PSIG and temperatures of -20 F to 300 F with cap and extension when used with insulated pipe.

1. Peterson Equipment 110
2. Universal Controls Corporation 45 PT-N

B. Acceptable manufacturers:

1. Duro Instrument Corporation
2. H.O. Trerice Company
3. Universal
4. Weksler

2.20 IDENTIFICATION

A. Pressure sensitive markers:

1. Flexible vinyl film identification markers and tape. Legend, sizes, and color in accordance with ANSI A13.1.
   a. Brady 350

B. Semi-rigid plastic identification pipe markers:

1. Legend, size, and color in accordance with ANSI A13.1. Direction-of-flow arrows included on each marker.
   a. 3/4 inch through five inches: Setmark type SNA
   b. 6 inches and larger: Setmark type STR

C. Paint: All piping in the new Plant (bare or insulated) will be painted. Provide separate submittals for paint for base pipe, and for insulation. Paint will be designed for the application, or indicate that it is suitable for the application:

1. Colors: Follow published standards for the color chosen for each piping application (HW, make up, fuel oil), etc – include the color scheme in the submittal

D. Nameplates: Three-layer laminated plastic with engraved black letters on light-color contrasting background.

3 EXECUTION

3.1 ACCESSIBILITY AND VISIBILITY

A. The interior of the new Plant will be visible to the public, and much of the equipment has been placed as shown for the purpose of making its function visible to the public. Do not relocate equipment without approval from the A/E.

1. However, should the Contractor believe that the equipment as located will not be serviceable, bring the deficiency to the notice of the A/E for resolution.

B. The same holds for the piping – the general arrangement of the piping as shown on project plan(s) was designed to illustrate its function to viewers. Do not deviate from the general arrangement without approval from the A/E.

C. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. Equipment shall include, but not be limited to, valves, traps, cleanouts, motors, controllers, and drain points. If required for better accessibility, furnish access doors for this purpose.

3.2 PIPING COORDINATION

A. All piping shown on the Project Plans is by Mechanical, unless specifically noted otherwise.

3.3 PIPING AND FITTINGS

A. Install piping as shown on drawings insofar as practical. Make minor adjustments to fit piping to conditions. Obtain approval of A/E prior to making changes.

B. Install horizontal drainage piping with straight alignment and at a uniform slope.

C. Locate piping so as not to interfere with equipment removal or maintenance.

D. Arrange piping to minimize pressure losses.

E. Provide suitable adapters at junctions of dissimilar materials and incompatible connections.

F. Keep braze joints as far as possible from threaded joints and valve seats. Heat sink piping to prevent the heat of brazing from damaging the seal of joint tapes or valve seats.

G. Install piping, valves, fittings, and flanges with a minimum clearance of 2 inches when installed in concrete trenches.

H. Unless otherwise indicated on drawings, install piping with a minimum passageway of 3 feet between piping and equipment, and a minimum vertical clearance of 9 feet 6 inches between piping and finished floor.

I. Install piping with minimum of 1½-inch clearance between pipes including insulation when installed on pipe racks. Stagger valves horizontally a minimum of 6 inches to allow for operation of valve handles and installation of other piping accessories.

J. Make screw joints with tapered threads conforming to GSA Federal Standards. Use teflon joint tape or non-toxic joint compound.

K. Make direction changes with fittings, except for underground, copper water piping. Install underground, copper water piping with sweeping bends and without crimping or joints.

L. Do not hammer or pound piping joints or equipment without specific approval of the Engineer.

M. Provide sufficient swing joints, anchors, expansion loops and devices to permit free expansion and contraction without causing undue stresses. Support piping independently at all equipment so that the piping weight is not supported by the equipment. Install piping without springing or forcing.

N. Do not cut building structure to facilitate piping installation without specific approval of the A/E.

O. Install piping to clear windows, doors, and other openings.

P. Install piping horizontal or vertical unless otherwise indicated on drawings or required for proper system functioning. Install vertical risers plumb and straight, horizontal runs parallel with partitions. Conceal piping above ceilings and within partitions when practical. Bullhead tee construction is prohibited.

Q. Seal penetrations of fire-rated assembles and surfaces with UL listed sealants. Maintain fire rating of assemblies and surfaces.

R. Paint piping and pipe supports that are exposed to weather with one coat of primer and two coats of exterior grade enamel. Color as selected by Engineer.

S. The use of wire or perforated metal strap to support piping is not permitted.

T. Make provisions to allow for piping movement at roof drains with piping offsets. Anchor drains to deck. Make provisions in piping for building movement where piping crosses building expansion joints.

U. Provide shutoff valves and unions suitably located to isolate each item of equipment, branch circuit, or section of piping.

V. Burning of holes in piping is not allowed. Provide fittings or drilled taps.

W. Provide dielectric unions at junctions of dissimilar metals in fresh water systems.

X. Unless otherwise indicated, use type material specified for overhead piping for underground locations. Where joints are permitted in underground copper piping, braze joints. Weld joints in underground iron piping. Minimize the number of joints in underground piping. Wrap insulated underground piping with Protecto Wrap 20 protective coating, install in accordance with manufacturer's recommendations.

Y. Wet taps connecting to existing iron piping over 2-1/2 inches in diameter which conveys non-flammable liquids shall be made with Weld-O-Lets providing that the intersecting pipe is at least two sizes smaller than the main. Bolted saddles will not be allowed unless indicated in drawings.

3.4 SCREWED JOINTS

A. Use threads on iron and steel pipes, fittings and couplings in accordance with ASME B31.1.

B. Produce sufficient lengths of high quality threads to insure full metal-to-metal contacts when screwed home in fittings. Countersink, ream and clean ends of pipes after threading.

C. Make up full connections with not more than 3 full threads exposed, by such method that will not subject pipes or fittings to twisting or cross strains. Lubricate male threads with thread lubricant or pipe joint tape.

D. Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.5 SOLDERED JOINTS

A. Comply with applicable provisions of ASTM B 828 or ”Copper Tube Handbook” by CDA for soldered joints.

B. Cut ends square and remove fins and burrs. Replace dents and damaged tubing with new tubing.

C. Remove grease and oil from joints by wiping with clean cloth saturated with suitable chemical solvent. Clean with emery cloth.

D. After cleaning, apply non-corrosive flux, apply heat and material and hold joint rigidly until hardened.

E. Wipe excess material from exterior of joint before hardening.

F. Before soldering, remove stems and washers of solder joint valves.

3.6 WELDED JOINTS

A. Weld 2-1/2 inch and lager steel piping. Construct joints according to AWS D10.12.

B. Bevel piping ends mechanically or by flame cutting. Where beveling is done by flame cutting, thoroughly clean surfaces of scale and oxidation just prior to welding.

C. Do not split, bend, flatten or otherwise deform piping before, during, or after installation. During erection, take care to remove dirt, scale, and other foreign matter from inside piping by use of pipe swab or pipe ”pig” before connecting sections, valves, equipment, and fittings. Where pipe temperature falls to 32 F or lower, heat pipe to approximately 100 F for distance of 1 foot each side of weld before welding, and finish weld before pipe cools to 32 F.

D. Replace defective welds at no additional cost to the Owner. Do not repair by adding weld material over defect or by peening.

3.7 FLANGED JOINTS

A. Match flanges within piping system, and at connections with valves and equipment.

B. Clean flange faces and install gaskets concentrically positioned.

C. Use suitable lubricants on bolt threads and tighten bolts to provide uniform compression of gaskets.

3.8 PIPING DRAINS

A. Install piping so that it can be easily drained.

B. Provide drain valves and drain lines from each piping low point, between two block valves, between block valves and backflow preventer discharge check valves, and from each item of equipment requiring drains.

C. Provide drain lines, connections, and valves of the same size and material of the lines to which they are connected. Install minimum size of 3/4 inch. Slope drain lines a minimum of 1/16 inch per foot.

D. Route piping to floor drain, janitor's sink or other approved location which connects to sanitary sewer.

E. Obtain approval from A/E prior to piping drains into existing drains or waste systems.

F. Plug non-operating drains. Use extra long solid bull plugs for insulated lines.

3.9 HANGERS

A. Support each pipe with a separate hanger rod. Hanger rod size and spacing as follows:

	Pipe Size Inches	**Spacing Feet**	**Hanger Rod Inches**
Steel Pipe	1/2	6	3/8

	3/4 through 1-1/4	8	3/8
	1-1/2, 2	10	3/8
	2-1/2	10	1/2
	3	12	1/2
	4	14 (12)(note 1)	5/8
	5	16 (12)(note 1)	5/8
	6	16 (12)(note 1)	3/4
	8 through 12	16 (12)(note 1)	7/8
Copper Tube	1/2 through 1-1/2	6	3/8
	2	10	3/8
	2-1/2 through 5	12	1/2
	6 and larger	14	3/4
Cast Iron	2	Note 2	3/8
	3	Note 2	1/2
	4 and 5	Note 2	5/8
	6	Note 2	3/4
Plastic Pipe			
	1/2 through 2	4	3/8
	3	4	1/2
	4, 5	4	5/8
	6	4	3/4
	8	4	7/8

1. Note 1: Steel pipe with screwed connections may not exceed 12 feet between supports for pipes larger than 3" diameter.
2. Note 2: Substantially support suspended horizontal runs of cast iron soil piping from the building structure at each pipe joint and at intervals not to exceed 5 feet on center

B. Suspend mains and branches from overhead construction with expansion type anchors or beam clamps with a minimum safety factor of 5.

C. Use hot dipped galvanized hangers in contact with steel or iron. Use copper, copper clad, or suitably lined hangers to prevent electrolysis where hanger contacts copper piping.

D. Support multiple pipe runs on trapeze hangers or with individual pipe hangers. Trapeze shall be Unistrut P-1000. Hanger rods for trapeze supports shall be one size larger than specified for the largest pipe supported by the trapeze. Determine hanger spacing based on the smallest pipe supported by the trapeze. Install additional trapeze hanger rods at mid-span of trapeze which exceed 42 inches in width.

E. Support vertical risers at each floor with steel riser clamps. Riser clamps shall be Automatic Sprinkler Corporation of America, Auto-Grip Division, Figure 230.

F. Support piping on roof using roller supports of adjustable height. Wood blocks or straps are not acceptable for pipe lengths in excess of 6 feet.

G. Provide thermal hanger shields at supports where insulation is specified to be continuous through hanger. Provide stickers or color coding indicating that the calcium silicate in the hanger shields is non-asbestos bearing. Extend insulation insert one inch beyond sheet metal shield. Use double layer shield on bearing surface if pipe hanger spacing exceeds 10 feet. Install vapor barrier mastic at

insert/insulation interface. Provide shield lengths and shield metal gauges as follows:

Pipe Size Inches	Insulation Length Inches	Minimum Gauge
1/2 through 1-1/2	6	22
2 through 4	9	20
5 through 8	9	18
10 through 14	12	16
16 through 24	18	16

H. Locate piping supports and hangers to allow for expansion, contraction, structural settlement and vibration.

I. Support piping which is located closer to the floor than it is to the ceiling on adequately constructed floor-mounted supports. Fabricate supports from steel angles or steel pipe. Anchor supports to floor with same spacing, same degree of safety, and same degree of flexibility as specified for overhead supports.

J. Substantially support soil, waste, and vent stacks at their base with either a base stack fitting and concrete base or a riser clamp resting on the floor slab. Provide structural steel cross beam where necessary for stack support.

3.10 VALVES

A. Use ball valves in lieu of gate valves 2 inches and smaller and butterfly valves 2-1/2 inches and larger in domestic water, chilled water, and low temperature heating water systems.

B. Provide valves of sizes indicated on drawings. Where size is not indicated, provide full-line size valve.

C. Provide extended handles or chain-wheel operators for valves that must be operated during normal operation and which are located more than seven feet above the floor.

D. Ball valves, butterfly valves, or eccentric valves may be used in lieu of gate valves where their pressure and temperature rating are satisfactory for the application.

E. Provide temperature control valves and balancing valves of sizes suitable for the application based on their CV rating.

F. Provide non-slam type check valves at discharge of pumps.

G. Install valves in accessible locations with sufficient clearance around hand wheels and levers to permit easy operation. Install gate valves with stems upright.

3.11 FLOW MEASURING DEVICES

A. Provide combination flow measuring and balancing devices.

B. Provide calibration charts, mount in plastic and attach with metal chain to measuring device.

3.12 INSTALLATION OF PRESSURE AND TEMPERATURE WELLS

A. Install pressure and temperature wells and taps so that they are visible and flush with the exterior of the piping insulation.

B. Provide angle taps on pressure gauges and thermometers to allow viewing from the floor.

3.13 INSTRUMENT CONNECTIONS AND PRESSURE GAUGES

A. Provide valves at each gauge to permit maintenance of each individual instrument.

B. Provide gauges on the inlet and outlet of each pump and each coil.

C. For HW and CHW systems applications, use gauges with the smallest standard gauge range which is 10 percent larger than the final balanced flow.

D. Install instruments in accordance with the manufacturer's recommendations.

3.14 STRAINERS

A. Provide strainers with a strainer area of at least two times the internal pipe area.

B. Use strainer screens and bodies which are compatible with the application.

C. Provide a 3/4 inch blowdown valve on 2-1/2 inch and larger strainers. Attach metallic tag labeled "screen" to valve handle.

D. Following systems start-up, remove strainer screens, clean screen and body, and reinstall screen.

3.15 UNIONS

A. Provide unions at each equipment connection, at each relief or control valve, at specialty items, and at locations to accommodate maintenance and to ensure safety. Locate unions between shut-off valves and equipment so as to permit removal of the equipment with minimal disturbance to the piping.

B. Isolate piping connections between ferrous and copper material with dielectric unions.

C. Unions are not required at flanged valves, flanged equipment connections, or Victaulic-type mechanical joints provided that maintenance and safety requirements are met.

3.16 IDENTIFICATION

A. Piping:

1. Identify all piping accessible for maintenance in crawl spaces, tunnels, and above ceilings, and exposed piping using stenciled markings.
2. Thoroughly clean surfaces to receive markings. Remove dirt, dust, grease, rust, and moisture. Apply markers to clean, dry surface.
3. Neatly stencil markings with no overspray, drips, runs, or other imperfections.
4. Use arrow marker for piping content legend. Point arrow away from the legend and in the direction of flow. Color and height of arrow to be same as content legend lettering. Use double-headed arrow if flow can be in either direction.
5. Identify piping adjacent to equipment within 3 inches of each valve, at each partition and floor penetration, at each change in direction greater than 45 degrees, and at intervals not exceeding 30 feet.
6. Apply markings in the most legible position. Apply markings for overhead piping on the lower half of the pipe where the view is unobstructed.
7. Identify piping that is smaller than 3/4 inch outside diameter with brass tags. Secure tags at specified legend locations.
8. Include the system working pressure or vacuum as a part of the legend for steam, condensate return, compressed air, gas, and vacuum systems.
9. Field and marking dimensions shall be as follows:

Insulation or Pipe Diameter Inches	**Length of Color Field Inches**	**Size of Letters Inches**
3/4 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
Larger than 10	32	3-1/2

B. Valves:

1. Identify all valves indicating service application.
2. Identify valves controlling branch mains or risers indicating service application and valve location number.
3. Identify valves with 1-1/2 inch diameter brass tag. Securely attach tag to valve handle with "S" hook or chain.
4. Provide valve tag chart for inclusion in O & M Manual.

C. Equipment:

1. Identify all equipment such as pumps, storage tanks, water treatment equipment, heaters, fans, and air conditioning equipment with stenciled markings indicating the equipment title and service application. Equipment titles shall be same as indicated on the drawings. Identify equipment in finished spaces with engraved plastic nameplates.
2. Identify pumps indicating service application and zone served. Small in-line pumps may be identified with brass tags secured with tie wires.

3. Identify exhaust fans, supply fans, and air-handling units indicating service application and zone served.
4. Strictly adhere to Owner's numbering system.

D. Controls and electrical equipment:

1. Identify controls, electrical equipment, and instruments with engraved plastic nameplates. Lettering shall be at least 1/4-inch high.
2. Secure nameplates with brass or stainless steel pan-head screws. Adhesive backed nameplates or pressure sensitive embossed labels are not acceptable.

E. Access doors:

1. Provide engraved plastic nameplates on access doors identifying the concealed item or equipment. Indicate equipment title, service application and zone or circuit served.
2. Obtain approval from Engineer prior to installing nameplates on access doors in finished areas.

3.17 ANCHORS

A. Powder driven anchors are not allowed in occupied structures unless coordinated with and approved by the Owner.

3.18 CLEANING AND FLUSHING CLOSED LOOP WATER CIRCULATING SYSTEMS

A. Thoroughly clean all water circulating systems before placing them in operation. Rid the system of dirt, piping compounds, mill scale, oil, and all other materials which are foreign to the water being circulated.

B. Provide sufficient cleaner to elevate the pH above 10.5. Once system is properly dosed with chemical, circulate for 24 hours and, if a heating water system, heat the system water up to 140-180 F. Following circulation, drain down and flush.

C. Fill, circulate 30 minutes and flush system until the water is clear and conductivity of system water is ± 50 mhos that of city water.

D. Once system has been properly flushed, add Nitrate based closed-system inhibitor to boost chilled water levels to 375-500 ppm as NO_2. Boost nitrite levels to 500-750 ppm in heating water systems.

3.19 PIPING SYSTEM TESTS

A. Perform tests after piping and equipment installation is complete and prior to putting systems into service. Perform tests prior to installation of insulation and with all joints, connections, valves, and accessories exposed to view.

B. Advise A/E and Owner in writing 48 hours prior to the start of testing. Tests may be observed by A/E and Owner.

C. Perform hydrostatic tests at 1-1/2 times the system operating design pressure, unless otherwise indicated.

D. Hydrostatically test all domestic water piping, condenser water piping, and chilled and heating water piping. Test at a pressure of 125 PSIG for 8 hours. At completion of the test, systems shall show no pressure loss. Test piping prior to making final connections to fixtures and equipment.

E. Do not exceed rated working pressures stamped on plastic piping.

F. Test soil, waste, vent, roof drainage, acid waste, and acid drainage systems with a minimum hydrostatic head of 10 feet.

G. Pneumatic test pressures shall not exceed 110 percent of the design pressure of the piping system.

H. Test all joints and components of pneumatic systems using a Sherlock 5-second leak detector solution, type CG concentrate. Use test solutions equal to American Gas and Chemical Leak-Tex or Nupro Snoop. Comply with manufacturer's instructions supplied with the leak detection product.

I. During tests, leave automatic control valves in the open position unless provided with a bypass which applies pressure to both sides of the valve.

J. Supply pressure to piping which contains check valves upstream of the check valve so that pressure is applied under the valve seat. Where this is not possible, remove the check device or hold it in an open position during testing.

K. If the test pressure will be different upstream from control valves than it will be down stream from control valves, perform the test with bypass valve closed, upstream block valve open, downstream block valve open, and control valve open.

L. During testing, do not exceed the permitted test pressure on vessels, exchangers, separators, strainers, or other items installed in the line and subject to test pressures. Advise the Engineer of conflicts.

M. Do not subject the following to test pressures:

1. Pumps, turbines, compressors
2. For hydrostatic tests, equipment which would be damaged by water
3. Rupture disc
4. Inlet side of relief valves
5. Instrument tubing beyond the first process block valve
6. Level controllers and level switches with floats or displacers
7. Pressure gauges, pressure sensing instruments

N. Test all piping and joints. Repair leaks and retest until satisfactory results are obtained.

O. After satisfactory completion of all testing, remove temporary blanks and blinds, drain all lines, and open valves that were closed solely for testing. After piping has been drained, complete specified insulation, cleaning, and painting.

P. Provide written certification of the satisfactory completion of the testing. Owner's representative to sign off on testing. Include document in O & M Manual.

3.20 ACCESS DOORS

A. Coordinate location of access doors not provided by this division with general contractor.

B. Access doors shall include doors required in ceilings, walls, soffits, and other locations that are provided by other divisions, but are required for access to equipment provided in Division 15.

END OF SECTION

1 GENERAL

1.1 WORK INCLUDED

A. After completion of the work of installation and testing, adjusting and balancing, commission all building systems as called for herein.

B. Contractor and all sub-contractors are required to participate in this process and provide the commissioning agent all necessary assistance including but not limited to meeting time, information, logging, other paperwork, tools and instruments required for complete commissioning.

C. There is a small amount of Test and Balalnce work required; Bidder may take this work on directly, or subcontract it out, but the responsibility for this work lies within this specification section.

1.2 REFERENCES

A. ASHRAE – Guideline 1-1996 The HVAC Commissioning Process.

1.3 QUALITY ASSURANCE

A. Agency shall be company specializing in the commissioning of systems specified in this Section with minimum five years documented experience.

1.4 SUBMITTALS

A. Submit name of commissioning agency for approval within 30 days after award of Contract.

B. Submit commissioning reports as a submittal under provisions of Section 15010.

C. Prior to commencing work, submit draft plans, logs and sign off sheets indicating commissioning needs of each system.

D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Owner and for inclusion in operating and maintenance manuals.

E. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.

2 PRODUCTS

2.1 REPORT AND MEETING CONTENT

A. Reports and Plans Forms shall include the following information:

1. Commissioning Plan:

a. List of all equipment.

b. Specific equipment and components to be commissioned.

c. Process to be followed.

d. Communication, documentation and reporting protocols.

e. Estimated schedule.

2. Commissioning Kick Off Meeting:

a. Coordinate meeting with Design Team, Contractors, Sub Contractors and Owner to discuss commissioning process and requirements.

b. Outline role and responsibilities of members.

c. Specify procedure for commissioning and record keeping.

3. Logs:

a. Keep record of all issues and findings.

4. Commissioning Meeting:

a. Hold regular meetings to remained informed and communicate commissioning needs.

5. Submittal Review:

a. Review all product submittals following design team and report on compliance with commissioning plan.

6. Construction Observation:

a. Visit site as needed and report on any items that may effect proper commissioning of systems.

7. Construction Check List and Start Up

a. Provide contractor with required checklists and start up forms.

b. Review complete forms for compliance with commissioning plan.

8. Training and Operation Records

a. Review O&M Manuals and attend training to assure that all meet with requirements of commissioning plan.

9. Systems Manual

a. Compile design records, space and use descriptions, schematics of systems, control sequences and all other pertinent data.

b. Include required seasonal testing and re-commissioning schedules.

10. Commissioning Report

a. Compile data from all meeting, plans, logs, tests and repots into a final complete report.

3 EXECUTION

3.1 TEST AND BALANCE WORK

A. Bidder shall set the balancing devices on all constant volume pump outlets to achive the design flow.

B. Pumps shall be balanced one at a time only, not while both are operating.

3.2 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the contractors clearly understand their responsibilities

B. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for commissioning or coordinate with other trades and contractor for necessary instruments.

3.4 INCLUDED SYSTEMS

A. Systems to be included in commissioning are:

1. HVAC systems and associated controls.

2. Boilers and associated controls.

3. Pump systems and associated controls.

B. Written Work Products

1. Work products to include:

a. Commissioning Plan.

b. Commissioning Schedule.

c. Minutes from all commissioning meetings.

d. Commissioning progress reports.

e. Report of all site visits.

f. Reports of submittal reviews.

g. Construction checklists blank and completed.

h. Report on training and O&M Manuals.

i. Systems Manual.

j. Commissioning Report.

END OF SECTION

RL1600 Weigh Module

LIGHT TO MEDIUM CAPACITY MOUNT ASSEMBLY

Stainless Mount shown with RL75016 WHE load cell

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RL1600 LIGHT TO MEDIUM CAPACITY MOUNT ASSEMBLY

The RL1600 Series Weigh Module is ideally suited for a variety of applications including batching, mixing, blending, general weighing and inventory control.

Available in cast iron, mild steel, and stainless steel construction, the RL1600 series weigh modules provide accuracy, consistency, and durability in capacities ranging from 1000 lb to 75,000 lb per module.

For a complete solution, kits are available including load cells, mounting assemblies, cable, and junction box. Choose from various analog junction boxes or iQUBE®—an intelligent, non-proprietary digital diagnostic junction box. iQUBE provides simplified calibration, diagnostics, numerous connectivity solutions and enhanced electrical overload protection.

Standard Features:

- *Cast iron construction—capacities per assembly: 1000 lb-25,000 lb*
- *Mild steel and stainless steel construction—capacities per assembly: 1000 lb-75,000 lb*
- *Low-profile bolt-in-place design minimizes installation time*
- *Self-checking movement allows for thermal expansion/contraction and lift-off protection, eliminating external hardware*

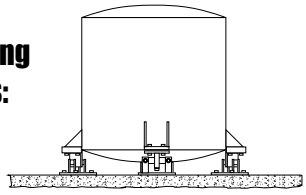
FM APPROVED LOAD CELLS

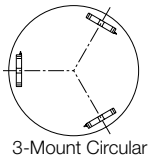
INTEGRATES WITH iQUBE®

Options:

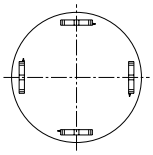
- *RL75016 tool steel or RL75016SS stainless steel environmentally-protected load cell*
- *RL75016 WHE stainless steel, hermetically-sealed load cells*
- *Vishay Sensortronics 65016 tool steel or 65016W stainless steel load cells*
- *iQUBE digital diagnostic junction box*

Typical Mounting Configurations:

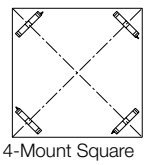




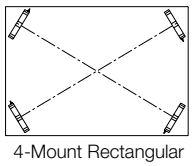
3-Mount Circular



4-Mount Circular



4-Mount Square

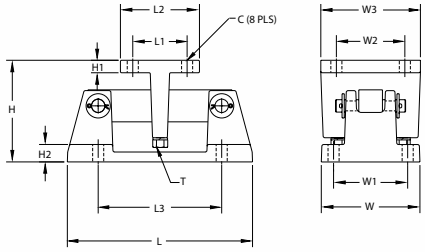


4-Mount Rectangular

Vertical & Horizontal Vessel Arrangements

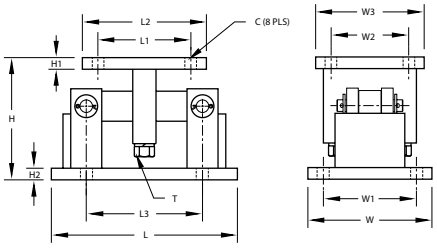
Capacities/Dimensions:

Cast Iron Construction—capacities per assembly: 1000 lb, 1500 lb, 2000 lb, 2500 lb, 3000 lb, 5000 lb, 10,000 lb, 15,000 lb, 20,000 lb, 25,000 lb



Fabricated Mild Steel Construction—capacities per assembly: 1000 lb, 1500 lb, 2000 lb, 2500 lb, 3000 lb, 5000 lb, 10,000 lb, 15,000 lb, 20,000 lb, 25,000 lb, 50,000 lb, 75,000 lb

Stainless Steel Construction—capacities per assembly: 1000 lb, 1500 lb, 2000 lb, 2500 lb, 5000 lb, 10,000 lb, 15,000 lb, 20,000 lb, 25,000 lb, 50,000 lb, 75,000 lb



Dimensions Inches (mm)	1000 lb-5000 lb* (454 kg-2268 kg)	10,000 lb-25,000 lb (4536 kg-11,340 kg)	50,000 lb-75,000 lb† (22,680 kg-34,020 kg)
C	.56 (15.8)	.78 (19.8)	.78 (19.8)
H	5.00 (127.0)	7.89 (199.9)	9.31 (236.5)
H1	.50 (12.7)	.75 (19.1)	1.00 (25.4)
H2	.50 (12.7)	.75 19.1)	1.00 (25.4)
L	9.25 (235.0)	12.00 (304.8)	16.25 (412.8)
L1	2.75 (69.9)	6.00 (152.4)	6.50 (165.1)
L2	4.00 (101.6)	8.00 (203.2)	9.00 (228.6)
L3	6.25 (158.8)	7.50 (190.5)	11.50 (292.1)
T	1/2-13 UNC	3/4-10 UNC	11/4-7 UNC
W	5.00 (127.0)	8.00 (203.2)	12.00 (304.8)
W1	3.75 (95.3)	6.00 (152.4)	9.50 (241.3)
W2	2.75 (69.9)	6.00 (152.4)	6.50 (165.1)
W3	4.00 (101.6)	8.00 (203.2)	9.00 (228.6)

** Stainless steel load cell not available in the 3000 lb capacity.*
† Fabricated mild steel and stainless steel construction only.

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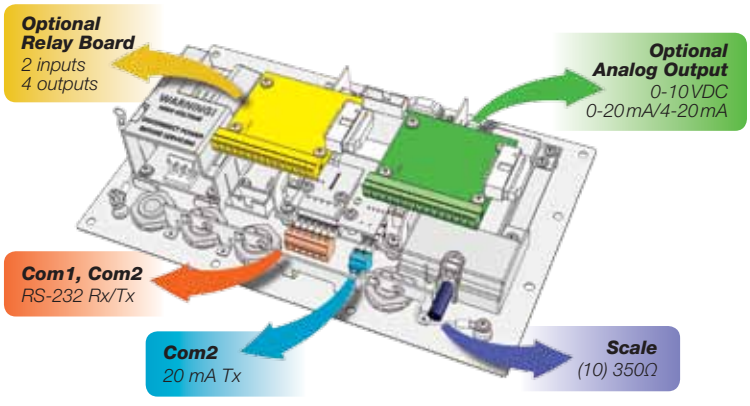
Advance to Rice Lake's Legend Series—classic Rice Lake quality and design with new ideas for tomorrow. As the flagship of Rice Lake's Legend Series, the 480 digital weight indicator has been perfected to provide the very best in performance and value.

With its stainless steel enclosure and advanced gasket system, the industrial-strength 480 is built for dirty, wet environments and demanding workplaces, inside or out. Advanced circuitry also withstands electrical noise, power disturbances and transient spikes that are common to industrial applications.

Rice Lake's 480 is the industry's first choice for readability. With its large, ultra-bright LED display, 0.8 inch digits and sharp contrast, the 480 provides superior display visibility. Its six-button tactile keypad allows for quick navigation and programming.

Connect the 480 to a printer, PC or remote display and make use of configurable print formats, time and date function, and local/remote capability. Whether it's used in heavy capacity or batching operations, the 480 powers as many as ten 350 ohm load cells in parallel. Engineered with Rice Lake's advanced digital filtering, the 480 Legend Series promises top speed without sacrificing weight stability.



Standard Features

- Large .8 inch LED display
- Nema 4X/IP66 stainless steel washdown
- Operator functions through Menu key for audit trail, tare, unit ID, accumulator, time and date, setpoints, serial communications, and print formats
- Time and date, battery backed
- 8 setpoints, free running or latched
- Password protection for user and configuration changes
- Two independent serial ports, RS-232 and 20mA
- Programmable ticket formats for gross, net, accumulator, and setpoints
- Local/remote operation
- Hardware or audit trail sealed
- Filter settings for light, medium and heavy noise
- Selectable conversion rate and display update rate

Options

- Analog output, 0-10VDC, 0-20mA, selection for 20% offset
- Relay output, 2 digital inputs, 4 dry contact relays

Specifications

Power:	70mA @ 115VAC, 35mA @ 230VAC
Excitation Voltage:	5VDC, 10 x 350Ω
Input Range:	7mV/V
Sensitivity:	0.1uV/graduation minimum 0.5uV/graduation approved
Resolution:	Internal: 523,000 graduations Display: 100,000 displayed graduations
Measurement Rate:	Selectable 5, 10, 20 and 40Hz
System Linearity:	Within 0.01% of full scale
Circuit Protection:	18KV, 10V/meter
Serial Output:	Com 1: RS-232 Full Duplex Com 2: RS-232 Full Duplex or 20 mA Simplex
Display:	0.8in (20.3mm) LED 6 digit
Status Annunciators:	Gross, Net, Center of Zero, Standstill, lb, kg, Tare, Preset Tare
Keyboard:	Flat membrane panel, embossed keys, tactile feel
Analog Output Option:	16-bit resolution, voltage output 0-10VDC, current output 0-20mA
Digital Inputs:	Two inputs (requires relay output option). Primary keys, Pseudo functions, Batching functions.
Relay Board Option:	(2) opto-isolated inputs up to 24VDC (4) 30VDC, 2 Amp Dry Contract Relays
Temperature Range:	Legal for Trade: 14°F to 104°F/-10°C to +40°C
Rating/Material:	NEMA 4X/IP66
Warranty:	Two-year limited warranty
Dimensions:	9.5in x 6in x 2.75in (241.3mm x 152.4mm x 69.9mm)

Approvals

NTEP
CC Number 12-123
Accuracy Class III/IIIL n_{max}: 10,000

OIML
R76/2006-NL1-12.48
European Test Certificate TC8322
European EC Type-Approval T5692
Accuracy Class III n_{max}: 10,000

Measurement Canada Approved
AM-5892
Accuracy Class III/IIIHD n_{max}: 10,000

CE

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