

ADDENDUM NO. 01  
Addendum Date: December 6, 2024

Notice to Bidders: This addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated December 2024 as noted below. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the bidder to disqualification.

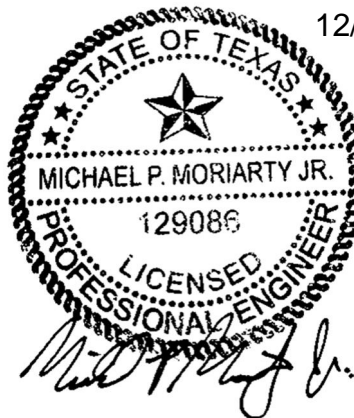
This Addendum consists of 91 pages and can be downloaded from the internet at Civcast at: <https://www.civcastusa.com>, browse for PW24-18.

MODIFICATIONS TO CONTRACT DOCUMENTS

1. Addition of Base Bid Item 16: Removal of 2-ft thick concrete structure to the bid form.
2. Addition of Base Bid Item 16 to Section 01 20 00 Measurement and Payment.
3. Addition of the following technical specifications to the project manual:
  - a. Section 22 00 10
  - b. Section 22 05 12
  - c. Section 22 10 00
  - d. Section 22 10 01
  - e. Section 22 11 19
  - f. Section 22 30 00
  - g. Section 22 40 01
4. Addition of the Site Plan from the 1980 record drawings for the existing plant as Appendix D to the project manual.

END OF ADDENDUM

12/6/2024



Michael P. Moriarty, P.E.  
Kimley-Horn and Associates, Inc.  
TBPE Firm No. F-928

**BID FORM  
FOR  
Wastewater Treatment Plant Improvements Phase 1  
City of West University Place, Texas**

**Bidder:** \_\_\_\_\_ Date \_\_\_\_\_  
 (Name of Contractor)  
 \_\_\_\_\_  
 (Address)  
 \_\_\_\_\_  
 (Phone) \_\_\_\_\_ (Fax) \_\_\_\_\_

**ARTICLE 1 – BID RECIPIENT**

- 1.01 This Bid is submitted to:  
**City of West University Place**  
**Attention: City Secretary**  
**3800 University Boulevard**  
**West University Place, TX 77005**
- 1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

**ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS**

- 2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for ninety (90) calendar days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.
- 2.02 Bidder will sign and submit the Agreement with the Bonds and other required documents within fifteen (15) calendar days after the date of Owner’s Notice of Award.

**ARTICLE 3 – BIDDER’S REPRESENTATIONS**

- 3.01 In submitting this Bid, Bidder represents that:
- A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:
- | Number | Addendum Date |
|--------|---------------|
| _____  | _____         |
| _____  | _____         |
| _____  | _____         |
- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Section 4.02 of Specification 00 21 13 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in Section 4.03 of Specification 00 21 13 as containing reliable "technical data."
- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents in the Contract Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

#### **ARTICLE 4 – BIDDER'S CERTIFICATION**

##### 4.01 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;
  2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition
  3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
  4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

**ARTICLE 5 – BASIS OF BID**

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

\*WWTP:Wastewater Treatment Plant Improvements Plan Set

\*CIVIL:Wastewater Treatment Plant Improvements Civil Sitework Plan Set

Spec Item: 01 22 00

**BASE BID**

No.	Plan Set	Name of Pay Item with Unit Price in Words	Est. Quantity	Unit	Unit Bid Price	Amount Bid
1	General	Mobilization	1	LS	\$	\$
		dollars and _____ cents per unit				
2	Vol I: Civil	Temporary Erosion, Sediment, and Water Pollution Prevention	1	LS	\$	\$
		dollars and _____ cents per unit				
3	Vol I: Civil	Site Civil Work	1	LS	\$	\$
		dollars and _____ cents per unit				
4	Vol I: Civil	Demolition	1	LS	\$	\$
		dollars and _____ cents per unit				
5	Vol III: WWTP	Influent Lift Station	1	LS	\$	\$
		dollars and _____ cents per unit				
6	Vol III: WWTP	Consolidated Operations and Maintenance Manual	1	LS	\$	\$
		dollars and _____ cents per unit				
7	Vol III: WWTP	WWTP Structural Improvements	1	LS	\$	\$
		dollars and _____ cents per unit				
8	Vol II: Building	Control Building	1	LS	\$	\$
		dollars and _____ cents per unit				
9	Vol III: WWTP	Security Cameras	1	LS	\$	\$
		dollars and _____ cents per unit				

Item No.	Spec. Item	Name of Pay Item with Unit Price in Words	Est. Quantity	Unit	Bid Price	Amount Bid
10	Vol III: WWTP Vol II: Building	System Integrator Allowance	1	LS	\$	\$
		dollars and _____ cents per unit				
11	Vol III: WWTP	Integration of Existing Chlorine Gas System to Proposed Equipment	1	LS	\$	\$
		dollars and _____ cents per unit				
12	Vol III: WWTP	Site Electrical, Instrumentation, and Control	1	LS	\$	\$
		dollars and _____ cents per unit				
13	Vol III: WWTP	Electrical Power Service Improvements	1	LS	\$	\$
		dollars and _____ cents per unit				
14	Vol III: WWTP	CenterPoint Energy Allowance	1	LS	\$ 75,000.00	\$ 75,000.00
		dollars and _____ cents per unit				
15	Vol III: WWTP	Trench Safety	1	LS	\$	\$
		dollars and _____ cents per unit				
16	Vol III: WWTP	Removal of 2-ft Thick Concrete Structure	2,000	CY	\$	\$
		dollars and _____ cents per unit				

**TOTAL BASE BID ITEMS 1 through 15 (words and figures)**

\_\_\_\_\_ DOLLARS

\_\_\_\_\_ CENTS      \$ \_\_\_\_\_

**ADDITIVE ALTERNATE BID**

No.	Plan Set	Name of Pay Item with Unit Price in Words	Est. Quantity	Unit	Unit Bid Price	Amount Bid
A-1	Vol III: WWTP	Disinfection System, Alternate Base Bid Item 11	1	LS	\$	\$
		dollars and _____ cents per unit				
A-2	Vol III: WWTP	Removeable Flood Protection Walls	60	LF	\$	\$
		dollars and _____ cents per unit				
A-3	Vol III: WWTP	Vertical Crack Injection for Existing Concrete	2,000	LF	\$	\$
		dollars and _____ cents per unit				
A-4	Vol III: WWTP	Concrete Joint Repair for Existing Concrete	1,500	LF	\$	\$
		dollars and _____ cents per unit				
A-5	Vol III: WWTP	Concrete Mortar Repair for Existing Concrete	75	CF	\$	\$
		dollars and _____ cents per unit				

**TOTAL ADDITIVE ALTERNATE BID For All Items (words and figures)**

\_\_\_\_\_ **DOLLARS**  
 \_\_\_\_\_ **CENTS**      \$ \_\_\_\_\_

BID SUMMARY FOR  
City of West University Place, Texas  
Wastewater Treatment Plant Improvements Phase 1

TOTAL FOR BASE BIDS \$ \_\_\_\_\_

TOTAL FOR ADDITIVE ALTERNATE BID \$ \_\_\_\_\_

TOTAL FOR BASE BIDS AND ADDITIVE ALTERNATE BID \$ \_\_\_\_\_

- 5.02 Unit Prices have been computed in accordance with Section 01 22 00.
- 5.03 For Unit Price bid items, Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Waste For Lump Sum bid items, Bidder acknowledges that amounts bid shall be full compensation for the associated work and changes water in the final payment amount may only by change order as provided in for in the Contract.  
Treat

**ARTICLE 6 – TIME OF COMPLETION**

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- 6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Article 15 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.
- 6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

**ARTICLE 7 – ATTACHMENTS TO THIS BID**

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- 7.01 The following documents are submitted with and made a condition of this Bid:
  - A. Required Bid security in the form of a certified or cashier's check or a Bid Bond in an amount of five percent of the Bidder's maximum bid price, made payable to the Owner, in accordance with Article 8 of the Instructions to Bidders.
  - B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

**ARTICLE 8 – DEFINED TERMS**

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- 8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on \_\_\_\_\_

Signed: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

Fax: \_\_\_\_\_

Submitted by: \_\_\_\_\_

Doing Business As: \_\_\_\_\_

- an individual
- a partnership
- a corporation
- a joint venture
- an LLC

SEAL:  
(if Bidder is a corporation)



**No specifications on this page for formatting purposes.**

SECTION 01 20 00  
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

- A. The prices included in the Bid Form will be full compensation for all labor, materials, tools, equipment and incidentals, permit fees, bonds, taxes, mobilization/demobilization, insurance, overhead and profit, temporary access roads and facilities, and other miscellaneous costs necessary to complete the construction as shown on the Drawings and/or as specified in the Contract Documents to be performed under this Contract. Actual quantities of each item bid on a unit price basis will be determined upon completion of the construction in the manner set up for each item in this section of the specifications. Payment for all items listed in the Bid Form will constitute full compensation for all work shown and/or specified and required to accomplish the intent of this Contract.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. Not all work required, significant or incidental, is identified in this section or the Schedule of Prices. Where work is shown on the Drawings or specified in the Specifications but not specifically described in this section or is incidental to or affiliated with the work as identified, the work shall be deemed to be included in the value of the work described in the payment items with which the work is most closely associated. Examples of incidental work include:
  - 1. Stripping, Clearing and Grubbing
  - 2. Compaction Testing
  - 3. Construction Staking and Survey
  - 4. Cleaning
- D. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. In some cases, a unit price item has been added to the bid schedule to establish a cost basis in the event work associated with that item is required. No guarantee is expressed or implied that the quantities shown in the bid schedule shall be required to fulfill the Contract.
- E. Payment for any stored material or equipment shall not imply that the material or equipment meets the Contract Specifications or that it will be found acceptable when incorporated into the Work.

F. Retainage and other payment conditions apply to all payments.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION

3.1 MOBILIZATION

- A. The work under this item shall include the establishment of offices and other facilities on the project site and the movement of personnel, construction equipment and supplies to the project site or to the vicinity of the project site in order to enable the Contractor to begin work on the contract. The cost of all bonds and insurance for the project will also be considered part of this specification.
- B. Mobilization will be measured as a lump sum item as the work progresses. The adjusted contract amount for construction items as used below is defined as the total contract amount less the lump sum bid for Mobilization. Partial payments for mobilization shall be paid for at the Total Unit Price as shown in the bid proposal with the regular monthly estimates as follows:
  - 1. When 1% and less than 5% of the adjusted contract amount for construction items is completed, 50% of the mobilization lump sum bid will be paid.
  - 2. When 5% and less than 10% of the adjusted contract amount for construction items is completed, 75% of the mobilization lump sum bid will be paid. Previous payments under this section will be deducted from this amount.
  - 3. When 10% or more of the adjusted contract amount for construction items is completed, 95% of the mobilization lump sum bid will be paid. Previous payments under this section will be deducted from this amount.
  - 4. Payment for the remainder of the lump sum bid for "Mobilization" will be made on the final estimate.
- C. This pay item shall encompass mobilization costs on a lump sum basis for the entire project.

3.2 TEMPORARY EROSION, SEDIMENTATION, AND WATER POLLUTION PREVENTION CONTROL

- A. This item shall consist of all the work, labor, materials, and equipment associated with installing erosion control measures shall be in accordance with City of Houston Storm Water Management Handbook for Construction Activities. The Contractor shall be responsible for determination of adequate and appropriate control measure items, quantities, and locations, and shall include this information in the submitted Storm Water Pollution Prevention Plan.
- B. This item is generally shown in the drawings in Volume I: Site Civil Plans sheets C3.0 and C3.1.
- C. This item is generally described in technical specifications 01 31 46 and 01 57 13.
- D. Measurement for payment shall be on a lump sum basis.

3.3 SITE CIVIL WORK

- A. This item shall consist of all work, labor, tools, materials, and incidentals necessary to complete in place, the site clearing, paving, drainage, grading, plumbing, fencing, removal of spoils and all other site related work not accounted for by other pay items as shown in the Contract Documents and as listed in the following paragraphs.

- B. Paving, drainage, and grading shall include, but is not limited to, subgrade preparation, drainage inlets, curb & gutters, culverts, installation of asphalt, slope stabilization, revegetation, and concrete flat work.
- C. This item shall include all work, labor, tools, materials, equipment, and incidentals necessary to furnish and install the yard piping, connections to existing structures, excavation, embedment, and backfill as shown in the plans and in the specifications. Yard piping shall include, but is not limited to all meters, hydrants, valves, hose bibs, manholes, cleanouts, thrust blocking, pipe restraints and supports, fittings, and piping.
- D. This item shall include all work, labor, tools, materials, equipment, and incidentals necessary to furnish and install the storm drain system, stormwater underground detention system, drainage gates, and detention pond as shown in the plans and in the specifications.
- E. This item shall include all work, labor, tools, materials, equipment, and incidentals necessary to furnish and install the retaining wall, site fence, gate, and as shown in the plans and in the specifications.
- F. This item shall include all work, labor, tools, materials, equipment, and incidentals necessary to coordinate utility connections and relocations as shown in the plans and in the specifications.
- G. This item includes coordination with City of Houston inspectors.
- H. This item is generally shown in the drawings in Volume I: Site Civil Plans sheets C0.0 to C9.2.
- I. This item is generally described in technical specifications in divisions 03, 13, 31, 32, 33, and 34.
- J. Measurement for payment shall be on a lump sum basis.

#### 3.4 DEMOLITION

- A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary for the demolition and removal of structures as shown in the plans and in the specifications. Demolition pay items includes removal and proper disposal of demolished materials.
- B. Demolition shall include Site clearing, and is not limited to, the removal of existing fencing, trees, shrubs and any miscellaneous items that are conflict with the proposed improvements. Appendix includes a subsurface exploration to identify buried rubble from previous structures on the site.
- C. Demolition shall include removal of the existing ground storage tank (approximate dimensions 36-foot diameter, 12-feet tall) including walls and slab. This item includes testing the tank for hazardous materials and appropriate disposal. The existing tank roof was previously removed and the tank has been out of service for over a decade.
- D. Demolition shall include demolition and recycling of electrical service, generator pad and railings.
- E. Demolition shall include demolition and recycling of existing chlorination system. The chlorination shed structure will remain.
- F. Demolition shall include demolition and recycling of existing screw pumps and related structures.
- G. This item is generally shown in the drawings in Volume I: Site Civil Plans sheet C2.0 and Volume III: WWTP Plans sheets C-600, M-300 to M304, and S-007.

- H. This item is generally described in technical specifications in Division 2.
- I. Measurement for payment shall be on a lump sum basis.

### 3.5 INFLUENT LIFT STATION

- A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to furnish and install the proposed lift station including but not limited to: the wet well, excavation, backfill, piping, appurtenances, pipe supports, submersible pumps, access hatch, startup, testing, and operator training in accordance with the Contract Documents for the project.
- B. This item is generally shown in the drawings in Volume III: WWTP Plans sheets M-100 through M-102.
- C. This item is generally described in technical specifications 33 32 00.
- D. Measurement for payment shall be on a lump sum basis. Upon approval of shop drawing Contractor may submit up to 10% of this pay item in the subsequent Pay App.

### 3.6 CONSOLIDATED OPERATIONS AND MAINTENANCE MANUAL

- A. This item shall consist of all work, labor, materials, equipment, and incidentals necessary to provide a custom consolidated operations and maintenance manuals incorporating the key information for all installed equipment regardless of manufacturer and providing an overall operation guidebook with various scenarios for treatment. Custom-designed operation and maintenance manuals will be delivered in binders and in digital format.
- B. This item is generally described in technical specification 01 78 23.
- C. Measurement for payment shall be on a lump sum basis.

### 3.7 WWTP STRUCTURAL IMPROVEMENTS

- A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to perform structural repairs on buildings and treatment units. There are signs of wear on several areas of the plant. A structural analysis was performed to check for safety or structural concerns that need to be addressed.
- B. This item is generally shown in the drawings in Volume III: WWTP Plans sheets S-001 through S-006.
- C. This item is generally described in technical specifications division 03.
- D. Measurement for payment shall be on a lump sum basis.

### 3.8 CONTROL BUILDING

- A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to furnish and install the proposed Control Building, structures, platforms, and elevator in accordance with the Contract Documents.
- B. This item includes coordination with City of Houston inspectors.
- C. This item is generally shown in the drawings in Volume II: Building Permit Plans (all sheets).
- D. This item is generally described in technical specifications in divisions 04, 05, 06, 07, 08, 09, 10, 11, 12, and 14.

E. This item includes the coating of existing structures on shown in Volume II: Building Permit Plans sheet A-973 and described in technical specification 09 96 00.

F. Measurement for payment shall be on a lump sum basis.

### 3.9 SECURITY CAMERAS

A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to closed circuit television cameras, required poles and mounting hardware, communications infrastructure, and integration with the Owner's existing security camera system.

B. This item is generally shown in the drawings in Volume III: WWTP Plans sheets E-1000 through E-1003.

C. This item is generally described in technical specifications in division 28.

D. Measurement for payment shall be on a lump sum basis.

### 3.10 SYSTEM INTEGRATOR ALLOWANCE

A. The City of West University Place, Texas has selected a Video Surveillance Systems, Wireless Access, Security Alarms, and Fire Control system integrator (Mobile Communications America, Inc., contact Jeff Paris, (832) 786-5822, jeffparis@callmc.com or Chris Lloyd, 832-786-5807, chrislloyd@callmc.com). This allowance will include the current quote from MCA for integrating the new control building systems into the current city networks. Contractor will provide all required coordination, connections, power, and finishes for complete functional systems as described in the Contract Documents.

B. This item is generally shown in the drawings in Volume III: WWTP Plans sheets TN001 to TN501.

C. This item is generally described in technical specifications divisions 27 and 28.

D. Measurement for payment shall be on a lump sum basis.

### 3.11 INTEGRATION OF EXISTING CHLORINE AND DECHLOR SYSTEMS

A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to integrate the existing chlorine gas system and existing dechlorination system to the proposed electrical system.

B. This item is generally shown in the drawings in Volume III: WWTP Plans.

C. Measurement for payment shall be on a lump sum basis.

### 3.12 SITE ELECTRICAL, INSTRUMENTATION, AND CONTROL

A. This pay item shall consist of all work, labor, materials, equipment, and incidentals necessary to complete in-place site electrical as described in the contract documents. Contractor shall coordinate with electrical provider.

B. Electrical, Instrumentation, and Control items shall include, but are not limited to, the following: Motor Control Center (MCC), site lighting, conduit duct banks, wire and cable, fixtures and receptacles, panelboards, commissioning, SCADA equipment, relay settings, testing, and startup services.

C. This item shall consist of the work, labor and materials necessary to complete in place the programing, testing and verification of the proposed SCADA system. This work shall include but

is not limited to: coordination with manufacturer, programming associated with PLCs, I/O modules, network components, power supplies and batteries.

- D. This item is generally shown in the drawings in Volume III: WWTP Plans sheets E-001 to E-916.
- E. This item is generally described in technical specifications in Division 26.
- F. Measurement for payment shall be on a lump sum basis. Upon approval of shop drawing Contractor may submit up to 10% of this pay item in the subsequent Pay App.

### 3.13 ELECTRICAL POWER SERVICE IMPROVEMENTS

- A. This pay item shall consist of all work, labor materials, equipment, and incidentals necessary to complete in-place site electrical as described in the contract documents. Contractor shall coordinate with electrical provider.
- B. Electrical power items shall include, but are not limited to, the following: conduit duct banks, wire and cable, fixtures and receptacles, grounding for each building, temporary power setup, lightning protection, pad mounted transformer, moving the and re-installing the existing generator, panelboards, commissioning, relay settings and testing, and startup services.
- C. This pay item shall consist of all work, labor, materials, equipment, and incidentals necessary to relocate the existing site backup generator and related switch gear including required electrical connections. This includes maintenance of power throughout the construction phases to keep the WWTP operational and coordination of any required power outages with the WWTP operations staff.
- D. This item is generally shown in the drawings in Volume III: WWTP Plans sheet E-007 and E-012.
- E. This item is generally described in technical specifications in Division 26.
- F. Measurement for payment shall be on a lump sum basis. Upon approval of shop drawing Contractor may submit up to 10% of this pay item in the subsequent Pay App.

### 3.14 CENTERPOINT ENERGY ALLOWANCE

- A. This pay item shall consist of an allowance to be paid to CenterPoint for site electrical service, and Contractor shall be reimbursed after submitting invoices from CenterPoint for work necessary to complete in-place site electrical as described in the contract documents. Contractor shall coordinate with electrical provider.
- B. Measurement for payment shall be on a lump sum basis.

### 3.15 TRENCH SAFETY

- A. This item consists of the required trench safety measures for underground utility lines. This item consists of the required trench safety measures for utility trench excavation. It shall be the responsibility of the Contractor to provide and maintain a viable trench safety system at all times during construction activities. The Contractor is directed to become knowledgeable and familiar with the standards as set forth by the Occupational Safety and Health Administration (OSHA) for trench safety that will be in effect during the period of construction of the project and the Contractor is responsible for conforming to such regulations as prescribed by OSHA standards. A bid item for trench excavation safety protection and/or shoring is included in the proposal.

B. Per Texas House Bill 1569 effective as of September 1, 1989, it shall be the responsibility of the Contractor to provide and maintain a viable trench safety system at all times during construction activities. The Contractor is directed to become knowledgeable and familiar with the standards as set forth by the Occupational Safety and Health Administration (OSHA) for trench safety that will be in effect during the period of construction of the project and the Contractor is responsible for conforming to such regulations as prescribed by OSHA standards. A bid item for trench excavation safety protection and/or shoring is included in the proposal.

C. Measurement for payment shall be on a lump sum basis.

### 3.16 REMOVAL OF 2-FT THICK CONCRETE STRUCTURE

A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to remove and dispose of existing underground 2-ft or less thick concrete structures. ITEM MAY ONLY BE USED WITH PRIOR WRITTEN AUTHORIZATION FROM CITY OR EOR.

B. This item is generally shown in the SUE Findings in Appendix B and 1980 Record drawing in Appendix D of the Project Manual.

C. Measurement for payment shall be on a per cubic yard basis.

### 3.17 ADDITIVE ALTERNATE A-1: DISINFECTION SYSTEM

A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to replace the existing chlorination and dechlorination system and building, and convert the existing chlorine gas disinfection system to liquid bleach. Item includes new structure, storage tanks, piping, and chemical feed pumps, and decommissioning of the existing system in accordance with the Contract Documents for the project.

B. This item is generally shown in the drawings in Volume III: WWTP Plans sheets M-400A to M-401A.

C. This item is generally described in technical specification 46 30 00.

### 3.18 ADDITIVE ALTERNATE A-2: REMOVEABLE FLOOD PROTECTION WALLS

A. This item shall consist of all work, labor, tools, materials, equipment, and incidentals necessary to procure and deliver removable flood protection barriers, Mayim Modular Flood Barrier by Garrison Flood Control, or approved equal.

B. Estimated Quantity: 60 Linear Feet

C. Measurement for payment shall be on a per linear foot installed basis.

### 3.19 ADDITIVE ALTERNATE A-3: VERTICAL CRACK INJECTION FOR EXISTING CONCRETE

A. Estimated quantity: 2,000 Linear Feet

B. Measurement for payment shall be on a per linear foot installed basis.

### 3.20 ADDITIVE ALTERNATE A-4: CONCRETE JOINT REPAIR FOR EXISTING CONCRETE

A. Estimated quantity: 1,500 Linear Feet

B. Measurement for payment shall be on a per linear foot installed basis.

### 3.21 ADDITIVE ALTERNATE A-5: CONCRETE MORTAR REPAIR FOR EXISTING CONCRETE



City of West University Place, Texas PW24-18 Wastewater Treatment Plant Improvements Phase 1

A. Estimated quantity: 75 Cubic Feet

B. Measurement for payment shall be on a per cubic foot installed basis.

END OF SECTION

**SECTION 22 0010****BASIC PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.01 GENERAL PROVISIONS AND SUPPLEMENTAL GENERAL PROVISIONS**

- A. The "General Conditions" and "Supplementary Conditions" are by reference made a part of this section and shall apply to each and every heading as though included herein.
- B. In the event of conflict, the requirements of the "General Conditions" and "Supplementary Conditions" will take precedence over these "General Requirements".

**1.02 GENERAL**

- A. The Contractor shall provide all plans, labor, equipment, appliances and materials, and shall perform all operations in connection with the installation of the plumbing work in accordance with the Specifications, applicable drawings, and the conditions specified above.
- B. Contractor shall provide all equipment required and usually furnished in connection with such work and systems whether or not specifically mentioned or specifically indicated on the drawings.

**1.03 COMMISSIONING**

- A. The Contractor shall provide all system commissioning services as required by section C408 of the 2015 International Energy Conservation Code (IECC). Plumbing systems shall comply with IECC section C403.
- B. Commissioning, as outlined in IECC section C408 shall include the following:
  - 1. A commissioning plan.
  - 2. Water heater(s).
  - 3. Hot water systems balancing.
  - 4. Functional performance testing for all plumbing equipment and controls.
  - 5. A preliminary commissioning report.
  - 6. Final documentation including drawings, O&M manual(s), T&B report, and final commissioning report.

**1.04 INSPECTION OF THE SITE**

- A. The Contractor shall visit the site, verifying all existing items indicated on drawings and/or specified, and familiarize himself with the existing work conditions, hazards, grades, actual

formations, soil conditions, and local requirements. The submission of bids shall be deemed evidence of such visits.

- B. All proposals shall take these existing conditions into consideration, and the lack of specific information on the drawings shall not relieve the Contractor of any responsibility.
- C. The trade furnishing the equipment shall be responsible for notifying the Contractor prior to ordering it, in the event that equipment specified and/or reviewed is incompatible with this requirement.

#### 1.05 PERMITS, UTILITY CONNECTIONS, AND INSPECTIONS

- A. Refer to other sections of the specifications for construction phasing and time increments.
- B. The Contractor shall obtain and pay for all required utility connections, impact fees, utility extensions and/or relocations and shall pay all costs and inspection fees for all work included herein.

#### 1.06 APPLICABLE CODES AND STANDARDS

- A. The installation shall meet the minimum standards prescribed in the latest editions of the following listed codes and standards, which are made a part of the Specifications, except as may be hereinafter modified in these Specifications and associated drawings.
- B. Latest edition of the National Fire Protection Association Standards (NFPA):
  - 1. NFPA No. 70                      National Electrical Code
  - 2. NFPA No. 101                    Safety to Life from Fire in Buildings and Structures
  - 3. NFPA No. 255                    Test of Surface Burning Characteristics of Building Materials
- C. United States of America Standards Institute (ASA) Standards:
  - 1. A40.8                              National Plumbing Code
  - 2. B31.1 & B31.1a                  Code for Pressure Piping
- D. American Society of Mechanical Engineers (ASME): Boiler and Pressure Vessel Codes.
- E. American Society of Testing and Material (ASTM): All applicable manuals and standards.
- F. American Water Works Association (AWWA): All applicable manuals and standards.
- G. National Electrical Manufacturer's Association (NEMA): All applicable manuals and standards.
- H. City and State Building Codes.
- I. State of Texas Occupational Safety Act: Applicable safety standards.
- J. Occupational Safety and Health Act (OSHA).

- K. State of Texas Energy Conservation Construction Code.
- L. All work shall be in accordance with all regulations and requirements of the State of Texas Architectural Barriers Act (TAS).
- M. Refer to Specifications sections hereinafter bound for additional codes and standards.
- N. All materials and workmanship shall comply with all applicable state and national codes, specifications, and industry standards. All material shall be listed by the Underwriter's Laboratories, Inc., as conforming to its standards and so labeled in every case where such a standard has been established for the particular type of material in question.
- O. All equipment provided and all installation methods shall meet all applicable requirements of the International Energy Conservation Code.
- P. The Contract Documents are intended to comply with the aforementioned rules and regulations; however, some discrepancies may occur. Where such discrepancies occur, the Contractor shall immediately apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with said regulations shall be paid for as covered by other specifications of the Contract Documents, providing no work or fabrication of materials has been accomplished in a manner of non-compliance. Should the Contractor fabricate and/or install materials and/or workmanship in such a manner that does not comply with the applicable codes, rules and regulations, the Contractor who performed such work shall bear all costs arising in correcting these deficiencies to comply with said rules and regulations.

1.07 CONTRACT DOCUMENTS

- A. These specifications are accompanied by drawings of the building and details of the installations indicating the locations of equipment, piping, ductwork, outlets, switch controls, circuits, lines, etc. The drawings and these specifications are complementary to each other, and what is required by one shall be as binding as if required by both.
- B. If the Contractor deems any departures from the drawings necessary, details of such departures and the reasons therefore shall be submitted to the Architect for review. No departures shall be made without prior written acceptance.
- C. There are intricacies of construction that are impractical to specify or indicate in detail; however, in such cases the current rules of good practice and applicable specifications shall govern.
- D. It is the Contractor's responsibility to properly use all information found on the Civil, Architectural, Structural, Fire Protection, Plumbing, Mechanical and Electrical drawings where such information affects his work.
- E. All dimensional information related to new structures should be taken from the appropriate drawings. All dimensional information related to existing facilities shall be taken from actual measurements made by the Contractor on the site.

- F. The interrelation of the specifications, the drawings, and the schedules is as follows: The specifications determine the nature and setting of the several materials, the drawings establish the quantities, dimensions and details, and the schedules give the performance characteristics.
- G. Should the drawings or specifications disagree within themselves, or with each other, the better quality of greater quantity of work or materials shall be estimated upon, and unless otherwise directed by the Architect in writing, shall be performed or furnished. Figures indicated on drawings govern scale measurements and large-scale details govern small-scale drawings.

1.08 SPACE AND EQUIPMENT ARRANGEMENT

- A. The size of fire protection, plumbing, mechanical, and electrical equipment indicated on the drawings is based on the dimensions of a particular manufacturer. While other manufacturers may be acceptable, it is the responsibility of the Contractor to determine if the equipment he proposes to furnish will fit in the space. Shop drawings shall be prepared to indicate a suitable arrangement.
- B. All equipment shall be installed in a manner to permit access to all surfaces. All valves, motors, drives, filters, and other accessory items shall be installed in a position to allow removal for service without disassembly of another part.
- C. Maintain all Code required clearances for equipment access.

1.09 FABRICATION DRAWINGS

- A. Contractor shall submit piping shop drawings for review by the Architect and Engineer. Fabrication drawings shall be fully coordinated with ALL other trades and with existing conditions.
- B. All required shop drawings, except as hereinafter specified, shall be prepared at a scale of not less than 1/8 in. equal to 1 ft. for floor plans and 1/4 in. equal to 1 ft. for mechanical rooms.

1.10 SUPERVISION

- A. Each contractor shall keep a competent superintendent or foreman on the job at all times necessary for the timely and proper completion of the work.
- B. It shall be the responsibility of each superintendent to study all drawings and familiarize himself with the work to be done by other trades. He shall coordinate this work with other trades, and before material is fabricated or installed, make sure that his work will not cause an interference that cannot be resolved without major changes to the drawings. If a conflict between trades arises that cannot be resolved at the jobsite, the matter shall be referred to the Architect for his ruling.

1.11 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. The Contractor shall prepare, in triplicate for the Owner's Manual, complete sets of operating and maintenance instructions, system piping, valving, control and interlock diagrams, manuals, parts lists, etc., for each item of equipment. Include copies of all equipment warranties.
- B. In addition, the Contractor shall provide the services of a competent engineer or a technician acceptable to the Architect to instruct a representative of the Owner in the complete and detailed operation of all equipment and systems. These instructions shall be provided for a period of not less than 4 hours to fully accomplish the desired results. Upon completion of these instructions, a letter of release will be required, stating the dates of instruction and the personnel to whom instructions were given. The Contractor shall be responsible for proper maintenance until the instructions have been given to the Owner's maintenance personnel.

1.12 GUARANTEE

- A. All work and equipment shall be guaranteed for a period of one year from the date of substantial completion.
- B. Guarantee shall be for all labor and materials.
- C. Certain items for equipment shall have additional or extended warranties when so specified.

1.13 MATERIALS AND WORKMANSHIP

- A. All materials, unless otherwise specified, shall be of current U.S. manufacture, new, free from all defects, and of the best quality of their respective kinds. Materials and equipment shall be installed in accordance with the manufacturer's recommendations and the best standard practice for the type of work involved. All work shall be executed by mechanics skilled in their respective trades, and the installations shall present a neat, workmanlike appearance. Materials, and/or equipment damaged in shipment, or otherwise damaged prior to installation, shall not be repaired at the job site, but shall be replaced with new materials and/or equipment.
- B. The responsibility for furnishing the proper equipment and/or material, and to see that it is installed as intended by the manufacturer rests entirely upon the Contractor, who shall request advice and supervisory assistance from the representative of specific manufacturers during the installation.

1.14 FLAME SPREAD PROPERTIES OF MATERIALS

- A. Materials and adhesives incorporated in this project shall conform to NFPA 255, latest edition. The classification shall not exceed No. 2, with the range of indices between 0 to 25 for these Classifications as listed in the Federal Specifications. Modifications shall be made to insulating materials, etc., as required to comply with the Federal Specification.

## 1.15 LARGE APPARATUS

- A. Any large piece of apparatus which is to be installed in any space in the building, and which is too large to permit access through stairways, doorways, or shafts shall be brought to the job and placed in the space before the enclosing structure is completed. Following placement in the space, such apparatus shall be thoroughly, completely protected from damage as hereinafter specified.

## 1.16 FLOOR AND CEILING PLATES

- A. Except as otherwise noted, provide chrome plated brass floor and ceiling plates around all pipes, conduits, ducts, etc., passing exposed through walls, floors, or ceilings, in any spaces, except under floor and attic spaces. Plates shall be sized to fit snugly against the outside of the pipe or against the insulation on lines that are insulated and positively secured to such pipe or insulation. Plates will not be required for piping where pipe sleeves extend 3/4 in. above finished floor. All equipment rooms are classified as finished areas. Round and rectangular ducts shall have plates made to fit accurately at all floor, wall and ceiling penetrations.

## 1.17 SLEEVES, INSERTS AND FASTENINGS

- A. Proper openings through floors, walls, roofs, etc., for the passage of piping, ductwork, etc., shall be provided. All penetrations must pass through sleeves except soil pipe installed under concrete slabs on fill. Sleeves shall be set in new construction before concrete is poured, as cutting holes through any part of the concrete will not be permitted unless acceptable to the Architect.
- B. Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- C. The minimum clearance between horizontal penetrations including insulation where applicable, and sleeves shall be 1/4 in., except that the minimum clearance shall be 2 in. where piping contacts the ground. Sleeves through walls and partitions shall be installed flush with exposed surfaces. Sleeves through floors shall be extended 2 in. above finished floor.
- D. Above grade and dry location sleeves shall be constructed from 20 to 22 gauge galvanized steel. Sleeves passing through walls or floors on or below grade and/or moist areas such as mechanical rooms shall be constructed of galvanized steel Schedule 40 pipe and shall be designed with suitable flange in the center of the floor or wall to form a waterproof passage. After the pipes have been installed in the sleeves, void space around the pipe shall be sealed with "Link-Seal" modular wall and casing seals as manufactured by Thunderline Corporation.
- E. Suitable concrete inserts for pipe and equipment hangers shall be set and properly located for all pipe and equipment to be suspended from concrete construction.

- F. Fastening of pipes, conduits, etc., in the building shall be as follows: To wood members - by wood screws; to masonry - by threaded metal inserts, metal expansion screws, or toggle bolts, whichever is appropriate for the particular type of masonry; to steel - machine screws or welding (when specifically permitted or directed), or bolts, and to concrete by suitable inserts anchored to reinforcing steel, and poured in place unless other means are acceptable for general use, and will only be permitted where specifically acceptable to the Architect.
- G. Under no circumstances will the use of plastic anchors or plastic expansion shields be permitted for any purpose whatsoever.
- H. Vermin Proofing: The open space around all ductwork, piping, etc., passing through the ground floor and/or exterior walls shall be sealed with a continuous bead of sealant.
- I. The space around piping, ductwork, etc., penetrating walls, ceilings and floors that define air plenums shall be sealed airtight in an acceptable manner. Ceiling plenums used for return air are considered air plenums.

#### 1.18 ACCESS DOORS

- A. This Contractor shall provide wall or ceiling access doors for unrestricted access to all concealed shutoff or service valves, strainers, unions, flow switches, pressure reducing valves, control valves, air terminal units, fire and/or smoke dampers, and other items of concealed mechanical equipment. All access door locations are not shown on the drawings. It is the Contractor's responsibility to provide access doors at all locations required.
- B. Access doors mounted in painted surfaces shall be equal to Milcor (Inland-Ryerson Construction Products Company) manufacture, Style K for plastered surfaces and Style M or DW for non-plastered surfaces. The Style K doors shall be set so that the finished surface of the door is even with the finished surfaces of the adjacent finishes. Access doors mounted on tile surfaces shall be stainless steel materials. Access doors shall be minimum of 18 in. x 18 in. in size.

#### 1.19 CONSTRUCTION REQUIREMENTS

- A. The Civil, Architectural, Structural, Mechanical, Plumbing, and Electrical plans and specifications including the General Provisions, Supplemental General Provisions, and other pertinent documents issued by the Architect, are a part of these specifications and shall be complied with in every respect. All the above is included in the Contract Documents, and shall be examined by all bidders. Failure to comply shall not relieve the Contractor of responsibility or be used as a basis for additional compensation due to omission of architectural, structural and electrical details from the plumbing drawings.
- B. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction may be required for work indicated or specified in this section or work specified in other sections, it shall be the responsibility of the Contractor to provide same as well as to provide material and equipment usually furnished with such systems or required to complete the installation, whether mentioned or not.



- C. The Contractor shall be responsible for fitting his material and apparatus into the building and shall carefully lay out his work at the site to conform to the structural conditions, to avoid all obstructions, to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby to provide an integrated satisfactory operating installation.
  - D. The plumbing and associated drawings are necessarily diagrammatic in character and cannot show every connection in detail or every pipe or equipment in its exact location. These details are subject to the requirements of ordinances and also structural and architectural conditions. The Contractor shall carefully investigate structural and finish conditions and shall coordinate the separate trades in order to avoid interference between the various phases of work. Work shall be laid out so that it will be concealed in furred chases and suspended ceilings, etc., in finished portions of the building, unless specifically noted to be exposed. Work shall be installed to avoid crippling of structural members; therefore, inserts to accommodate pipe hangers shall be set before concrete is poured, and proper openings through floor, walls, beams, etc., shall be provided as hereinafter specified or as otherwise indicated or required. All work shall be installed parallel or perpendicular to the lines of the building unless otherwise noted.
  - E. When the plumbing drawings do not give exact details as to the elevation of pipe, ducts, etc., physically arrange the systems to fit in the space available at the elevations intended with the proper grades for the functioning of the system involved. Piping and duct systems are generally intended to be installed true and square to the building construction, and located as high as possible against the structure in a neat and workmanlike manner, and the plans do not show all required offsets, control lines, pilot lines and other location details. Work shall be concealed in all finished areas. Piping specified to be insulated shall be supported in a manner that will allow the insulation to be installed without gaps. Insulated piping in concealed areas shall be offset with fittings as necessary to permit installation of insulation. Bending of pipes or installing pipes in a strain in order to insulate will not be permitted.
  - F. All oiling devices and all parts of equipment requiring adjustment shall be easily accessible. Equipment shall be so located and installed as to permit convenient and safe maintenance and future replacement. Piping, ductwork, valve stems, etc., shall not block service space.
- 1.20 PLUMBING SUBMITTALS
- A. Refer to the Conditions of the Contract (General and Supplementary) and Division 01 Section: "SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES" for submittal definitions, requirements, and procedures.
  - B. Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by The Contractor. Data submitted from Subcontractors and material suppliers directly to the Architect/Engineer will not be processed.
  - C. Submit Shop Drawings, product data, and samples on items indicated in the individual sections.

- D. Shop Drawings and submittal data shall not be used as requests or proposals for alternate equipment or materials. Refer to Item "Product Options and Substitutions" elsewhere in this section.

1.21 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Refer to the Instructions to Bidders and the Division 01 Section "SUBSTITUTION PROCEDURES" for requirements in selecting products and requesting substitutions.

B. Standards for Materials:

1. These specifications indicate a standard for all materials incorporated into the work, with manufacturer's names and catalog numbers used to establish a grade and quality of materials and equipment. The manufacturer listed on the equipment schedules, or named first in the specifications, is the one on whose equipment the layout is based. Other named manufacturers must meet the indicated performance and space requirements.
2. The "approved equal" clause used in these specifications is to permit the proposal of unnamed manufacturer's products for the work, and the Architect/Engineer's decision concerning equal products is final.
3. Considerations as to determination of equal products include, but are not limited to, the following:

Materials	Physical size
Workmanship	Weight
Gauges of Materials	Appearance
Available Local Service Personnel	Performance
Previous successful installations	Capacity
Delivery Schedules	Required Equipment Clearances

- C. Requests for substitutions for equipment, materials and apparatus listed in Division 22 Sections must be submitted in writing a **MINIMUM OF 10 DAYS** prior to the scheduled bid date. Such requests must be accompanied by complete data to permit proper evaluation.
- D. BIDS SHALL NOT BE BASED ON UN-APPROVED MATERIALS, EQUIPMENT, OR APPARATUS. UNAPPROVED MATERIAL, EQUIPMENT OR APPARATUS WILL NOT BE ACCEPTED.
- E. Should electrical, water, drain, natural gas, structural support, or other similar requirements for alternate equipment, whether named in the specifications or approved as a substitution, be different from requirements for the products used in laying out the project, such changes shall be the responsibility of the Contractor, and shall not result in extra charges to the Owner or Architect/Engineer.

### 1.22 RECORD DOCUMENTS

- A. Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for requirements. The following paragraphs supplement the requirements of Division 01.
- B. Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.
- C. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

### 1.23 PAINTING

- A. Field painting of plumbing equipment, piping systems, etc., shall be accomplished under Division 09 of these specifications.
- B. Protection of Factory-applied Finishes:
  - 1. Factory-applied finishes on equipment and apparatus installed on the project shall be carefully protected.
  - 2. At the conclusion of the work, and prior to final acceptance of the project, equipment and apparatus shall be thoroughly cleaned of all construction dirt, oil and grease smears, temporary labels, debris, paint droppings, etc.
  - 3. Damaged factory finishes shall be restored to their original condition using procedures, materials and application techniques as set forth in Division 09 found elsewhere in these specifications.

### 1.24 CLEANING

- A. Refer to the Division 01 Section: "CLOSEOUT PROCEDURES" for general requirements for final cleaning.
- B. Refer to Division 23 Section: "TESTING, ADJUSTING, AND BALANCING" for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.
- C. Name Plates:
  - 1. All nameplates shall be protected from damage during the construction process.
  - 2. At the conclusion of the work, the nameplates shall be carefully cleaned and left in a fully legible condition.

- D. Removal of Rubbish: Each Contractor is responsible for the timely removal of rubbish and trash generated by his work, such as empty cartons, containers, materials crates, etc. Particular attention is called to residue that may present a potential tripping or injury hazard.

1.25 MOTORS AND DRIVES

A. Motors:

1. General: Motors shall be U/L-approved, with copper windings, and with a minimum Service Factor of 1.15. The nominal capacity shall exceed the brake horse-power requirements at duty schedules.
2. Motors 1/2 HP and smaller shall be 120-volt, single-phase with internal overload protection.
3. Motors 3/4 HP and larger shall be 208/230 -volt, 1 or 3-phase, unless scheduled or noted otherwise, and shall have thermal over-load cutouts in each phase as recommended by the motor manufacturer.
4. Motors shall be as manufactured by Century, General Electric, US Motors, Wagner, Westinghouse, or approved equal.

B. Drives:

1. Belts drives shall be rated for 150% of motor-rated horsepower.
2. Drive assemblies up to two (2) belts shall have adjustable motor sheaves with the mid-point of the adjustment range at the RPM required for the specified performance.
3. On drive assemblies with 3 or more belts, provide fixed motor sheaves for the specified RPM. Provide and install up to 2 pulley changes as necessary to achieve the required air quantities.
4. All multiple-belt drives shall be factory-marked-matched sets.

C. Specific requirements:

1. Provide high-efficiency motors for the following:
  - a. Pumps, as scheduled.
2. Efficiency ranges shall be as follows:

Nominal HP	Minimum Efficiency	Premium Efficiency
3	86.5	89.5
5	87.5	89.5
7.5	88.5	91.7
10	89.5	91.7
15	91.0	92.4

20	91.0	93.0
25	91.7	93.6
30	92.4	93.6
40	93.0	94.1
50, 60, 75	93.0, 93.6, 94.1	94.5, 95.0, 95.4
100	94.1	95.4

Motor efficiency certification shall be included with Product Submittal Data in accordance with Division 01 of these specifications.

3. Variable Speed (Frequency) AC Drives:
  - a. Where scheduled on the plans, provide and install variable speed (frequency) AC drives for motors.
  - b. Variable speed (frequency) AC drives shall be as described in Section 23 8965 - MOTOR CONTROLLERS - of these Specifications.
4. Motor Starters and Controllers:
  - a. Motor starters and controllers for fans, pumps, air-handling units, compressors, etc., which are not provided as an integral part of a factory-assembled package, shall be provided under Division 23 of the specifications. Refer to Section 23 8965 "MOTOR CONTROLLERS."

## PART 2 - PRODUCTS

### 2.01 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

- A. The manufacturer's published instructions shall be followed for preparing, assembling, installing, erecting, and cleaning manufacturer's materials or equipment, unless otherwise indicated. The Contractor shall promptly notify the Architect in writing of any conflict between the requirements of the Contract Documents and the manufacturer's directions and shall obtain the Architect's instructions before proceeding with the work. Should the Contractor perform any such work that does not comply with the manufacturer's directions or such instructions from the Architect, he shall bear all costs arising in connection with the deficiencies.
- B. The Contractor shall not receive material or equipment at the jobsite until there is suitable space provided to properly protect equipment from rust, drip, humidity, and dust damage.
- C. Capacities shall be not less than those indicated but shall be such that no component or system becomes inoperative or is damaged because of start-up or other overload conditions.
- D. Where materials or equipment are specified to be approved, listed, tested, or labeled by the Underwriter's Laboratories, Inc., or constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Contractor shall submit proof that the items furnished under these sections of the specifications conform to such requirements. The

ASME stamp will be acceptable as sufficient evidence that the items conform to the respective requirements.

- E. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a plate securely attached to the item of equipment. All data on nameplates shall be legible at the time of Final Observation.
- F. Standard factory finish will be acceptable on equipment specified by model number; otherwise surfaces of ferrous metal shall be given a rust-inhibiting coating. The treatment shall withstand 200 hours in salt-spray fog test, in accordance with Method 6061 of Federal Standard No. 141. Immediately after completion of the test, the specimen shall show no signs of wrinkling or cracking, and no signs of rust creepage beyond 1/8 in. on either side of the scratch mark. Where rust-inhibitor coating is specified hereinafter, any treatment that will pass the above test is acceptable, unless a specific coating is specified, except that coal tar or asphalt type coatings will not be acceptable, unless so stated for a specific item. Where steel is specified to be hot-dip galvanized, mill-galvanized sheet steel may be used provided all raw edges are painted with a zinc-pigmented paint conforming to Military Specification MIL-P-6215.
- G. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto, shall be fully enclosed or properly guarded.
- H. The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, to verify all dimensions in the field, and to advise the Architect of any discrepancy before performing any work. Adjustments to the work required, in order to facilitate a coordinated installation, shall be made at no additional cost to the Owner.

## 2.02 PROTECTION

- A. The Contractor shall at all times take such precautions as may be necessary to properly protect all materials and equipment from damage from the time of delivery until the completion of the work. This shall include the erection of all required temporary shelters and supports to adequately protect any items stored in the open on the site from the weather, the ground and surrounding work; the cribbing of any items above the floor of the construction; and the covering of items in the incomplete building with tarpaulins or other protective covering. Failure on the part of the Contractor to comply with the above will be sufficient cause for the rejection of the items in question.
- B. Take particular care not to damage the building structure in performing work. All finished floors, steel treads, and workmen or their tools and equipment shall cover finished surfaces to prevent any damage during the construction of the building.
- C. Equipment and materials shall be protected from rust both before and after installation. Any equipment or materials found in a rusty condition at the time of final observation must be cleaned of rust and repainted as specified elsewhere in these specifications.

2.03 COOPERATION BETWEEN TRADES AND WITH OTHER CONTRACTORS

- A. Each trade, subcontractor and/or contractor must work in harmony with the various other trades, subcontractors, and/or contractors on the job as may be required to facilitate the progress to the best advantage of the job as a whole. Each trade, subcontractor, and/or contractor must pursue his work promptly and carefully as not to delay the general progress of the job. This Contractor shall work in harmony with contractors working under other contracts on the premises.

2.04 PRECEDENCE OF MATERIALS

- A. These specifications and the accompanying drawings are intended to cover systems which will not interfere with the structural design of the building, which will fit into the available space, and which will insure complete and satisfactory systems. Each Contractor shall be responsible for the proper fitting of his material and apparatus into the building.
- B. Each Contractor shall so harmonize his work with that of the other trades so that it may be installed in the most direct and workmanlike manner without hindering or handicapping the other trades. Piping interferences shall be handled by giving precedence to pipelines that require a stated grade for proper operation. Where space requirements conflict, the following order of precedence shall, in general, be observed: See special conditions noted hereinafter for work integrated with structural systems.

1. Building lines
2. Structural members
3. Drain piping
4. Vent piping
5. Condensate piping
6. Refrigerant piping
7. Electrical bus duct
8. Supply ductwork
9. Return ductwork
10. Exhaust ductwork
11. Domestic hot and cold water piping
12. Electrical conduit

## 2.05 LOCATION OF OUTLETS IN ROOMS

- A. All fire protection, plumbing, acoustical tile, diffusers, grilles, registers, and other devices shall be referenced to coordinated, established data points and shall be located to present symmetrical arrangements with these points and to facilitate the proper arrangements of acoustical tile panels and other similar panels with respect to the mechanical and electrical outlets and devices. Those mechanical and electrical outlets shall be referenced to such features as wall and ceiling furrings, balanced border widths, masonry joints, etc. Outlets in acoustical tile shall occur symmetrically in tile joints or in the center of whole tiles. When locations of mechanical and electrical devices shown on the Architect's reflected ceiling plans need to be modified, the final determination of the exact location of each outlet and the arrangement to be followed shall be acceptable to the Architect.
- B. The drawings show diagrammatically the location of the various outlets and apparatus. Exact locations of these outlets and apparatus shall be determined by reference to the general plans and to all detail drawings, equipment drawings, roughing-in drawings, etc., by measurements at the building, and in cooperation with the other trades. The Architect reserves the right to make any reasonable change in location of any outlet or apparatus before installation, without additional cost to the Owner.
- C. The Contractor, by submitting a bid on this work, sets forth that he has the necessary technical training and ability, and that he will install his work in a satisfactory and workmanlike manner which is up to the best standards of the trade, complete, and in good working order. If any of the requirements of the drawings and specifications are impossible of performance, or if the installation, when made in accordance with such requirements, will not perform satisfactorily, he shall report it to the Architect for correction promptly after discovery of the discrepancy.

## 2.06 CONNECTIONS FOR OTHERS

- A. This Contractor shall rough-in for and make all gas, water, steam, sewer, etc., connections to all fixtures, equipment, machinery, etc., provided by others in accordance with detailed roughing-in drawings provided by the equipment suppliers, along with actual measurements of the equipment connections, or as detailed.
- B. After the equipment is set in place, this Contractor shall make all final connections and shall provide all required pipe, fittings, valves, traps, etc.
- C. Provide all air gap fittings where required. In each water line serving an item of equipment or piece of machinery, provide a shut-off valve. On each drain not provided with a trap, provide a suitable trap.
- D. All pipe fittings, valves, traps, etc., exposed in finished areas and connected to chrome-plated lines provided by others shall be chrome plated to match.



## 2.07 WALL HUNG CARRIERS

- A. Provide floor mounted carriers for all wall mounted fixtures. Refer to Architectural plans and confirm walls intended to conceal carriers are adequate in depth to provide necessary space and clearance to properly install the carriers.

## PART 3 - INSTALLATION

### 3.01 INSTALLATION METHODS

- A. All pipes shall be concealed in pipe chases, walls, furred spaces, or above the ceiling, unless otherwise indicated.
- B. Piping may be run exposed in mechanical rooms, janitors' closets, or storage spaces, but only where necessary. All exposed piping shall be run in the neatest, most inconspicuous manner, and parallel or perpendicular to the building lines.
- C. All piping shall be adequately and properly supported from the building structure by means of hanger rods or clamps to walls as herein specified.
- D. Where limited space is available above the ceilings and below concrete beams or other deep projections, pipe and conduit shall be sleeved through the projection where it crosses, in a manner to provide maximum above-floor clearance. Sleeves shall be as specified or as required.
- E. All pipe, conduits, etc., shall be cut accurately to measurements established at the building and shall be worked into place without springing or forcing. All ducts, pipes and conduits run, exposed in machinery and equipment rooms, shall be installed parallel to the building plans, except as otherwise shown. Conduits in furred ceilings and in other concealed spaces may be run at angles to the construction but shall be neatly grouped and racked indicating good workmanship. All conduit and pipe openings shall be kept closed until the systems are closed with final connections.
- F. There shall be no pipe joints nearer than 12 in. to a wall, ceiling, or floor penetration, unless pipe joint is the welded type joint.
- G. The Contractor shall study all construction documents and carefully lay out all work in advance of fabrication and erection in order to meet the requirements of the extremely limited spaces. Where conflicts occur, the Contractor shall meet with all involved trades and the Architect and resolve the conflict, prior to erection of any work, in the area involved.

### 3.02 CUTTING AND PATCHING

- A. Cut and patch openings through walls, floors, etc., resulting from work in existing construction or by failure to provide proper openings or recesses in new construction.
- B. Openings cut through concrete and masonry shall be made with masonry saws and/or core drills at locations acceptable to the Architect. Impact-type equipment will not be used, except

where specifically acceptable to the Architect. Openings in Precast concrete slabs for pipes, conduits, outlet boxes, etc., shall be core drilled or cast to exact size.

- C. All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
- D. Where openings are cut through masonry walls, provide and install lintels or other structural supports to protect the remaining masonry. Adequate supports shall be provided during the cutting operation to prevent any damage to the masonry occasioned by the operation. All structural members, supports, etc., shall be of the proper size and shape, and shall be installed in a manner acceptable to the Architect.
- E. All plumbing work in areas containing plaster shall be completed prior to the application of the finish plaster coat. Cutting of finish plaster coat will not be permitted.
- F. No cutting, boring, or excavating, which will weaken the structure, shall be undertaken. NO STRUCTURAL MEMBER MAY BE CUT WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECT.

### 3.03 ROOF PENETRATIONS

- A. Pipe and duct sleeves and flashings compatible with the roofing installation shall be provided for roof penetrations. Manufacturer of roofing materials shall approve methods and materials.
  - 1. Pitch pans are not acceptable.
- B. Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.
- C. Piping penetration flashings shall be specially made for metal roofs and shall be EPDM or neoprene compression molded rubber with corrosion resistant metal base. Flashings shall be by Portals Plus, Inc., Buildex Dektite, or approved equal.

### 3.04 FABRICATION OF PIPE

- A. All the various piping systems shall be made up straight and true and run at proper grades to permit proper flow of the contained material. Lines shall also be graded for proper drainage.
- B. Piping shall follow as closely as possible the routes shown on plans, but shall take into consideration conditions to be met at the site.
- C. Should any unforeseen conditions arise, lines shall be changed or rerouted as required after approval has been obtained.
- D. All piping shall be installed with due regard to expansion and contraction and so as to prevent excessive strain and stress in the piping, in connections, and in equipment to which lines are connected.

- E. All piping shall be clean when it is installed. Before installation it shall be checked, upended, swabbed, if necessary, and all rust or dirt from storage shall be removed. Pipe shall not be permitted to lie on the ground during storage. Pipe ends shall be sealed during storage.

### 3.05 IDENTIFICATION AND LABELING

- A. The Contractor shall make it possible for the personnel operating and maintaining the equipment and systems in this project to readily identify the various pieces of equipment, valves, piping, etc., by marking them.
- B. All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16 in. thick, 3-ply, with black surfaces and white core. Engraving shall be condensed gothic, at least 1/2 in. high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information. Equipment to be labeled shall include, but not be limited to, the following:
  - 1. Domestic Water Heaters
  - 2. Circulation Pumps
  - 3. Motor controllers
  - 4. Miscellaneous similar and/or related items.
- C. The Contractor shall install identification tags to be affixed to those valves that have functions that are not obvious. For example, it would not be expected that valves at a pressure reducing station in a machine room would be tagged. The valve identification tags shall be brass discs, 2 in. in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material.

### 3.06 TESTS AND INSPECTIONS

- A. The Contractor shall, during the progress of the work and upon its completion, test his work and make all tests as required by the specifications, state, municipal and other authorities having jurisdiction of the work. Piping pressure tests shall be made before pipe is concealed or covered. Tests shall be made in the presence of authorities requiring tests. The Contractor shall pay all costs, inspection charges and fees required for the tests of his work.
- B. The Contractor shall provide all apparatus, temporary piping connection, etc., required for tests. The Contractor shall take all due precautions to prevent damage to the building or its contents incurred by such tests. The Contractor shall repair and make good at his own expense any damage caused by failures or leaks during the tests.
- C. Leaks, defects or deficiencies shall be repaired and/or replaced, and tests shall be repeated until the test requirements are complied with fully.
- D. All equipment shall be placed in operation and tested for proper automatic control before the final balancing of the system is started.

- E. All tests shall have pertinent data logged by the Contractor at the time of testing. Data shall include date, time, personnel, description, and extent of system tested, test condition, test results, specified results, and any other pertinent data. Data shall be delivered to the Architect.

### 3.07 COOPERATION AND CLEANUP

- A. It shall be the responsibility of each trade to cooperate fully with the other trades on the job to help keep the job site in a clean and safe condition. At the end of each day's work, each trade shall properly store all of his tools, equipment and materials and shall clean his debris from the job. Upon the completion of the job, each trade shall immediately remove all of his tools, equipment, any surplus materials and all debris caused by his portion of the work.

### 3.08 CLEANING AND PAINTING

- A. All equipment, piping, ductwork, grills, insulation, etc., in finished areas furnished and installed by the Contractor shall be painted. Finished areas include mechanical rooms, boiler rooms, and outside the building as well as occupied areas inside the building. Final painting is to be done by the General Contractor. This Contractor shall thoroughly clean all part of materials and equipment of cement, plaster, and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and left smooth and clean.
- B. This Contractor shall thoroughly clean the finish on all parts of the materials and equipment with factory applied finishes. Exposed parts in equipment rooms, above crawl space slabs, and all other spaces except sealed chases and attics shall be thoroughly cleaned of cement, plaster and other materials, and all oil and grease spots shall be removed. Such surfaces shall be carefully wiped and all cracks and corners scraped out. If the finish has been damaged, the Contractor shall re-paint to the satisfaction of the Architect.
- C. All canvas finishes shall be painted with one sizing coat if not already sized, containing a mildew resistant additive and Arabol adhesive prior to any other specified finish paint.
- D. No nameplates on equipment shall be painted, and suitable protection shall be afforded to the plates to prevent their being rendered illegible during painting operation.

### 3.09 ELECTRICAL PROVISIONS OF PLUMBING WORK

- A. The extent of electrical provisions to be provided as plumbing work is indicated in other sections of the specifications, on the drawings and as further specified in this section.
- B. Starters, Controllers: In general, plumbing includes furnishing combination starters. Controllers are specifically included as electrical work when mounted in motor control centers. Electrical work includes installation, mounting and wiring of starters and controllers that are furnished as mechanical work. Free standing, large motor controllers shall be set in place, on pads, as plumbing work.
- C. Electrical heating equipment shall be furnished complete with internal or integral fusing and subdivision of loads to comply with the NEC.

- D. Wherever possible, match the elements of the electrical provisions of plumbing work with similar elements of the electrical work specified in electrical sections of the specifications.
  - E. Standards:
    - 1. For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards to definitions of terminology herein.
    - 2. Comply with National Electrical Code (NFPA No. 70) for installation requirements.
    - 3. Comply with National Electrical Contractors Association (NECA) "Standard of Installation".
- 3.10 TEMPORARY FACILITIES
- A. Unless noted otherwise in the Supplementary General Conditions; provide temporary facilities.
- 3.11 EQUIPMENT INSTALLATION REQUIREMENTS
- A. All plumbing equipment shall be furnished and installed complete and ready for use.
  - B. Others shall furnish certain kitchen , lab, or Owner process equipment. Contractor shall be responsible for furnishing and installing all items as required to make equipment complete operating systems. The Contractor shall furnish and install all auxiliary piping, valves, controls, control wiring, conduit, alarms, etc., required. All necessary devices, control wiring, conduit, etc., will not necessarily be shown on the drawings.
- 3.12 OWNER FURNISHED EQUIPMENT
- A. The Contractor's responsibility shall include receiving and installing all Owner-furnished equipment.

**END OF SECTION 22 0010**

**SECTION 22 0512**

**PLUMBING AND ELECTRICAL COORDINATION**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Refer to Section 26 0510 - GENERAL REQUIREMENTS FOR ELECTRICAL WORK .
- B. Refer to Section 22 0010 - BASIC PLUMBING REQUIREMENTS.
- C. Refer to Section 23 0010 - BASIC MECHANICAL REQUIREMENTS.

1.02 SUMMARY

- A. This Section describes the coordination between the Plumbing, Mechanical and Electrical portions of the work.
- B. This Section is included under the Division 22 portion of the Specifications as Section 21 0512, under the Division 23 portion of the Specifications as Section 22 0512, and under the Division 26 portion of the Specifications as Section 26 0512.

1.03 WORK INCLUDED

- A. Responsibility: Unless otherwise indicated, motors and controls shall be furnished, set in place and wired in accordance with the following schedule. **This schedule may include equipment and systems that are not required for this project. Only the equipment and systems that are required on the drawings and/or specified elsewhere will be required by this section:**

ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
1. Equipment Motors	21/22/23	21/22/23	26
2. Magnetic Motor Starters			
a. Automatically controlled, with or without HOA switches	21/22/23	26	Notes 1,3,5
b. Automatically controlled, with or without HOA switches and furnished as part of factory wired equipment	21/22/23	22/23	Notes 1,3,5
c. Manually controlled	21/22/23	26	Notes 1,3,5
d. Manually controlled and furnished as part of factory wired equipment	21/22/23	26	Notes 1,3,5
e. Furnished in Motor Control Centers	26	26	Notes 1,3,5
3. Variable Speed (Frequency) AC Drives	22/23	26	Notes 1,4,5

ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
4. Line voltage thermostats, time clocks, etc., not connected to control panel systems	23	26	23
5. Electric thermostats, time clocks, remote bulb thermostats, motorized valves, float controls, etc. which are an integral part or directly attached to ducts, pipes, etc.	22/23	22/23	22/23
6. Temperature control panels and time switches mounted on temperature control panels	23	23	23
7. Motorized valves, motorized dampers, solenoid valves, EP and PE switches, etc.	23	23	Note 1
8. Alarm bells furnished with equipment installed by Division 22 or 23	22/23	22/23	22/23
9. Wiring to obtain power for control circuits, including circuit breaker	21/22/23	21/22/23	21/22/23
10. Low voltage controls	21/22/23	21/22/23	21/22/23
11. Fire protection system (sprinkler) controls	21	21	Note 8
12. Fire and smoke detectors installed on mechanical units and in ductwork	28	23	Note 8
13. All relays required for fan shutdown, motorized dampers, smoke control devices, and other items integral with HVAC equipment to provide operation and control of HVAC equipment	23	23	Note 1
14. Smoke dampers, and combination fire/smoke dampers	23	23	Note 7
15. Boiler and water heater controls, boiler burner controls panels	22/23	22/23	22/23
16. Pushbutton stations, pilot lights	22/23	22/23	22/23
17. Heat Tape	21/22/23	21/22/23	26
18. Disconnect switches, manual operating switches furnished as a part of the equipment	21/22/23	21/22/23	Notes 1,5
19. Disconnect switches, manual operating switches furnished separate from equipment	26	26	26
20. Multispeed switches	23	23	26
21. Thermal overloads	21/22/23	21/22/23	21/22/23

ITEM	FURNISHED UNDER DIVISION	INSTALLED UNDER DIVISION	WIRED AND CONNECTED UNDER DIVISION
22. Control relays, transformers	21/22/23	21/22/23	21/22/23
23. Refrigeration cycle, cooling tower and controls	23	23	23
24. Tamper switches for fire protection (sprinkler) system	21	21	28
25. Flow and/or pressure switches for fire protection (sprinkler) system	21	21	28
26. Fire and jockey pump controllers and automatic transfer switch	21	21	Note 6
27. Alarm bells or horns for fire protection (sprinkler) system	21	21	28
28. Generator (underground) fuel tank	22	22	--
29. Generator fuel level indicator	22	22	26
30. Generator fuel piping from tank to generator	22	22	--
31. Underground fuel tank leak detection and monitoring system	22	22	22

- NOTES:
- (1) Power wiring as defined in Section 26 2913 of the specifications shall be provided under Division 26; control wiring as defined in Section 26 2913 of the specifications shall be provided under Division 21/22/23.
  - (2) Wiring from alarm contacts to alarm systems provided by Division 26, wiring from auxiliary contacts to air handling system controls provided by Division 23. Division 26 shall provide power to smoke detector. Smoke detectors required for all air handling systems 2000 CFM or greater. Refer to other Division 23 specifications, Division 26 and Drawings for more specific requirements.
  - (3) For requirements for Magnetic Motor Starters, refer to Section 23 8965 - MOTOR CONTROLLERS.
  - (4) For requirements for Variable Speed (Frequency) AC drives, refer to Section 23 8965 - MOTOR CONTROLLERS.
  - (5) Disconnect switches, operating switches, starters and other similar items that are factory-mounted, as a part of complete assembly, shall comply with applicable provisions of the National Electric Code. All such disconnect switches shall be fused.
  - (6) Power wiring from energy source to controllers and automatic transfer switch provide shall be provided under Division 26. Interconnection power and control wiring from controllers and automatic transfer switch to pumps shall be provided under Division 21, 22 or 23 and conforming to Division 26 specifications. Control wiring from automatic transfer switch to generator starter shall be provided under Division 26.



- (7) Division 26 will provide power to all smoke and combination fire/smoke dampers, and Division 28 will provide control for all such dampers using area smoke detectors.
- (8) Wiring for sprinkler system controls to be provided by Division 21. Wiring from devices to Fire Alarm System to be provided by Division 28.

B. CONNECTIONS: Make all connections to controls that are directly attached to ducts, piping and mechanical equipment with flexible connections.

C. PRECEDENCE

- 1. In general, piping systems that require a stated grade for proper operation shall have precedence over other systems.
- 2. Precedence for pipe, conduit and duct systems shall be as follows.
  - a. Building lines
  - b. Structural members
  - c. Soil and drain piping
  - d. Vent piping
  - e. Condensate piping
  - f. Refrigerant piping
  - g. Electrical bus duct
  - h. Supply ductwork
  - i. Return ductwork
  - j. Exhaust ductwork
  - k. Domestic hot and cold water piping
  - l. Electrical conduit
- 3. Lighting Fixtures shall have precedence over air grilles and diffusers.

D. FINAL INSPECTION AND REPORT

1. At the completion of the work, there shall be a meeting of the Fire Protection, Plumbing, Mechanical, Electrical Fire Alarm and Temperature Control Contractors, representatives of mechanical and electrical equipment manufactures whose equipment was actually installed on the project, and similarly-involved individuals, who shall thoroughly inspect all systems, and who shall mutually agree that all equipment has been properly wired and installed, and that all temperature and safety controls are properly functioning. A written report of this meeting, listing those in attendance, and the companies that they represent, shall be filed with the Owner and Architect or Engineer.

**END OF SECTION 22 0512**

**SECTION 22 0593****PLUMBING TESTING, ADJUSTING AND BALANCING****PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Adjust and balance plumbing hot water recirculation systems
- B. Check each piece of operating equipment provided under Division 22.
- C. Provide Balancing Report

## 1.02 QUALITY ASSURANCE

- A. Independent Subcontractor: All testing, adjusting and balancing shall be performed by a Testing, Adjusting and Balancing firm that is independent from the plumbing systems installer.
- B. Balancing Work: Under direct supervision of AABC accredited testing organization certified supervisor.

## 1.03 REFERENCES

- A. Reference Standards: Comply with AABC National Standards for Total System Balance, latest edition.

## 1.04 SUBMITTALS

- A. Certificate: Before beginning work, submit certification of AABC certified supervisor and AABC firm certification in accordance with Section 22 0010.
- B. Balancing Report: At completion of work, submit balancing report in accordance with Section 22 0010. After adjustments have been made submit three (3) copies of a complete detailed report on mechanical systems and their operation to include:
  - 1. Blackline prints with balance valves marked to correspond with data sheets and with thermometer locations clearly marked.
  - 2. Data sheets showing amount of water at balance valves, instrument used.
  - 3. Operating data including pump RPM, measured motor current and voltage BHP and flow (GPM).
  - 4. Equipment and operating data including water temperatures entering and leaving the thermostatic mixing valve(s).
  - 5. A statement outlining any abnormal or notable conditions not covered in above data. Make special note of any discrepancies between tabulated data and specified conditions.

1.05 PROJECT CONDITIONS

- A. Existing Conditions: Verify following conditions before proceeding with work:
  - 1. Installation of the designated system is complete and in full operation.

**PART 2 - PRODUCTS**

2.01 INSTRUMENTS

- A. Calibration and maintenance of instruments shall be in accordance with manufacturer's standards and recommendations and requirements of AABC.
- B. Calibration histories for each instrument shall be available for examination.

**PART 3 - EXECUTION**

3.01 INSPECTION

- A. Inspect preceding work in accordance with Section 22 0010 - BASIC PLUMBING REQUIREMENTS.

3.02 PREPARATION

- A. Water Systems: Check:
  - 1. Strainers are clean.
  - 2. Automatic control valves operation.
  - 3. Pump rotation.
  - 4. Other conditions as required.

3.03 ADJUSTING AND BALANCING

- A. General: Check, adjust and balance hot water recirculation system to meet the design performance and tabulate results on acceptable forms. Minimum data to include amperage, voltage input, and thermal heater capacity of each pump, equipment nameplate data and operating speed, pressure rise across each pump, GPM capacity of each balance valve.
- B. Test Run: In order to determine that the system installation is complete and will operate satisfactorily, make a test run with equipment operating per normal temperature control schedule and sequence. Run test and operate and adjust equipment as may be required during test run.

3.04 COMPLETION SERVICES

- A. Final Check: Make final checks and do any rebalancing as directed.

- B. Report: Submit Balancing Report as specified above.
- C. Acceptance: Final acceptance of the project will not be made until a satisfactory report is received. Owner reserves the right to spot check the report by field verification prior to final acceptance.

**END OF SECTION 22 0593**

**SECTION 22 0716****PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.01 SUMMARY**

- A. Extent of plumbing insulation required by this section is indicated on Drawings and schedules, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
  - 1. Piping System Insulation:
    - a. Fiberglass.
    - b. Flexible Unicellular.

**1.02 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical (insulating material, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
  - 1. Exception: Outdoor mechanical insulation may have flame-spread index of 75 and smoke developed index of 150.
  - 2. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame-spread index of 75 and smoke developed index of 150.

**1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

**PART 2 - PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Armacell.
  - 2. Manson.
  - 3. Knauf Fiber Glass.
  - 4. Johns Manville Products Corp.
  - 5. Owens-Corning Fiberglass Corp.

2.02 PIPING INSULATION MATERIALS

- A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated.
- B. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.
- C. Jackets for Piping Insulation: ASTM C 921 and ASTM C 1136, Type I (Vapor Barrier) for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installer's option.
  - 1. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations, ASTM D 1784.
  - 2. Encase exterior piping insulation with aluminum jacket with weather-proof construction, ASTM C 1729.
- D. Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.
- E. Adhesives, Sealers and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

**2.03 METAL PROTECTIVE JACKET**

- A. Sheet aluminum: ASTM B209, 3003 alloy, H-14 temper, and 0.016 in. thick. Provide moisture barrier lining for service temperatures 60°F or less except where applied over a Type I or II jacket. Longitudinal lap shall be at least two in. wide.
- B. Fitting covers: Factory fabricated from not lighter than 0.020 in. thick type 3003 sheet aluminum.
- C. Bands: 3/4 in wide aluminum on maximum 18 in. centers.
- D. A two in. overlap is required at longitudinal and circumferential joints.
- E. Provide metal jackets over insulation as follows:
  - 1. All water piping and all sanitary sewer p-traps exposed to outdoor weather (piping is specified with heat tracing).

**PART 3 - EXECUTION****3.01 INSPECTION**

- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Thickness of insulation shall be as recommended by the manufacturer for the temperatures and pipe sizes involved, and in accordance with standards of T.I.M.A.

**3.02 PLUMBING PIPING SYSTEM INSULATION**

- A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.
- B. Cold Piping:
  - 1. Application Requirements: Insulate the following cold plumbing piping systems:
    - a. Potable cold water piping.
    - b. Interior horizontal above-ground storm water piping from roof drains and overflow drains.
    - c. Plumbing vents within 6 linear ft. of roof outlet.
    - d. Condensate drains from HVAC units, refrigerated equipment, etc., including traps and lateral lines concealed above ceilings.



- e. Roof drain bodies.
  - f. Floor drain bodies and traps.
  - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Fiberglass: 1 in. thickness; for cold water and storm drain piping.
    - b. Flexible Unicellular: ½ in. thick for condensate drain piping, vent piping and floor drains.
  - C. Hot Piping:
    - 1. Application Requirements: Insulate the following hot plumbing piping systems:
      - a. Potable hot water piping.
      - b. Potable hot water recirculating piping.
      - c. Hot drain piping (where indicated).
    - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
      - a. Fiberglass (Above Ground Only): 1 in. thick for pipe sizes up to and including 1-1/4 in., 1-1/2 in. thick for pipe sizes 1-1/2 in. and larger.
      - b. All insulation requirements shall comply with applicable edition of IECC.
- 3.03 INSULATION EXPOSED TO WEATHER
- A. Protect outdoor insulation from weather by installation of weather-barrier metal jacketing. It may be factory-applied or field applied. Joints shall be overlapped a minimum of 2 inches. Securement shall be accomplished by using screws, rivets, or stainless steel bands. Any vapor-barrier jacket or coating under the metal jacketing shall not be disturbed or punctured by the use of screws or rivets on the outer jacket.
- 3.04 PROTECTION AND REPLACEMENT
- A. Replace damaged insulation that cannot be repaired satisfactorily, including units with vapor barrier damage and moisture-saturated units.
  - B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

**END OF SECTION 22 0716**

**SECTION 22 1000****PLUMBING PIPING****PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Extent of Plumbing Piping Work required by this section is indicated on Drawings and by requirements of this section.
- B. Types of Plumbing Piping systems specified in this section include the following:
  - 1. Sanitary waste and vent system.
  - 2. Domestic water system.
  - 3. Miscellaneous Drain Lines
  - 4. Storm drainage system.

## 1.02 REFERENCES

- A. ANSI/ASME B16.18 - Cast Copper Alloy Solder - Joint Pressure Fittings.
- B. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- C. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.
- D. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- E. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- F. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
- G. ANSI/ASTM B32 - Solder Metal.
- H. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- I. ANSI/AWS D1.1 - Structural Welding Code.
- J. AWS D10.12 - Recommended Practices and Procedures for Welding Plain Carbon Steel Pipe.
- K. AWS D10.9 - Qualifications and Procedures for Piping and Tubing Welding.
- L. AWS B3.0 - Welding Procedure and Performance Qualification.
- M. ASME - Boiler and Pressure Vessel Code.
- N. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

- O. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- P. ASTM B88 - Seamless Copper Water Tube.
- Q. ASTM B306 - Copper Drainage Tube (DWV).
- R. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- S. ASTM C 1540 - Heavy Duty Shielded Hubless Couplings
- T. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- U. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
- V. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- W. ASTM D2321 - Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-flow Applications.
- X. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain Waste and Vent Pipe and Fittings.
- Y. ASTM D2680 - Acrylonitrile - Butadiene - Styrene (ABS) Composite-Sewer Piping.
- Z. ASTM D2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe.
- AA. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- AB. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVS) Pipe and Fittings.
- AC. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AD. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- AE. ASTM E84 - Standard test method for surface burning characteristics of building materials.
- AF. ASTM F477 - Electrometric Seals (Gaskets) for Joining Plastic Pipe.
- AG. AWS A5.8 - Brazing Filler Metal.
- AH. AWWA C651 - Standard for Disinfecting Water Mains.
- AI. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
- AJ. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- AK. CISPI 310 - Couplings for Use with Hubless Cast Iron Soil Pipe and Fittings.

- AL. ASTM D2564 - Solvent Cements for Poly (vinyl) (chloride) (PVC) Plastic Pipe and Fittings.

1.03 QUALITY ASSURANCE

- A. Plumbing Certification: Persons performing plumbing work shall have a current Texas State Plumbing License.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME Code and AWS 10.12.
- D. Welders Certification: In accordance with ANSI/ASME Sec. 9 or AWS D1.1, AWS D10.9, and AWS B3.0, as applicable.
- E. Pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.

1.04 REGULATORY REQUIREMENTS

- A. Conform to the most recent editions of the applicable City codes and ordinances.
- B. Piping materials specified herein are acceptable products to the Architect/Engineer, but all are not necessarily acceptable to applicable local codes and ordinances. It is the responsibility of the Contractor to provide materials, from the options listed herein, that are acceptable to both the Architect or Engineer and applicable local codes and ordinances.

1.05 SUBMITTALS

- A. Submit product data on pipe materials, fittings, valves and accessories in accordance with Division 01 and Section 22 0010.
- B. Submit shop drawings and piping layout in accordance with Division 01 and Section 22 0010.
- C. Submit certificates as listed below to Architect in accordance with Division 01 and Section 22 0010.
  - 1. Test Certificates of Approval for Piping Systems.
  - 2. Flushing Certificates of Approval for Piping Systems.
  - 3. Disinfection Certificates of Approval for Domestic Water Piping Systems.

1.06 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

## PART 2 - PRODUCTS

### 2.01 SANITARY WASTE AND VENT PIPING

- A. Sanitary waste and vent piping, buried beyond 5 ft. of building.
  - 1. See Section 33.
- B. Sanitary waste and vent piping, below grade.
  - 1. PVC Pipe: ASTM D2665, Schedule 40. Fittings: PVC DWV Type, Schedule 40, and ASTM D2665. Joints: ASTM D2855 and D2564, solvent weld. Reference ASTM D23221 for installation.
- C. Sanitary waste and vent piping, exposed above grade.
  - 1. Cast Iron Pipe & Fittings: CISPI 301, hubless. Joints: ASTM C 564, neoprene gaskets and stainless steel clamp-and-shield assemblies. Joints shall be Heavy Duty couplings conforming to ASTM C 1540 as manufactured by Husky SD 4000 or Clamp All 125.
- D. Sanitary waste and vent piping concealed within walls or above ceiling.
  - 1. Cast Iron Pipe & Fittings: CISPI 301, hubless. Joints: ASTM C 564, neoprene gaskets and stainless steel clamp-and-shield assemblies. Joints shall be Heavy Duty couplings conforming to ASTM C 1540 as manufactured by Husky SD 4000 or Clamp All 125.
  - 2. PVC Pipe: ASTM D2665, Schedule 40. Fittings: PVC DWV Type, Schedule 40, ASTM D2665. Joints: ASTM D2855 and D2564, solvent weld. Do not install PVC in return air plenums.

### 2.02 WATER PIPING

- A. Water piping buried below grade.
  - 1. See Section 33.
- B. Water piping, above grade.
  - 1. Copper Tubing: For 4 in. diameter and less, ASTM B88, Type "L" inside the building and outside the building, hard drawn. Fittings: ANSI/ASME B16.18, cast brass, or ANSI/ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA.
  - 2. Mechanically pressed copper fittings are acceptable for pipe sizes 1/2 in. through 4 in. diameter. Operating pressure: 200 PSI CWP Max, Temperature range: -20°F to 250°F. Fittings shall conform with ASME B16.18, ASME B16.22 or ASME B16.26, and performance criteria of IAPMO PS-117 or ASME B16.51. Fittings shall utilize a factory installed EPDM sealing element and be listed by NSF 61. The installer shall be trained and certified by the fitting manufacturer. Copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. Acceptable products are Apollo Press, Viega ProPress or Mueller Industries Streamline PRS.

### 2.03 MISCELLANEOUS DRAIN PIPING

#### A. Condensate Drain Piping:

1. Copper pipe; ASTM B306, DWV fittings; ANSI/ASME B16.3, cast bronze, or AWSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
2. Mechanically pressed copper fittings are acceptable for pipe sizes 1/2 in. through 4 in. diameter. Operating pressure: 200 PSI CWP Max, Temperature range: -20°F to 250°F. Fittings shall conform with ASME B16.18, ASME B16.22 or ASME B16.26, and performance criteria of IAPMO PS-117 or ASME B16.51. Fittings shall utilize a factory installed EPDM sealing element. The installer shall be trained and certified by the fitting manufacturer. Copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. Acceptable products are Apollo Press, Viega ProPress or Mueller Industries Streamline PRS.

#### B. Pumped Drain for Elevator Sump:

1. Copper pipe; ASTM B306, Fittings; ANSI/ASME B16.3, cast bronze, or AWSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
2. Mechanically pressed copper fittings are acceptable for pipe sizes 1/2 in. through 4 in. diameter. Operating pressure: 200 PSI CWP Max, Temperature range: -20°F to 250°F. Fittings shall conform with ASME B16.18, ASME B16.22 or ASME B16.26, and performance criteria of IAPMO PS-117 or ASME B16.51. Fittings shall utilize a factory installed EPDM sealing element. The installer shall be trained and certified by the fitting manufacturer. Copper press fittings shall be installed using the proper tool, actuator, jaws and rings as instructed by the press fitting manufacturer. Acceptable products are Apollo Press, Viega ProPress or Mueller Industries Streamline PRS.

### 2.04 STORM DRAINAGE PIPING

#### A. Storm drainage piping, buried beyond 5 ft. of building.

1. See Division 33.

#### B. Storm drainage piping, buried below grade.

1. PVC Pipe: ASTM D2665, Schedule 40. Fittings: PVC. Joints: ASTM D2855 and D2564, solvent weld. Reference ASTM D2321 for installation.

#### C. Storm drainage piping, above grade.

1. Cast Iron Pipe & Fittings: CISPI 301, hubless, service weight. Joints: ASTM C564, neoprene gaskets and stainless steel clamp-and-shield assemblies. Joints over 4 in. shall be Heavy Duty couplings conforming to ASTM C 1540 .

2.05 FLANGES, UNIONS AND COUPLINGS

- A. Pipe Size 2 in. and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 in.: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; gaskets suitable for intended service – NO ASBESTOS GASKET MATERIAL ALLOWED.
- C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction and expansion; “C” shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
  - 1. Acceptable Manufacturers:
    - a. Victaulic
    - b. Apollo Shurjoint
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.06 BALL VALVES

- A. Ball valves: For water shut-off and throttling.
  - 1. Ball valves 2 in. and less: Rated 175 lb. minimum water, oil, air and gas pressure, brass or bronze construction, seat material as recommended by manufacturer for material conveying, lever handle, threaded or soldered connections. Throttling valves shall be provided with memory stops (for establishing any setpoint from 0-100% flow).
    - a. Acceptable Manufacturers and Models:

1) Crane	9302, 9322
2) Apollo	70 Series
3) Jomar	T-100-SS
4) ITT Grinnell	3500, 3500SJ
5) Milwaukee	BA-200, BA-250
6) Watts	B-6000, B-6001
7) Nibco	T-580, & S-500
8) KITZ	868

2.07 CHECK VALVES

A. Swing check valves: For water and pumped waste and drain.

1. Check Valves 2 in. and less: MSS SP-80 rated 175 lb. minimum water and air pressure, brass or bronze construction, renewable seat, bronze disc, threaded or soldered connections.

a. Acceptable Manufacturers and Models:

1) Nibco	T-413
2) Apollo	163T
3) Crane	137
4) Jomar	T/S-511
5) Stockham	B-321
6) Milwaukee	508
7) KITZ	822

2.08 EXCAVATION, BACKFILLING AND COMPACTING

A. Provide excavation, backfilling and compacting in accordance with Division 31 .

2.09 PIPING SPECIALTIES

A. Provide piping specialties in accordance with Section 22 1119.

2.10 PLUMBING SUPPORTS AND ANCHORS

A. Provide supports and anchors in accordance with industry standards. All supports and anchors shall be the same type by the same manufacturer throughout the project.

2.11 PLUMBING INSULATION

A. Provide piping insulation in accordance with Section 22 0716.

**PART 3 - EXECUTION**

3.01 PIPING

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.



- D. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- E. Route piping in orderly manner and maintain gradient.
- F. Install piping to conserve building space and not interfere with use of space.
- G. Pipes passing through concrete or cinder walls and floor or other corrosive material shall be protected by a protective sheathing or wrapping or by sleeves, as required to meet the local code. Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire-resistance-rated assemblies shall be filled or tightly caulked in accordance with the local code.
- H. Group piping whenever practical at common elevations.
- I. Exposed piping, valves, fittings, escutcheons, trim, etc., serving plumbing fixtures in finished areas, shall be polished chromium plated. Exposed piping, valves, fittings, escutcheons, trim, etc., serving plumbing equipment, kitchen equipment, or other equipment located in finished areas, shall be chrome plated, or when not available with chrome plating, they shall be painted with chromium paint.
- J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- K. Provide clearance for installation of insulation and access to valves and fittings.
- L. Provide access where valves and equipment are not accessible. Coordinate size and location of access doors with Architect.
- M. Slope water piping and arrange to drain at low points.
- N. Establish elevations of buried piping outside the building to ensure not less than 3 ft. of cover.
- O. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Division 09, PAINTING.
- P. Install piping parallel with or at right angles to walls unless otherwise shown on Drawings.
- Q. Conceal piping above ceilings, in walls or chases etc., unless otherwise shown or noted on Drawings.
- R. Joints in soft copper piping below slab will not be allowed.
- S. Soft copper shall not be routed through areas with exposed ceilings except in mechanical rooms.
- T. Bending of rigid piping is not permitted; only ells shall be utilized for a change in direction.
- U. Temporarily plug or cap open ends of pipe at the end of each workday.

- V. Establish invert elevations for drainage piping. Minimum slopes for drainage are 1/4 in. per foot for 3 in. diameter and less and 1/8 in. per ft. for 4 in. diameter pipe and greater.
  - W. Install bell and spigot pipe with bell end upstream.
  - X. Install vented U-type drain trap on all draw-thru cooling coil drain pans.
  - Y. All sanitary waste stacks and storm drain down spouts 4 in. diameter and larger with vertical drops over 30 ft. 0 in. shall be provided with joint restraint on the horizontal branch or offset below the vertical drop. Threaded joints, grooved joints or a combination of pipe clamps and tie-rods as required in NFPA 24 shall accomplish joint restraint. Thrust blocks shall accomplish joint restraint below ground as required in NFPA 24. Vertical joint restraint shall be provided from the 90° ell at the bottom of the vertical drop through every joint up to the riser clamp at the floor penetration of the floor above. Horizontal joint restraint shall be provided from that same 90° ell through every joint on the horizontal branch.
  - Z. Materials exposed within ducts or plenums (ceiling spaces used as supply or return air plenums) shall have a flame-spread index of not more than 25 and a smoke-developed rating of not more than 50 when tested in accordance with the test for Surface Burning Characteristics of Materials, U.B.C. Standard No. 42-1. Do not install any PVC piping in any Return Air Plenums.
  - AA. Piping hangers shall be sized large enough to allow insulation to pass through. Hangers for piping 2-1/2 in. and greater shall be provided with pipe covering protection saddle, or high compressive strength insulation saddle. Hangers for piping 2 in. and less shall be provided with pipe covering shields. On cold or chilled water piping provide vapor barrier through hanger.
  - AB. Support vertical piping at every floor and every 5 ft. 0 in. along columns.
  - AC. A pressure reducing valve station shall be furnished and installed on incoming domestic cold water lines with pressure exceeding 80 psi. Furnish valve station with separate strainer.
  - AD. Installation of PVC plastic drainage piping underground shall be in compliance with ASTM D2321 Latest Edition "Standard Practice for Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications". Minimum trench width shall be pipe diameter plus 16 in. and all bedding material shall meet Class 1A or Class 1B bedding criteria.
  - AE. Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.
- 3.02 PIPING CONNECTIONS
- A. Threaded Connections
    - 1. Threaded joints shall be in accordance with ANSI B1.20.1. Threaded joints shall be made up Teflon tape or lead free pipe joint compound applied to the male thread only. Should a joint be loosened after being made up, it shall not be made up a second time unless the threads are cleaned and new compound applied.

2. All steel piping which is assembled with screwed joints shall have exposed threads thoroughly primed with a coat of lead free rust resistant paint. Paint immediately after installation. This shall apply to both piping that is to be covered as well as uncovered.

B. Soldered Connections

1. Soldered joints shall be in accordance with ASTM B32. Flux shall be nonacid type. Remove composition discs from solder end valves during soldering. Pipe ends, fittings and valves shall be properly cleaned before soldering and wiped clean to remove flux and excess solder after soldering.

C. Welded Connections

1. Welded joints shall be in accordance with AWS D10.12-79. The oxyacetylene or electric process shall make all joints.
2. Nipples or half couplings welded into the mains will not be accepted. Welded branch connections shall be used to tap mains only where the mains are at least two pipe sizes larger than the branch.
3. All openings cut into pipe for welded outlets shall be accurately made, to give matched intersections. For welded branch outlet fittings, the opening shall be cut before the fittings welded.
4. Long radius type ells shall be on all bends in welded pipelines. No field fabricated or factory segmentally fabricated fittings shall be allowed.
5. Welds on piping shall be cleaned and primed with corrosion resistant paint before insulation is applied or installation is complete.

D. Solvent Cement Connections:

1. Solvent cement connections shall be joined with primer and PVC solvent cement complying with ASTM D2564. Solvent cement connections shall be in compliance with GSR Bulletin SCJ-1 Solvent Cementing Procedure.

E. Mechanical Grooved Connections:

1. Pipe shall be prepared and mechanical grooved connections shall be assembled in accordance with ANSI/AWWA C606 and the latest published instructions from the manufacturer.

F. Copper Press Connections:

1. Mechanical copper press fittings shall be made in strict accordance with the manufacturer's installation instructions.
  - a. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the

tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

### 3.03 FLANGES AND UNIONS

- A. Provide flanges and unions at all final connections to equipment, and traps. Arrange piping and piping connections so that equipment being served may be serviced or totally removed without disturbing piping beyond final connections and associated shut-off valves.
- B. All flanged connections shall be in accordance with ANSI B16.5 for steel flanges and ANSI B16.1 for cast iron flanges.
- C. Bolting shall be in accordance with ASTM A307 Grade B with bolts and nuts in accordance with ANSI B18.2.1 and ANSI B18.2.2.
- D. Tighten flange bolts in sequence 180° directly opposite each to equal tension.
- E. Flanges and unions shall be made of same material or compatible material as piping systems in which they are installed.

### 3.04 VALVES

- A. Install valves with stems upright or horizontal, not below horizontal.
- B. Horizontal swing check valves shall be installed in a true horizontal position. Vertical lift check valves shall be installed in a true vertical position.
- C. Install ball valves for shut-off and to isolate equipment, parts of systems, or vertical risers.
- D. Install ball valves for throttling, bypass or manual flow control services.
- E. Throttling or balancing valves shall be provided with memory stops.

### 3.05 TESTING

- A. General: Furnish pumps, gauges, equipment and personnel required, and test as necessary to demonstrate the integrity of the finished installation.
- B. Soil, Waste and Vent, and Storm Drainage: Unless otherwise directed, plug all openings and fill with water to a height equal to the lowest vent or roof drain. Allow to stand one hour or longer as required. Remake leaking joints and retest.
- C. Water Lines: Hydrostatically test and make tight at 150 psi. Retain for four hours. Repair all leaking joints and retest.
- D. Pumped Drain: Hydrostatically test and make tight at 50 psi. Retain for four hours. Repair all leaking joints and retest.
- E. Tests and test procedures shall be witnessed and approved by the Owner's Representative.

- F. After completion and approval of testing, submit "Test Certificates of Approval" for Sanitary Waste and Vent, Water, and Pumped Drain piping systems stating that all test results are satisfactory. Certificates of approval must be signed by Contractor.

### 3.06 FLUSHING

- A. General: After piping systems have been tested and approved, systems shall be flushed. Furnish compressors, pumps, equipment, personnel, etc. required to flush piping systems.
- B. Water Lines: Flush piping with water until water flows clear for a minimum of 60 seconds per 100 linear ft. of piping being flushed at a velocity of 9 ft. per second.
- C. All strainers and filters shall be cleaned and replaced prior to start-up.
- D. Flushing and flushing procedures shall be witnessed and approved by the Owner's Representative.
- E. After completion and approval of flushing, submit "Flushing Certificates of Approval" for water piping systems stating that all flushing results are satisfactory. Certificates of approval must be signed by Contractor.

### 3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50-to 80 mg/L residual.
- C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 5 remote outlets.
- D. Maintain disinfectant in system for 24 hours.
- E. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- F. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- G. Take samples no sooner than 24 hours after flushing, from 5 remote outlets and from water entry, and analyze in accordance with AWWA C651.
- H. Disinfection and disinfection procedures shall be witnessed and approved by the Owner's Representative.
- I. After disinfection is completed, submit "Disinfection Certificate of Approval" for domestic water piping systems to the Architect stating that all test results are satisfactory. Certificate of Approval must be signed by Contractor and Testing Laboratory. Certificate shall show the date, time and residual of each of the following tests:
  - 1. Initial disinfection residual (50 PPM minimum) - 5 samples.

2. Final disinfection residual (25 PPM minimum) - 5 samples.
3. After flushing residual (5 PPM maximum) - 5 samples.
4. Analyze in accordance AWWA C651 - 5 samples.

3.08 CLOSING IN UNINSPECTED WORK

- A. Do not cover up or enclose work until it has been properly and completely inspected and approved. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required. After it has been completely inspected and approved, make all repairs and replacements as necessary to the satisfaction of the Architect, Engineer, and Owner's Representative. Repairs and replacements shall be at no additional cost to the Owner.

**END OF SECTION 22 1000**

**SECTION 22 1001****PLUMBING SPECIALTIES****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Extent of Plumbing Specialties Work required by this section is indicated on Drawings and by requirements of this section.
- B. Types of Plumbing Specialties specified in this section include the following:
  - 1. Roof drains.
  - 2. Floor drains.
  - 3. Cleanouts.
  - 4. Backflow preventers.
  - 5. Vacuum breakers.
  - 6. Water hammer arrestors.
  - 7. Trap guards.
  - 8. Thermostatic mixing valves.
  - 9. Wall hydrants.
  - 10. Heat tracing systems.
  - 11. Drain Flashings
  - 12. Expansion tanks

**1.02 REFERENCES**

- A. ANSI/ASSE 1015 - Backflow Preventers, Double Check Principle.
- B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- C. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- D. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- E. ANSI A112.21.1 - Floor Drains and Area Drains.
- F. ANSI A112.21.2 - Roof Drains.

G. ANSI A112.26.1 - Water Hammer Arresters.

H. PDI WH-201 Water Hammer Arresters.

1.03 QUALITY ASSURANCE

A. Conformance with applicable state and local codes and ordinances.

B. Manufacturer: For each product specified, provide components by same manufacturer throughout.

C. Plumbing Certification: Persons performing plumbing work shall have a current Texas State Plumbing License.

1.04 REGULATORY REQUIREMENTS

A. Conform to applicable City codes and ordinances .

1.05 SUBMITTALS

A. Submit product data in accordance with Division 01 and Section 23 0010.

B. Include component sizes, rough-in requirements, service sizes, and finishes.

C. Submit Certificates as listed below to Architect in accordance with Division 01 and Section 23 0010.

1. Certificate of Approval - First Heat Tracing System Megohmmeter Test.
2. Certificate of Approval - Second Heat Tracing System Megohmmeter Test.
3. Certificates of Approval - Backflow Preventers.

**PART 2 - PRODUCTS**

2.01 ROOF DRAINS

A. Roof Drain: ANSI A112.21.2; cast iron body with sump, bottom outlet, removable galvanized or cast iron dome strainer, adjustable level, membrane flange and clamp with integral gravel stop, with adjustable under deck clamp and drain receiver.

1. Acceptable Manufacturers and Models:

- |               |               |
|---------------|---------------|
| a. Josam      | Series 21000  |
| b. Tyler/Wade | Series W-3010 |
| c. Smith      | Series 1015   |
| d. Zurn       | Series Z-113  |



- e. Watts Series RD-300
- f. Mifab Series R1200

B. Overflow Roof Drain: ANSI A112.21.2; cast iron body with sump, bottom outlet, removable polyethylene dome strainer, adjustable level, secured plastic internal water guard for 2 in. above inlet of adjacent roof drain (or as required by local code), membrane flange and clamp with integral gravel stop, adjustable under deck clamp, drain receiver, and extension collar.

1. Acceptable Manufacturers and Models:

- a. Josam Series 26000
- b. Smith Series 1074
- c. Tyler/Wade Series W-3000-SD
- d. Watts Series RD-300-W
- e. Zurn Series 2101
- f. Mifab Series R1260-W

C. Downspout Nozzle (DSN): Stainless steel with perforated, hinged cover.

1. Acceptable Manufacturers and Models:

- a. Watts Series RD-950
- b. Or equal

2.02 FLOOR DRAINS

A. Floor drain: ANSI A112.21.1; cast iron body, double drainage flange, weep holes, bottom outlet, 6 in. dia. nickel bronze adjustable flat strainer, and non-puncturing flashing collar.

1. Acceptable Manufacturers and Models:

- a. Sioux Chief Series 832
- b. Or equal

2.03 CLEANOUTS

A. Floor Clean out: Cast iron body, adjustable type, inside caulk connection, standard round nickel bronze top, threaded bronze plug.

1. Acceptable Manufacturers and Models:

- a. Josam Series 56000-X-22

- |               |                     |
|---------------|---------------------|
| b. Smith      | Series 4028C        |
| c. Tyler/Wade | Series W-6000-IC    |
| d. Zurn       | Series ZN-1400IC-BP |
| e. Mifab      | Series C1100X-R     |
| f. Watts      | Series CO-100-C-RX  |

- B. Grade Clean out: Cast iron body, with straight body for caulking into soil pipe hub with countersunk tapered threaded bronze plug, heavy duty access cover, . Provide "T" handle wrench.

1. Acceptable Manufacturers and Models:

- |          |                              |
|----------|------------------------------|
| a. Josam | Series 58860                 |
| b. Smith | Series 4253S                 |
| c. Zurn  | Series Z-1474 with Z-1449-BP |
| d. Mifab | Series 1300-MF               |
| e. Watts | Series CO-300-MF             |

## 2.04 BACKFLOW PREVENTERS

### A. Double Check

1. Double check backflow preventer 2 in. and smaller: ANSI/ASSE 1015; complete unit of two independently acting check valves, two ball valves, strainer and four test cocks, bronze or iron body with bronze internal parts, 150 psi working pressure, and shall comply with AWWA Standard C-510. Devices used in domestic water systems shall be verified "lead free".

a. Acceptable Manufacturers and Models:

- |            |        |
|------------|--------|
| 1) Apollo  | DC 4A  |
| 2) Watts   | 007    |
| 3) Wilkins | 950XLT |
| 4) Milfab  | FDC    |
| 5) Febco   | 805Y   |

### B. Reduced Pressure

1. Reduced pressure backflow preventer 2 in. and smaller: ANSI/ASSE 1013; complete unit of two independently acting check valves together with an automatically operating pressure relief valve, two ball valves, strainer, and four test cocks, bronze or iron body with bronze internal parts, lead free, 150 psi working pressure, and shall comply with AWWA Standard C506. Devices used in domestic water systems shall be certified "lead free".

a. Acceptable Manufacturers and Models:

- |            |         |
|------------|---------|
| 1) Apollo  | RP 4A   |
| 2) Watts   | 009     |
| 3) Wilkins | 975XLMS |
| 4) Mifab   | FRP     |
| 5) Febco   | 825Y    |

C. Backflow Preventer Test Kits

1. Double Check Principle Test Kit: Gauge tubing models, adaptors, test hardware and lightweight case.

a. Acceptable Manufacturer and Model:

- |           |             |
|-----------|-------------|
| 1) Apollo | 40-200-TK5U |
| 2) Watts  | TK-7        |
| 3) Milfab | TK          |

2. Reduced Pressure Principle Test Kit: Gauge test valves, hoses, adaptors, securing strap, instruction guide and lightweight case.

a. Acceptable Manufacturer and Model:

- |           |             |
|-----------|-------------|
| 1) Apollo | 40-200-TK5U |
| 2) Watts  | TK-9-A      |
| 3) Mifab  | TK          |

2.05 VACUUM BREAKER

A. Atmospheric Vacuum Breakers

1. Atmospheric type vacuum breaker (AVB): ASSE 1001, ANSI 112.1.1; brass body and internal parts, silicone rubber disc, polished chrome plated finish, and threaded connections.

a. Acceptable Manufacturer and Model:

- |           |      |
|-----------|------|
| 1) Apollo | AVB1 |
| 2) Watts  | 288A |
| 3) Mifab  | HY   |

B. Pressure Vacuum Breakers

1. Pressure type vacuum breaker (PVB): ASSE 1020; 150 psi rated, brass or stainless steel construction, silicone rubber disc, ball valve shut-offs, test cocks, and threaded connections. Chrome plated when exposed in finished areas.

a. Acceptable Manufacturer and Model:

- |          |       |
|----------|-------|
| 1) Apoll | PVB4A |
| 2) Watts | 800   |
| 3) Mifab | PVB   |

2.06 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors (WHA): ANSI A112.26.1, ASSE 1010, and PDI WH-201; permanently sealed expanding chamber type . Sizing symbols indicated on Drawings refer to Plumbing and Drainage Institute "Standard PDI-WH201" established standard classifications. Air chambers are not allowed.

1. Acceptable Manufacturers and Models:

a. Expanding Chamber Type

- |                |                       |
|----------------|-----------------------|
| 1) PPP         | "SC" Series           |
| 2) Sioux Chief | "Hydra-Rester" Series |
| 3) Watts       | Series 15             |
| 4) Mifab       | CL/MWH                |

2.07 TRAP GUARDS

- A. Trap Guard shall be an elastomeric, normally closed trap guard device that utilizes a normally closed seal to prevent evaporation of the trap seal and also protect against sewer gases from backing up into habitable areas. It shall open with fluid and allow liquid drainage to flow through into the building drain. The elastomeric membrane material shall be tested according to CAN/CSA B602 Standard requirements.

1. Acceptable Manufacturers and Models:

- a. ProVent Systems ProSet Trap Guard
- b. Sure Seal SS3509
- c. No Substitutions

## 2.08 THERMOSTATIC MIXING VALVES

- A. Thermostatic Mixing Valve: Thermostatic type to automatically close hot water port if cold-water pressure fails or close cold-water port if hot water pressure fails, and closes both ports if thermostatic element fails. Valve shall include check valves, stops, and strainers. See Schedule for capacity.

- 1. Acceptable Manufacturers and Models:

- a. Powers 430
- b. Leonard TM
- c. Symmons 5-A Series

## 2.09 WALL HYDRANTS

- A. Non-freeze wall hydrant: ANSI/ASSE 1019; exposed wall hydrant type, with chrome plated brass or nickel bronze finish on brass castings, freezeless, 3/4 in. hose thread nozzle, integral vacuum breaker, and loose key handle.

- 1. Acceptable Manufacturers and Models:

- a. Woodford 65
- b. Josam 71050
- c. Smith 5609
- d. Tyler/Wade W-8620
- e. Zurn Z-1310
- f. Watts HY-420
- g. Mifab MHY

## 2.10 HEAT TRACING SYSTEMS

- A. Freeze Protection System

- 1. Heat tracing: Automatic self-regulating, UL listed, with tinned copper braid, able to crossover itself without overheating, parallel circuit design, able to be cut to length at job site, flat and flexible for easy installation, corrosion and chemical resistant, complete with

power connection kits, splice kits, tee kits, end seal kits and necessary accessories for a complete operating installation. Heat tracing shall be as scheduled on Drawings.

a. Acceptable Manufacturers and Models:

- |                     |        |
|---------------------|--------|
| 1) Hevi-Duty/Nelson | LT 5/2 |
| 2) Raychem          | 5XL    |
| 3) Thermon          | 5-FLX  |
| 4) Mifab            | CPR    |

2. Thermostat control: NEMA 4X enclosure, UL listed, nickel/ copper or stainless steel liquid filled bulb and capillary, with fixed temperature set for 40°F. Thermostat shall be used as an ambient or line sensing thermostat.

a. Acceptable Manufacturers and Models:

- |                     |        |
|---------------------|--------|
| 1) Hevi-Duty/Nelson | TF4X40 |
| 2) Raychem          | AMC-F5 |
| 3) Thermon          | AMC-F5 |
| 4) Mifab            | CTC    |

2.11 EXPANSION TANKS

- A. Expansion Tanks: Factory fabricated expansion tanks shall be furnished with each storage-type water heater. Water heaters with 200,000 BTU and larger input capacities or larger than 119 gallons storage shall be furnished with ASME coded expansion tanks.

**PART 3 - EXECUTION**

3.01 PREPARATION

- A. Coordinate forming of roof or floor construction to receive drains to required invert elevations.

3.02 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded clean out plugs with mixture of graphite and linseed oil. Ensure clearance at clean out for rodding of drainage system.
- C. Encase yard cleanouts in concrete flush with grade when not located in concrete, pavement, sidewalk, etc.

- D. Trap all drains connected to the sanitary sewer.
- E. Install floor and area drains with top depressed 1/2 in. below finished floor elevation.
- F. Inlet of overflow drain shall be 2 in. above inlet of adjacent roof drain (or as required by local code).
- G. In addition to cleanouts, as shown on the Drawings, Contractor shall provide any additional cleanouts required by local codes and ordinances at no additional cost to the Owner.
- H. Outlet of plumbing vents and flues shall be located a minimum of 10 ft. 0 in. from fresh air intakes. Provide offset as required.
- I. Relief valve discharge drain from reduced pressure backflow preventers shall be piped full outlet size down to nearest floor drain. Drain line shall terminate above floor drain with air gap.
- J. One backflow preventer test kit shall be provided for each type of backflow preventer (Reduced Pressure Principle or Double Check Principle) provided by the Contract Documents.
- K. Floor drains that connect into acid waste piping shall be provided with the Manufacturer's standard acid resistant coating. The coating shall be factory applied to the interior and exterior of the body. Strainer shall not be coated. Field application will not be acceptable. Gasket for the drain connection to the acid waste piping system shall be acid resistant material as recommended by the manufacturer.
- L. Pipe Flashing:
  - 1. Open-end dry vent pipes passing through roof waterproofing membrane shall be installed through a 4-pound lead flashing or a 16-ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 in. from the pipe and shall be set over the roof membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe and turn down into the pipe to form a waterproof joint. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed with tightly pack fiberglass wool insulation.
  - 2. Closed end pipes passing through roof waterproofing membrane shall be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing-clamp device, pressure ring with brass bolts and deck clamping assembly. Flashing shield shall be fitted into the sleeve-clamping device.
- M. Install trap guards on all floor drains unless specifically not required by local codes.
- N. Install line size wye-pattern strainer upstream of backflow preventer. Strainer shall be lead free for all potable water systems.

- O. Install heat trace wiring on water piping and sanitary sewer p-traps outside the building envelope. Piping with heat tracing shall be wrapped with fiberglass insulation and encapsulated in a weather tight aluminum jacket.

3.03 TESTING

- A. Heat tracing systems shall be continuity tested and insulation resistance tested. Contractor shall continuity test each cable after installation. Manufacturer's Representative and Contractor shall Megger test at 2500 volts each heat cable system two times. The first test shall be performed after heat cable installation, but prior to installation of insulation. The second test shall be after installation of insulation but prior to initial start-up. Contractor shall submit certificates of approval to the Architect and Owner's Representative after each test.
- B. Backflow preventers shall be tested for proper operation by the backflow preventer Manufacturer's Representative. The test shall be performed prior to initial start-up. Manufacturer's Representative shall submit certificates of approval to the Architect and Owner's Representative.

**END OF SECTION 22 1001**



**SECTION 22 1119****PIPING SPECIALTIES****PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Extent of piping specialties work required by this section is indicated on Drawings and schedules and by requirements of this section.
- B. Types of piping specialties specified in this section include the following:
  - 1. Pipe Escutcheons.
  - 2. Pipeline Strainers.
  - 3. Dielectric Unions.
  - 4. Mechanical Penetration Seals.
  - 5. Fire Barrier Penetration Seals.
  - 6. Drip Pans.
  - 7. Pipe Sleeves.
  - 8. Penetration Seals.
- C. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 22 sections.

## 1.02 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  - 1. FCI Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1 "Pressure Rating Standard for "Y" Type Strainers". Test and rate other type strainers in accordance with FCI 78-1 "Pressure Rating Standard for Pipeline Strainers Other than "Y" Type".

## 1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned Drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.

- B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.
- C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data, product data, and shop Drawings in maintenance manual; in accordance with requirements of Division 01.

## **PART 2 - PRODUCTS**

### **2.01 PIPING SPECIALTIES**

- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

### **2.02 PIPE ESCUTCHEONS**

- A. General: Provide pipe escutcheons as specified herein with inside diameter tightly fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: Exterior use and interior use including mechanical rooms and any room with water or floor type drains. For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.
- C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
- D. Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following or approved equal:
  - 1. Chicago Specialty Mfg. Co.
  - 2. Producers Specialty & Mfg. Corp.
  - 3. Sanitary-Dash Mfg. Co.

### **2.03 LOW PRESSURE Y-TYPE PIPELINE STRAINERS**

- A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens, with 3/64 in. perforations @ 233 per sq. in.

- B. Threaded Ends, 2 in. and Smaller: Cast-iron body, screwed screen retainer with centered blow down fitted with pipe plug.
- C. Threaded Ends, 2+ in. and Larger: Cast-iron body, bolted screen retainer with off-center blow down fitted with pipe plug.
- D. Flanged Ends, 2+ in. and Larger: Cast-iron body, bolted screen retainer with off-center blow down fitted with pipe plug.
- E. Butt Welded Ends, 2+ in. and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blow down fitted with pipe plug.
- F. Grooved Ends, 2+ in. and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EPDM gasket.
- G. Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following or approved equal:
  - 1. Armstrong Machine Works.
  - 2. Hoffman Specialty ITT; Fluid Handling Div.
  - 3. Metraflex Co.
  - 4. R-P&C Valve; Div. White Consolidated Industries, Inc.
  - 5. Spirax Sarco.
  - 6. Trane Co.
  - 7. Victaulic Co. of America.
  - 8. Watts Regulator Co.

#### 2.04 DIELECTRIC UNIONS

- A. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.
- B. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following or approved equal:
  - 1. B & K Industries, Inc.
  - 2. Capital Mfg. Co.; Div. of Harsco Corp.
  - 3. Eclipse, Inc.
  - 4. Epco Sales, Inc.

5. Perfection Corp.

6. Rockford-Eclipse Div.

## 2.05 PENETRATION SEALS

A. Caulked Seals: Provide seals for penetrations through interior walls of one of the following:

1. Mineral Wool or Oakum: Caulked watertight between sleeve and pipe.

B. Mechanical Seals:

1. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following or approved equal.

a. Thunderline Corp.

C. Fire Barrier Seals:

1. Provide seals for any opening through smoke or fire-rated walls, and all above grade floors, used as passage for mechanical components such as piping or ductwork.

2. Cracks, Voids, or Holes Up to 4 in. Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL-listed.

3. Openings 4 in. or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F UL-listed.

4. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following or approved equal.

a. Electro Products Div./3M.

b. Nelson; Unit of General Signal.

## 2.06 DRIP PANS

A. General: Provide drip pans fabricated from 20 gauge corrosion-resistant sheet metal with watertight joints, and with edges turned up 2+ in. Reinforce top, either by structural angles or by rolling top over 1/8 in. steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1 in. drain line connection.

2.07 PIPE SLEEVES

- A. Provide pipe sleeves of one of the following:
  - 1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snap lock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3 in. and smaller, 20 gauge; 4 in. to 6 in. 16 gauge; over 6 in., 14 gauge.
  - 2. Steel-Pipe: Fabricate from Schedule 10 (minimum) steel pipe; remove burrs.
  - 3. Floor sleeves shall be provided with water stop around perimeter of sleeve.

**PART 3 - EXECUTION**

3.01 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration through floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
- B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2 in. and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
  - 1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
    - a. Pumps.
    - b. Steam traps serving steam main drips.
    - c. Temperature control valves.
    - d. Pressure reducing valves.
    - e. Temperature or pressure regulating valves.
- C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
- D. Mechanical Penetration Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
- E. Fire Barrier Penetration Seals: Fill opening with sealing compound. Adhere to manufacturer's installation instructions.

- F. Drip Pans: Locate drip pans under piping passing over or within 3 ft. horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1 in. drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
- G. Pipe Penetrations: Sleeve new construction or core drill existing construction pipe penetrations as specified below where piping passes through walls, floors, and roofs. Do not penetrate structural members, except as detailed on Drawings, or as reviewed by Architect. Install penetrations accurately centered on pipe runs. Size penetrations so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than two pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide penetration with sufficient clearance for installation. When sleeves are required, install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves two inches above finished floor. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeve. Pipe penetrations shall be as follows:
1. New floors on grade: Provide sleeved penetrations for all piping except piping two inches and less and waste, drain, and vent piping. Piping not requiring sleeves shall be provided with 30 lb. asphalt saturated roofing felt wrapped around pipe through the thickness of the floor with concrete floor placed up to roofing felt.
  2. New floors above grade: Provide sleeved penetrations for all piping.
  3. Existing Floors Above Grade: Provide core-drilled penetrations for all piping.
  4. New and Existing Walls: Provide sleeved or core drilled penetrations for all piping.
  5. Floor type drains, cleanouts, and water closet waste connections do not require sleeved or core drilled penetrations. Concrete shall be placed tight to connection.
  6. Roof penetrations through metal roofs by the Plumbing or Mechanical Contractor will be required to have written approval by the Roofing Contractor.
- H. Pipe Sleeves: Install in accordance with the following:
1. Install sheet metal on steel pipe sleeves in interior walls.
  2. Install steel pipe sleeves in interior floors above grade.
  3. Install galvanized steel pipe sleeves in floors on grade and in exterior walls above grade and below grade.
- I. Penetration Seals:
1. Install mineral wool/oakum seals as follows:

- a. In interior walls where piping passes from one space to another, where any one of the spaces the piping penetration is not concealed by a ceiling. Caulk penetration watertight.
2. Install mechanical seals in accordance with manufacturer's recommendations as follows:
  - a. In interior floors on grade.
  - b. In interior floors above grade, use three-hour fire rated type only.
  - c. In exterior walls above grade and below grade.
  - d. In all roof penetrations except vent piping, flue piping, roof or overflow drain piping or any other piping as otherwise detailed on Drawing.
3. Install fire barrier seals in accordance with manufacturer's recommendations as follows:
  - a. In all floors above grade, roofs and fire rated walls.

**END OF SECTION 22 1119**

**SECTION 22 3000****PLUMBING EQUIPMENT****PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Extent of Plumbing Equipment Work required by this section is indicated on Drawings and Schedules, and by requirements of this section.
- B. Types of Plumbing Equipment specified in this section include the following:
  - 1. Domestic water heaters and accessories.
  - 2. Domestic hot water circulation pump.
  - 3. Sump pumps and accessories.

## 1.02 REFERENCES

- A. ANSI/ASME Section 8D - Pressure Vessels.
- B. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water heaters.
- C. UL 174 - Household Electric Storage Tank Water heaters.

## 1.03 QUALITY ASSURANCE

- A. Plumbing Certification: Persons performing plumbing work shall have a current State Plumbing license.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
  - 1. Canadian Standards Association (CSA).
  - 2. National Sanitation Foundation (NSF).
  - 3. American Society of Mechanical Engineers (ASME).
  - 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
  - 5. National Electrical Manufacturers' Association (NEMA).
  - 6. Underwriters Laboratories (UL).



- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25 percent of midpoint of published maximum efficiency curve.

#### 1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable City codes and ordinances.
- B. Conform to UL, NSF, ANSI/NFPA 70, UL 174, and ANSI/UL 1453 requirements for water heaters.
- C. Conform to ANSI/ASME Section 8D for manufacture of pressure vessels for heat exchangers.
- D. Conform to ANSI/ASME Section 8D for tanks.

#### 1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Division 01 and Section 22 0010.
- B. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.
- C. Include heat exchanger dimensions, size of tappings, and performance data.
- D. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, and drains.
- E. Indicate pump type, capacity, power requirements, and affected adjacent construction.
- F. Submit pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
- G. Submit manufacturer's installation instructions of all equipment and accessories in accordance with Division 01 and Section 22 0010.
- H. Submit certificates as listed below to Architect in accordance with Division 01 and Section 22 0010.
  - 1. ASME Coded Tank Certificate - Pressure Vessels.
  - 2. Test Certificates of Approval for plumbing equipment.
  - 3. Demonstration Certificates of Completion for all plumbing equipment.

#### 1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data in accordance with Division 01 and Section 22 0010.
- B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.07 WARRANTY

- A. Provide 3 year manufacturer's non-prorated warranty for domestic water heaters in accordance with Division 01 and Section 22 0010.

**PART 2 - PRODUCTS**

2.01 DOMESTIC WATER HEATERS AND ACCESSORIES

- A. Electric Water Heaters (Direct Fired)
  - 1. Domestic water heater: ASHRAE 90.1-2019 energy efficient, standard height electric vertical type, interior-lined tank, anode protection, drain valve, safety relief valve, high-temperature cut-off, individual operating thermostats, insulated tank, baked enamel exterior steel jacket, and UL approved. Commercial water heaters shall meet the minimum UEF rating as mandated by the DOE.
    - a. Acceptable Manufacturers and Models:
      - 1) AO Smith DEN Series
      - 2) Approved equal

2.02 WATER HEATING SYSTEM ACCESSORIES:

- A. Circulation pumps: Inline type, flanged connections, rated for 125 psi at 220°F, single stage, vertical split case, all bronze or stainless steel and provided with oil cups. See Schedule for capacity.
  - 1. Acceptable Manufacturers:
    - a. Bell & Gossett
    - b. Armstrong
    - c. Taco
    - d. Grundfos
- B. Thermostatic control for circulation pumps: Heavy-duty snap-acting SPDT switch, copper constructed liquid filled capillary and bulb sensing element, 100 to 210°F set point adjustment range, 5 to 15°F adjustable differential, 120 VAC, UL listed.
  - 1. Acceptable Manufacturer and Model:
    - a. Barber-Colman Company TC-4112
- C. Expansion Tank for Water Heater: Bladder type, full acceptance, fabricated steel shell constructed and stamped per ASME VIII, heavy duty butyl FDA approved removable bladder,

125 psig working pressure, 240°F operating temperature. Tank head shall be galvanized. Pre-charge tank to static pressure of system.

1. Acceptable Manufacturer and Model:

- |           |             |
|-----------|-------------|
| a. Elbi   | DTS Series  |
| b. Amtrol | STC Series  |
| c. Watts  | DETA Series |
| d. Taco   | CA Series   |

2.03 SUMP AND WASTE WATER PUMPS AND ACCESSORIES

A. Sump Pump: Heavy-duty commercial-grade, single submersible type, cast-iron body, bronze impeller, stainless-steel shaft, heavy-duty lubricated ball bearing. See Drawings for pump capacity. Provide 10 ft. long UL approved PVC cord with 120 volt grounded three-prong plug.

1. Acceptable Manufacturers:

- a. Dayton
- b. Approved equal

B. Controls for Sump Pump and Waste Water Pump: Simplex pump control single integral automatic-mercury-float switch for on-off operation. Controls shall be supplied and warranted by pump manufacturer.

2.04 PIPING SPECIALTIES

A. Provide piping specialties in accordance with Section 22 1119.

2.05 PLUMBING INSULATION

A. Provide piping insulation in accordance with Section 22 0716.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A. Install plumbing equipment and accessories in accordance with manufacturer's recommendations.
- B. Coordinate with heating hot water and electrical work to achieve operational system.
- C. Pipe relief valves and drains to nearest floor drain. Provide 1 in. air gap.
- D. Install plumbing equipment plumb and square to wall on a 4 in. thick reinforced concrete housekeeping pad.

- E. Provide all interconnecting electrical power and control wiring from control panel to equipment and accessories for a complete operable system. All exposed wiring shall be in conduit.
- F. Provide line sized shut-off valve and check valve on each sump and pump discharge.
- G. Secure control panels and float switches to walls and brackets for proper operation.
- H. Coordinate exact location of water heater to insure all required clearances are maintained.

3.02 TESTING

- A. Contractor shall test water heaters, circulation pumps and sump pumps including all associated accessories and controls to ensure proper operation.
- B. Tests shall be witnessed and approved by the Owner's Representative.
- C. After completion and approval of testing, submit "Test Certificate of Approval" for water heaters, circulation pumps, and sump pumps including all associated accessories and controls stating that all test results are satisfactory. Certificates of Approval must be signed by the Contractor.

3.03 DEMONSTRATION OF EQUIPMENT

- A. Prior to final acceptance, Contractor shall provide a minimum of 4 hours (or as long as required by the Owner) to demonstrate to the Owner the proper operation of all the plumbing equipment and associated accessories and controls installed under this section other than the equipment listed above.
- B. After completion and approval of demonstrations, submit "Demonstration Certificate of Completion" for domestic water heaters and sump pump including all associated accessories and controls stating that the demonstration of all equipment is satisfactory. Certificates must be signed by the Contractor and Owner.

**END OF SECTION 22 3000**

**SECTION 22 4001****PLUMBING FIXTURES****PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Extent of Plumbing Fixture Work required by this section is indicated on Drawings and Schedules, and by requirements of this section.
- B. Types of plumbing fixtures specified in this section include the following:
  - 1. Water closets.
  - 2. Urinals.
  - 3. Lavatories.
  - 4. Sinks.
  - 5. Showers.
  - 6. Mixing Valves.
  - 7. Electric water coolers.
  - 8. Mop sinks.
  - 9. Flush Valves.
  - 10. Plumbing Brass.
  - 11. Wall Hung Fixture Carriers.

## 1.02 REFERENCES

- A. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- B. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
- C. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).
- D. ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.
- E. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- F. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
- G. All fixtures shall comply with ANSI/NSF STD 61.

1.03 QUALITY ASSURANCE

- A. Conformance with applicable state and local codes and ordinances.
- B. Fixtures: By same manufacturer throughout, where possible.
- C. Trim: By same manufacturer throughout.

1.04 REGULATORY REQUIREMENTS

- A. Conform to the most recent editions of the City codes and ordinances.
- B. Conform to Article 7/601b. - Vernon's Texas Civil Statutes (Handicapped Accessibility Act) (Texas Accessibility Standards (TAS)).

1.05 SUBMITTALS

- A. Submit product data in accordance with Division 01 and Section 22 0010.
- B. Include fixtures, sizes, utility sizes, trim, and finishes.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data in accordance with Division 01 and Section 22 0010.
- B. Include fixture trim exploded view and replacement parts lists.

1.07 WARRANTY

- A. Provide one-year manufacturer's warranty for electric water cooler compressor in accordance with Division 01 and Section 22 0010.

**PART 2 - PRODUCTS**

2.01 PLUMBING FIXTURES

- A. Provide plumbing fixtures as scheduled or approved equal.
- B. Approved equals will be limited to the following manufacturers:
  - 1. Water Closets:
    - a. American Standard.
    - b. Kohler.
    - c. Toto.
    - d. Zurn.

2. Urinals:
  - a. American Standard.
  - b. Kohler.
  - c. Toto.
  - d. Zurn.
3. Lavatories:
  - a. American Standard.
  - b. Kohler.
  - c. Zurn.
4. Stainless Steel Sinks:
  - a. Elkay.
  - b. Just.
5. Showers:
  - a. American Standard.
  - b. Delta.
  - c. Kohler.
6. Shower Mixing Valves:
  - a. Delta.
  - b. Leonard.
  - c. Powers.
  - d. Speakman.
  - e. Symmons.
7. Electric Water Coolers (Stainless Steel Cabinet):
  - a. Elkay.
  - b. Halsey Taylor.
  - c. Oasis.

- d. Sunroc.
8. Mop Sinks:
- a. Fiat.
  - b. Florestone
  - c. Mustee.
  - d. Stern/Williams.
  - e. Swan.
9. Flush Valves;
- a. American Standard.
  - b. Kohler.
  - c. Sloan (Royal).
  - d. Zurn.
10. Plumbing Brass:
- a. American Standard.
  - b. Chicago Faucets.
  - c. Delta.
  - d. Kohler.
  - e. Moen Commercial.
  - f. T & S Brass.
11. Floor Mounted Fixture Carriers (For All Wall Hung Fixtures):
- a. Josam.
  - b. Sioux Chief.
  - c. Smith.
  - d. Watts.
  - e. Zurn.



**PART 3 - EXECUTION**

## 3.01 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

## 3.02 INSTALLATION

- A. Install each fixture in accordance with the manufacturer's recommendations.
- B. Piping, valves, fittings, trim, etc. shall be polished chromium plated when exposed in finished areas.
- C. Piping penetrating floors, walls or ceilings shall be provided with solid polished chromium plated escutcheons.
- D. Install components level, plumb, and at right angles to walls.
- E. Provide floor mounted carriers for all wall mounted fixtures.
- F. Install and secure fixtures in place with wall supports carriers and bolts. Exposed bolts, nuts, etc. shall be stainless steel or chrome-plated brass.
- G. Seal fixtures to wall and floor surfaces with white sealant.
- H. Mount fixtures to Architectural drawings interior wall elevations and to requirements of TAS.
- I. Provide removable insulation covering on stops and supplies and drains and P-traps on all handicapped lavatories with hot water supply. All lavatories in rooms with handicapped water closets are considered handicapped lavatories.
- J. Provide keyed stops on all water supplies to fixtures and equipment.
- K. Provide water hammer arrestors on hot and cold water supplies to all plumbing fixtures. Water hammer arrestors shall be as shown on diagrams and if not shown, provide for each fixtures in accordance with Standard PDI-WH-201.
- L. Provide drainage and vent piping run outs to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the Plumbing Code.
- M. Provide drainage piping run outs to urinals of cast iron material. Copper or brass material is not allowed.

## 3.03 ADJUSTING AND CLEANING

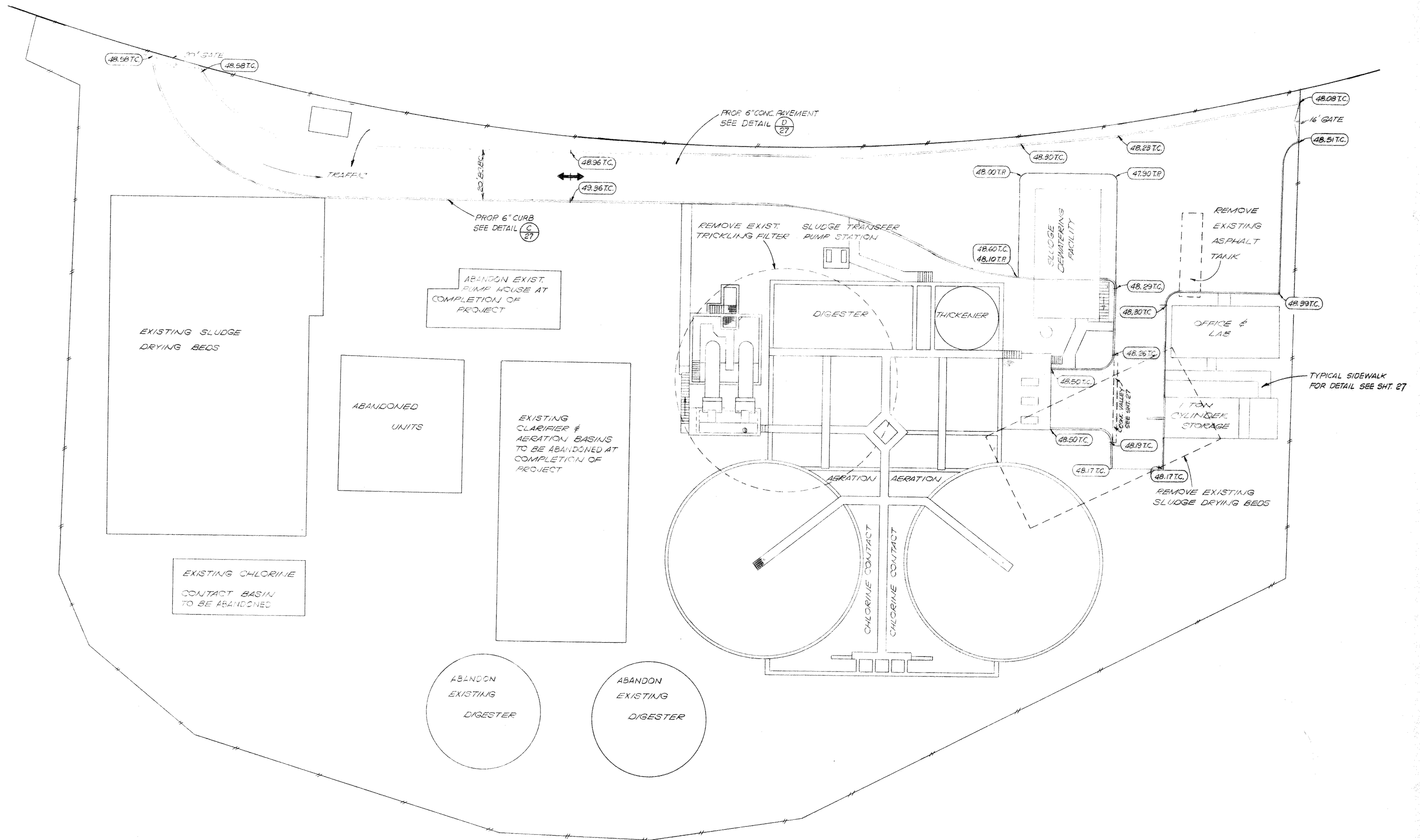
- A. Adjust and balance stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

- B. At completion clean plumbing fixtures and equipment.

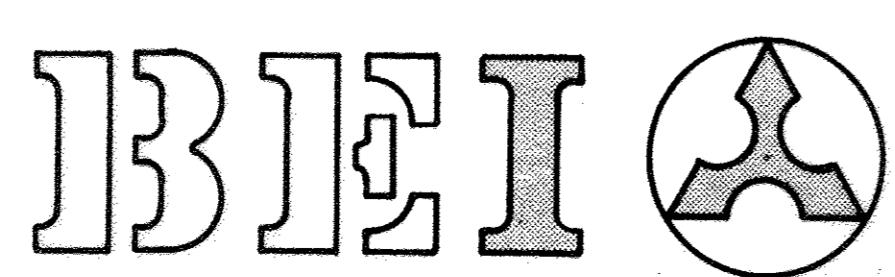
**END OF SECTION 22 4001**



NORTH BRAESWOOD BLVD.

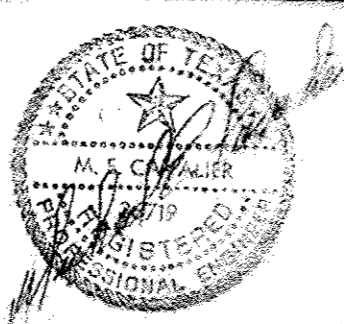


No.	Revision	Date	No.	Revision	Date



**BAYSHORE ENGINEERS, INC.**  
 CONSULTING ENGINEERS  
 P.O. BOX 627  
 DEER PARK, TEXAS 77536

Scale: 1" = 20'  
 Dwn. By: M.G. Date: 9/80  
 Chkd. By: MEC Date: 10/80



**WEST UNIVERSITY PLACE**  
 SEWAGE TREATMENT PLANT  
 PLOT PLAN

Project No: 31-01-78  
 Drawing No:  
 Sheet 2 of 40