

PUMP HOUSE #5 RENOVATION

PROJECT NO. 54 1019 1763

SALT LAKE CITY DEPARTMENT OF AIRPORTS

**Engineering Division
P. O. Box 145550
Salt Lake City, Utah 84114-5550**

ADDENDUM NO. 1

January 24, 2022

All Contractors submitting bids on the project referenced above shall be governed by the following addendum changes and/or clarifications and the work designated herein shall be part of and included in the contract and contract documents.

The Contractors shall acknowledge receipt of the addendum by indicating so in the space provided in Section 2 of the bid form.

This addendum consists of (39) thirty nine pages including this page.

J. Scott Martin

**Scott Martin, AIA
Facilities Engineering Manager**

ADDENDUM NO. 1

SLCIA Pump House #5 Remodel

CEA PROJECT NO. 2019-145.00

Date: 01/24/2022

All contractors submitting proposals for this project shall be governed by the following addendum, changes, and explanations to the bidding documents. Bids shall be submitted in accordance with the following:

Item No.	Add, Delete or Clarify	Specification Section or Drawing No.	Reference / Description:
1.	Add	230529 2.5 & 2.6	Clarification on utility gate valve and swing check valve requirements.
2.	Delete	2321233 2.1	Removed Bell & Gossett, Taco, Weinman, Grundfos, Paco, Flo Fab, from approved bidders for vertical turbine pump.
3.	Delete	EX601	Delete type C fixture from the plans, originally intended for inside the new manhole vault, the fixture was changed to type A.
4.	Change	ES100	Change circuit A-31, to A-27,29 to match the panel schedule A on sheet EX601

Prior Approval to Bid

5. Note that Alternates will not be accepted for the main pump.
6. Note that Alternates will not be accepted for the VFD's.
7. No other request for prior approvals were accepted during the bid window.

Questions from Contractor

8. See attached bid questions 1 through 5 with official answers.

Modified Specifications Sections

9. See attached modified spec section 230529, major modifications were made to answer question 5 16 inch check valve as submitted by the bidders.
10. See attached modified spec section 232123 HVAC Pumps, major modification was deleting approved manufacturers to source Fairbanks Morse as the only approved pump as indicated at the prebid walk.

END OF NARRATIVE ADDENDUM NO. 1

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME: Crescent Construction		
NAME (PLEASE PRINT): Dakota Nielson	TITLE: Chief Estimator	DATE: 1/19/2022
ADDRESS: 45 E. Center St. STE 2 North Salt Lake, UT 84054		
PHONE NO.: 385-235-5081	FACSIMILE NO.: N/A	E-MAIL ADDRESS: dakota@crescentbuilding.com
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:		
REFERENCE DRAWINGS:	Drawing 22	
OTHER REFERENCE:		
STATE QUESTION:	<p>Drawing 22 has the luminaire schedule, this schedule shows a fixture type C. We are unable to locate where this fixture is being installed and how many.</p> <p>Can you tell us where this fixture will be installed and how many?</p>	
SLCDA RESPONSE:	<p>Delete fixture type C from the schedule, it was originally intended to go inside the new manhole vault but we changed that fixture to vaportight 4 foot type A.</p> <p>by CEA - addendum 1</p>	

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME: Crescent Construction		
NAME (PLEASE PRINT): Dakota Nielson	TITLE: Chief Estimator	DATE: 1/19/2022
ADDRESS: 45 E. Center St. STE 2 North Salt Lake, UT 84054		
PHONE NO.: 385-235-5081	FACSIMILE NO.: N/A	E-MAIL ADDRESS: dakota@crescentbuilding.com
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:	N/A	
REFERENCE DRAWINGS:	N/A	
OTHER REFERENCE:		
STATE QUESTION:	<p>During the Prebid Walk we were taken to the south side of the airport to look at some conduits that need to be extended to a building.</p> <p>Will there be prints coming out for this portion of work to clarify the conduit sizes, wiring required, and any other unforeseen items?</p>	
SLCDA RESPONSE:	<p>No new work for division 26 is expected at the outflow near the Canal. The contractor shall demolish the flow meter, but leave the unistrut rack, solar panel, and control panel in place for future potential use. Flow monitoring will be accomplished at the main pumphouse 5 building.</p> <p>by CEA - addendum 1</p>	

SALT LAKE CITY DEPARTMENT OF AIRPORTS CONTRACTOR PRE-BID QUESTION FORM

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME: Crescent Construction		
NAME (PLEASE PRINT): Dakota Nielson	TITLE: Chief Estimator	DATE: 1/19/2022
ADDRESS: 45 E. Center St. STE 2 North Salt Lake, UT 84054		
PHONE NO.: 385-235-5081	FACSIMILE NO.: N/A	E-MAIL ADDRESS: dakota@crescentbuilding.com
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:	N/A	
REFERENCE DRAWINGS:	N/A	
OTHER REFERENCE:		
STATE QUESTION:	<p>During the Prebid Walk it was discussed that we are not able to turn power off to the building. In order for new electrical to be installed we would need to turn power off to the building remove the old and install the new.</p> <p>If the intention is for the contractor to install a temporary generator with temporary wiring to maintain the building operations, we would need the airport to specify what loads (number of pumps, pump horsepower, voltage, amperage) need to remain in service.</p> <p>Can we get more clarification to this Prebid discussion?</p>	
SLCDA RESPONSE:	<p>The contractor is required to maintain pump flow at all times, for possible storm events, during the duration of the contract. The main prime contractor shall coordinate all requirements with their subs, including powering up temporary bypass pumps and the remote pump station fed from this building. For the main electrical outages, we are expecting an RMP transformer and meter outage, a switchboard replacement outage, and a small panel outage, all of which affect the building pumps and remote pumping station. If provisions are made to provide temporary pumping with generators and/or diesel pumps, then coordination of these main three power outages at similar times <u>when the contractor has temporary provisions for the pumps could be done.</u></p>	

subject to delivery of equipment, and coordination with the power company, at the discretion of the contractor. If timing does not line up, then the contractor shall provide temporary power for a minimum of two building pumps, the remote pumphouse, and control power as necessary during any extended outage that exceeds 30 minutes. Also coordinate with airport communications that feed from this site for an outage on comm. The remote pump site is fed with a 30 amp circuit as shown on the plans.

The OFCI generator may not be used for temporary power provisions because installation and testing may not be done in the initial stages of construction due to lack of equipment delivery such as transfer switches.

cc: File

The contractor shall provide all required temporary trailer gen sets, setup, fuel, and wiring, and monitor the gen sets and temporary pumps to ensure operation at a minimum of every 4 hours.

by CEA - addendum number 1

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME: Crescent Construction		
NAME (PLEASE PRINT): Dakota Nielson	TITLE: Chief Estimator	DATE: 1/19/2022
ADDRESS: 45 E. Center St. STE 2 North Salt Lake, UT 84054		
PHONE NO.: 385-235-5081	FACSIMILE NO.: N/A	E-MAIL ADDRESS: dakota@crescentbuilding.com
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:		
REFERENCE DRAWINGS:	Drawing 22 and Drawing 26	
OTHER REFERENCE:		
STATE QUESTION:	<p>Drawing 22 shows new piping to what appears to be a new meter vault building. This drawing specifies conduits only no wiring.</p> <p>Drawing 26 the one-line drawing does not show this meter vault building, conduits or wiring.</p> <p>Are we to assume that we are installing pipe only and the Airport will be installing the wire and terminations?</p>	
SLCDA RESPONSE:	<p>The electrical contractor shall pull branch circuit wires to panel A, as indicated on the site plan ES100 and on panel schedule circuit A-29, for light and receptacle, and to SMP-1 pull wiring to circuit A-27. Change circuit A-31 on site plan to circuit A-27,29.</p> <p>The controls contractor shall pull controls wires to metering through 1 inch conduit provided by electrical contractor.</p>	

by CEA - addenda 1

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME: Crescent Construction		
NAME (PLEASE PRINT): Dakota Nielson	TITLE: Chief Estimator	DATE: 1/19/2022
ADDRESS: 45 E. Center St. STE 2 North Salt Lake, UT 84054		
PHONE NO.: 385-235-5081	FACSIMILE NO.: N/A	E-MAIL ADDRESS: dakota@crescentbuilding.com
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:		
REFERENCE DRAWINGS:		
OTHER REFERENCE:		
STATE QUESTION:	The specifications do not address the 16" check valve or the gates. Can this information be provided? This information was requested by a mechanical equipment supplier.	
SLCDA RESPONSE:	Spec section 230529 has been updated. Paragraphs 2.5 and 2.6 have been added to provide guidance on 16" swing check and gate valves. by CEA Addendum Number 1	

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME:		
NAME (PLEASE PRINT):	TITLE:	DATE: 1/24/2022
ADDRESS:		
PHONE NO.:	FACSIMILE NO.:	E-MAIL ADDRESS:
	N/A	
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:		
REFERENCE DRAWINGS:		
OTHER REFERENCE:		
STATE QUESTION:	Estimated Cost:	
SLCDA RESPONSE:	Estimated project cost: \$850,000 by CEA Addendum Number 1	

**SALT LAKE CITY DEPARTMENT OF AIRPORTS
CONTRACTOR PRE-BID QUESTION FORM**

Instructions: All questions pertaining to the bid shall be submitted in writing to the attention of Catherine Hilden at catherine.hilden@slcgov.com. This form is being provided to you for your convenience for submitting your questions. Additional sheets may be attached to this form if needed. The deadline for receiving all questions concerning the bid is **1:00 p.m. local time, Thursday, January 20, 2022** in order for an addendum containing all questions and answers to be prepared and sent to all plan holders.

COMPANY NAME:		
NAME (PLEASE PRINT):	TITLE:	DATE: 1/24/2022
ADDRESS:		
PHONE NO.:	FACSIMILE NO.:	E-MAIL ADDRESS:
	N/A	
BID OR CONTRACT PACKAGE:	Pump House 5 Renovations Project No. 54 1019 1763	
REFERENCE DOCUMENTS:		
REFERENCE DRAWINGS:		
OTHER REFERENCE:		
STATE QUESTION:	When are the existing pumps allowed to be shutdown?	
SLCDA RESPONSE:	The shutdown of the existing pumps has to be minimized. The contractors have to coordinate with the new pump delivery schedule and work with SLCDA staff (refer to General Note, A on sheet GC002). by CEA Addendum Number 1	

SECTION 230529 - BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED WORK

- A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.
- B. Work furnished but not installed by this Contractor:
 - 1. Access doors in accordance with paragraph 2.3 in this Section 230529.

1.2 SYSTEM DESCRIPTION

- A. The work includes, but is not limited to the following:

Materials and methods common to the work in general of Division 23 and other Divisions and Sections of the Specifications where referenced.

1.3 QUALITY ASSURANCE

- A. Welder Qualifications: Welding shall be performed by an ASME Certified welder with current certificate in accordance with ANSI B31.1 for shop and project site welding of piping work. Welder Qualifications:
 - 1. Each welder shall have passed a qualification test within the past 6 months.
 - 2. The test shall be in accordance with the ASME Boiler and Pressure Vessel Code, Section IX, "Welding Qualifications", ASME Section VIII, and ANSI 313.
 - 3. The test report shall certify that the welder is qualified to weld the material to be used at the job site.
 - 4. The Contractor shall submit three copies of each welder's qualification test report to the Project Manager for approval prior to commencing the work. No welder shall be used on the project until so certified.

1.4 REFERENCES

- A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:
 - 1. For electrical equipment and products, comply with applicable National Electrical Manufacturers Association (NEMA) Standards, and refer to NEMA Standards for definitions of terminology herein.
 - 2. Comply with National Electrical Code (NEC) NFPA-70 for electrical installation requirements.
 - 3. Certified Pipe Welding Bureau (NCPWB) and American National Standards Institute (ANSI) Code Numbers B31.2, & B31.9 as applicable for welding requirements.
 - 4. Comply with American National Standards Institute (ANSI A13) for identification of piping systems.

5. Comply with American National Standards Institute (ANSI B31.1) Code for Pressure Piping.

1.5 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings and Product Data for the following items in accordance with the General Conditions of the Contract:
 1. Legend and color of piping and equipment identification.
 2. Proposed access door sizes and locations
- B. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items in accordance with Operating and Maintenance Data Paragraph in Section 230500.
 1. Motors.
 2. Starters.
- C. Certificates: Before proceeding with the Work, submit to the Architect/Construction Manager/General Contractor, two copies of Certification that the welding work will be done according to ANSI B31.1 by welders who have been tested and whose qualification test sheets are available, attesting to their ability to weld in accordance with the Standard Procedure Specifications as established by the National Certified Pipe Welding Bureau.

PART 2 - PRODUCTS

2.1 MOTORS

- A. General: Furnish motors necessary to operate mechanical equipment.
- B. Motor Characteristics: Comply with the following requirements:
 1. Variable Speed Drive Compatibility: All motors which are powered through a variable frequency drive shall conform to NEMA MG-1, Part 31 for inverter duty and shall be capable of continuous operation at 20% of nominal speed and shall meet the requirements of the Variable Frequency Drive specification in Section 230810 or Division 26 as applicable.
 2. Altitude Deration: Motors to be furnished to maintain specified rated service factor at altitude of project.
 3. NEMA Temperature Rating: Rated for 40 deg.C environment for continuous duty at full load, Class B motor temperature rise. Motors for use with variable frequency drives shall be Class F insulated.
 4. Starting Capability: Provide each motor capable of making starts as frequently as indicated by the automatic control system.
 5. Phases and Current Characteristics: Provide squirrel-cage induction polyphase motors for 3/4 horsepower and larger, and provide capacitor-start single-phase motors for 1/2 horsepower and smaller. One-sixth horsepower and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division 26 and with individual equipment requirements specified in other Sections of Division 23. Provide two separate windings on polyphase two speed motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

6. Power Factor: All motors rated greater than 1000 watts shall have a Power Factor of not less than 95% under rated load conditions. The 95% PF may be obtained by design of the motor or by providing a capacitor. Capacitors, if provided to obtain the 95% PF, must be switched with the motor. If the motor draws less than 1000 watts at full load, it is excluded from the 95% power factor requirement.
7. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors. Motors shall be selected such that the brake horsepower requirement is not within the service factor at design load.
8. Efficiency: All motors shall be premium efficiency type in accordance with the current State Energy Code, except where a higher efficiency is noted on drawings.
9. Motor Construction: Provide Design "B" motors for general purpose continuous duty and Design "C" motors where required for high starting torque such as the low speed motor on fans with a two-motor drive arrangement. Small motors that are part of packaged equipment may be manufacturer's standard motors meeting Energy Code requirements for efficiency.
 - a. Bearings: Ball or roller bearings with inner and outer shaft seals: regreasable; except permanently sealed where motor is normally inaccessible for regular maintenance. Where belt drives and other drives produce lateral or axial thrust in the motor, provide bearings designed to resist the thrust loading. Refer to individual sections of Division 23 for fractional horsepower light-duty motorized equipment where sleeve-type bearings are permitted.
 - b. Enclosure Type: Except as otherwise indicated, provide open drip-proof motors for indoor use where satisfactorily housed during operation, and provide guarded drip-proof motors where exposed to contact by employees or building occupants. Provide weather-protected Type I for outdoor use, Type II where not housed. Refer to individual Sections of Division 23 for other enclosure requirements.
 - c. Overload Protection: Provide built-in thermal overload protection for each leg of each phase and, where indicated, provide internal sensing device suitable for signaling and stopping the motor at the starter. Thermal overload protectors shall be sized to accommodate the altitude of installation.
 - d. Name Plate: Provide metal nameplate on each motor, indicating full identification of manufacturer, ratings, characteristics, construction, NEMA efficiency, power factor, special features and similar information.
 - e. Motor Connections: Provide conduit connection boxes.
 - f. Motors shall not exceed 80dbA rating when running their full speed and power range.

2.2 STARTERS

- C. General: Furnish starters and contactors necessary to operate mechanical equipment motors. **Starter manufacturer shall be the same brand for ALL motors furnished under Division 23.**

- D. Motor Starter Characteristics: Comply with NEMA standards and NEC. Furnish Type I general purpose enclosures with padlock ears, and with frames and supports for mounting on wall, floor or panel as required. Furnish the type and size of starter recommended by the motor manufacturer and equipment manufacturer for the applicable protection and start-up condition; refer to individual equipment sections for basic load requirements. All starters shall be by the same manufacturer. Only manufacturers approved by Division 26 will be accepted. All starters shall comply with Division 26 requirements.
- E. Manual Control:
 - 1. Furnish maintained-contact push buttons and pilot lights, properly arranged for single-speed or multi-speed operation as indicated.
 - 2. Furnish manual switch and pilot light for motors 1/3 horsepower and smaller, except where interlock or automatic operation is indicated.
- F. Automatic Control:
 - 1. Furnish magnetic starters for motors 1/2 horsepower and larger and for smaller motors where interlock or automatic operation is indicated. Include the following:
 - a. Maximum number of auxiliary contacts available: three or more.
 - b. "Hand-Off-Automatic" switches in starter cover.
 - c. Interlocks, pneumatic switches and similar devices as required for coordination with the control requirement specified in Section 230900-Electronic Controls.
 - d. Built-in 120 volt control circuit transformer, fused from line side, where service exceeds 240 volts.
 - 1) Control circuit conductors to be protected in accord with the National Electrical Code.
 - e. Trip-free thermal overload relays, each phase.
 - f. Externally operated manual reset except on refrigeration compressors which shall have automatic reset. Automatic reset shall be limited to three attempts. If motor fails to start after three attempts, manual reset shall be required.
 - g. Undervoltage release or protection.
 - h. Phase failure/phase reversal protection on all legs.
- G. Weather Protection: Provide weather-proof mounting of magnetic starters for equipment outside of the building.

2.3 ACCESS DOORS

- A. Furnish steel access doors, minimum size required for normal service use or as sized on drawings as manufactured by Inryco/Milcor, where shown on mechanical or architectural drawings, and where required for access to valves, shock absorbers, dampers, mechanical equipment or appurtenances.
- B. Standard Doors:
 - 1. Frames: 16 ga. steel.
 - 2. Panels: 14 ga. steel.

3. Finish: Chemically bonded prime coat of baked enamel.
4. Hinge: Concealed spring hinges openable to 175 degree; removable pins. Provide number of hinges as recommended by manufacturer for size of door.
5. Locking Devices: Flush steel, screwdriver operated, cam type locks. All access doors below 8'-0" in public areas shall be key-operated cylinder lock with two keys. Same key shall open all access doors.
6. Style of doors shall be appropriate for architectural finish at door location. Furnish masonry anchors where required.

C. Fire Rated Doors:

1. Frames: 16 ga. steel.
2. Panels: Sandwich type, 20 ga. steel sheets, manufacturer's standard insulated core.
3. Finish: Chemically bonded prime coat of baked enamel.
4. Hinge: Continuous type, steel with stainless steel pin.
5. Closer: Automatic closing mechanism.
6. Locking Devices: Self-latching, key-operated cylinder lock with two keys; interior, latch release mechanism.
7. Style of doors shall be appropriate for architectural finish at door location.
8. Fire rated doors shall have components and assemblies meeting requirements of the American Insurance Association, Factory Mutual Insurance Association and listed by Underwriters Laboratories, Inc.

- D. Exact location of access doors shall be as directed by Mechanical Contractor and approved by the Architect. Coordinate with General Contractor and Architect.

2.4 VALVES

H. General:

1. Provide valves as specified herein and as indicated on the Drawings complete with accessories and attachments as required and appropriate for the pressure/temperature of system.
2. Supply valves for proper pressure ratings determined by the system working pressures at point of use and of proper types for systems and functions indicated.
3. Steam and Condensate System Isolation Valves: Use steam rated ball valves on pipe sizes 2" and smaller. Use gate valves on pipes larger than 2". Use globe valves on manual bypass lines.
4. Provide like type valves of one manufacturer only unless specified otherwise.
5. Plainly and permanently mark valves with manufacturer's name or trademark, pressure rating, both Cold Working Pressure (CWP) and Steam Working Pressure (SWP), as applicable and flow direction when required to prevent improper installation.
6. Mark valves requiring approval by Underwriter's Laboratories (UL) or Factory Mutual Engineering Division (FM) with appropriate markings cast into the valve body.
7. Provide extended necks as appropriate for insulation.

I. Manufacturers:

1. The following manufacturers are acceptable providing the product to be considered is equivalent in every respect to the nomenclature provided by the specified make and model.
 - a. Bronze Valves: Powell, Milwaukee, Crane, Hammond, Nibco.
 - b. Iron Body Valves: Powell, Milwaukee, Traverse City, Kennedy, Iowa, American, Nibco.
 - c. U.L., F.M. Approved or Listed Valves: Nibco, Demco, Pratt, Kennedy, Mission, Milwaukee, Hammond.
 - d. Ball Valves: Hammond, Watts, Jamesbury, Worcester, Milwaukee, Apollo, Powell, Dynaquip, Nibco, Spirax Sarco, FNW.
 - e. Butterfly Valves: Milwaukee, Hammond, Centerline, DeZurik, Fisher, Victaulic, Keystone, Posi-Seal, TEC, Flowseal, Nibco, IFC, FNW, Bray, EBRO.
 - f. Lubricated Plug Valves: Homestead, Nordstrom, Powell.
 - g. Non-Lubricated Eccentric Plug Valves: DeZurik.
 - h. Stop and Drain and Drain Valves: Milwaukee, Hammond, Prier, Nibco or United Brass.
 - i. Gas Cock: Peter Healy or Crane.
 - j. Check Valves: Nibco, IFC, DFT, Crane.

J. Valve Schedule:

1. Standard Bronze Valves - 150 SWP/300 CWP, per ASTM B61/B62. No brass materials will be accepted.
 - a. Check, Gate, and globe with union bonnet and rising stem.
 - b. Sizes 1/8 through 2 inches.
 - c. Schedule:

Plan Code:	G.V.	GL.V.	C.V. *	L.C.V. *
Valve Type:	Gate	Globe	Swing	Lift
Make:	Nibco	Nibco	Nibco	CRANE
Straight Threaded:	T-134	T-235Y	T-433Y	366E
Straight Soldered:	S-134	S-235Y	S-433Y	--
Angle Threaded:	--	T-335Y	--	--
Angle Soldered:	--	--	--	--

* Pressure drop across check valves shall not exceed 1 psi at design flow.

2. Standard Bronze Valves - 300 SWP/600 CWP, per ASTM B61/B62, no brass materials will be accepted.
 - a. Gate, globe and check.
 - b. Sizes 1/8 through 2 inches.

c. Schedule:

Plan Code	G.V.	GL.V.	C.V. *	L.C.V. *
Valve Type:	Gate	Globe	Swing	Lift
Make:	Nibco	Nibco	Nibco	Crane
Straight Threaded:	T-174-A	T-275-Y	T-473-Y	
Straight Soldered:	--	--	--	366E
Angle Threaded:	--	T-375-Y	--	--
Angle Soldered:	--	--	--	--

* Pressure drop across check valves shall not exceed 1 psi at design flow.

3. Standard Iron Body Valves - 125 SWP/200 CWP.

- a. Gate, globe and check.
- b. Sizes 2-1/2 through 12 inches.
- c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V. *	W.C.V. *	N.S.C.V. *
Valve Type:	Gate	Gate	Globe	Swing	Weighted	Non Slam
Make:	Nibco	Nibco	Nibco	Nibco	Nibco	CRANE
Straight Threaded:	T-619	T-617-0	--	T-918-B	--	--
Straight Flanged:	F-619	F-617-0	F-718B	F-918-B	F-918BLW	223
Angle Threaded:	----	----	--		----	----
Angle Threaded:	----	----	F-818B	----	----	----

* Pressure drop across check valves shall not exceed 1 psi at design flow.

4. Standard Iron Body Valves - 150 SWP/300 CWP.

- a. Gate, globe and check.
- b. Sizes 2 through 12 inches.
- c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V.	N.S.C.V.
Valve Type:	Gate	Gate	Globe	Swing *	Non Slam *
Make:	Nibco	Nibco	Nibco	Nibco	Crane
Straight Threaded:	--	--	--	--	--
Straight Flanged:	F-669	F-667-0	F-768B	F-968B	223
Angle Threaded:	--	--	--	--	--
Angle Flanged:	--	--	F-868B	--	

* Pressure drop across check valves shall not exceed 1 psi at design flow.

5. Standard Iron Body Valves - 250 SWP/500 CWP.

- a. Gate, globe and check.
- b. Sizes 2 through 12 inches.

c. Schedule:

Plan Code:	G.V.	OS&Y	GL.V.	C.V.	N.S.C.V.
Valve Type:	Gate	Gate	Globe	Swing *	Non Slam *
Make:	Nibco	Nibco	Nibco	Nibco	Crane
Straight Threaded:	--	--	--	--	--
Straight Flanged:	F-669	F-667-0	F-768B	F-968B	223
Angle Threaded:	--	--	--	--	--
Angle Flanged:	--	--	F-868B	--	--

* Pressure drop across check valves shall not exceed 1 psi at design flow.

6. UL and FM Approved Valves.

- a. Gate, check and butterfly.
- b. Sizes all.
- c. Schedule:

Plan Code:	OS&Y	C.V.	W.V.C.	BF.V	D.V.
Valve Type:	Gate	Swing	Wafer	BTFY	Drain
Make:	Nibco	Nibco	Nibco	Demco	Nibco
Straight Threaded:	T-104-0	T-413W	--	--	T-211Y
Straight Flanged:	F-607-0	F-908-W	--	--	--
Wafer:	--	--	KW-900-W	NE-H	--

7. UL and FM Approved Valves - 175 Pound Water.

- a. Post indicator with indicator post.
- b. Sizes 4 through 12 inches.
- c. Schedule:

Plan Code:	P.I.V.	P.I.V.B.F.
Valve Type:	Gate	BTFY
Make:	Nibco	Demco
Straight Flanged:	F-609	NE-H (Wafer)
Mechanical Joint:	M-609	--
Indicator Post Vertical:	NIP-1	Stem extension and gear operator with post indicator U.L. Listed only.
Indicator Post through Wall:	NIP-2	--

8. Underground Valves - 175 Pound Water, American Water Works Association (AWWA).

- a. Gate valves with service boxes.
- b. Sizes (see schedule).

c. Schedule:

Plan Code:	GV & SB	GV & SB
Size/Inches:	3/4 thru 2	2 thru 16
Valve Type:	Oriseal	Gate
Make:	Mueller	Mueller
Model:	H-15201	A-2380-22 or 2380-18
Service Box:	H-10396-86	H-10357
Base:	H-10396-7-8-9 or H-10400	No. 6 Oval
Key:	Stationary rod attached.	A-24610 Furnish one each box.

9. Ball Valve:

- a. Blowout proof stem.
- b. Full port type with appropriate seals and seat, as specified.
- c. Bronze bodies per ASTM B61/B62 or ASTM B-584. No brass material will be accepted.
- d. Stainless steel bodies per ASTM A-351, Grade CF3M.
- e. Schedule:

Plan Code:	B.V.	B.V.	H.V.	S.B.V.
Service:	Balancing	In line control and isolation	Refrigeration	Steam and Steam Condensate
Pressure:	150 SWP/300 CWP	150 SWP/300 CWP	500 CWP	150 SWP
Sizes/Inches:	1/4 thru 2-1/2	1/4 thru 3"	3/8" thru 2 1/8"	1/2" thru 2"
Make:	Nibco	Nibco	Nibco	Nibco
Straight Threaded:	T-580-70-66	T-585-70-66	--	T-595-Y-S6R-66
Straight Solder End:	S580-70	S585-70	S595-Y-66	--
Actuator:	Lever with memory stop	Lever	Lever	Lever
Port:	Standard	Full	Full	full

* Steam ball valve includes a three-piece body, seals rated for steam operating temperatures up to 400°F.

10. Butterfly Valves:

- a. Schedule; standard 150 psi with 150 psi ANSI companion flanges for use where system pressures cannot exceed 200 psig shut off (static) pressure.

Plan Code:	BFV	
Style:	Lugged	
Pressure Rating ANSI Class:	150 minimum	
Body:	ASTM A126 Cast Iron or ASTM A395 Ductile Iron	
Disc:	Aluminum Bronze	
Stem:	316 Stainless	17-4 PH Stainless or 18-8 Stainless
Seat:	EPDM (-40 deg.F to 250 deg.F)	
Actuator:	2" thru 5" Infinite position lever with memory stop. 6" thru 24" Self-locking worm gear with adjustable limit stops, and position indicator. Provide chain wheel and chain where indicated by contract documents.	
Make:	Keystone	
Size:	2"-12"	14"-36
Model:	222	AR2

- b. Schedule: High performance 300 psi with 300 psi ANSI companion flanges for use where system pressures are more than 200 psig but cannot exceed 700 psig shut-off (static) pressure.

Plan Code:	BFV	
Style:	Lug	
Pressure Rating ANSI Class:	300 minimum	
Body:	Carbon steel ASTM A-216	
Disc:	316 stainless steel ASTM A-216	
Stem:	Stainless steel ASTM A564 Type 630 (17-4PH)	
Seat:	Virgin TFE	
Actuator:	3" and 4": Ratchet handle with lock. 6 and over: Worm gear with lock.	
Make:	Flowseal (Mark Controls Corp.)	
Size:	3" and 4"	6" and over
Model:	XX-3L-121TTH-L	XX-3L-121TTH-2

11. Stop Check Valve:

a. Schedule:

Plan Code:	S.C.V.
Pressure:	250 SWP/500 CWP
Size/Inches:	2-1/2 thru 10"
Make:	Crane
Straight Flanged:	28E
Angle Flanged:	30E

12. Eccentric Plug Valve:

a. Schedule:

Plan Code:	E.P.V.	E.P.V.
Pressure:	175 lb. CWP	175 lb. CWP
Size/Inches:	1/2 thru 3	4 thru 8
Make:	DeZurik	DeZurik
Model:	400	100
Actuator:	483-487	159 w/Memory Stop
Ends:	Threaded	Flanged

13. Gas Valves:

- a. Gas cock and lubricated plug.
- b. Schedule:

Plan Code:	G.C.K.	L.P.V.	L.P.V.	G.B.V.
Pressure:	100 PSI Air	200 lb. CWP	200 lb. CWP	250 PSI LP-Gas
Size/Inches:	1/2 thru 1	1/2 thru 3	4 thru 12	1/4" thru 3"
Make:	Peter Healy	Walworth	Walworth	Apollo
Model:	1500-F	1700	1707-F	80-100
Actuator:	None	E-2	Wrench as required	1/4 turn
Ends:	Threaded	Threaded	Flanged	Threaded

14. Specialty Valves:

- a. Petcock, stop and drain, drain, needle.

b. Schedule:

Plan Code:	PTK	S&D.V.	D.V.	N.V.
Type:	Petcock	Gate	Ball	Needle
Pressure:	250 LB.	125 LB.	125 LB.	200 LB.
Size/Inches:	1/8	1/2 and 3/4	3/4	1/8 thru 3/4
Make:	Powell	Nibco	Apollo	Jenkins
Model:	922	76 or 726	78-104	743G
Ends:	Threaded	Threaded or Soldered	Threaded and Hose End Adaptor	Threaded

2.5 UTILITY WATER GATE VALVES TO 16"

- A. Description: The valves shall be suitable for an ordinary waterworks service intended to be installed in a normal position as indicated in the Plans. All valves shall be Mueller, AVK, or equal, with rising stem valves.

The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of AWWA C509 or AWWA C515 for Resilient-Sealed Gate Valves. All materials used in the manufacture of waterworks gate valves shall conform to the AWWA Standards designed for each material listed. All gate valve operating stems shall be equipped with a two (2) inch operating nut. All gate valves shall open counterclockwise.

Where static line pressure exceeds 125 psi, only 250 psi working-pressure valves shall be used.

B. Materials:

1. Manufacture and Marking: The valves shall have the name or mark of the manufacturer, year valve casting was made, size and working pressure plainly cast in raised letters on the valve body.
2. Type and Mounting: The valve bodies shall be ductile iron, mounted with approved non-corrosive metals. All wearing surfaces shall be bronze or other approved non-corrosive material. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.
3. Valve Seats: Resilient seats shall be applied to the gate and shall seat against a corrosion-resistant surface. The surface may be either metallic or non-metallic, applied in a manner to withstand the action of line fluids and the operation of the sealing gate under long-term service. A metallic surface shall have a corrosion resistance equivalent to or better than bronze. A non-metallic surface shall be in compliance with ANSI/AWWA C550. Resilient seats shall be bonded or mechanically attached to the gate. The method used for bonding or vulcanizing shall be proved by ASTM D429; either method A or method B. For method A, the minimum strength shall not be less than 250 psi (1,725 kPa). For method B, the peel strength shall not be less than 75 lb/in. (9.3 kg/m).

4. All exposed mechanical attaching devices and hardware used to retain the resilient seat shall be made of a corrosion-resistant material.
5. End Connections: The dimensions push-on end connections shall conform to the dimensions of the AWWA Standard C111/A21.11. The dimensions for the mechanical joint connections shall conform to the ANSI/AWWA C111/A21.11.
6. The end flanges of flanged valves shall conform in dimensions and drilling to the standard ANSI B16.1 for ductile iron flanges and flanged fittings, Class 125, unless specifically provided otherwise. The bolt holes shall straddle the vertical center line.
7. Gate Valve Stem Seals: Unless otherwise designated in the Approved Plans, all gate valves up to and including 12-inch in size shall be furnished with O-ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals. For all valves over 12", the stem seals shall be conventional type stuffing-box with graphite packing per AWWA Standard No. C600-18.1.
8. Installation of Gate Valves: All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings.

2.6 SWING CHECK VALVES

- A. The rubber flapper swing check valve shall have a heavily constructed cast iron body and cover in accordance with ASTM A126 Grade B. The body shall be long pattern design (not wafer) with integrally cast-on end flanges. The flapper shall be Buna-N, or other elastomer, having an O-ring seating edge and be internally reinforced with steel.
- B. Flapper to be captured between the body and the body cover in a manner to permit the flapper to flex from closed to full open position. Flapper shall be easily removed without the need to remove the valve from line. Check Valves to have full pipe size flow area. Seating surface to be on a 45-degree requiring the flapper to travel only 35 degrees from closed to full open position for minimum headloss. Valve has non-slam closure characteristics.
- C. Buna-N flapper which creates an elastic spring effect to assist the flapper to close against a slight head to prevent or minimize slamming.
- D. Valve designed for 175 psi differential pressure for water, sewage, oil or gas (higher pressure available). The valve shall be suitable for buried service, in which case, stainless cover bolts must be furnished.
- E. When necessary to prime or backflush a clogged pump, an external backflow device can be furnished—sizes 3-inch and larger.

- F. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work are:
1. APCO
 2. Flomatic
 3. Or equal.

2.2 PIPE HANGERS, SUPPORTS, AND ACCESSORIES PROTECTION

A. General:

1. Provide hangers, rods, clamps, brackets, attachments, inserts, bracing, nuts, coach screws, eye bolts, clips, plates, and washers as required for appropriate installation for building structure provided.
2. All hangers and accessories shall be manufactured by one manufacturer for compatibility of all components.
3. All hangers, attachments, and accessories shall be provided with a certified manufacturer's safety factor of five (5).
4. All hangers, attachments and accessories shall comply with the following:
 - a. Safety factor of 5 (actual load vs. ultimate load).
 - b. National Fire Protection Association (NFPA) (except as amended by provisions of this Specification for minimums) and as applicable.
 - c. Factory Mutual Engineering Division (FM) as applicable.
 - d. Manufacturers Standardization Society (MSS).
5. Support and positioning of piping shall be by means of engineered methods that comply with IAPMO PS 42-96.

B. Material:

1. Hangers in contact with steel, iron, cast or ductile iron shall be hot dipped galvanized or cold galvanized with "Galviline by ZRC" cold galvanized compound only to a thickness of not less than 3.0 mil (.003 inches). "Galviline by ZRC Worldwide, Marshfield, MA. Tel: (800) 831-3275, www.zrcworldwide.com" or equal.
2. Hangers in contact with copper piping shall be copper clad or provided with heavy density felt (20 oz.) pad permanently attached to the hanger and placed so as to prevent direct contact between pipe and hanger. Felt shall be mildew and moisture rot-proof. Heavy polyvinyl chloride coating on hanger, 5 mil thickness minimum will be acceptable in lieu of felt.
3. Hangers in contact with "plastic" or "glass" piping shall be galvanized in accordance with Sub-paragraph B-1, above and padded in accordance with Sub-paragraph B-2, above.

4. Hangers for insulated piping shall be sized to accommodate the insulation. Provide with insulation shields or insulation saddles* as applicable and appropriate and in accordance with the following schedule:

Nominal Pipe or Tubing Size	Shield Length	Shield Gauge Thickness	Material
½" thru 3"	12"	18	Galvanized
4"	12"	16	Galvanized
5"	15"	16	Galvanized
6"	18"	16	Galvanized
8"	24"	--	B-line (B3160-3165)
over 8"	36"	--	B-line (B3160-3165)

* Insulation inserts between piping and shield shall be furnished by 230700 Contractor for appropriate pipe size and insulation thickness for all insulated piping requiring a vapor barrier.

5. Provide swivel ring hangers similar and equivalent to B-Line B-3170, 3170CT, and 3170C for pipe sizes 1/2" thru 8".
6. Clevis type hangers may, at the Contractors option, be provided when similar and equivalent to B-Line B-3100, and 3100C.
7. Roller type hangers shall be used on all steam piping 4" and larger and when appropriate shall be equivalent to B-Line B-3110 black steel with cast iron roller. Provide insulation saddles for all roll-type hangers, B-Line B3160-3165. Calcium silicate inserts, in conjunction with insulation saddles shall be provided on all steam piping.
8. Beam and bar joist clamps shall be appropriate for attachment locations, top beam, bottom beam, etc., and provided with retainer rods, clips or straps as required.
9. Hanger spacing and minimum rod sizes shall be based on the applicable Mechanical and Plumbing Codes for the type of piping installed.
10. Riser clamps shall be provided on all vertical risers at each floor and shall conform to materials and protective coatings or pads as specified in Paragraph B of this Article 2.05. Clamps shall be similar and equivalent to B-Line B-3131 and B-3148.
11. Provide concrete inserts where required in flat slab construction similar and equivalent to B-Line B-22-1 Series 2000 lbs. per foot load capacity and spaced per hanger spacing schedule (sub-paragraph B-9 above) provide all accessories and nuts required.
12. Trapeze hangers shall be constructed of channel similar and equivalent to B-Line Series B-11 thru B-72 as appropriate complete with pipe clamps, nuts, rollers etc., as required. Channel to bear 5 times actual weight of all piping on trapeze system with minimum deflection. (.01 inch maximum). At a minimum, install pipe clamps on every other trapeze hanger, and where required to comply with seismic restraint design.
13. Wall brackets shall be fabricated "knee" brackets conforming to requirements of sub-paragraph B-12 above and made up with B-Line Series B-11 thru B-72 channel. Angle clips may be used in wood joist construction when similar and equivalent to B-Line B-3060 or 3061.

14. Hangers attached to wood construction shall be attached by use of eye bolts, coach screws or lag bolts when load bearing ratings maintain a safety factor of 5.
15. All other means of support i.e., special construction, pipe stands, earthquake bracing, sway bracing, etc., shall be provided as required and in conformance with jurisdictional authority and these Contract Documents, submit all special or required support and bracing systems for review by the Architect/Engineer prior to installing any item.
16. All vertical refrigeration suction and hot gas, and all steam piping shall be provided with insulation shields and calcium silicate inserts at each support location.
17. All piping systems exposed to motorized traffic shall be fully protected by installation of concrete-filled pipe bollards. Bollards shall be cleaned and painted as directed by the Owner.
18. For plenum applications use pipe supports that meet ASTM E-84 25/50 standards.

C. Acceptable Manufacturers:

1. Manufacturers acceptable to this Specification are as follows, all other manufacturers must submit for acceptance.
 - a. B-Line
 - b. Fee & Mason
 - c. Grinnell
 - d. Hubbard Enterprises/HOLDRITE
 - e. P.H.D.
 - f. Michigan
 - g. Tolco
 - h. MAPA
 - i. Hilti

2.3 IDENTIFICATION MATERIALS FOR PIPING AND EQUIPMENT

A. Materials for identification shall be as follows:

1. Metal Tags: Round brass discs, minimum 1-1/2" diameter with edges ground smooth. Each tag shall be punched and provided with brass chains for installation.
2. Engraved Nameplates: Fabricate from plastic sheet stock of sufficient thickness to allow engraved lettering in contrasting color. Attach nameplates to equipment with screws.
3. Painted Stencils: Of size and color per ANSI A13.1 using clean cut letters and oil base paint. Paint material shall comply with Architectural Painting Specifications. See Part 3 for legend and size for Stencils.

*** OR ***

3. Pressure Sensitive Markers: Brady Type 350 flexible vinyl film identification markers and tape, with legend, size and color coding per ANSI A13.1. or approved equal.

*** OR ***

3. Semi-rigid Plastic Identification Pipe Markers: Section Setmark with legend, size and color coding per ANSI A13.1 Direction of flow arrows are to be included on each marker, unless otherwise specified.
 - a. Setmark Type Snap-Around markers to be used on diameters 3/4" thru 5".
 - b. Setmark Type Strap-Around markers to be used on diameters 6" or larger.

Insulation or Pipe Diameter	Length of Color Field	Size of Letters
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"
over 10"	32"	3-1/2"
Ductwork and Equipment	NA	2-1/2"

2.4 DIELECTRIC PIPE FITTINGS AND ISOLATORS

- A. Manufacturer: Epco Sales Inc., Victaulic.
- B. Schedule: (complete unions)

Model:	FX	GX
Sizes:	1/2" thru 2"	2" thru 12"
Maximum Pressure:	250 psi	175 psi
Maximum Temp.:	210 deg. F	210 deg. F
Epconite Gasket:	#2	#2
Ends:	FPT x Solder	FPT x Solder
Type:	Union	Flanged Union

C. Schedule: (companion flanges)

Model:	X	W	H
Sizes:	1-1/2" - 10"	1-1/2" - 12"	1-1/2" - 12"
Maximum Pressure:	175 psi	175 psi	175 psi
Maximum Temp.:	210 deg. F	210 deg. F	210 deg. F
Epconite Isolators:	#2	#2	#2
End Style:	Solder (Brass)	Weld neck	Iron Pipe Thread
Type:	Companion	Companion	Companion
Face Gasket:	Same as Isolators		

D. Dielectric fittings shall conform to ASA B16.8, and shall be plated as applicable a minimum of .0005" and have no flow restriction when assembled.

2.5 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tubing: ASTM B88, Type M, hard drawn.

1. Fittings: ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
2. Joints: ASTM B32, solder, Grade 95TA.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. General: Unless otherwise specifically indicated on Drawings or in Specifications, install equipment and materials in accordance with recommendations of manufacturer, including performance of tests as manufacturer recommends.

B. Protection:

1. Close ends of pipe and ductwork during construction and cover equipment to prevent entry of foreign material. Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation. Cover floor drains and protect fixtures and equipment against damage during concrete pours and mechanical work.

C. Quiet Operation and Vibration:

1. All work shall operate in accordance with Section 230540 - Mechanical Sound and Vibration Control under all conditions of load.
2. Sound or vibration conditions not in accordance with Section 230540 and considered objectionable shall be corrected in a manner approved by the Architect under the Work of Division 23.

3.2 WELDING

- A. Joints between sections of pipe, between pipe and fittings, shall be fusion welded. Use only certified welders. Strength of finished welded joints to be equal to strength of pipe. Width of finished weld to be at least 2-1/2 times the thickness of the part joined. Thickness of weld to be at least 25% greater than the thickness of pipe or fittings. Finished welded joints to present neat and workmanlike appearance.
- B. Make no direct welded connections to valves, strainers, apparatus, and related equipment. Make connections to flanged valves, and flanged equipment with welded pipe connection flanges.
- C. Radii of weld ells to be 1-1/2 times nominal diameter of fittings. Fittings used for all branch connections, whether full-size or reducing, to have interior surfaces smoothly contoured. Wall thickness of welded fittings equal to adjacent piping.

3.3 ELECTRIC WIRING

- A. Furnish equipment requiring electrical connections to operate properly and to deliver full capacity at electrical service available.
- B. All control wiring to be in accordance with manufacturer's recommendations; all wiring shall be color coded to facilitate checking.
- C. Unless otherwise indicated, all mechanical equipment motors, starters, and controls shall be furnished, set in place, and wired in accordance with the Electrical Equipment/Wiring Responsibility Matrix on the drawings. Contractor should note that the intent of this electric wiring matrix is to have the Division 23 Contractor responsible for coordinating all control wiring as outlined, whether or not specifically called for by the mechanical or electrical drawings and specifications. Mechanical Contractor shall comply with the applicable requirements of Division 26 for electrical work of this Division 23 which is not otherwise specified. No extras will be allowed for Contractor's failure to provide for these required items. The Division 23 Contractor shall also refer to the Division 26 specifications and plans for all power and control wiring and shall advise the Architect/Engineer of any discrepancies prior to bidding.

ELECTRICAL EQUIPMENT/WIRING RESPONSIBILITY MATRIX

Item	Furnished By*	Set By*	Power Wiring*	Control Wiring*
Equipment Motors	MC	MC	EC	MC
Motor Starters & Overload Heaters	MC – Except when shown on MCC	EC	EC	MC
Variable Frequency Drives (VFDs)	MC	EC	EC	MC
Fused & Unfused Disconnect Switches, Thermal Overload & Heaters	EC	EC	EC	--
Manual Switches & Speed Control Switches carrying full load currents.	MC	EC	EC	EC
Fire/Smoke and Smoke Dampers	MC	MC	EC – Requires emergency power circuit if air system served is on emergency power.	EC
Control Relays & Transformer (See Note 2)	MC	MC	EC	MC

* MC = Mechanical Contractor under Division 23 of the work.

* EC = Electrical Contractor under Division 26 of the work.

- D. All temperature control conduit and wiring shall be furnished and installed under Section 23.

3.4 SLEEVES, PLATES AND CLOSURES

- A. Division 23 Contractor shall provide and locate pipe sleeves, and inserts required before new floors and walls are built or shall be responsible for the cost of cutting and patching required where sleeves and inserts were not installed or where incorrectly located.
- B. Provide sleeves for mechanical piping passing through concrete floor slabs and through concrete, masonry, tile, and gypsum wall construction. Provide metal collars to close and protect openings.
- C. Where sleeves are placed in exterior walls below grade, pack spaces between the pipe or conduit and the sleeves with Hornflex Thiokol L-32 Sealant or Link Seal and make water-tight. Provide metal rodent collars securely fastened to structure. Link seal shall not be used on fire lines.

- D. Where pipe motion due to expansion and contraction will occur, make sleeves of sufficient diameter to permit free movement of pipe. Where sleeves pass insulated pipes, the sleeves shall be large enough to pass the pipe only and the insulation shall be made to butt against the construction, except for pipes requiring insulation having a vapor barrier, in which case, the sleeves shall be large enough to pass the pipe and insulation. Check floor and wall construction finishes to determine proper length of sleeves for various locations, make actual lengths to suit the following:
1. Terminate sleeves flush with floors, walls, partitions, and ceilings.
 2. Seal annular space around pipes watertight at floor penetrations.
 3. In areas where pipes are concealed, as in chases, terminate sleeves flush with floor.
 4. In all areas where pipes are exposed, extend sleeves 1/4" above finished floor, except in rooms having floor drains, where sleeves shall be extended 2" above floor and in Kitchens and Mechanical Equipment Rooms, where sleeves shall be extended 4" above floor.
- E. Sleeves shall be constructed of 24 gauge galvanized sheet steel with lock seam joints for all sleeves set in concrete floor slabs terminating flush with the floor. All other sleeves shall be constructed of galvanized steel pipe unless otherwise indicated on the drawings. "Crete Sleeve" (plastic type) sleeves are acceptable for concrete construction as manufactured by Sperzel Division, Shamrock Industries or Willoughby Industries.
- F. Fasten sleeves securely in floors and walls so that they will not become displaced when concrete is placed or when other construction is built around them.
- G. Provide tight fitting floor and ceiling plates on pipes passing thru walls, ceilings, and floors. Nickel or chrome plated in finished areas, galvanized cast iron in unfinished areas. Provide wall and ceiling flanges for ducts in finished areas.
- H. Provide all cutting, patching of holes, openings, notches. Obtain written approval for notching, boring, chipping, burning, drilling, welding to structural members in accordance with the General Conditions of the Contract and paragraph 3.7 of this Section.
- I. Where pipe sleeves penetrate fire rated walls and floors, this contractor shall use fire safing to seal openings.

3.5 FOUNDATIONS, PADS AND CURBS

- A. Provide dowels, anchor bolts, groutings, concrete foundations and pads for pumps, plumbing, heating and ventilating or air conditioning equipment in accordance with Concrete Specifications.
- B. Dimensions and exact locations for foundations and concrete curbs for mechanical equipment to be field verified and located accurately by Division 23 Contractor.

3.6 EXCAVATING AND BACKFILLING

- A. Excavate for all mechanical equipment such as fuel tanks, ductwork, sump pumps, manholes and trenches for underground pipelines to required depths. Compact bottoms of excavations. Slope to obtain required grade. Remove rocks, trash and debris before installation of equipment and backfilling. Backfill by hand tamping earth under the haunch of the pipe to specified compaction. Backfill and compact in thin layers until top of pipe is covered. Complete backfill by methods required or directed for soil characteristics to comply with the Architectural section of these specifications.
- B. Excavations near footings shall be such that, when nearing building footings, or bearing foundation walls, the excavation bottom shall not be nearer the footing than a normal 45 degree bearing line from edge of footing bottom to bottom of excavation. When it is necessary to perpendicularly cross under a continuous foundation wall, care shall be taken to insure that crossing is clear of the structural foundation and of minimal width.
- C. Do not place backfill over pipe lines until lines are properly tested.
- D. When trenching through specially tested areas, such as paving, asphalt, etc., Contractor shall be responsible for restoring the surface to its original condition, and in a manner approved by the Architect. Repair trenches where settlement occurs, and restore the surface for the period of one year after final acceptance of the project. All cutting of paving, asphalt, etc. shall be by saw cutting.

3.7 CUTTING AND PATCHING

- A. Cutting in Existing Building:
 - 1. The Construction Manager/General Contractor shall make arrangements for required openings in the existing building to facilitate the passage of ductwork, piping, etc. thru existing floors, walls, and beams. Division 23 Contractor to coordinate all requirements.
- B. Patching in Existing Building:
 - 1. The Construction Manager shall provide for patching all existing walls and floors to match existing.

3.8 PIPE HANGERS/SUPPORTS

- A. Use inserts, anchors, expansion bolts or other approved and acceptable means of attachment to concrete construction. Set inserts in advance of concrete installation, provide required reinforcement rod for all inserts carrying loading equivalent of one 4" pipe or more. All inserts shall be flush with face of slab or wall containing insert.
- B. Provide flat square washers for rods thru metal decking with nut above washer, when acceptable and approved.
- C. Cinch hangers to carry appropriate share of loading and slope piping without sags or "pocketing" as appropriate and required.
- D. Rod offsets, or angle installation, plumber tape or wire will not be accepted. Hanger rods shall be true and plumb.

- E. Piping shall not be hung from other piping or equipment items. Provide attachments to building structure only. Use trapeze, wall brackets, knee brackets, etc., where hanger rods cannot be attached within spacing plumb to structures.
- F. Provide sway and earthquake bracing where required in accordance with Section 230548 - Mechanical Seismic Control.

3.9 INSTALLATION OF VALVES

A. General:

1. Provide valves as shown on Contract Documents and as required for pressure relief, balancing and/or control of flow.
2. Provide isolation valves for maintenance and service on each piece of equipment regardless of whether or not shown on Contract Drawings.
3. Provide isolation valves for all branch line take-offs that serve more than two items of fixtures or equipment.
4. Provide balancing valves for each branch of domestic hot water circulating system, all heating/cooling water returns or supplies to equipment, and as shown on Contract Documents.
5. Provide access means for each valve or group of valves either by access panels or utilization of inherent access provided by building methods i.e., lift out ceiling construction or exposed valve installations in non critical areas such as janitor's closets, storage rooms, etc.
6. Install all valves with valve bonnets or operating stems in vertical (upright) position when possible, valves may be installed with bonnets or stems not less than 35 degrees downward from vertical plane except valves on vertical piping may be 90 degrees from vertical plane. Swing type check valves shall be installed on horizontal piping no more than 45 degrees upward slope from horizontal plane, using lift checks on vertical piping. Lift check valves shall not be used on sewage or sump pump discharge piping.
7. Inspect and tighten all bonnet nuts, bolts, packing glands, lubricate all valves requiring lubrication, secure all hand wheels and identification plates, be responsible for all valves having manufacturers name, trade name, working pressure and size stamped or cast into the body of the valve. Perform all maintenance, repacking and inspection prior to installation of valve.

B. Proper Installation of Valves:

1. Provide valves in accordance with the following schedule unless specified otherwise in Contract Documents.
 - a. Dead-end shut off: Gate, ball, butterfly, plug, stop and drain.
 - b. Throttling: Ball, plug, globe, diaphragm, needle, butterfly (when using butterfly valves for throttling, additional valves must be provided for service shutoff.)
 - c. Backflow prevention: Check.
 - d. Water hammer prevention: Silent or pilot operated non slam check.
 - e. Gas piping: Lubricated plug (or ground joint cock up to 1" only), or UL-Listed ball valve.

C. Removal and Repair Provisions:

1. Provide all valves which are not accessible for repair without removal from piping with union connection immediately adjacent to valve outlet.

3.10 PAINTING

- A. Surfaces of exposed equipment and materials to be thoroughly cleaned and left ready for painting in accordance with Architectural Painting Specifications.
- B. Duct interiors visible through registers, grilles and diffusers shall be painted flat black.
- C. All other painting of mechanical equipment and piping, unless otherwise noted, shall be performed under other divisions of the work with the exception of identification of piping and equipment which will be the responsibility of the Division 23 Contractor.

3.11 IDENTIFICATION OF PIPING AND EQUIPMENT

- A. General: Provide pipe identification, valve tags, stencils, or engraved nameplates to clearly identify the mechanical equipment, piping and controls of the various mechanical systems and direction of flow in piping.
- B. Methods for identification shall be as follows:
 1. Metal Tags: Stamp tags with letter prefixes to indicate service, followed by a number for location in system.
 2. Engraved Nameplates: Attach nameplates with brass screws. Pressure-sensitive embossed labels are not acceptable. Nameplates shall bear the same identifying legend used on the Contract Documents.
 3. Painted Stencils: Stenciled markings shall be neatly performed with no overspray, drips, or other imperfections. Pipes and equipment to be stenciled shall first be wiped clean of dirt, dust, rust, grease and moisture. Pipes and smooth, hard surface in the area the stencil is to be applied. Paint application shall comply with Architectural Painting Specifications.
Size of Legend and Letters for Stencils:

Insulation or Pipe Diameter	Length of Color Field	Size of Letters
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"
over 10"	32"	3-1/2"
Ductwork and Equipment	NA	2-1/2"

4. Pressure Sensitive Markers: Apply pressure sensitive markers in accordance with manufacturer's recommendations with complete wrap around may be used at Contractor's option. Marker adhesion will be tested for permanence. Any markers showing dog ears, bubbles, or other failings shall be replaced.
 5. Semi-Rigid Plastic Identification Markers: Seton Setmark premolded (not pressure sensitive) identification markers may be used at Contractor's option on service piping which is accessible for maintenance operations (but not on piping in finished spaces). This type marker shall not be installed on bare pipe when surface temperature exceeds 180 deg.F unless a 1" thick insulation band is first provided under marker for protection from the hot pipe.
- C. Valves: All valves, including but not limited to domestic hot and cold water, hot water recirculation, heating water, chilled water, condenser water, steam, steam condensate return, fire protection, gas, medical gas, vacuum and special service valves located inside the building, shall be tagged and identified as to type of service, location number, and normal valve position (normally open or normally closed).
 - D. Controls: All magnetic starters and relays, shall have nameplates or be stenciled to identify connecting or controlled equipment. All manual operating switches, fused disconnect switches and thermal over-load switches which have not been specified as furnished with indexed faceplates shall also have nameplates or be stenciled as to "connected" or "controlled" equipment. All automatic controls, control panels, zone valves, pressure electric, electric pressure switches, relays, and starters shall be clearly identified.
 - E. Air Conditioning Equipment: Air conditioning equipment such as chillers, pumps, condensers, or roof-top equipment shall be identified by stencils, or system nameplates.
 - F. Access Doors: Provide engraved nameplates or painted stencils to identify concealed valves, controls, dampers or other similar concealed mechanical equipment. Obtain Architect approval before installation on all access doors in finished areas.
 - G. Lift Out Ceilings: Provide engraved nameplates or black lettering on transparent adhesive labels on ceiling tee stem to identify concealed valves, controls dampers or similar concealed mechanical equipment which is directly above nameplate in ceiling space. Obtain Architect approval before installation.
 - H. Expansion tanks shall be labeled to indicate system served and precharge pressure.
 - I. Access Flooring: Provide thin engraved nameplate on access panel to indicate location of underfloor fan coils and smoke/fire dampers.

3.12 DRIP PANS

- A. Provide drip pans under all fluid conducting piping which runs over servers, telecom equipment, electric switchgear, busway, or electric motor starters, and under all point-of-use water heaters.
- B. Pans: 18 gauge galvanized iron. Pans shall be two inch deep, with rolled top edges, and shall extend six inches each side of the pipe or group of pipes and six inches beyond the equipment below. Keep pans as close to the underside of the pipes as practicable. All seams shall be soldered, and pans shall be crossbraced as required to prevent sagging and warping.

- C. Pitch each pan to a drain connection, and pipe a 1-1/2 inch or larger copper tube drain to discharge over nearest available open drain.
- D. Provide a drip pan under all coils that may have condensate during operation like heat recovery coils, etc. Pipe drain to nearest drain.

3.13 FIRE SAFING

- A. Mechanical Contractor shall provide fire safing for his work as follows: Where fire rated separations are penetrated by pipes, conduit or ductwork, the annular space around the pipe, conduit or ductwork shall be filled with a U.L. Rated fire safing material. Refer to Division 7 for materials and application specifications.

3.14 DIELECTRIC PIPE FITTINGS AND ISOLATORS

- A. Provide dielectric pipe fittings and isolators at all connections between dissimilar metals in the domestic water, to control corrosion potential caused by galvanic or electrolytic action.
- B. Typical locations for dielectric isolation are; water heaters, storage and pressure tanks, water conditioning equipment, pumps, changes in service piping materials, make-up connections to boilers and chilled water systems, valves, deaerators, flexible connectors and the like where materials of different electrode potential are joined.
- C. Hangers for piping shall be isolated per Section 230529 when hanger and piping materials are dissimilar and subject to production of electrolysis or galvanic action.
- D. Storage tanks shall be isolated from piping and tank stands by use of anti-electrolytic and galvanic isolators.

3.15 DRAIN LINES

- A. Provide drain lines from each pump to nearest drain or to termination indicated.
- B. Do not route condensate lines above electrical panels, switch gear, transformers, motor starters, elevator equipment, servers, or telecom equipment. Should there be a conflict with the plans and this paragraph, notify the Engineer immediately for corrective instruction prior to starting work.

3.16 EXISTING PIPES AND MECHANICAL EQUIPMENT TO BE REMOVED

- A. Where existing mechanical equipment, fixtures and/or piping is to be removed and/or relocated, all piping shall be disconnected and capped. All existing piping and hangers not to remain in use shall be removed completely to an existing main that is to remain in use, and capped at the main. General Contractor shall do all cutting, patching, and restoring that may be required for the removal of this piping and equipment. Where it is not possible to remove branch piping not remaining in use, due to its being concealed in the structure, the Division 23 Contractor shall cap the piping concealed at both ends in these areas as approved by the Architect.

SLCIA On-Call Pump House #5

- B. All mechanical equipment, fixtures, and piping to be removed and not re-used shall remain the property of the Division 23 Contractor for credit to the contract price except as noted otherwise.

END OF SECTION 230529

SECTION 232123 - HVAC PUMPS

PART 1 - GENERAL

1.1 RELATED WORK

- A. The General Conditions, Supplementary Conditions and Division 1 General Requirements apply to this Section, and Contractor shall review and adhere to all requirements of these documents.
- B. Related work specified in other Sections:
 - Section 230500 - Basic Mechanical Requirements
 - Section 230529 - Basic Mechanical Materials and Methods
 - Section 230540 - Mechanical Sound and Vibration Control
 - Section 230548 – Mechanical Seismic Control
 - Section 230593 - Testing, Adjusting and Balancing
 - Section 232113 - HVAC Piping and Specialties
 - Section 233400 - Air Handling Fans

1.2 SYSTEM DESCRIPTION

- A. The work includes, but is not limited to, providing the following:
 - 1. Site drainage dewater system pumps.

1.3 REFERENCES

- A. Reference Standards: Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:
 - 1. Comply with American National Standards Institute (ANSI B31.1) Code for Pressure Piping.

1.4 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings and Product Data including materials of construction, actual impeller size, pump speed, motor size, motor efficiency, motor amps, mounting requirements, weights, dimensioned drawings, and performance curves at scheduled flow conditions and 120% of scheduled head, for the following items in accordance with the General Conditions of the Contract:
 - 1. Site drainage dewater system pumps.
- B. Operating Instructions and Maintenance Data: Submit printed Operating Instructions and Maintenance Data for the following items in accordance with Operating and Maintenance Data paragraph in Section 230500.
 - 1. All pumps.

PART 2 - PRODUCTS

2.1 VERTICAL TURBINE PUMPS

A. Acceptable Manufacturers: Fairbanks Morse.

B. Pump Construction:

1. Bowl assembly: The intermediate bowls, suction bell, and discharge bowl shall be flanged type constructed of close grained cast iron, and shall conform to ASTM designation A48, class 30. They shall be free from sand holes, blowholes, or other faults and must be accurately machined and fitted to close tolerances. The intermediate bowls shall have enamel or epoxy lined waterways for maximum efficiency and wear protection. All intermediate bowls shall be of identical design for interchangeability. A discharge bowl shall be used to connect bowls to the discharge column. All the bowls shall be fitted with sleeve type bearings of bronze alloy C89835.
2. Impellers: The impellers shall be constructed from ASTM B584 Silicon Bronze and shall be the enclosed type. They shall be free from defects and must be accurately cast, machined for optimum performance and minimum vibration. Impellers are to be balanced to grade G6.3 of ISO 1940 as minimum. They shall be securely fastened to the bowl shaft with taper locks of C1018 steel and key and split thrust ring of SS. The impeller running position shall be adjustable by shaft adjusting nut in the discharge head or on top of the hollow shaft driver.
3. Suction: The suction bell shall be provided with a non-soluble grease packed bronze bearing, and a bronze sand collar shall be incorporated in the pump design to protect this bearing from abrasives. The bearing housing shall have sufficient opening at the bottom for easy removal of the bearing. A bronze basket type strainer shall be attached to the suction bell. It shall have a free area of at least four times the flow area of the suction connection size and the opening shall be sized to restrict the passage of ½" solids.
4. Wear Ring: Bowl assembly shall be fitted with replaceable wear rings of C95200 bronze material in the suction bowl and intermediate bowls. Wear rings shall have the minimum practical clearance to the mating cylindrical surface of the impeller to provide adequate sealing independent of vertical positioning of the impellers.
5. Shaft: The bowl shaft shall be constructed from ASTM 582 type 416 stainless steel. It shall be precision turned and ground with surface finish better than 40 RMS and shall be supported by water lubricated bearings of C89835 bronze alloy.

C. Column Assembly-Water Lubricated:

1. Column pipe: The column pipe shall be furnished in sections not exceeding a nominal length of 10 ft and shall be connected by threaded sleeve couplings or flanges. The length of the top and bottom sections shall not be more than 5 ft. It shall be of ASTM A53 grade A steel pipe and the weight shall be not less than schedule 30. The threaded pipe shall be with 8 threads per inch with 3/16" taper per foot thread and faced parallel to butt against the centering spiders to form accurate alignment. All column flange faces shall be parallel and machined for

rabbit fit to permit accurate alignment. The inside diameter of the pipe shall be such that the head losses shall not be more than 5 feet per 100 feet of pipe.

2. Lineshaft: The lineshaft shall be furnished in interchangeable section not over ten feet in length, and shall be coupled with threaded steel couplings machined from solid steel bar. It shall have left-hand thread to tighten during pump operation. The diameter of the shaft shall be based on a combined shear stress of not more than 18% of the ultimate strength or not excess of 30% of the elastic limit in tension of the shafting material. The coupling shall be designed with higher safety factor than shaft. Lineshaft and coupling shall be of type 416 stainless steel. Centering spiders shall be furnished at each column pipe joint for shaft stabilization. Bearings shall be fluted rubber.

D. Discharge Head Assembly-Water Lubricated:

1. Discharge Head: It shall be of the high profile type to allow shaft coupled above stuffing box and provided for mounting the driver and support the column and bowl assemblies it shall be of high-grade cast iron, ASTM A48 Class 30, or fabricated steel. The above ground outlet shall be flanged to match 8 inch ANSI class 150. It shall have a 1/2" NPT connection for a pressure gauge.
2. Stuffing Box: The stuffing box shall be cast iron and shall contain a minimum of five rings of packing with lantern ring. It shall have a pressure relief connection. The packing gland shall be a 316SS split type secured in place with non--corrosive studs and nuts. The bearing shall be C89835 bronze. A rubber slinger shall be secured to the shaft above the packing gland.

E. Accessories:

1. 3/4" casing relief valve (250 GPM through 2500 GPM) or 1" casing relief valve (3000 GPM and larger).
2. 1-1/2" automatic air release valve.
3. 3 1/2" dial suction and discharge gauges.
4. Concentric discharge increaser.

PART 3 - EXECUTION

3.1 GENERAL

- A. Provide installation in accordance with Section 230540 - Mechanical Sound and Vibration Control.
- B. Lubricate the pumps in accordance with manufacturer's instructions after completion of the system and before start-up.

END OF SECTION 232123