

## **ADDENDUM NO. 2**

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

### **Replace Cooling Towers**

St. Louis Forensic Treatment Center - North

St. Louis, Missouri

PROJECT NO.: M2015-01

Bid Opening Date: 1:30 PM, April 6, 2023 (UNCHANGED)

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

### **SPECIFICATION CHANGES:**

1. Section 230523 – General Duty Valves
  - a. REVISE multiple paragraphs to allow grooved end valves and accessories for grooved end piping systems. See revised section 230523 attached.
2. Section 232113 – Hydronic Piping
  3. REVISE multiple paragraphs to allow grooved end valves and accessories for grooved end piping systems. See revised section 232113 attached.
4. Section 236500 – Cooling Towers
  - b. REVISE Paragraph 2.1-E and 2.1-F to allow 301L or 304 stainless steel. See revised section 236500 attached.

### **DRAWING CHANGES:**

1. Drawing M-203
  - a. REVISE Cooling Tower Schedule Notes to read as follows:  
  
Note 1: Under Base Bid: Provide towers with stainless steel hot and cold basins, galvanized steel structural components, galvanized casing panels, PVC fill with integral air inlet louvers and drift eliminators, and mechanical float valve for basin level (make-up water) control.  
  
Note 2: Under Alternate Bid #3: All structural steel components shall be constructed from stainless steel.

### **GENERAL COMMENTS:**

(none)

### **ATTACHMENTS:**

1. Revised Section 230523 – General Duty Valves (revised)
2. Revised Section 232113 – Hydronic Piping (revised)
3. Revised Section 236500 – Cooling Towers (revised)
4. Sheet M-203 (revised)

**END ADDENDUM NO. 2**

## **SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Bronze ball valves.
  - 2. Iron butterfly valves.
  - 3. Bronze swing check valves.
  - 4. Iron swing check valves.
  - 5. Iron, center-guided check valves.
  - 6. Bronze gate valves.
  - 7. Iron gate valves
  - 8. Cast steel gate valve.
- B. Related Sections:
  - 1. Section 232113 “Hydronic Piping” for additional valves applicable only to this piping.
- C. This section also serves as General-Duty Valves for Plumbing Piping.

#### **1.3 DEFINITIONS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of valve indicated.

## **1.5 QUALITY ASSURANCE**

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 2. ASME B31.1 for power piping valves.
  - 3. ASME B31.9 for building services piping valves.
  - 4. NSF Compliance: NSF 61 for valve materials for potable-water service.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL REQUIREMENTS FOR VALVES**

- A. Refer to HVAC valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
  - 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
  - 2. Handwheel: For valves other than quarter-turn types.
  - 3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
  - 4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.

5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
    1. Gate Valves: With rising stem.
    2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
    3. Butterfly Valves: With extended neck.
  - F. Valve-End Connections:
    1. Flanged: With flanges according to ASME B16.1 for iron valves.
    2. Solder Joint: With sockets according to ASME B16.18.
    3. Threaded: With threads according to ASME B1.20.1.
    4. Grooved: With fittings and couplings according to Section 232113.
  - G. Valve Bypass and Drain Connections: MSS SP-45.

## 2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.; Apollo Valves.
    - c. Crane Co.; Crane Valve Group; Crane Valves.
    - d. Hammond Valve.
    - e. Lance Valves; a division of Advanced Thermal Systems, Inc.
    - f. Legend Valve.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Red-White Valve Corporation.
    - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  2. Description:
    - a. Standard: MSS SP-110.
    - b. SWP Rating: 150 psig.
    - c. CWP Rating: 600 psig.
    - d. Body Design: Two piece.
    - e. Body Material: Bronze.
    - f. Ends: Threaded.
    - g. Seats: PTFE or TFE.
    - h. Stem: Bronze.
    - i. Ball: Chrome-plated brass.
    - j. Port: Full.
- B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.; Apollo Valves.
    - b. Crane Co.; Crane Valve Group; Crane Valves.
    - c. Hammond Valve.

- d. Lance Valves; a division of Advanced Thermal Systems, Inc.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
- a. Standard: MSS SP-110.
  - b. SWP Rating: 150 psig.
  - c. CWP Rating: 600 psig.
  - d. Body Design: Two piece.
  - e. Body Material: Bronze.
  - f. Ends: Threaded.
  - g. Seats: PTFE or TFE.
  - h. Stem: Stainless steel.
  - i. Ball: Stainless steel, vented.
  - j. Port: Full.
- C. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Conbraco Industries, Inc.; Apollo Valves.
    - c. Crane Co.; Crane Valve Group; Jenkins Valves.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. DynaQuip Controls.
    - f. Hammond Valve.
    - g. Lance Valves; a division of Advanced Thermal Systems, Inc.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. SWP Rating: 150 psig.
    - c. CWP Rating: 600 psig.
    - d. Body Design: Two piece.
    - e. Body Material: Bronze.
    - f. Ends: Threaded.
    - g. Seats: PTFE or TFE.
    - h. Stem: Bronze.
    - i. Ball: Chrome-plated brass.
    - j. Port: Regular.
- D. Two-Piece, Regular-Port, Bronze Ball Valves with Stainless-Steel Trim:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.; Apollo Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. Nibco Inc.
  - 2. Description:
    - a. Standard: MSS SP-110.
    - b. SWP Rating: 150 psig.
    - c. CWP Rating: 600 psig.
    - d. Body Design: Two piece.

- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Stainless steel.
- i. Ball: Stainless steel, vented.
- j. Port: Regular.

## 2.3 IRON BUTTERFLY VALVES

- A. 200 CWP, Iron, Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
    - b. Bray Controls; a division of Bray International.
    - c. Conbraco Industries, Inc.; Apollo Valves.
    - d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
    - e. Crane Co.; Crane Valve Group; Jenkins Valves.
    - f. Crane Co.; Crane Valve Group; Stockham Division.
    - g. DeZurik Water Controls.
    - h. Hammond Valve.
    - i. Kitz Corporation.
    - j. Milwaukee Valve Company.
    - k. NIBCO INC.
    - l. Norriseal; a Dover Corporation company.
    - m. Red-White Valve Corporation.
    - n. Spence Strainers International; a division of CIRCOR International.
    - o. Tyco Valves & Controls; a unit of Tyco Flow Control.
    - p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - 2. Description:
    - a. Standard: MSS SP-67, Type I.
    - b. CWP Rating: 200 psig.
    - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    - d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    - e. Seat: EPDM.
    - f. Stem: One- or two-piece stainless steel.
    - g. Disc: Aluminum bronze.
    - h. Ends: Single flange or grooved end

## 2.4 HIGH-PERFORMANCE BUTTERFLY VALVES

- A. 150 Class, Carbon Steel, Butterfly Valves with PTFE Seat and Stainless-Steel Disc:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Keystone.
    - b. Mueller Steam.
    - c. NIBCO INC.
    - d. Milwaukee
  - 2. Description:
    - a. Standard: MSS SP-68, Type I.

- b. CWP Rating: 285 psig, 150 psig saturated steam.
  - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
  - d. Body Material: Carbon steel ASTM A216 WCB.
  - e. Seat: Reinforced PTFE.
  - f. Stem: Stainless steel ASTM A564.
  - g. Disc: Stainless steel ASTM A351 CF8M.
  - h. Ends: Single flange or grooved end
- B. 150 Class, Stainless Steel, Butterfly Valves with PTFE Seat and Stainless-Steel Disc:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Keystone.
    - b. Milwaukee.
  - 2. Description:
    - a. Standard: MSS SP-68, Type I.
    - b. CWP Rating: 285 psig, 150 psig saturated steam.
    - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    - d. Body Material: Stainless steel ASTM A351 GR CF8M.
    - e. Seat: Reinforced PTFE.
    - f. Stem: Stainless steel ASTM A564.
    - g. Disc: Stainless steel ASTM A351 CF8M
    - h. Ends: Single flange or grooved end

## 2.5 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane Co.; Crane Valve Group; Crane Valves.
    - c. Crane Co.; Crane Valve Group; Jenkins Valves.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. Hammond Valve.
    - f. Kitz Corporation.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Red-White Valve Corporation.
    - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - l. Zy-Tech Global Industries, Inc.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 3.
    - b. CWP Rating: 200 psig.
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded.
    - f. Disc: Bronze.
- B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Division.
    - d. Hammond Valve.
    - e. Kitz Corporation.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Red-White Valve Corporation.
    - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  2. Description:
    - a. Standard: MSS SP-80, Type 4.
    - b. CWP Rating: 200 psig.
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded.
    - f. Disc: PTFE or TFE.
- C. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane Co.; Crane Valve Group; Crane Valves.
    - c. Crane Co.; Crane Valve Group; Jenkins Valves.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. Kitz Corporation.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Red-White Valve Corporation.
    - i. Zy-Tech Global Industries, Inc.
  2. Description:
    - a. Standard: MSS SP-80, Type 3.
    - b. CWP Rating: 300 psig.
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.
    - e. Ends: Threaded.
    - f. Disc: Bronze.
- D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  2. Description:
    - a. Standard: MSS SP-80, Type 4.
    - b. CWP Rating: 300 psig.
    - c. Body Design: Horizontal flow.
    - d. Body Material: ASTM B 62, bronze.



- e. Ends: Threaded.
- f. Disc: PTFE or TFE.

## 2.6 IRON SWING CHECK VALVES

- A. Class 125, Iron Swing Check Valves with Metal Seats:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Division.
    - d. Hammond Valve.
    - e. Kitz Corporation.
    - f. Legend Valve.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Red-White Valve Corporation.
    - k. Sure Flow Equipment Inc.
    - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - m. Zy-Tech Global Industries, Inc.
  - 2. Description:
    - a. Standard: MSS SP-71, Type I.
    - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig, SWP rating: 125 psig to 353 degrees F.
    - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
    - d. Body Design: Clear or full waterway.
    - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
    - f. Ends: Flanged or Grooved.
    - g. Trim: Bronze.
    - h. Gasket: Asbestos free.

## 2.7 CAST STEEL SWING CHECK VALVE

- A. Class 150, Cast Steel Swing Check Valves:
- B.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Stockham Division.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Powell Valves.
    - g. Watts RegulatorCo.; a division of Watts Water Technologies, Inc.
    - h.
  - 2. Description:
    - a. Standard: ASME B16.34, B16.10.
    - b. NPS 2½ to NPS 12, CWP Rating: 285 psig, SWP Rating: 185 psig saturated to 450 degrees F.

- c. Body Material: ASTM A 216 WCB cast steel with bolted bonnet.
- d. Ends: Flanged ASME B16.5 or Grooved.
- e. Trim: CR-13 stainless steel.
- f. Disc: CR-13 stainless steel.
- g. Seat Ring: Stellite.

## 2.8 IRON, CENTER-GUIDED CHECK VALVES

- A. Class 125, Iron, Globe, Center-Guided Check Valves with Resilient Seat:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. APCO Willamette Valve and Primer Corporation.
    - b. Crispin Valve.
    - c. DFT Inc.
    - d. Hammond Valve.
    - e. Keckley.
    - f. Milwaukee Valve Company.
    - g. NIBCO INC.
    - h. Val-Matic Valve & Manufacturing Corp.
  - 2. Description:
    - a. Standard: MSS SP-125.
    - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig at 100 degrees F, 125 psig at 450 degrees F.
    - c. Body Material: ASTM A 126, Class B cast iron.
    - d. Trim and Disc: Stainless Steel.
    - e. Style: Globe, spring loaded.
    - f. Ends: Flanged or Grooved.
    - g. Seat: EPDM.

## 2.9 BRONZE GATE VALVES

- A. Class 125, NRS Bronze Gate Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Valve, Inc.
    - b. Crane Co.; Crane Valve Group; Crane Valves.
    - c. Crane Co.; Crane Valve Group; Jenkins Valves.
    - d. Crane Co.; Crane Valve Group; Stockham Division.
    - e. Hammond Valve.
    - f. Kitz Corporation.
    - g. Milwaukee Valve Company.
    - h. NIBCO INC.
    - i. Powell Valves.
    - j. Red-White Valve Corporation.
    - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - l. Zy-Tech Global Industries, Inc.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 1.
    - b. CWP Rating: 200 psig, SWP Rating: 125 psig saturated to 353 degrees F.

- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded[ or solder joint.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

B. Class 125, RS Bronze Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Valve, Inc.
  - b. Crane Co.; Crane Valve Group; Crane Valves.
  - c. Crane Co.; Crane Valve Group; Jenkins Valves.
  - d. Crane Co.; Crane Valve Group; Stockham Division.
  - e. Hammond Valve.
  - f. Kitz Corporation.
  - g. Milwaukee Valve Company.
  - h. NIBCO INC.
  - i. Powell Valves.
  - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - k. Zy-Tech Global Industries, Inc.
- 2. Description:
  - a. Standard: MSS SP-80, Type 2.
  - b. CWP Rating: 200 psig, SWP Rating: 125 psig saturated to 353 degrees F..
  - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
  - d. Ends: Threaded[ or solder joint].
  - e. Stem: Bronze.
  - f. Disc: Solid wedge; bronze.
  - g. Packing: Asbestos free.
  - h. Handwheel: Malleable iron.

C. Class 150, NRS Bronze Gate Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hammond Valve.
  - b. Kitz Corporation.
  - c. Milwaukee Valve Company.
  - d. NIBCO INC.
  - e. Powell Valves.
  - f. Red-White Valve Corporation.
  - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
  - a. Standard: MSS SP-80, Type 1.
  - b. CWP Rating: 300 psig, SWP Rating: 150 psig saturated to 366 degrees F..
  - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
  - d. Ends: Threaded.
  - e. Stem: Bronze.
  - f. Disc: Solid wedge; bronze.

- g. Packing: Asbestos free.
  - h. Handwheel: Malleable iron.
- D. Class 150, RS Bronze Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Stockham Division.
    - c. Hammond Valve.
    - d. Kitz Corporation.
    - e. Milwaukee Valve Company.
    - f. NIBCO INC.
    - g. Powell Valves.
    - h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - i. Zy-Tech Global Industries, Inc.
  2. Description:
    - a. Standard: MSS SP-80, Type 2.
    - b. CWP Rating: 300 psig, SWP Rating: 150 psig saturated to 366 degrees F..
    - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
    - d. Ends: Threaded.
    - e. Stem: Bronze.
    - f. Disc: Solid wedge; bronze.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron.

## 2.10 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Division.
    - d. Flo Fab Inc.
    - e. Hammond Valve.
    - f. Kitz Corporation.
    - g. Legend Valve.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Powell Valves.
    - k. Red-White Valve Corporation.
    - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - m. Zy-Tech Global Industries, Inc.
  2. Description:
    - a. Standard: MSS SP-70, Type I.
    - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig, SWP Rating: 125 psig saturated to 353 degrees F..
    - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
    - d. Ends: Flanged or Grooved.
    - e. Trim: Bronze.

- f. Disc: Solid wedge.
  - g. Packing and Gasket: Asbestos free.
- B. Class 125, OS&Y, Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Division.
    - d. Flo Fab Inc.
    - e. Hammond Valve.
    - f. Kitz Corporation.
    - g. Legend Valve.
    - h. Milwaukee Valve Company.
    - i. NIBCO INC.
    - j. Powell Valves.
    - k. Red-White Valve Corporation.
    - l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - m. Zy-Tech Global Industries, Inc.
  2. Description:
    - a. Standard: MSS SP-70, Type I.
    - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig, SWP Rating: 125 psig saturated to 353 degrees F.
    - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
    - d. Ends: Flanged or Grooved.
    - e. Trim: Bronze.
    - f. Disc: Solid wedge.
    - g. Packing and Gasket: Asbestos free.

## 2.11 CAST STEEL GATE VALVE

- A. Class 150, OS&Y, Cast Steel Gate Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Stockham Division.
    - c. Hammond Valve.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Powell Valves.
    - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  2. Description:
    - a. Standard: ASME B16.34, B16.10.
    - b. NPS 2-1/2 to NPS 12, CWP Rating: 285 psig, SWP Rating: 185 psig saturated to 450 degrees F.
    - c. Body Material: ASTM A 216, WCB cast steel with bolted bonnet.
    - d. Ends: Flanged, ASME B16.5 or Grooved.
    - e. Trim: CR-13 Stainless Steel.
    - f. Disc: Solid wedge, CR-13 Stainless Steel.
    - g. Seat Ring: Stellite.
    - h. Packing and Gasket: Asbestos free.

## 2.12 BRONZE GLOBE VALVES

- A. Class 125, Bronze Globe Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Stockham Division.
    - c. NIBCO INC.
    - d. Red-White Valve Corporation.
  2. Description:
    - a. Standard: MSS SP-80, Type 2.
    - b. CWP Rating: 200 psig.
    - c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
    - d. Ends: Threaded[ or solder joint].
    - e. Stem: Bronze.
    - f. Disc: PTFE or TFE.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron.
- B. Class 150, Bronze Globe Valves with Nonmetallic Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Hammond Valve.
    - c. Kitz Corporation.
    - d. Milwaukee Valve Company.
    - e. NIBCO INC.
    - f. Powell Valves.
    - g. Red-White Valve Corporation.
    - h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - i. Zy-Tech Global Industries, Inc.
  2. Description:
    - a. Standard: MSS SP-80, Type 2.
    - b. CWP Rating: 300 psig.
    - c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
    - d. Ends: Threaded.
    - e. Stem: Bronze.
    - f. Disc: PTFE or TFE.
    - g. Packing: Asbestos free.
    - h. Handwheel: Malleable iron.

## 2.13 IRON GLOBE VALVES

- A. Class 125, Iron Globe Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Crane Co.; Crane Valve Group; Crane Valves.
    - b. Crane Co.; Crane Valve Group; Jenkins Valves.
    - c. Crane Co.; Crane Valve Group; Stockham Division.
    - d. Hammond Valve.

- e. Kitz Corporation.
  - f. Milwaukee Valve Company.
  - g. NIBCO INC.
  - h. Powell Valves.
  - i. Red-White Valve Corporation.
  - j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  - k. Zy-Tech Global Industries, Inc.
2. Description:
- a. Standard: MSS SP-85, Type I.
  - b. CWP Rating: 200 psig.
  - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
  - d. Ends: Flanged or Grooved.
  - e. Trim: Bronze.
  - f. Packing and Gasket: Asbestos free.
- B. Class 250, Iron Globe Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Crane Co.; Crane Valve Group; Jenkins Valves.
  - c. Crane Co.; Crane Valve Group; Stockham Division.
  - d. Hammond Valve.
  - e. Milwaukee Valve Company.
  - f. NIBCO INC.
  - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
- a. Standard: MSS SP-85, Type I.
  - b. CWP Rating: 500 psig.
  - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
  - d. Ends: Flanged or Grooved.
  - e. Trim: Bronze.
  - f. Packing and Gasket: Asbestos free.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

### **3.2 VALVE INSTALLATION**

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly, gate, and globe valves installed in mechanical rooms, NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.
- F. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.

### **3.3 ADJUSTING**

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### **3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS**

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service Hydronic: Ball or butterfly valves.
  - 2. Shutoff Service Steam: Gate valves.
  - 3. Butterfly Valve Dead-End Service: Single-flange (lug) type.
  - 4. Throttling Service except Steam: Ball or butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
  - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
  - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends except where socket welded ends are indicated in valve schedule below.
  - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option or grooved ends are indicated in valve schedules below.
  - 6. For Steel Piping, NPS 5 and Larger: Flanged or grooved ends.



### **3.5 CONDENSER WATER**

- A. Pipe NPS 3 and Smaller:
  - 1. Ball Valves: Two piece, NPS 2 and smaller: full port; NPS 2.5 and larger: regular port, bronze with stainless-steel trim.
  - 2. Bronze Swing Check Valves: Class 150 nonmetallic disc.
  - 3. Iron Globe Center-Guided Check Valve: Class 150, stainless steel trim and disk (For pump discharge check valves)
  
- B. Pipe NPS 2.5 and Larger:
  - 1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
  - 2. Iron Swing Check Valves: Class 150, nonmetallic disc.
  - 3. Iron Globe Center-Guided Check Valve: Class 150, stainless steel trim and disk (For pump discharge check valves)
  - 4. Grooved end valves and accessories are acceptable where installed in grooved end mechanically coupled piping systems.

### **3.6 DOMESTIC COLD WATER, DOMESTIC HOT WATER, PROCESS WATER**

- A. Pipe NPS 3 and Smaller:
  - 1. Ball Valves: Two piece, NPS 2 and smaller: full port; NPS 2.5 and larger: regular port, bronze with stainless-steel trim.
  - 2. Bronze Swing Check Valves: Class 150 nonmetallic disc.
  
- B. Pipe NPS 4 and Larger:
  - 1. Iron Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

**END OF SECTION 230523**

## **SECTION 232113 - HYDRONIC PIPING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:
  - 1. Condenser water piping
  - 2. Process Cold water (make-up water) piping
  - 3. Condensate Drain piping
  - 4. Cooling Tower Overflow Drain piping
  - 5. Condenser System Chemical Treatment piping
- B. Related Sections include the following:
  - 1. Section 232123 "Hydronic Pumps" for pumps, motors and accessories for hydronic piping.

#### **1.3 PERFORMANCE REQUIREMENTS**

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:
  - 1. Condenser water piping: 150 psig at 250 deg. F.
  - 2. Process Cold water piping: 150 psig at 250 deg. F.
  - 3. Condensate Drain piping: 150 psig at 250 deg. F.
  - 4. Cooling Tower Overflow Drain piping: 15 feet water column
  - 5. Condenser System Chemical Treatment piping: 125 [psig at 180 deg. F)

#### **1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of the following:
  - 1. Pipe and fittings.
  - 2. Mechanical couplings
  - 3. Valves.
  - 4. Hydronic specialties.
  - 5. Air control devices.
  - 6. Chemical Treatment.
  - 7. Plastic pipe and fittings with solvent cement.

## **1.5 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.
- B. Field quality-control test reports.

## **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For valves, air control devices, hydronic specialties, and special-duty valves to include in operation and maintenance manuals.

## **1.7 QUALITY ASSURANCE**

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

## **PART 2 - PRODUCTS**

### **2.1 COPPER TUBE AND FITTINGS**

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. Wrought-Copper Fittings: ASME B16.22.
- D. Wrought-Copper Unions: ASME B16.22.

### **2.2 STEEL PIPE AND FITTINGS**

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.
- F. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- G. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
  - 1. Material Group: 1.1.
  - 2. End Connections: Butt welding.
  - 3. Facings: Raised face.
- H. Grooved Mechanical-Joint Fittings and Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Anvil International, Inc.
    - b. Victaulic Company.
  - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
  - 3. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- I. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

## 2.3 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

- D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.
- G. Solvent Cements for Joining Plastic Piping:
  - 1. CPVC Piping: ASTM F 493.
    - a. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - b. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
    - a. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - b. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Description:
    - a. Standard: ASSE 1079.
    - b. Pressure Rating: 125 psig minimum at 180 deg F.
    - c. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
  - 1. Description:
    - a. Standard: ASSE 1079.
    - b. Factory-fabricated, bolted, companion-flange assembly.
    - c. Pressure Rating: 125 psig minimum at 180 deg F.
    - d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

## 2.5 VALVES

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."
- B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Section 230900 "Instrumentation and Control for HVAC."
- C. Bronze, Calibrated-Orifice, Balancing Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    - c. Flow Design Inc.
    - d. Gerand Engineering Co.
    - e. Griswold Controls.
    - f. Taco.
  - 2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
  - 3. Ball: Brass or stainless steel.
  - 4. Plug: Resin.
  - 5. Seat: PTFE.
  - 6. End Connections: Threaded or socket.
  - 7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
  - 8. Handle Style: Lever, with memory stop to retain set position.
  - 9. CWP Rating: Minimum 125 psig.
  - 10. Maximum Operating Temperature: 250 deg F.
- D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett Domestic Pump; a division of ITT Industries.
    - c. Flow Design Inc.
    - d. Gerand Engineering Co.
    - e. Griswold Controls.
    - f. Taco.
    - g. Tour & Andersson; available through Victaulic Company.
  - 2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
  - 3. Ball: Brass or stainless steel.
  - 4. Stem Seals: EPDM O-rings.
  - 5. Disc: Glass and carbon-filled PTFE.
  - 6. Seat: PTFE.
  - 7. End Connections: Flanged or grooved.
  - 8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
  - 9. Handle Style: Lever, with memory stop to retain set position.
  - 10. CWP Rating: Minimum 125 psig.
  - 11. Maximum Operating Temperature: 250 deg F.
- E. Plastic Ball Valves:

1. Body: One-, two-, or three-piece CPVC or PVC to match piping.
  2. Ball: Full-port CPVC or PVC to match piping.
  3. Seats: PTFE.
  4. Seals: EPDM.
  5. End Connections: Socket, union, or flanged.
  6. Handle Style: Tee shape.
  7. CWP Rating: Equal to piping service.
  8. Maximum Operating Temperature: Equal to piping service.
  9. Comply with MSS SP-122.
- F. Diaphragm-Operated, Pressure-Reducing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong Pumps, Inc.
    - b. Bell & Gossett; a division of ITT Industries.
    - c. Taco.
    - d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
  2. Body: Bronze or brass.
  3. Disc: Glass and carbon-filled PTFE.
  4. Seat: Brass.
  5. Stem Seals: EPDM O-rings.
  6. Diaphragm: EPT.
  7. Low inlet-pressure check valve.
  8. Valve Seat and Stem: Noncorrosive.
  9. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.
- G. Diaphragm-Operated Safety Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Bell & Gossett; a division of ITT Industries.
    - b. Spence Engineering Company, Inc.
    - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - d. Kunkle.
  2. Body: Bronze or brass.
  3. Trim: Stainless Steel
  4. Test Lift Lever: Stainless Steel
  5. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

## 2.6 AIR CONTROL DEVICES

- A. Manual Air Vents, Manual Drains:
1. Body: Bronze, ball valve, two-piece, threaded.
  2. Trim: Chrome plated bronze.
  3. Inlet Connection: NPS ¾ or as indicated on drawings.
  4. Discharge Connection: NPS 3/4 with male threaded hose connection and cap.
  5. CWP Rating: 150 psig.

6. Maximum Operating Temperature: 225 deg F.
- B. Automatic Air Vents:
1. Body: Bronze or cast iron.
  2. Internal Parts: Nonferrous.
  3. Operator: Noncorrosive metal float.
  4. Inlet Connection: NPS ½ (minimum).
  5. Discharge Connection: NPS 1/4.
  6. CWP Rating: 150 psig.
  7. Maximum Operating Temperature: 240 deg F.

## 2.7 CHEMICAL TREATMENT

- A. Bypass Chemical Feeder: Welded steel construction; 125-psig working pressure; 5-gal. capacity; with fill funnel and inlet, outlet, and drain valves.
1. Chemicals: **See Section 232500 – HVAC Water Treatment.**

## 2.8 HYDRONIC PIPING SPECIALTIES

- A. Y-Pattern Strainers:
1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
  2. End Connections: Threaded ends for NPS 2 and smaller; flanged or grooved ends for NPS 2-1/2 and larger.
  3. Strainer Screen: [40] [60]-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
  4. CWP Rating: 125 psig.
- B. Coil Hoses
1. For NPS pipe sizes 2 inches and smaller: 375 psi maximum CWP, stainless steel braided hose and a synthetic polymer core with stainless ferrules; available as male by female swivel and male by male swivel and in lengths: 12" or 24". Suitable for operating temperatures up to 230°F.”

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

- A. Condenser Water Piping aboveground, NPS 2 and smaller, shall be the following:
1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joints.
- B. Condenser Water Piping aboveground, NPS 2-1/2 and larger, shall be the following:
1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.



- C. Air-Vent Piping, Drain Piping:
  - 1. Inlet: Same as service where installed.
  - 2. Outlet: Type L, drawn-temper copper tubing with soldered or flared joints.
- D. Process cold-water piping; aboveground, NPS 3 and smaller, shall be the following:
  - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered or brazed joint.
- E. Condensate Drain Piping: Type L, drawn-temper copper tubing with soldered joints.
- F. Cooling Tower Overflow Drain piping: Schedule 40 PVC plastic pipe and fittings and solvent-welded joints
- G. Condenser System Chemical Treatment piping: Schedule 80 CPVC plastic pipe and fittings and solvent-welded joints.
- H. Safety-Valve-Inlet and -Outlet Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed.

### **3.2 VALVE APPLICATIONS**

- A. Install shutoff-duty valves at each branch connections to supply and return mains, at supply and return connections to each piece of equipment and where shown on Drawings.
- B. Install calibrated-orifice, balancing valves in the supply/return pipe of each heating or cooling terminal and where shown on Drawings.
- C. Install check valves at each pump discharge and where shown on Drawings.
- D. Install safety valves at hot-water generators, hot-water boilers, where shown on drawings and elsewhere as required by ASME Boiler and Pressure Vessel Code. For hydronic applications, pipe discharge to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
- E. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

### **3.3 PIPING INSTALLATIONS**

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to allow the removal of air handling unit and other heat transfer coils. Piping run-outs to coil connections shall be removable. Coil piping service valves shall not be in the coil pull space path.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- M. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains, heat transfer coils and elsewhere as required for system drainage. Provide larger drain valve assembly where indicated on Drawings.
- N. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- O. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- P. Install branch connections to mains using tee fittings in main pipe.
- Q. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."
- R. Install unions in piping, NPS 1.5 through NPS 2, adjacent to valves, at final connections of equipment, and elsewhere as indicated. Do not install unions in copper pipe NPS 1.25 and smaller.
- S. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment, flanged valves and accessories and elsewhere as indicated.
- T. Install strainers in piping as indicated on Drawings.
- U. Steel piping connections to equipment with rotation or reciprocating components shall be provided with three grooved clamp type couplings per piping connection, which shall be Victaulic style 77 couplings or equivalent. Copper piping connections to equipment with rotating or reciprocating components shall be provided with Mason Industries SafetyFlex

model SFDEJ flexible joint. Air handling units with internal fan isolation are not included in the above.

- V. Identify piping as specified in Section 230553 "Identification for HVAC Piping and Equipment."
- W. Install sleeves for piping penetrations of walls, ceilings, and floors where required. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping." and Section 078446 "Firestopping".

### 3.4 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor devices are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal piping, cold or ambient temperature pipe and hot temperature pipe 2 inches and smaller.
  - 2. Adjustable roller hangers for individual horizontal hot temperature piping 2-1/2 inch and larger and 20 feet or longer.
  - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal hot temperature piping 2-1/2 inch and larger and 20 feet or longer, supported on a trapeze or pipe support rack.
  - 4. Spring hangers to support vertical runs.
  - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 3/4: Maximum span, 7 feet; minimum rod size, 1/4 inch.
  - 2. NPS 1: Maximum span, 7 feet; minimum rod size, 1/4 inch.
  - 3. NPS 1-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
  - 4. NPS 2: Maximum span, 10 feet; minimum rod size, 3/8 inch.
  - 5. NPS 2-1/2: Maximum span, 11 feet; minimum rod size, 3/8 inch.
  - 6. NPS 3: Maximum span, 12 feet; minimum rod size, 3/8 inch.
  - 7. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.
  - 8. NPS 6: Maximum span, 12 feet; minimum rod size, 1/2 inch.
  - 9. NPS 8: Maximum span, 12 feet; minimum rod size, 5/8 inch.
  - 10. NPS 10: Maximum span, 12 feet; minimum rod size, 3/4 inch.
  - 11. NPS 12: Maximum span, 12 feet; minimum rod size, 7/8 inch.
- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
  - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
  - 3. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 4. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 5. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
  - 6. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

- E. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions but not more than 4 feet for piping 1-1/4 inch or larger and 3 feet for piping 1 inch or smaller. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

### **3.5 PIPE JOINT CONSTRUCTION**

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: 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.
- F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- H. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

### **3.6 HYDRONIC SPECIALTIES INSTALLATION**

- A. Install manual air vents and caps at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting and shown on Drawings.
- B. Install automatic air vent at air separator.
- C. Install tangential air separator where shown on Drawings. Install blowdown piping with full-port ball valve; extend full size to nearest floor drain.
- D. Install bypass chemical feeders in each hydronic system where indicated on Drawings, in upright position with top of funnel not more than 48 inches above the floor. Install feeder

in minimum NPS 3/4 bypass line, from main with full-port, ball valves at main connection. Install NPS 3/4 pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

### 3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
  2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
  3. The Contractor shall provide all flushing media and cleaning chemicals in sufficient quantity, inlet connections, discharge or drainage outlets and any temporary provision to protect components, or remove it, to facilitate the flushing. Contractor shall provide circulation pumps as required for cleaning.
  4. All new hydronic pipe systems shall be flushed continuously with 100% city water make-up until the water runs clean from all drain locations. Each piping system shall be subsequently cleaned with recommended dosage of an approved pre-cleaning chemical designed to remove deposition such as pipe dope, oils, loose rust, mill scale, and other extraneous materials for a minimum period of twenty-four (24) hours. The piping system shall then be drained, refilled, and rinsed clean. Flushing before and rinsing after cleaning shall be supplying constant make-up water while draining at all system low points and drains.
  5. After cleaning, remove start-up strainers and/or remove and clean or replace permanent strainer screens.
  6. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
  7. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing.
  2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
  3. Isolate expansion tanks and determine that hydronic system is full of water.
  4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
  5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
  6. Prepare written report of testing.

- C. Perform the following before operating the system:
1. Open manual valves fully.
  2. Inspect pumps for proper rotation.
  3. Set makeup pressure-reducing valves for required system pressure.
  4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
  5. Set temperature controls so all coils are calling for full flow.
  6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
  7. Verify lubrication of motors and bearings.

**END OF SECTION 232113**

## **SECTION 236500 - COOLING TOWERS**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Open-circuit, induced-draft, crossflow cooling towers.

#### **1.3 DEFINITIONS**

- A. BMS: Building management system.
- B. FRP: Fiber-reinforced polyester.

#### **1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Cooling towers shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rated capacities, pressure drop, fan performance data, rating curves with selected points indicated, furnished specialties, and accessories.
  - 1. Maximum flow rate.
  - 2. Minimum flow rate.
  - 3. Drift loss as percent of design flow rate.
  - 4. Volume of water in suspension for purposes of sizing a remote storage tank.
  - 5. Sound power levels in eight octave bands for operation with fans off, fans at minimum, and design speed.
  - 6. Performance curves for the following:
    - a. Varying entering-water temperatures from design to minimum.

- b. Varying ambient wet-bulb temperatures from design to minimum.
  - c. Varying water flow rates from design to minimum.
  - d. Varying fan operation (off, minimum, and design speed).
7. Fan airflow, brake horsepower, and drive losses.
  8. Pump flow rate, head, brake horsepower, and efficiency.
  9. Motor amperage, efficiency, and power factor at 100, 75, 50, and 25 percent of nameplate horsepower.
  10. Electrical power requirements for each cooling tower component requiring power.
- B. Shop Drawings: Complete set of manufacturer's prints of cooling tower assemblies, control panels, sections and elevations, and unit isolation. Include the following:
1. Assembled unit dimensions.
  2. Weight and load distribution.
  3. Required clearances for maintenance and operation.
  4. Sizes and locations of piping and wiring connections.
  5. Wiring Diagrams: For power, signal, and control wiring.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
1. Structural supports.
  2. Piping roughing-in requirements.
  3. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
  4. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.
- B. Certificates: For certification required in "Quality Assurance" Article.
- C. Seismic Qualification Certificates: For cooling towers, accessories, and components, from manufacturers.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Source quality-control reports.
- E. Field quality-control reports.
- F. Startup service reports.
- G. Warranty: Sample of special warranty.



## **1.7 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each cooling tower to include in emergency, operation, and maintenance manuals.

## **1.8 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Certified by CTI.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. CTI Certification: Cooling tower thermal performance according to CTI STD 201, "Certification Standard for Commercial Water-Cooling Towers Thermal Performance."
- D. FMG approval and listing in the latest edition of FMG's "Approval Guide."

## **1.9 COORDINATION**

- A. Coordinate sizes, locations, and anchoring attachments of structural-steel support structures.

## **1.10 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of cooling towers that fail in materials or workmanship within specified warranty period:
  - 1. Gear Reducer Transmission.
  - 2. Warranty Period: 5 years from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 OPEN-CIRCUIT, INDUCED-DRAFT, CROSSFLOW COOLING TOWERS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Marley Cooling Technologies NC 8405 as scheduled and indicated on Drawings and specified here-in or comparable product by one of the following:
  - 1. Baltimore Aircoil Company.
  - 2. EVAPCO.
- B. Fabricate cooling tower mounting base with reinforcement strong enough to resist cooling tower movement during a seismic event when cooling tower is anchored to field support structure.
- C. Cooling tower designed to resist wind load of 30 lbf/sq. ft..
- D. Casing and Frame:

1. Casing and Frame Material: Galvanized steel
2. Fasteners: Galvanized steel
3. Joints and Seams: Sealed watertight.
4. Welded Connections: Continuous and watertight.

E. Cold Water Collection Basin:

1. Material: 301L or 304 Stainless steel.
2. Construction: Welded continuous and watertight.
3. Removable stainless-steel strainer with openings smaller than nozzle orifices.
4. Overflow and drain connections as shown on Drawings
5. Outlet Connection: Remote sump with ASME B16.5, Class 150 flange outlet and drain connection configured as shown on Drawings.
6. Equalizer connection for field-installed equalizer piping as shown on Drawings.

F. Gravity Hot Water Distribution Basin: Nonpressurized design with head of water level in basin adequate to overcome spray nozzle losses and designed to evenly distribute water over fill throughout the flow range indicated.

1. Material: 301L or 304 Stainless steel.
2. Location: Over each bank of fill (total of two) with easily replaceable plastic spray nozzles mounted in bottom of basin.
3. Inlet Connection: ASME B16.5, Class 150 flange.
4. Joints and Seams: Sealed watertight.
5. Partitioning Dams: Same material as basin to distribute water over the fill to minimize icing while operating throughout the flow range indicated.
6. Removable Panels: Same material as basin to completely cover top of basin. Secure panels to basin with removable stainless-steel hardware.
7. Valves: Manufacturer's standard valve installed at each inlet connection and arranged to balance or shut off flow to each gravity distribution basin.

G. Fill:

1. Materials: PVC, with maximum flame-spread index of 25 according to ASTM E 84.
2. Minimum Thickness: 20 mils, before forming.
3. Fabrication: Fill-type sheets, fabricated, formed, and bonded together after forming into removable assemblies that are factory installed by manufacturer.
4. Fill Material Operating Temperature: Suitable for entering-water temperatures up through 120 deg F.

H. Drift Eliminator:

1. Material: PVC; with maximum flame-spread index of 25 according to ASTM E 84.
2. UV Treatment: Inhibitors to protect against damage caused by UV radiation.
3. Configuration: Multipass, designed and tested to reduce water carryover to achieve performance indicated.
4. Location: Integral to fill.

I. Air-Intake Louvers:

1. Material: PVC.
  2. UV Treatment: Inhibitors to protect against damage caused by UV radiation.
  3. Louver Blades: Arranged to uniformly direct air into cooling tower, to minimize air resistance, and to prevent water from splashing out of tower during all modes of operation including operation with fans off.
  4. Location: Integral to fill.
- J. Axial Fan: Balanced at the factory after assembly.
1. Blade Material: Aluminum.
  2. Hub Material: Galvanized steel.
  3. Blade Pitch: Field adjustable.
  4. Protective Enclosure: Removable, galvanized-steel, wire-mesh screens complying with OSHA regulations.
  5. Fan Shaft Bearings: Self-aligning ball or roller bearings with moisture-proof seals and premium, moisture-resistant grease suitable for temperatures between minus 20 and plus 300 deg F. Bearings designed for an L-10A life of 100,000 hours.
  6. Bearings Grease Fittings: Extended lubrication lines to an easily accessible location.
- K. Gear Drive: Right angle, reduced speed, and designed for cooling tower applications according to CTI STD 111. Motor and gear drive shall be aligned before shipment.
1. Gear Drive and Coupling Service Factor: 2.0 based on motor nameplate horsepower.
  2. Housing: Cast iron, with epoxy or polyurethane finish, beveled high-strength steel gears continuously bathed in oil, and with lubrication to other internal parts at all operating speeds.
  3. Mounting: Directly mounted to fan hub and connected to motor so motor shaft is in horizontal position.
  4. Operation: Able to operate both forward and in reverse.
  5. Drive-to-Motor Connection: Connected to motor located outside of cooling tower casing by a full-floating drive shaft.
  6. Drive Shaft Material: Stainless steel, and fitted with flexible couplings on both ends. Provide exposed shaft and couplings with guards according to OSHA regulations.
  7. Extend oil fill, drain, and vent to outside of cooling tower casing using galvanized-steel piping. Provide installation with oil-level sight glass.
- L. Fan Motor:
1. General Requirements for Fan Motors: Comply with NEMA designation and temperature-rating requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment" and not indicated below.
  2. Motor Enclosure: Totally enclosed fan cooled (TEFC).
  3. Energy Efficiency: NEMA Premium Efficient (MG-1).
  4. Service Factor: 1.15.
  5. Insulation: Class F.
  6. Variable-Speed Motors: Inverter-duty rated per NEMA MG-1, Section IV, "Performance Standard Applying to All Machines," Part 31, "Definite-Purpose, Inverter-Fed, Polyphase Motors."
  7. Motor Location: Mounted outside of cooling tower casing and cooling tower discharge airstream.

M. Vibration Switch: For each fan drive.

1. Enclosure: NEMA 250, Type 4.
2. Vibration Detection: Sensor with a field-adjustable, acceleration-sensitivity set point in a range of 0 to 1 g and frequency range of 0 to 3000 cycles per minute. Cooling tower manufacturer shall recommend switch set point for proper operation and protection.
3. Provide switch with manual-reset button.

N. Personnel Access Components:

1. Doors: Large enough for personnel to access cooling tower internal components from both cooling tower end walls. Doors shall be operable from both sides of the door.
2. External Ladders with Safety Cages: Aluminum, galvanized- or stainless-steel, fixed ladders with ladder extensions to access external platforms and top of cooling tower from adjacent grade without the need for portable ladders. Comply with 29 CFR 1910.27.
3. Handrail: Aluminum, galvanized steel, or stainless steel complete with kneerail and toeboard, around top of cooling tower. Comply with 29 CFR 1910.23.
4. Internal Platforms: galvanized-steel bar grating.
  - a. Spanning the collection basin from one end of cooling tower to the other and positioned to form a path between the access doors. Platform shall be elevated so that all parts are above the high water level of the collection basin.

O. Capacities and Characteristics:

1. Number of Cells: See Drawings.
2. Air-Inlet Arrangement: Two sides.
3. Maximum Drift Loss: 0.005 percent of design water flow.
4. Water Flow/Cell: See Drawings.
5. Entering-Water Temperature: See Drawings.
6. Leaving-Water Temperature: See Drawings.
7. Entering-Air Wet-Bulb Temperature: See Drawings.
8. Fan Motor: See Drawings
  
9. Sound Pressure Level: 76 dBA at 5 feet when measured according to CTI ATC 128.
10. Basin Heater:
  - a. Basin Water Temperature: 40 deg F.
  - b. Outdoor Ambient Temperature: -15 deg F.
  - c. Capacity/Cell: 7.5 KW .
  - d. Electrical Characteristics: 480-V ac, 3 phase, 60 Hz.

## 2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Test and certify cooling tower performance according to CTI STD 201, "Certification Standard for Commercial Water-Cooling Towers Thermal Performance."

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Before cooling tower installation, examine roughing-in for tower support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting tower performance, maintenance, and operation.
  - 1. Cooling tower locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- A. Install cooling towers on support structure indicated.
- B. Install anchor bolts to for proper attachment to supported equipment.
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

### **3.3 CONNECTIONS**

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to cooling towers to allow service and maintenance.
- C. Provide drain piping with valve at cooling tower drain connections and at low points in piping.
- D. Connect cooling tower overflows and drains, and piping drains to roof drain system.
- E. Supply, Return, Equalizer, Bypass and Drain Piping: Comply with applicable requirements in Section 232113 "Hydronic Piping." Connect to cooling tower as shown on Drawings.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform field tests and inspections.
- C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Cooling towers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

### **3.5 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
- C. Obtain performance data from manufacturer.
  1. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
    - a. Clean entire unit including basins.
    - b. Verify that accessories are properly installed.
    - c. Verify clearances for airflow and for cooling tower servicing.
    - d. Check for vibration isolation and structural support.
    - e. Lubricate bearings.
    - f. Verify fan rotation for correct direction and for vibration or binding and correct problems.
    - g. Adjust belts to proper alignment and tension.
    - h. Verify proper oil level in gear-drive housing. Fill with oil to proper level.
    - i. Operate variable-speed fans through entire operating range and check for harmonic vibration imbalance. Set motor controller to skip speeds resulting in abnormal vibration.
    - j. Check vibration switch setting. Verify operation.
    - k. Verify water level in tower basin. Fill to proper startup level. Check makeup water-level control and valve.
    - l. Verify operation of basin heater and control.
    - m. Verify that cooling tower air discharge is not recirculating air into tower or HVAC air intakes. Recommend corrective action.
    - n. Replace defective and malfunctioning units.
  - D. Start cooling tower and associated water pumps. Follow manufacturer's written starting procedures.
  - E. Prepare a written startup report that records the results of tests and inspections.

### **3.6 ADJUSTING**

- A. Set and balance water flow to each tower inlet.

Replace Cooling Towers

St. Louis Forensic Treatment Center – North

M2015-01

**3.7 DEMONSTRATION**

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

**END OF SECTION 236500**