SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. The system shall include but not limited to the following: All plumbing fixtures, roughing and accessories, piping, insulation, fittings, valves, strainers, pumps, water distribution, water heaters, storm and sanitary drainage, sanitary vents, interceptors, gauges, thermometers, equipment and piping identification.

B. This Section includes general administrative and procedural requirements for the plumbing installations. The administrative and procedural requirements included in this section expand the requirements specified in Division 01.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this and the other sections of Division 22.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Sustainable design Requirements – Division 01

2. Site Utilities – Division 02 “Site Work”.

3. Cast-in Place Concrete - Division 03 -“Concrete”

4. Metal Fabrications - Division 05-“Metals”

5. Firestopping-Division 07 -“Thermal and Moisture Protection”

6. Flashing Wall and Roof Penetrations - Division 07 - “Thermal and Moisture Protection”

7. Sealants and Caulking - Division 07 - “Thermal and Moisture Protection”

8. Painting – Division 09 – “Finishes”

9. Division 21 – Fire Protection

10. Division 22 - Plumbing

11. Division 23 – Heating, Ventilation, and Air Conditioning

12. Division 26 – Electrical

13. Excavation and Backfill – Division 31 – “Earthwork”

1.3 CODES, PERMITS AND INSPECTIONS

A. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over construction work at the project.

B. It shall be understood that the requirements of the specifications and drawings are complimentary to the requirements delineated elsewhere in the code or by the authorities exercising jurisdiction over the project. Nothing on the drawings and specifications shall be interpreted as reason to waive the applicable code requirements. Installed work identified as having code deficiencies shall be replaced at the contractor's expense.

C. All required permits, approval and inspection certificates shall be obtained, paid for, and made available at the completion of the work, by the Plumbing Contractor.

D. Installation procedures, methods, and conditions shall comply with the latest requirements of The Federal Occupational Safety and Health Act (OSHA).

E. Prepare and submit to the building department a set of "as-built" record drawings for approval, in a form acceptable to the building department.

F. The Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

G. Comply with all owner requirements and all bright horizons requirements.

H. The Contractor shall be responsible for the installation and filing until the installation has been approved by the authorities having such jurisdiction.

1.4 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks and defects. Any defective materials or workmanship, as well as damage to the work of all trades resulting from same, shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Non-durable replaceable items, such as water filter media, do not require replacement after the date of acceptance. If received in writing, requests to have earlier acceptance dates established for these items will be honored.

E. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of plumbing equipment.

1.5 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. Piping: Pipe, fittings, flanges, valves, controls, hangers, drains, insulation, and items customarily required in connection with the transfer of fluids.

G. By Other Trades: By persons or parties responsible for work at the project other than the party or parties who have been duly awarded the contract for the work of this Trade. In the event that this document is used to acquire work as part of a general construction contract the words “by other trades” shall mean by persons or parties who are not anticipated to be the sub-contractor for this trade working together with the general contractor. In this context the words “by other trades” shall not be interpreted to mean not included in the overall contract.

H. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.

2. CPVC: Chlorinated polyvinyl chloride plastic.

3. PE: Polyethylene plastic.

4. PVC: Polyvinyl chloride plastic.

I. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

1.6 SUBMITTALS

A. In accordance with Division 01, SUBMITTAL PROCEDURES, furnish the following:

B. Prior to purchasing any equipment or materials, a list of their manufacturers shall be submitted for approval.

C. Prior to assembling or installing the work, the following shall be submitted for approval:

1. Scale drawings indicating insert and sleeve locations if required by Architect or Structural Engineer.

2. Scale drawings showing all piping runs with sizes, elevations and appropriate indication of coordination with other trades. This submission shall consist of one (1) electronic file and two (2) paper prints.

3. Catalog/internet information, factory assembly drawings and field installation drawings as required for a complete explanation and description of all items of equipment.

4. Coordination drawings for access panels and door locations

5. Welder Certificates signed by the Contractor certifying that welders comply with requirements specified under “Quality Assurance” in this section.

D. Documents for equipment and materials will not be accepted for review unless:

1. They include complete information pertaining to appurtenances and accessories.

2. They are submitted as a package where they pertain to related items.

3. They are properly marked with service or function, project name, where they consist of catalog sheets displaying other items which are not applicable.

4. They indicate the project name and address along with the Contractor's name, address and phone number.

5. They are properly marked with external connection identification as related to the project where they consist of standard factory assembly or field installation drawings.

E. Shop Drawing Review

1. The purpose of the review of shop drawings is to maintain integrity of the design. Unless the contractor clearly points out changes, substitutions, deletions or any other differences between the submission and the Contract Documents in writing on the Contractor's letterhead, approval by the Engineer or Architect does not constitute acceptance. It is not to be assumed that the engineer has read the text nor reviewed the technical data of a manufactured item and its components except where the Vendor has pointed out differences between his product and the specified model.

2. Upon receipt of the approved manufacturers and material suppliers list, the Contractor shall immediately obtain complete Shop Drawings, Product Data and Samples and equipment and material Specification Compliance Review documents from the manufacturers, suppliers, vendors and all Division 22 Contractors, for all materials and equipment as specified herein in various sections of the specifications and shall submit data and details of such materials and equipment for review by the Architect and Engineer. Prior to submission of the Shop Drawings, Product Data and Samples to the Architect and Engineer, the Contractor shall thoroughly review the Shop Drawings, Product Data and Samples and certify they are in compliance with the Contract Documents. The Contractor shall provide a compliance review ("Compliance Review") of the applicable Drawings, Specifications and Addenda for all equipment and materials. The Compliance Review will be a paragraph by paragraph review of the Specifications with the following information marked for each Specification section paragraph or in the margin of the original Specification and any subsequent Addenda.

   a. "C": Comply with no exceptions.

   b. "D": Comply with minor deviations. For each and every deviation, provide a numbered footnote with reasons for the proposed deviation and how the intent of the Specification can be satisfied.

   c. "E": Exception. Equipment, product or material does not comply. For each and every exception, provide a numbered footnote with reasons for each exception and suggest possible alternatives for the owner's consideration.

   d. "N/A": The specification paragraph does not apply to the proposed equipment, material or product.

   e. Unless a deviation or exception is specifically noted in the Compliance Review, it is assumed that the Contractor is in complete compliance with the Contract Documents. Deviations or exceptions taken in cover letters, subsidiary documents, by omission or by contradiction does not relieve the Contractor from being in complete compliance unless the exception or deviation has been specifically noted (explicitly, not by implication) in the Compliance Review.

3. It is the responsibility of the contractor to confirm all dimensions, quantities, and the coordination of materials and products supplied by him with other trades. Approval of shop drawings containing omissions improper coordination does not relieve the contractor from making corrections at his expense.

4. Substitutions of equipment, systems, materials, must be coordinated by the Contractor with his own or other trades which may be involved with the item, such as, but not limited to, equipment substitutions which change electrical requirements, or hanging or support weights or dimensions.

5. Any extra charges or credits which may be generated by other trades due to substitutions will not be accepted unless the Contractor has an agreement in writing with the Owner.

6. Substitutions of equipment, systems, etc. requiring approval of local authorities must comply with such regulations and be filed at the expense of the Contractor (should filing be necessary). Substitutions are subject to approval or disapproval by the Engineer. The Contractor in offering substitutions shall hold the Owner and Engineer harmless if the substituted item is an infringement of patent held by the specified item.

7. Any proposed substitution submitted for review, must be accompanied by additional documentation indicating all the differences between the specified materials or equipment and the proposed substitution. Substitutions submitted for review without supporting documentation will be returned as Incomplete – Resubmit.

8. Alternate materials or manufacturers of equipment will be considered only if the contractor submits detailed information and appropriate credit for the substitution at the time of bid opening. These detailed proposals, must include sufficient catalog information, including differences, efficiencies, dimensions, warranties and major component identification for proper evaluation of the alternate proposed. No alternate system by another manufacturer will considered prior to considering alternate equipment of the specified manufacturer.

9. Shop drawing review by the engineer, does not constitute reason to waive applicable code requirements. Work identified as having code deficiencies shall be replaced at the contractor's expense.

F. Explanation of Shop Drawing Stamp

1. Reviewed - No Exception Taken: indicates that we have not found any reason why this item should not be acceptable within the intent of the contract documents.

2. Exception Taken As Noted: indicates that we have found questionable components which if corrected or otherwise explained make the product acceptable.

3. Revised and Resubmit: indicates that this item should be resubmitted for review before further processing.

4. Resubmit Specified Item: indicates that the item will not meet the intent of the Contract.

5. Incomplete - Resubmit: Indicates that the submission is not complete and ready for review by the Architect or Engineer.

6. Verified for Electrical Services: Indicates that the electrical requirements has been confirmed with the electrical contract documents.

7. Architects Approval Required: Indicates that the submission will require the Architects review.

8. Structural Approval Required: Indicates that the submission will require the Structural Engineer's review.

9. Acoustical Consultant Review Required: Indicates that the submission will require the Acoustical Consultant's review

10. No shop drawing stamp or note shall constitute an order to fabricate or ship. Such notification can only be performed by the Project Manager for Construction, the Contractor scheduling his own work, or the Owner.

11. The Contractor is responsible for having "Reviewed" copies of shop drawings bearing the "Reviewed - No Exception Taken" stamp of the Architect/Engineer or Owner's Consultant are kept on the job site and work is implemented in the field in accordance with these documents.

12. Where information from one Contractor is required by another contractor, it is the responsibility of the contractors to exchange information and coordinate their work.

1.7 MAINTENANCE DATA AND OPERATING INSTRUCTIONS

A. Maintenance and operating manuals in accordance with Division 01, for systems and equipment.

B. After all final tests and adjustments have been completed, fully instruct the proper Owner's Representative in all details of operation for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time to assure that Owner's Representative is properly qualified to take over operation and maintenance procedures. Supply qualified personnel to operate equipment for sufficient length of time as required to meet all governing authorities in operation and performance tests.

C. Furnish required number of manuals, in bound form containing data covering capacities, maintenance of operation of all equipment and apparatus. Operating instruction shall cover all phases of control and include the following:

1. Performance Curves: For pumps and similar equipment at the operating conditions.

2. Lubrication Schedule: Indicating type and frequency of lubrication required.

3. List of Spares: Recommended for normal service requirements.

4. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.

5. Instruction Books may be standard booklets but shall be clearly marked to indicate applicable equipment.

6. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.

7. Automatic Controls: Diagrams and functional descriptions.

D. Where applicable, one set of operating and maintenance instructions shall be neatly framed behind glass and securely hung adjacent to the equipment concerned.

E. Welding certificates. Submit welding certificates as specified herein.

1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

B. Unit shall be stored and handled in accordance with manufacturer's instructions.

C. Unit shall be shipped with all listed items and control wiring factory installed unless noted on the submittals and approved prior to shipment.

D. Unit shall be shipped complete as specified. Parts for field installation shall not be shipped and stored on site without prior approval.

E. Rigging: Units shall be fully assembled. Units requiring disassembly for rigging shall be factory assembled and tested. Disassembly, reassembly and testing shall be supervised by the manufacturer's representative.

F. Unit shall be shipped with firmly attached labels that indicate name of manufacturer, model number, serial number, date of manufacturer, capacity information and plan tagging.

G. Deliver, store and handle all materials to keep clean and protected from damage.

H. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.

I. Protect flanges, fittings, and piping specialties from moisture and dirt.

J. Protect stored plastic pipes and materials from direct sunlight and excessive heat. Support to prevent sagging and bending.

K. Protect equipment and other materials from damage after installed from construction debris and other damage.

L. This trade shall be responsible for its work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

M. This trade shall protect work and material of other trades from damage that might be caused by its work or workmen and make good damage thus caused.

1.9 PRE-CONSTRUCTION CONFERENCE PRIOR TO START OF WORK

A. Prior to commencing any Work, the Construction Manager, together with designated major Contractors, shall confer with the Architect and Engineer concerning the Work under the Construction Contract.

B. The pre-construction conference will be conducted under the leadership of the CM and will occur soon after the CM notifies the Subcontractors of contract award. The pre-construction conference will focus on items such as the expedited submittal review procedure, interface and coordination between Contractor work scope, the CM's project site rules and requirements, temporary utility requirements, CM's construction schedule, etc.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate plumbing equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for plumbing installations.

C. Coordinate the installation of required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installations of plumbing materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.

E. Coordinate connection of electrical services prior to purchasing equipment.

F. Coordinate connection of plumbing systems with existing and new exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

G. Coordinate requirements for access panels and doors where plumbing items requiring access are concealed behind finished surfaces. See paragraph titled “Separation of Work Between Trades” to determine whether access panels and doors the responsibility of the Contractor for Division 08 or the Contractor responsible for Division 22.

H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

1.11 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces.

D. Provide all designating signs for shutoff valves, control valves, alarms, and the like, as required by the agencies having jurisdiction.

1.12 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 01 Section titled "PROJECT COORDINATION," to a scale of 3/8"=1'-0" or larger; detailing major elements, components, and systems of plumbing equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work:

1. The coordination drawings shall be produced using AutoCad 2011 or later software. The design drawings will be made available on disks in AutoCad format for use as a basis for the "Coordination" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings.

2. Indicate the proposed locations of piping, equipment, and materials. Include the following:

   a. Planned piping layout, including valve and specialty locations and valve stem movement.

   b. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.

   c. Equipment connections and support details.

   d. Exterior wall and foundation penetrations.

   e. Fire-rated wall and floor penetrations.

   f. Sizes and location of required concrete pads and bases.

   g. Clearances as required by Electric Code.

3. Indicate piping loads and support points for all piping 4" and larger, racked piping, and submit to the Structural Engineer for review and approval. Indicate the elevation, location, support points, and loads imposed on the structure at support, anchor points, and size of all lines. Indicate all beam penetrations and slab penetrations sized and coordinated. Indicate all work routed underground or embedded in concrete by dimension to column and building lines.

4. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

5. Prepare floor plans, elevations and details to indicate penetrations in floors, walls and ceilings and their relationship to other penetrations and installation.

6. Prepare reflected ceiling plans to coordinate and integrate sprinkler installations, air outlets and inlets, light fixtures, communication systems components and other ceiling-mounted items.

B. Plumbing Coordination Drawings

1. This trade shall add to Coordination Drawings prepared by the HVAC Contractor showing all of the plumbing work (equipment, piping, etc.) to be installed as part of the work of this section of the specifications.

2. The Coordination Drawings shall be prepared on electronic media (CADD) at not less than 3/8": 1'-0" scale.

3. This Trade after showing all of the plumbing work shall forward the reproducible Coordination Drawings to the Electrical or Fire Protection Contractor.

4. The sequence of coordination drawings shall be HVAC-PLBG-FP-ELEC-CM/GC.

5. The Plumbing Contractor shall attend a series of meetings arranged by the General Contractor/Construction Manage to resolve any real or apparent interferences or conflicts with the work of the other Contractors.

6. The Plumbing Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts.

7. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the Plumbing Contractor shall "sign-off" the final Coordination Drawings.

8. The Plumbing Contractor shall not install any of his work prior to "sign-off" of final Coordination Drawings. If the plumbing work proceeds prior to sign-off of Coordination Drawings, any change to the plumbing work to correct the interferences and conflicts which result will be made by the Plumbing Contractor at no additional cost to the project.

9. Coordination Drawings are for the Contractor's and Architects use during construction and shall not be construed as replacing any shop "as-built", or Record Drawings required elsewhere in these Contract Documents.

10. Architect's review of Coordination Drawings shall not relieve Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

1.13 RECORD DRAWINGS

A. Prepare record documents in accordance with the requirements in Division 1. In addition to the requirements specified in Division 1, comply with the following.

1. A complete set of "as-built" or record drawings shall be made up and delivered to the Architect.

B. The drawings shall show:

1. All work installed exactly in accordance with the original design.

2. All installed as a modification or addition to the original design.

3. The dimensional information necessary to delineate the exact location of all piping runs which are so concealed as to be untraceable by inspection through the regular means of access established for inspection and maintenance.

C. This trade shall submit the "as-built" set for approval by the building department, when required by the jurisdiction.

D. The drawings shall be produced using AutoCad 2011 or later software. The design drawings will be made available on disks in AutoCad format for use as a basis for the "as-built" drawings. These documents remain the property of Cosentini Associates and shall be used for no other purpose without expressed, written consent. The contractor shall assume all liabilities resulting from unauthorized use or modifications to the drawings. Prior to developing any "as-built" drawings, the contractor shall coordinate with the Owner and the Architect and Engineer the drawing layers, colors, etc., of the CAD drawings. "As-built" information shall be submitted as follows:

1. CAD drawing files on disks in AutoCad 2011 format.

2. Two (2) sets of printed drawings.

E. Where shop drawings have been prepared and approved, the "as-built" drawings shall be cross referenced to the respective shop drawing.

F. As-built record drawings shall include the updating of all equipment schedule sheets

G. The record drawings shall be of legible reproducible and durable type.

H. The quantity of design drawings which are made available shall in no way be interpreted as setting a limit to the number of drawings necessary to show the required "as-built" information.

I. Progress prints of record drawings shall be submitted monthly during the construction period for Architect's approval.

J. This trade shall submit the "as-built" set for approval by the Engineer in a form acceptable to the Engineer.

K. Final acceptance of the fire protection systems by the authority having jurisdiction will not be implemented until "as-built" drawings are on site.

L. As-built drawings for filing with the Building Department (where required) shall be prepared at the same scale, in the same plan format and use the same symbols and nomenclature as the plans filed by Engineer of Record with the Building Department for “Building Permit.”

1.14 INTERPRETATION OF THE DRAWINGS AND SPECIFICATIONS

A. As used in the drawings and specifications, certain non-technical words shall be understood to have specific meanings as follows:

1. "Furnish"----------Purchase and deliver to the project site complete with every necessary appurtenance and support.

2. "Install"----------Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.

3. “Provide"----------"Furnish" and "Install".

B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether this instruction is explicitly stated as part of the indication or description.

C. It shall be understood that the specifications and drawings are complementary and are to be taken together for a complete interpretation of the work. Where there are conflicts between the drawings and specifications or within the specifications or drawings themselves, the items of higher standard shall govern.

D. No exclusions from, or limitations, in the language used in the drawings or specifications shall be interpreted as meaning that the appurtenances or accessories necessary to complete any required system or item of equipment are to be omitted.

E. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the diagrammatic intent expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings.

F. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded.

G. Certain details appear on the drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work.

H. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

I. The use of words in the singular shall not be considered as limiting where other indications denote that more than one item is referred to.

J. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by Bulletin is subject to the base building specifications in all respects.

1.15 SEPARATION OF WORK BETWEEN TRADES

A. The Specifications for the overall construction delineate various items of work under separate trade headings. The list below sets forth this delineation to the extent that it affects the Plumbing Work.

B. In the absence of more detailed information, this list shall be taken as a specific instruction to the Plumbing trade to include the work assigned to it.

C. Indications that the Plumbing trade is to perform an item of work mean that it is to perform the work for its own accommodation only, except as specifically noted otherwise.

D. Oth = Divisions other than Electrical (Division 26); Mechanical (Divisions 21, 22 & 23)

Plb = Plumbing

FP = Fire Protection

Htg = Heating, Ventilating & Air Conditioning

Elec = Electrical

f = Furnished

I = Installed

p = Provided (furnished and installed)

Item	Oth	Plb	Fp	Htg	Elec	Notes
Motors for plumbing equipment		p				
Motor controls for plumbing equipment		f			I	Specifications and drawings delineate detailed exceptions.
Power wiring for plumbing equipment motors & motor controls					p	Specifications and drawings delineate detailed exceptions.
Temporary heat	p					
Temporary water	p					
Temporary light & power	p					

Item	Oth	Plb	Fp	Htg	Elec	Notes
Temporary toilets	p					
Hoisting	p					
Rigging	p					
Bracing of building for safe rigging		p				
Cutting, chasing & patching	p					Cost where due to late installation or improper coordination of work is the responsibility of the delinquent trade.
Framed slots and openings in walls, decks and slabs	p					
Sleeves through slabs, decks and walls		p				
Sleeves through membraned and waterproofed slabs, decks and walls		p				For piping penetrating foundation walls and footings, the sleeve shall be 2 sizes greater than the penetrating pipe.
Waterproof sealing of pipes passing through sleeves		p				
Waterproof sealing of sleeves through membraned and water proofed slabs, decks and walls		p				
Fireproof sealing of excess openings in slabs, decks & fire rated walls		p				
Excavation and backfill inside buildings	p					
Excavation and backfill outside buildings	p					
Keeping site and excavations free from water during construction	p					To accommodate the overall project.
Fastenings		p				
Supports		p				
Concrete encasement of underground runs	p					

Item	Oth	Plb	Fp	Htg	Elec	Notes
Subsoil drainage inside building (footing drains)	p					Connection to the sand interceptor by this trade, including backwater valve.
Floor drain flashing		p				
Base flashing for roof drains and all piping penetrating roof	p					
Cap flashing for all piping penetrating roof		p				
Concrete foundations, pads and bases	p					Plumbing Contractor to furnish sizes and locations. Furnishing of anchors and vibration mounts included in the Plumbing Contractor.
Trenches in building foundation	p					
Field touch up painting of damaged shop coats		p				
Prime coating hangers & supports		p				
Rustproofing field cut and assembled iron supporting frames and racks		p				
Finished painting	p					
Finished Wall and Ceiling Access Doors and Supporting Frames	p					Supplying list locating all required access doors (none to be less than 16” x 16”) included in Plumbing.
Catwalks to plumbing equipment	p					Supplying list of locations where required included in the Plumbing Contractor.

Item	Oth	Plb	Fp	Htg	Elec	Notes
Ladders to equipment and valves	p					Supplying list of locations where required to be installed by the Plumbing Contractor
Domestic make-up water piping for heating and air conditioning systems including backflow preventer		p				Final equipment connections included in heating trade.
Toilet room accessories	f					Install certain toilet room accessories as required by local trade union jurisdiction.
Plumbing fixtures, roughing and accessories		p				
Food service equipment	p					Plumbing Contractor to provide roughing and final connections.
Rubbish removal		p				Where one trade furnishes and another installs, the installing trade removes the shipping and packing materials which accumulate.
Special tools for equipment maintenance		p				
Laundry equipment	p					Plumbing Contractor to provide roughing and final connections.
Balance hot water recirculation system(s)		p				Plumbing Contractor to provide equipment and labor. Provide balancing valves on all hot water return lines. Balance the system prior to the building opening.
Domestic and Fire water services up to five feet from the building, including valve & valve box. To capped OS&Y valve connection & water meter inside building		p				
Electric heating cables for pipe tracing – freeze protection.					p	Insulation over heat tracing by Plumber.

Item	Oth	Plb	Fp	Htg	Elec	Notes
Electric heating cables for pipe tracing – Hot Water Temperature Maintenance - HWAT		p				Coordinate insulation and installation requirements with the heat tracing manufacturer.
Electric heating cables for pipe tracing – Kitchen Grease Waste Lines Temperature Maintenance upstream of the grease interceptor.		p				Coordinate insulation and installation requirements with the heat tracing manufacturer. Include for all kitchen waste lines upstream of the grease interceptor.
Expansion tanks for the domestic hot water preparation system.		p				Provide for each zone sized to prevent exceeding the maximum working pressure. Expansion tank cannot be supported by the piping. Provide structural supports.
Expansion compensators/loops		p				Provide an engineered system for all metallic pipe in accordance with the specifications. For plastic piping follow the manufacturer recommendations.
Trap primers		p				Provide trap primers connected to the water supply for all drains that require it in accordance with the code.
Water Hammer Arrestors		p				Provide water hammer arrestors for all the fast closing valves, fixtures and appliances as indicated on the drawings and where required by code.
Tests		p				Contractor must perform all tests required by code for all installed piping. Coordinate the testing with the construction progress (i.e. piping must be tested at the required pressures before the equipment and fixtures are installed and the walls closed).

Item	Oth	Plb	Fp	Htg	Elec	Notes
Air vents		p				Provide automatic air vents for all the high points of the domestic water system.
Vacuum relief valves		p				Provide vacuum relief valves on the cold water supply to each water heater.
Wiring for pumps		p				Provide all wiring required for the pumping systems including control wiring in conduit and wiring from remote sensors, tank fill panels, alarms, etc.
Domestic Water Filters and Pump Controls		p				Provide controls and wiring as required between domestic water pumps and domestic water filters in order ensure proper pump/filter operation.
Mixing Valves		p				Provide master mixing valves for each hot water distribution zone. Provide anti scald measures for all master mixing valves. Coordinate with manufacturer requirements.
Back Water Valves		p				Provide back water valves for all sanitary and storm connections as required by code and for buildings in located flood zones.
Shut-off valves at pressure reducing valve rigs		p				Provide a master shut-off valve before every pressure reducing valve rig.
Kitchen sink waste lines		p				Provide min 2” kitchen sink waste lines.
Backflow preventer for beverage machines, coffee machines		p				Provide backflow preventers conforming to ASSE 1022.

Item	Oth	Plb	Fp	Htg	Elec	Notes
Anchorage to restrain drainage piping (sanitary, waste and storm) from axial movement		p				Provide at the base of all stacks and leaders regardless of size. Provide for pipe sizes greater than 4" at all changes in direction and at all changes in diameter greater than two pipe sizes.

E. The Plumbing Contractor is required to supply all necessary supervision and coordination information to any other trades who are to supply work to accommodate the Plumbing installation.

F. Where the Plumbing Trade is required to install items which it does not purchase, it shall include for such items:

1. The coordination of their delivery.

2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.

3. Their safe handling and field storage up to the time of permanent placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected.

5. Their field assembly and internal connection as may be necessary for their proper operation.

6. Their mounting in place including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.

7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

8. Items which are to be installed but not purchased as part of the work of the Plumbing Contractor shall be carefully examined by this trade upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of the Plumbing Contractor will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The work of the Plumbing Contractor shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.16 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

Reference	Definition
ASTM	American Society for Testing Materials
ASPE	American Society of Plumbing Engineers
NFPA	National Fire Protection Association
UL	Underwriters Laboratories, Inc.
NEMA	National Electrical Manufacturers Assn.
FM	Factory Mutual
USAS	United States of America Standards Institute
ANSI	American National Standards Institute
AWWA	American Water Works Association
I.S.O.	Insurance Services Organization
C.S.	Commercial Standards issued by the United States Department of Commerce.
M.S.S.	Manufacturers Standardization Society of the Valve and Fittings Industry
A.G.A.	American Gas Association, Inc.
A.S.H.R.A.E.	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.
P.D.I.	Plumbing and Drainage Institute
N.S.F.	National Sanitation Foundation
A.S.S.E.	American Society of Sanitary Engineering
I.A.P.M.O.	International Association of Plumbing and Mechanical Officials
C.I.S.P.I.	Cast Iron Soil Pipe Institute
DEP	Department of Environmental Protection

1.17 GUARANTEES AND CERTIFICATIONS

A. All work shall be guaranteed to be free from leaks or defects. Any defective materials or workmanship as well as damage to the work of all trades resulting from same shall be replaced or repaired as directed for the duration of stipulated guaranteed periods.

B. The duration of guarantee periods following the date of beneficial use of the system shall be one year. Beneficial use is defined as operation of the system to obtain its intended use.

C. The date of acceptance shall be the date of the final payment for the work or the date of a formal notice of acceptance, whichever is earlier.

D. Certification shall be submitted attesting to the fact that specified performance criteria are met by all items of Plumbing equipment.

1.18 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Before submitting prices or beginning work, thoroughly examine the site and the Contract Documents.

B. No claim for extra compensation will be recognized if difficulties are encountered which examination of site conditions and Contract Documents prior to executing Contract would have revealed.

1.19 WORKMANSHIP

A. The entire work provide in this Specification shall be constructed and finished in every aspect in a workmanlike and substantial manner.

B. It is not intended that the Drawings shall show every pipe, fitting and appliance. Plumbing Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice.

C. Keep other trades fully informed as to shape, size and position of all openings required for apparatus and give full information to the General Contractor and other trades in a timely manner so that all opening may be built in advance. Furnish and install all sleeves, supports and the like as specified or as required.

D. In case of failure on the part of the Plumbing Contractor to give proper and timely information as required above, he shall do his own cutting and patching or have same done by the General Contractor, but in any case, without extra expense to the Owner.

E. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the General Contractor and other trades which may be necessary to facilitate work and completion of the whole project.

1.20 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code Steel."

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

C. Products Criteria

1. All equipment furnished as part of the work shall comply with the latest editions of all applicable state and municipal energy codes. Provide certification from the equipment suppliers for all energy-consuming equipment that the equipment fully complies with these codes. Equipment submissions will not be accepted for review unless accompanied by such certification in writing.

2. All equipment and materials shall be new and without blemish or defect.

3. New equipment and materials shall be Underwriters Laboratories, Inc. (U.L.) labeled and/or listed where specifically called for or where normally subject to such U.L. labeling and/or listing services.

4. Asbestos

All equipment and materials shall be free of asbestos.

5. Electrical equipment and materials shall be products which will meet with the acceptance of the agency inspecting the electrical work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be examined, tested and certified. Where no specific indication as to the type or quality of materials or equipment is indicated, a first-class standard article shall be furnished.

6. It is the intent of these specifications that wherever a manufacturer of a product is specified, and the terms "other approved" or "or approved equal" or "equal" are used, the substituted item must conform in all respects to the specified item. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction (such as lesser heat exchange surface, etc.). Performance as delineated in schedules and in the specifications shall be interpreted as minimum performance. In many cases equipment is oversized to allow for pick-up loads which cannot be delineated under the minimum performance.

7. All equipment of one type such as drains, pumps, fixtures, etc. shall be the products of one Manufacturer.

8. Substituted equipment or optional equipment where permitted and approved, must conform to space requirements. Any substituted equipment that cannot meet space requirements, whether approved or not, shall be replaced at the Contractor's expense. Any modifications of related systems as a result of substitutions shall be made at the Contractor's expense.

9. Note that the approval of shop drawings, or other information submitted in accordance with the requirements hereinbefore specified, does not assure that the Engineer, Architect, or any other Owner's Representative, attests to the dimensional accuracy or dimensional suitability of the material or equipment involved or the ability of the material or equipment involved or the mechanical performance of equipment. Approval of Shop Drawings does not invalidate the plans and specifications if in conflict, unless a letter requesting such change is submitted and approved on the Engineer's letterhead.

10. Substitutions of equipment for that shown on the schedules or designated by model number in the specifications will not be considered if the item is not a regular cataloged item shown in the current catalog of the manufacturer.

11. Prohibition of Lead

    a. The presence and use of lead is strictly prohibited in potable water systems.

    b. Potable water shall not be subject to contact with lead in any form.

    c. The design and manufacture of all materials and equipment (piping, fittings, joints, connections, solders, fixtures, accessories, etc.) provided, shall not contain lead in any form.

    d. Contractor shall be responsible for all costs involved in testing and certifying that potable water systems, materials and equipment are lead free.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

    1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 ACCESS DOORS IN FINISHED CONSTRUCTION

A. Access doors as required for operation and maintenance of concealed equipment, valves, controls, etc. will be provided as part of the work of Division 08.

B. This Contractor is responsible for access door location, size and its accessibility to the valves, controls, equipment, etc. being served.

C. Coordinate and prepare a location, size, and function schedule of access doors required and deliver to a representative of the Contractor for Division 08.

D. Furnish and install distinctively colored buttons in finished ceiling.

E. Access doors shall be of ample size to perform proper maintenance on concealed equipment, valves, controls, etc. but shall not be less than a minimum of 16" x 16".

F. Construct doors and frames to comply with the requirements of the NFPA and Underwriters Laboratories Inc. for fire rating. Install UL label on each door in a non-exposed location unless otherwise required by the local authority having jurisdiction.

2.3 FOUNDATIONS

A. General

1. All equipment, piping, etc., mounted on/or suspended from approved foundations and supports, as specified, as shown on the drawings.

2. All concrete foundations and supports (and required reinforcing and forms) will be provided by the Contractor responsible for the work of Division 03. This trade shall furnish shop drawings showing adequate concrete reinforcing steel details and templates for all concrete foundations and supports, and all required hanger bolts and other appurtenances necessary for the proper installation of his equipment. Although another trade will complete all concrete work, all such work shall be shown in detail on the shop drawings, prepared by this trade, which drawings shall be submitted showing the complete details of all foundations including necessary concrete and steel work, etc.

B. Outdoor applications and all indoor applications in a harsh environment, comply with requirements in Division 09; Section titled “High Performance Coating.”

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Sections of this Division specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes, free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Sleeves are not required for core-drilled holes.

L. Permanent sleeves are not required for holes formed by removable PE sleeves.

M. Install sleeves for pipes passing through poured concrete and masonry walls, gypsum-board partitions, and poured concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1.4 inch (6.4 mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. Steel or Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).

    b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

        (i) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section #’s "Joint Sealants" for materials and installation.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1 inch (25 mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1 inch (25 mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Through-Penetration Firestop Systems" for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

S. No installation shall be permitted which blocks or otherwise impedes access to any existing machine or system. Except as otherwise indicated, emergency switches and alarms shall be installed in conspicuous locations. All indicators, to include gauges, meters, and alarms shall be mounted in order to be easily visible by people in the area.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.3 PAINTING

A. Refer to Division 09 titled Finishes for painting requirements

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

C. Provide prime coat painting for the following if not provided with factory applied corrosion protection.

1. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 22.

2. Hangers and supports iron provided by Contractor responsible for the work of Division 22.

3. Miscellaneous steel and iron provided by Contractor responsible for the work of Division 22 installed outdoors shall be provided with finished coats of exterior paint in accordance with requirements of Division 09 titled “Finishes” in addition to prime coat.

4. Plastic piping outdoors shall be field painted with two layers of water-based latex.

3.4 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18 inches (450 mm) centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 ERECTION OF WOOD AND METAL SUPPORTS AND ANCHORAGES

A. Comply with requirements in Division 05 "Metal." .

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

C. Refer to Division 22, Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment" for additional requirements.

D. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

E. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between

F. Attach to substrates as required to support applied loads.

G. Field welding: Comply with requirements AWS D1.1 titled "Structural Welding Code."

3.6 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 01; Section titled "Execution" covering "cutting and patching." In addition to the requirements of Division 01 of this Specification, the following requirements shall apply:

1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover Work to provide for installation of ill-timed Work.

2. Remove and replace defective Work.

3. Remove and replace Work not conforming to requirements of the Contract Documents.

4. Remove samples of installed Work as specified for testing.

5. Install equipment and materials in existing structures.

6. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

C. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1. Refer to Division 01 Section titled “References” for definition of "experienced Installer."

G. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.

1. Refer to Division 01 Section titled “References” for definition of "experienced Installer”.

3.7 DRIP PANS

A. Examine the drawings and in cooperation with the Electrical Trade and Food Service Trade confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric motors and controllers, switchboards, panelboards, or similar equipment. Piping is not permitted in Electric Equipment, Transformer, Switch Gear, Telephone Rooms. Except as required by the authority having jurisdiction to provide fire suppression.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, the piping shall be relocated.

C. Furnish gutters as follows:

1. Provide and erect a gutter of 16 ounce cold rolled copper or 18 gauge galvanized steel, under every pipe which is within 2'-0" from a vertical line to any motor, electrical controllers, switchboards, panel boards, or the like.

2. Each gutter shall be reinforced, rimmed, soldered and made watertight, properly suspended and carefully pitched to a convenient point for draining. Provide a 3/4" drain, with valve as directed, to nearest floor drain or slop sink, as approved.

In lieu of such separate gutters, a continuous protecting sheet of similar construction adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 2'-0" in all directions beyond the motor, over which such piping has to run.

D. Provide a leak detection system in each drip pan.

3.8 TESTS

A. Provide all designating signs for shutoff valves, control valves, alarms, and the like, as required by the agencies having jurisdiction.

B. Testing of Systems

1. Perform all required tests in the manner prescribed by and to the satisfaction of the local building department and local plumbing inspector, Owners Insurance Underwriters, and all authorities having jurisdiction. Owners and Architects representatives shall be present to inspect tests. Obtain all required certificates of approval and pay any fees or costs in conjunction therewith.

2. Provide and pay for all devices, materials, supplies, labor and power required in connection with all tests. All tests shall be made in the presence and to the satisfaction of the Architect and inspectors having jurisdiction.

3. Defects disclosed by the tests shall be repaired, or if required by the Architect, defective work shall be replaced with new work without extra charge to the Owner. Tests shall be repeated as directed, until all work is proven satisfactory.

4. This Contractor shall also be responsible for the work of other trades that may be damaged or disturbed by the tests, or the repair or replacement of his own work, and he shall, without extra charge to the Owner, restore to its original condition, work of the trades so damaged and disturbed, engaging the original Contractors to do the work of restoration.

3.9 PROTECTION AND CLEANING

A. Cleaning of Piping System (General)

1. During construction, properly cap, plug and cover all openings in pipe, lines and equipment nozzles so as to prevent the entrance of sand, dirt, and foreign matter. Each system of piping shall be flushed (for the purpose of removing grit, dirt, sand, and foreign matter from the piping), for as long a time as is required to thoroughly clean the systems.

B. Adjusting (General)

1. After the entire installation has been completed, make all required adjustments to balancing valves, air vents, automatic controls, circulators, flush valves, faucets, pressure reducing valves, etc., until all performance requirements are met. All water circulating systems shall be properly balanced.

C. All bearings of all equipment shall be oiled or greased as recommended by the manufacturer, after installation.

D. The alignment of each centrifugal pump shall be checked and each pump shall be properly aligned after the pumps are placed in service. Mechanical seals and shaft sleeves shall be replaced by this Contractor without charge in the event that unusual wear or faulty operation occurs during the guarantee period.

E. Cleaning (General)

1. Upon completion of the work, all fixtures, trimmings and equipment shall be thoroughly cleaned, polished and left in first class condition for final acceptance.

3.10 EQUIPMENT PROVIDED UNDER OTHER DIVISION OF THE WORK THAT REQUIRES PLUMBING

A. Certain equipment kitchen, laundry, will be supplied under other sections of the work. This Contractor shall provide as described below the requirements and all necessary services roughing and final connections as shown on the plans and as required.

B. Installation of the equipment shall be performed in the following manner.

1. Roughing: Provide all water, waste, vent piping and special laboratory services (acid waste and vent piping, gas, air vacuum, etc.) complete in accordance with detailed dimensioned drawings, to be provided by the equipment suppliers. This roughing shall be left ready for final connection to tables and equipment terminated at a point and height indicated by the Equipment Suppliers drawings.

2. Setting of Equipment: The Equipment Supplier will furnish and set in place and secure all equipment.

3. Final Connection: This trade shall make all final connections after the equipment has been set in place.

4. Trim: The Equipment Supplier will furnish all specialized appliances and trim such as faucets, tailpieces, strainers, service outlet bibbs, cocks, serrated hose connections and other related trim. This Trade shall coordinate and check with the Equipment Supplier and shall provide all valve, traps, stops, escutcheons, branch control valves, floor and funnel drains, nipples, fittings, tailpieces, pressure reducing valves, vacuum breakers, check valve, and other appurtenances which are not supplied by the Equipment Supplier and are necessary to the operating characteristics of the equipment being furnished. Also install all trim furnished with the equipment, as required, in accordance with the manufacturer's recommendations.

5. All exposed to view final connection piping, fittings, valves, etc., shall be chrome plated with finish matching equipment rim finishes. Submit finish samples to Architect for approval. Attention is hereby drawn to the Equipment Specifications being prepared under other sections of the work.

C. Review all Architectural drawings and equipment cuts for all equipment locations & services required at each piece of equipment.

3.11 EXCAVATION AND BACKFILL

A. All excavation and backfill will be done by General Contractor. The Plumbing Contractor shall be responsible for the coordination of trench routing, slope and elevation.

B. Instructions:

1. Trenches shall be excavated so that pipe can be laid to the alignment and depth indicated on the drawings, and shall be excavated only so far in advance of pipe laying as approved.

2. Width of trenches shall be held to a minimum consistent with the type of material encountered and the size of the pipe being laid, but the width at the top of the pipe shall not be more than 2'-0" plus outside diameter of pipe. Excavation for manholes and other accessories shall have 12" minimum and a 24" maximum clearance on all sides.

3. Before fill or backfilling commences, all trash, debris and other foreign material shall be removed from trenches to be backfilled by this Trade. Fill material shall be free from timber, rocks 3" or larger, organic material, frozen material, and other unsuitable material as determined by the Architect. Filling shall not be done in freezing weather, unless specifically approved. No filling shall be done when material already in place is frozen.

4. In filling around pipe, deposit backfill material in successive horizontal layers not exceeding 6" in thickness before compaction. Compact each layer thoroughly by means of approved mechanical tampers. Take special care to obtain compaction under pipe haunches. Deposit backfill adjacent to pipes on both sides to approximately same elevation at the same time. Continue this method of filling and compacting until backfill is at least 18" above top of pipe.

5. Backfilling for the remainder of pipe trenches to subgrades of paved or landscaped areas shall be done by mechanical tamping and rolling equipment, except that the use of such equipment is prohibited when said use may result in damage to pipelines or structures.

6. Backfill shall be moistened as necessary for proper compaction. Water settling of fill will not be permitted.

7. Complete backfilling of pipe trenches as soon as possible after the pipe is laid and tested.

8. Existing pavements, roadways, walkways, curbs and landscaped areas disturbed during the progress of the excavation and backfill work shall be restored to their original condition at no additional cost to the Owner.

9. Backfill shall be compacted to a minimum of 90% of modified AASHO maximum density as defined by ASTM D-1557. Any layer of fill, or portion thereof, which is not compacted to the required density shall be recompacted until the specified density is achieved, or the layer shall be removed.

3.12 APPLIANCES, TOILET ROOM ACCESSORIES AND TRIM

A. Handle and install all Plumbing connected appliances claimed under Plumber's jurisdiction from tailboard delivery, including hoisting and rigging to designated locations.

B. Handle and install all accessories and trim claimed under Plumber's jurisdiction.

C. Dispose of all appliance and accessories packing crates and debris off of the site.

3.13 ARCHITECTURAL COORDINATION AND SAMPLES

A. All devices and appurtenances which are to be installed in all finished areas must be coordinated with the Architect for final approval as it relates to location, finish, materials, color, texture, etc.

B. Submit samples of all materials requested by the Architect.

C. Samples shall be prepared and submitted with all postage and transportation costs paid by the Contractor submitting same. Label each sample with identifying numbers and titles.

D. Submit samples of:

1. All exposed to view finishes such as cleanout plates, access covers, drain grates and tops, fixture trim, fresh air inlet plates, gas vent caps, etc.

END OF SECTION 22 05 00

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SECTION 22 05 08 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing plumbing systems to produce design objectives, including but not limited to the following:

1. Balancing hot water circulation flow within distribution systems, including submains and/or branches.

2. Measuring electrical performance of plumbing equipment.

3. Setting quantitative performance of plumbing equipment.

4. Verifying that automatic control devices are functioning properly.

5. Reporting results of the activities and procedures specified in this Section.

1.2 RELATED DOCUMENTS

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

B. Related Sections include the following:

1. Testing and adjusting requirements unique to particular systems and equipment are included in the Sections that specify those systems and equipment.

2. Field quality-control testing to verify that workmanship quality for system and equipment installation is specified in system and equipment Sections.

3. Division 22 Section 22 05 00 “Common Work Results for Plumbing”.

4. This Section is a part of each Division 22.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate at the terminal equipment, such as to adjust balancing valves.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

D. Report Forms: Test data sheets for recording test data in logical order.

E. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

F. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

G. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

H. System Effect Factory: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

I. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

J. Test: A procedure to determine quantitative performance of a system or equipment.

K. Testing, Adjusting, and Balancing: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

1.4 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Sample Report Forms: Submit 2 sets of sample testing, adjusting, and balancing report forms.

F. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.5 QUALITY ASSURANCE

A. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Architect's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, plumbing controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, Plumbing controls installers, and other mechanics to operate plumbing systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.

2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of plumbing systems and equipment.

C. Examine project record documents described in Division 01 Section "Project Record Documents."

D. Examine Architect's and Engineer's design data, including plumbing system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about plumbing system and equipment controls.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine plumbing system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine strainers for clean screens and proper perforations.

J. Examine 3-way valves for proper installation for their intended function of diverting or mixing fluid flows (if required).

K. Examine open-piping-system pumps to ensure absence of entrained air in the suction piping.

L. Examine equipment for installation and for properly operating safety interlocks and controls.

M. Examine automatic temperature system components to verify the following:

1. Valves, and other controlled devices operate by the intended controller.

2. Valves are in the position indicated by the controller.

3. Integrity of valves for free and full operation and for tightness of fully closed and fully open positions.

4. Automatic modulating and shutoff valves, including 2-way valves and 3-way mixing and diverting valves, are properly connected (if required).

5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.

6. Sensors are located to sense only the intended conditions.

7. Sequence of operation for control modes is according to the Contract Documents.

8. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.

9. Interlocked systems are operating.

N. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.

2. Water systems are filled, clean, and free of air.

3. Equipment access doors are securely closed.

4. Isolating and balancing valves are open and control valves are operational.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Mark equipment settings with paint or other suitable, permanent identification material, including valve indicators, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL PROCEDURES FOR HOT WATER CIRCULATION SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.

2. Check expansion tank liquid level.

3. Check makeup-water-station pressure gage for adequate pressure for highest vent.

4. Check flow-control valves for specified sequence of operation and set at design flow.

5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type, unless several terminal valves are kept open.

6. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.

7. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.5 HOT WATER CIRCULATION SYSTEMS' BALANCING PROCEDURES

A. Determine water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Verify with the pump manufacturer that this will not damage pump. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on the manufacturer's pump curve at zero flow and confirm that the pump has the intended impeller size.

2. Check system resistance. With all valves open, read pressure differential across the pump and mark the pump manufacturer's head-capacity curve. Adjust pump discharge valve until design water flow is achieved.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on the pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.

4. Report flow rates that are not within plus or minus 5 percent of design.

3.6 WATER HEATERS

A. Measure entering- and leaving-water temperatures and water flow.

3.7 TEMPERATURE-CONTROL VERIFICATION (MIXING VALVES)

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Verify main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.8 TOLERANCES

A. Set plumbing system water flow rates within the following tolerances:

1. Heating-Water Flow Rate: 0 to minus 10 percent.

3.9 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to plumbing systems and general construction to allow access for performance measuring and balancing devices.

3.10 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 22 05 08

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SECTION 22 05 16 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Flexible-hose packless expansion joints.
2. Metal-bellows packless expansion joints.
3. Rubber packless expansion joints.
4. Grooved-joint expansion joints.
5. Pipe loops and swing connections.
6. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 GENERAL DESIGN REQUIREMENTS

A. Professional Engineer

1. As part of the work, the contractor shall engage the services of a professional engineer with experience in the field of piping support and expansion and contraction of piping systems.

B. General

1. The plumbing system, including all piping, risers, horizontal runs and parts thereof shall be designed to take into account the effects of thermal expansion and contraction and building movement (shrinkage, expansion joints, etc.)
2. It shall be understood that the requirements of this section are complimentary to requirements delineated elsewhere for the support and fastening of equipment, piping, etc. Nothing on the drawings and specifications shall be interpreted as reason to waive the requirements of this section.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.

2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.

3. Alignment Guide Details: Detail field assembly and attachment to building structure.

4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of expansion joint, from manufacturer.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Flex Pression Ltd.

b. Metraflex, Inc.

c. Flexicraft.

d. Omega.

3. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

4. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

5. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.

   a. Bronze hoses and single-braid bronze sheaths with 300 psig at 70 deg F (2065 kPa at 21 deg C) rating.

   b. Bronze hoses and double-braid bronze sheaths with 500 psig at 70 deg F (3445 kPa at 21 deg C) rating.

6. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Copper-alloy fittings with solder-joint end connections.

   a. Bronze hoses and single-braid, bronze sheaths with 100 psig at 70 deg F (965 kPa at 21 deg C) rating.

   b. Bronze hoses and double-braid, bronze sheaths with 225 psig at 70 deg F (1550 kPa at 21 deg C) rating.

7. Expansion Joints for Steel Piping NPS 2 (DN 50) and Smaller: Stainless-steel fittings with threaded end connections.

   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F (3100 kPa at 21 deg C).

   b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F (4830 kPa at 21 deg C.

8. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6 (DN 65 to DN 150): Stainless-steel fittings with flanged end connections.

   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 165 psig at 70 deg F (1138 kPa at 21 deg C).

   b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 250 psig at 70 deg F (1724 kPa at 21 deg C).

9. Expansion Joints for Steel Piping NPS 8 to NPS 12 (DN 200 to DN 300): Stainless-steel fittings with flanged end connections.

    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F (860 kPa at 21 deg C).

    b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F (1130 kPa at 21 deg C).

B. Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

    a. Flexicraft Industries.

    b. Flex Pression Ltd.

    c. Metraflex, Inc.

3. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

4. Type: Circular, corrugated bellows with external tie rods.

5. Minimum Pressure Rating: 150 psig (1035 kPa) unless otherwise indicated.

6. Configuration: Single joint and double joint with base class(es) unless otherwise indicated.

    a. End Connections for Copper Tubing NPS 2 (DN 50) and Smaller: Solder joint.

    b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Solder joint.

    c. End Connections for Steel Piping: NPS 2 (DN 50) and Smaller: Threaded.

    d. End Connections for Steel Piping: NPS 2½ (DN 65) and Larger: Flanged.

C. Rubber Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Flexicraft Industries.

   b. Mason Industries, Inc.; Mercer Rubber Co.

   c. Metraflex, Inc.

   d. Red Valve.

3. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."

4. Material: Fabric-reinforced rubber complying with FSA-NMEJ-703.

5. Arch Type: Single arch with external control rods.

6. Spherical Type: Single spheres with external control rods.

7. Minimum Pressure Rating for NPS 1-1/2 to NPS 4 (DN 40 to DN 100): 150 psig (1035 kPa) at 220 deg F (104 deg C).

8. Minimum Pressure Rating for NPS 5 and NPS 6 (DN 125 and DN 150): 140 psig (966 kPa) at 200 deg F (93 deg C).

9. Material for Fluids Containing Acids, Alkalies, or Chemicals: EPDM.

10. Material for Fluids Containing Gas, Hydrocarbons, or Oil: Buna-N.

11. Material for Water: BR.

12. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.2 GROOVED-JOINT EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   1. Anvil International, Inc.

   2. Shurjoint Piping Products.

   3. Victaulic Company.

C. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

D. Standard: AWWA C606, for grooved joints.

E. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.

F. Couplings: Five Seven 10 12, flexible type for steel-pipe dimensions. Include ferrous housing sections, EPDM gasket suitable for cold and hot water, and bolts and nuts.

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Flexicraft Industries.

b. Mason Industries, Inc.

c. Metraflex, Inc.

3. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.

2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.

3. Washers: ASTM F 844, steel, plain, flat washers.

4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.

b. Expansion Plug: Zinc-coated steel.

c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.

b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.

c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-NMEJ-702.

D. Install grooved-joint expansion joints to grooved-end steel piping.

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least four pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least five pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations indicated on the drawings to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Black-Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

2. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.

3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.

2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 22 05 16

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SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Metraflex.
3. Mifab.

C. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Advance Products & Systems, Inc.

2. CALPICO, Inc.

3. Metraflex Company (The).

4. Pipeline Seal and Insulator, Inc.

5. Link-Seal.

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Carbon steel Plastic Stainless steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant or stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Link seal.

2. Flexicraft.

3. Metraflex.

4. Presealed Systems.

C. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

F. Sleeves are not required for core-drilled holes.

G. Permanent sleeves are not required for holes formed by removable PE sleeves.

H. Install sleeves for pipes passing through poured concrete and masonry walls, gypsum-board partitions, and poured concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel or Pipe Sleeves: For pipes smaller than NPS 6 (DN 150).

b. Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

(i) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section #'s "Joint Sealants" for materials and installation.

I. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

J. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.

2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 13 "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves Galvanized-steel wall sleeves Galvanized-steel-pipe sleeves or Sleeve-seal fittings.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves Galvanized-steel wall sleeves or Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system or Sleeve-seal fittings.

(i) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.

(i) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system or Sleeve-seal fittings.

(i) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Cast-iron wall sleeves with sleeve-seal system Galvanized-steel wall sleeves with sleeve-seal system Galvanized-steel-pipe sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves.

(i) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves PVC-pipe sleeves Stack-sleeve fittings or Sleeve-seal fittings.

b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.

b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 22 05 17

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SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.

2. Floor plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated and rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated and rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed and exposed-rivet hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge or split-plate, stamped-steel type with exposed-rivet hinge.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.

f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated rough-brass finish.

g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with polished, chrome-plated rough-brass finish.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.

b. Insulated Piping: Split-plate, stamped-steel type with concealed or exposed-rivet hinge.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.

d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.

e. Bare Piping in Unfinished Service Spaces: Split-casting brass type with polished, chrome-plated rough-brass finish.

f. Bare Piping in Equipment Rooms: Split-casting brass type with polished, chrome-plated rough-brass finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

E. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type with spring clips.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.

e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.

f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.

g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.

h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.

i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw or spring clips.

j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.

k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.

l. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

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SECTION 22 05 19 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Filled-system thermometers.
3. Liquid-in-glass thermometers.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.
7. Test-plug kits.
8. Sight flow indicators.

B. Related Sections:

1. Section 22 11 16 "Domestic Water Piping" for water meters inside the building.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Ashcroft Inc.
2. Ernst Flow Industries.
3. Marsh Bellofram.
4. Miljoco Corporation.
5. Nanmac Corporation.
6. Noshok.
7. Palmer Wahl Instrumentation Group.
8. REOTEMP Instrument Corporation.
9. Tel-Tru Manufacturing Company.
10. Trerice, H. O. Co.
11. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
12. Weiss Instruments, Inc.
13. WIKA Instrument Corporation - USA.
14. Winters Instruments - U.S.

C. Standard: ASME B40.200.

D. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter suitable for potable water.

E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C) deg F and deg C.

F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

G. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.

H. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.

I. Window: Plain glass or plastic.

J. Ring: Stainless steel.

K. Element: Bimetal coil.

L. Pointer: Dark-colored metal.

M. Accuracy: Plus or minus 1 to 1.5 percent of scale range.

2.2 FILLED-SYSTEM THERMOMETERS

A. Direct-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Ashcroft Inc.
   b. Marsh Bellofram.
   c. Miljoco Corporation.
   d. Palmer Wahl Instrumentation Group.
   e. REOTEMP Instrument Corporation.
   f. Trerice, H. O. Co.
   g. Weiss Instruments, Inc.

3. Standard: ASME B40.200.

4. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch (114-mm) 5-inch (127-mm) 6-inch (152-mm) nominal diameter.

5. Element: Bourdon tube or other type of pressure element.

6. Movement: Mechanical, dampening type, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Pointer: Dark-colored metal.

9. Window: Glass or plastic.

10. Ring: Metal or Stainless steel.

11. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device rigid, back and rigid, bottom; with ASME B1.1 screw threads.

12. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

13. Accuracy: Plus or minus 1 percent of scale range.

B. Direct-Mounted, Plastic-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Ashcroft Inc.
   b. Miljoco Corporation.
   c. REOTEMP Instrument Corporation.

3. Standard: ASME B40.200.

4. Case: Sealed type, plastic; 4-1/2-inch (114-mm) 5-inch (127-mm) 6-inch (152-mm) nominal diameter.

5. Element: Bourdon tube or other type of pressure element.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Pointer: Dark-colored metal.

9. Window: Glass or plastic.

10. Ring: Metal or plastic.

11. Connector Type(s): Union joint, adjustable, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device rigid, back and rigid, bottom; with ASME B1.1 screw threads.

12. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

13. Accuracy: Plus or minus 1 percent of scale range.

C. Remote-Mounted, Metal-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    a. AMETEK, Inc.; U.S. Gauge.
    b. Ashcroft Inc.
    c. Marsh Bellofram.
    d. Miljoco Corporation.
    e. Palmer Wahl Instrumentation Group.
    f. REOTEMP Instrument Corporation.
    g. Trerice, H. O. Co.
    h. Weiss Instruments, Inc.
    i. WIKA Instrument Corporation - USA.

3. Standard: ASME B40.200.

4. Case: Sealed type, cast aluminum or drawn steel; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter with back front flange and holes for panel mounting.

5. Element: Bourdon tube or other type of pressure element.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Pointer: Dark-colored metal.

9. Window: Glass or plastic.

10. Ring: Metal Stainless steel.

11. Connector Type(s): Union joint, back bottom; with ASME B1.1 screw threads.

12. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

13. Accuracy: Plus or minus 1 percent of scale range.

D. Remote-Mounted, Plastic-Case, Vapor-Actuated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

a. AMETEK, Inc.; U.S. Gauge.
b. Ashcroft Inc.
c. Miljoco Corporation.
d. REOTEMP Instrument Corporation.
e. Trerice, H. O. Co.

3. Standard: ASME B40.200.

4. Case: Sealed type, plastic; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter with back front flange and holes for panel mounting.

5. Element: Bourdon tube or other type of pressure element.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Pointer: Dark-colored metal.

9. Window: Glass or plastic.

10. Ring: Metal or plastic.

11. Connector Type(s): Union joint, threaded, back bottom; with ASME B1.1 screw threads.

12. Thermal System: Liquid-filled bulb in copper-plated steel, aluminum, or brass stem and of length to suit installation.

a. Design for Thermowell Installation: Bare stem.

13. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Trerice, H. O. Co.

3. Standard: ASME B40.200.

4. Case: Cast aluminum; 6-inch (152-mm) nominal size.

5. Case Form: Back angle or Straight unless otherwise indicated.

6. Tube: Glass with magnifying lens and blue or red organic liquid.

7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Window: Glass or plastic.

9. Stem: Aluminum or brass and of length to suit installation.

   a. Design for Thermowell Installation: Bare stem.

10. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.

11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Compact-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Flo Fab Inc.
   b. Miljoco Corporation.
   c. Tel-Tru Manufacturing Company.
   d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   e. Weiss Instruments, Inc.
   f. WIKA Instrument Corporation - USA.

3. Standard: ASME B40.200.

4. Case: Plastic; 6-inch (152-mm) nominal size.

5. Case Form: Back angle or Straight unless otherwise indicated.

6. Tube: Glass with magnifying lens and blue or red organic liquid.

7. Tube Background: Nonreflective with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Window: Glass or plastic.

9. Stem: Aluminum or brass and of length to suit installation.

   a. Design for Thermowell Installation: Bare stem.

10. Connector: 3/4 inch (19 mm), with ASME B1.1 screw threads.

11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

C. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Flo Fab Inc.
   b. Miljoco Corporation.
   c. Palmer Wahl Instrumentation Group.
   d. Tel-Tru Manufacturing Company.
   e. Trerice, H. O. Co.
   f. Weiss Instruments, Inc.
   g. Winters Instruments - U.S.

3. Standard: ASME B40.200.

4. Case: Cast aluminum; 7-inch (178-mm) 9-inch (229-mm) nominal size unless otherwise indicated.

5. Case Form: Adjustable angle Back angle Straight unless otherwise indicated.

6. Tube: Glass with magnifying lens and blue or red organic liquid.

7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Window: Glass or plastic.

9. Stem: Aluminum and of length to suit installation.

   a. Design for Thermowell Installation: Bare stem.

10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

D. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. Ernst Flow Industries.
   b. Marsh Bellofram.
   c. Miljoco Corporation.
   d. Palmer Wahl Instrumentation Group.
   e. REOTEMP Instrument Corporation.
   f. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   g. Weiss Instruments, Inc.
   h. WIKA Instrument Corporation - USA.

3. Standard: ASME B40.200.

4. Case: Plastic; 7-inch (178-mm) 9-inch (229-mm) nominal size unless otherwise indicated.

5. Case Form: Adjustable angle Back angle or Straight unless otherwise indicated.

6. Tube: Glass with magnifying lens and blue or red organic liquid.

7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C) deg F and deg C.

8. Window: Glass or plastic.

9. Stem: Aluminum, brass, or stainless steel and of length to suit installation.

   a. Design for Thermowell Installation: Bare stem.

10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

11. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.4 LIGHT-ACTIVATED THERMOMETERS

A. Direct-Mounted, Light-Activated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

    a. Flo Fab Inc.
    b. REOTEMP Instrument Corporation.
    c. Trerice, H. O. Co.
    d. Weiss Instruments, Inc.
    e. WIKA Instrument Corporation - USA.
    f. Winters Instruments - U.S.

3. Case: Plastic Metal; 7-inch (178-mm) 9-inch (229-mm) nominal size unless otherwise indicated.

4. Scale(s): Deg F (Deg C) Deg F and deg C.

5. Case Form: Adjustable angle.

6. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.

7. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Display: Digital.

9. Accuracy: Plus or minus 2 deg F (1 deg C).

B. Remote-Mounted, Light-Activated Thermometers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Miljoco Corporation.
    b. Weiss Instruments, Inc.
    c. Winters Instruments - U.S.

3. Case: Plastic, for wall mounting.

4. Scale(s): Deg F (Deg C) Deg F and deg C.

5. Sensor: Bulb and thermister wire.

    a. Design for Thermowell Installation: Bare stem.

6. Display: Digital.

7. Accuracy: Plus or minus 2 deg F (1 deg C).

2.5 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. AMETEK, Inc.; U.S. Gauge.
b. Ashcroft Inc.
c. Ernst Flow Industries.
d. Flo Fab Inc.
e. Marsh Bellofram.
f. Miljoco Corporation.
g. Noshok.
h. Palmer Wahl Instrumentation Group.
i. REOTEMP Instrument Corporation.
j. Tel-Tru Manufacturing Company.
k. Trerice, H. O. Co.
l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
m. Weiss Instruments, Inc.
n. WIKA Instrument Corporation - USA.
o. Winters Instruments - U.S.

3. Standard: ASME B40.100.

4. Case: Liquid-filled Sealed Solid-front, pressure relief type(s); cast aluminum or drawn steel ; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter.

5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

6. Pressure Connection: Brass, with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa) psi and kPa.

9. Pointer: Dark-colored metal.

10. Window: Glass or plastic .

11. Ring: Metal Brass or Stainless steel.

12. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. AMETEK, Inc.; U.S. Gauge.
   b. Ashcroft Inc.
   c. Flo Fab Inc.
   d. Marsh Bellofram.
   e. Miljoco Corporation.
   f. Noshok.
   g. Palmer Wahl Instrumentation Group.
   h. REOTEMP Instrument Corporation.
   i. Tel-Tru Manufacturing Company.
   j. Trerice, H. O. Co.
   k. Weiss Instruments, Inc.
   l. WIKA Instrument Corporation - USA.
   m. Winters Instruments - U.S.

3. Standard: ASME B40.100.

4. Case: Sealed type; plastic ; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter.

5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

6. Pressure Connection: Brass, with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa) psi and kPa.

9. Pointer: Dark-colored metal.

10. Window: Glass or plastic .

11. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

C. Remote-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. AMETEK, Inc.; U.S. Gauge.
   b. Ashcroft Inc.
   c. Ernst Flow Industries.
   d. Flo Fab Inc.
   e. Marsh Bellofram.
   f. Miljoco Corporation.
   g. Noshok.
   h. Palmer Wahl Instrumentation Group.
   i. REOTEMP Instrument Corporation.
   j. Tel-Tru Manufacturing Company.
   k. Trerice, H. O. Co.
   l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   m. Weiss Instruments, Inc.
   n. WIKA Instrument Corporation - USA.
   o. Winters Instruments - U.S.

3. Standard: ASME B40.100.

4. Case: Liquid-filled Sealed type; cast aluminum or drawn steel metal ; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter with back front flange and holes for panel mounting.

5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

6. Pressure Connection: Brass, with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa) psi and kPa.

9. Pointer: Dark-colored metal.

10. Window: Glass or plastic .

11. Ring: Metal or Stainless steel .

12. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

D. Remote-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

   a. AMETEK, Inc.; U.S. Gauge.
   b. Ashcroft Inc.
   c. Miljoco Corporation.
   d. Noshok.
   e. Palmer Wahl Instrumentation Group.
   f. REOTEMP Instrument Corporation.
   g. Tel-Tru Manufacturing Company.
   h. Trerice, H. O. Co.
   i. Weiss Instruments, Inc.
   j. WIKA Instrument Corporation - USA.
   k. Winters Instruments - U.S.

3. Standard: ASME B40.100.

4. Case: Sealed type; plastic ; 4-1/2-inch (114-mm) 6-inch (152-mm) nominal diameter with back front flange and holes for panel mounting.

5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

6. Pressure Connection: Brass, with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa) psi and kPa.

9. Pointer: Dark-colored metal.

10. Window: Glass or plastic .

11. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

2.6 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads and piston porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball Brass or stainless-steel needle, with NPS 1/4 (DN 8) NPS 1/4 or NPS 1/2 (DN 8 or DN 15) NPS 1/2 (DN 15), ASME B1.20.1 pipe threads.

2.7 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

C. Description: Test-station fitting made for insertion into piping tee fitting.

D. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

E. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.

F. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).

G. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

2.8 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product product by one of the following:

1. Flow Design, Inc.
2. Miljoco Corporation.
3. National Meter, Inc.
4. Peterson Equipment Co., Inc.
5. Sisco Manufacturing Company, Inc.
6. Trerice, H. O. Co.
7. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
8. Weiss Instruments, Inc.

C. Furnish one test-plug kit(s) containing one two thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

D. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F (minus 4 to plus 52 deg C) .

E. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C) .

F. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be at least 0 to 200 psig (0 to 1380 kPa).

G. Carrying Case: Metal or plastic, with formed instrument padding.

2.9 SIGHT FLOW INDICATORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Archon Industries, Inc.
2. Dwyer Instruments, Inc.
3. Emerson Process Management; Brooks Instrument.
4. Ernst Co., John C., Inc.
5. Ernst Flow Industries.
6. KOBOLD Instruments, Inc. - USA; KOBOLD Messring GmbH.
7. OPW Engineered Systems; a Dover company.
8. Penberthy; A Brand of Tyco Valves & Controls - Prophetstown.

C. Description: Piping inline-installation device for visual verification of flow.

D. Construction: Bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.

E. Minimum Pressure Rating: 125 psig (860 kPa) 150 psig (1034 kPa).

F. Minimum Temperature Rating: 200 deg F (93 deg C).

G. End Connections for NPS 2 (DN 50) and Smaller: Threaded.

H. End Connections for NPS 2-1/2 (DN 65) and Larger: Flanged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches (51 mm) into fluid one-third of pipe diameter to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install test plugs in piping tees.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.

L. Install pressure gages in the following locations:

1. Building water service entrance into building.

2. Inlet and outlet of each pressure-reducing valve.

3. Suction and discharge of each domestic water pump.

3.2 CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:

1. Direct Remote-mounted, metal plastic-case, vapor-actuated type.

2. Compact Industrial-style, liquid-in-glass type.

3. Direct-mounted, light-activated type.

4. Test plug with chlorosulfonated polyethylene synthetic or EPDM self-sealing rubber inserts.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE AND LOCATIONS

THERMOMETER LOCATION	TEMPERATURE RANGE
Hot water outlet of water heaters	30° to 240°F (0 to plus 115 deg C).
Cold water service into the building	0°to 100°F (minus 20 to plus 50 deg C).
Cold water inlet to water heaters	0° to 100°F (minus 20 to plus 50 deg C).
In hot water circulation line adjacent to and upstream of circulating pump	30° to 180°F (0 to plus 82 deg C).

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be one of the following:

1. Liquid-filled Sealed Open-front, pressure-relief Solid-front, pressure-relief, direct remote-mounted, metal case.

2. Sealed, direct remote-mounted, plastic case.

3. Test plug with chlorosulfonated polyethylene synthetic EPDM self-sealing rubber inserts.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:

1. Liquid-filled Sealed Open-front, pressure-relief Solid-front, pressure-relief direct remote-mounted, metal case.

2. Sealed direct remote-mounted, plastic case.

3. Test plug with chlorosulfonated polyethylene synthetic EPDM self-sealing rubber inserts.

C. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:

1. Liquid-filled Sealed Open-front, pressure-relief Solid-front, pressure-relief direct remote-mounted, metal case.

2. Sealed direct remote-mounted, plastic case.

3. Test plug with chlorosulfonated polyethylene synthetic EPDM self-sealing rubber inserts.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE AND LOCATION

Gauge Location	Pressure Range
At each water service point of entry in building.	0-150 p.s.i. (0 to 1034 kPa)
Each pump suction	0-150 p.s.i. (0 to 1034 kPa)
Each pump discharge	0-250 p.s.i. or as required. (0 to 1725 kPa)
Cold supply and hot water supply for water heaters	0-150 p.s.i. (0 to 1034 kPa)
Inlet & outlet of master pressure reducing valves.	0-250 p.s.i. or as required. (0 to 1725 kPa)

END OF SECTION 22 05 19

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SECTION 22 05 23 - VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. The valve schedule included in the contract drawings indicates the valve type to be used for the services indicated. Similar valves as made by approved manufacturers may be submitted for approval.

B. Section Includes:

1. Bronze ball valves.
2. Steel ball valves.
3. Iron ball valves.
4. Iron, single-flange butterfly valves.
5. Stainless steel butterfly valves
6. Bronze lift check valves.
7. Bronze swing check valves.
8. Iron swing check valves.
9. Iron, center-guided check valves.
10. Bronze gate valves.
11. Iron gate valves.
12. Chainwheels.

1.2 RELATED DOCUMENTS

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

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of valve. Include manufacturer's submittals to include materials of construction, standards compliance, valve design, pressure and temperature ratings, end connections and dimensions. Include valve schedule indicating each valve and its application. Indicate all required options.

1. Certification that products comply with NSF 61 Annex G and NSF 372 where applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.

2. Protect threads, flange faces, and soldered ends.

3. Set ball valves open to minimize exposure of functional surfaces.

4. Set butterfly valves closed or slightly open.

5. Set check valves in either closed or open position.

6. Set gate valves closed to prevent rattling.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for solder-joint connections.
6. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 (DN 100) and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4 (DN 100).
3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.

I. Valves in Insulated Piping:

1. Include 2 inch (50 mm) stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.
4. RS Valves in Insulated Piping: With 2 inch (50 mm) stem extensions.

2.2 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

B. Description:

1. Standard: MSS SP-110.

2. CWP Rating: 600 psig (4140 kPa).

3. Body Design: Two piece.

4. Body Material: Bronze.

5. Ends: Threaded or soldered.

6. Seats: PTFE.

7. Stem: Bronze or brass.

8. Ball: Chrome-plated brass.

9. Port: Full only. Standard port not permitted.

C. Three-Piece, Bronze Ball Valves with Full Port and Bronze or Brass Trim:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-110.

b. CWP Rating: 600 psig (4140 kPa).

c. Body Design: Three piece.

d. Body Material: Bronze.

e. Ends: Threaded or soldered.

f. Seats: PTFE.

g. Stem: Bronze or brass.

h. Ball: Chrome-plated brass.

i. Port: Full only. Standard port not permitted.

D. Two-Piece, Safety-Exhaust, Bronze Ball Valves:

1. Manufacturers:

a. Milwaukee Valve Co.

b. Nibco, Inc.

2. Description:

a. Standard: MSS SP-110.

b. CWP Rating: 600 psig (4140 kPa).

c. Body Design: Two piece.

d. Body Material: Bronze, ASTM B 584, Alloy C844.

e. Ends: Threaded.

f. Seats: PTFE.

g. Stem: Bronze.

h. Ball: Chrome-plated brass, with exhaust vent opening for pneumatic applications.

i. Port: Full.

2.3 STEEL BALL VALVES

A. Class 150, Steel Ball Valves with Full Port:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-72.

b. CWP Rating: 285 psig (1964 kPa).

c. Body Design: Split body.

d. Body Material: Carbon steel, ASTM A 216, Type WCB.

e. Ends: Flanged or threaded.

f. Seats: PTFE.

g. Stem: Stainless steel.

h. Ball: Stainless steel, vented.

i. Port: Full.

2.4 IRON BALL VALVES

A. Class 125, Iron Ball Valves:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

2. Description:

a. Standard: MSS SP-72.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Split body.

d. Body Material: ASTM A 126, gray iron.

e. Ends: Flanged.

f. Seats: PTFE.

g. Stem: Stainless steel.

h. Ball: Stainless steel.

i. Port: Full.

2.5 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 250 psig (1725 kPa).

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.

e. Seat: EPDM.

f. Stem: One- or two-piece stainless steel.

g. Disc: Aluminum bronze.

2.6 DUCTILE-IRON, GROOVED-END BUTTERFLY VALVES

A. 300 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers:

a. Nibco, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating, NPS 8 (DN 200) and Smaller: 300 psig (2070 kPa).

c. Body Material: Coated, ductile iron.

d. Stem: Two-piece stainless steel.

e. Disc: Coated, ductile iron.

f. Seal: EPDM.

2.7 STAINLESS STEEL BUTTERFLY VALVES

A. Stainless steel, High-Performance Butterfly Valve with Stainless Steel Disc

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

2. Description:

a. Standard: MSS SP-68

b. Pressure Class: 150 psig 300psig

c. Body Design: Lug type; suitable for bi-directional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A351 CG8M, cast stainless steel

e. Seat: TFM 1700

f. Stem: 17-4 PH

g. Disc: ASTM A351 CF8M cast stainless steel

2.8 BRONZE LIFT CHECK VALVES

A. Class 250, Lift Check Valves with Nonmetallic Disc:

1. Manufacturers:

a. Milwaukee Valve Co.

b. Nibco, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. WOG Rating: 250 psig (1725 kPa).

c. Body Design: Vertical flow.

d. Body Material: ASTM B 61 or ASTM B 62, bronze.

e. Ends: Threaded or threaded.

f. Disc: NBR, PTFE.

2.9 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded or Soldered.

f. Disc: Bronze.

2.10 IRON SWING CHECK VALVES

A. Class 125 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Nibco, Inc.

2. Description:

a. Standard: MSS SP-71, Type I. 125 250

b. CWP Rating: 200 psig (1380 kPa) 500 psig (3450 kPa).

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Gasket: Asbestos free.

2.11 IRON, CENTER-GUIDED, SPRING-LOADED CHECK VALVES

A. Class 125, Iron, Compact-Wafer, Center-Guided Check Valves with Metal or Resilient Seat:

1. Manufacturers:

a. Watts.

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-125.

b. CWP Rating: 200 psig (1380 kPa) 500 psig (3450 kPa).

c. Body Material: ASTM A 126, gray iron.

d. Style: Compact wafer or globe, spring loaded.

e. Seat: Bronze.

2.12 BRONZE GATE VALVES

A. Class 125, NRS or RS, Bronze Gate Valves:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: Bronze with integral seat and screw-in bonnet.

d. Ends: Threaded or solder joint.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron, bronze, or aluminum.

2.13 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: Gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Disc: Solid wedge.

g. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers:

a. Conbraco Industries, Apollo Valves

b. Milwaukee Valve Co.

c. Nibco, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Material: Gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Disc: Solid wedge.

g. Packing and Gasket: Asbestos free.

2.14 CHAINWHEELS

A. Manufacturers:

1. Babbitt Steam Specialty Co.

2. Roto Hammer Industries.

3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, chain guides, chain, and attachment brackets for mounting chainwheels directly to handwheels.

1. Sprocket Rim with Chain Guides: Ductile or cast iron, of type and size required for valve. Include zinc or epoxy coating.

2. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

2.15 PLASTIC VALVES

A. Comply with requirements for general-duty metal valves in Section 220523 "General-Duty Valves for Plumbing Piping."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Install appropriate dielectric fittings where valve is of dissimilar metal construction.

C. Locate valves for easy access and provide separate support where necessary.

D. Install valves in horizontal piping with stem at or above center of pipe.

E. Install valves in position to allow full stem movement or in the case of quarter-turn valves, full handle movement.

F. Install valve tags. Comply with requirements in Section 22 05 53 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

G. Install chainwheels on operators for butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.

H. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

2. Center-Guided Check Valves: In horizontal or vertical position, between flanges.

3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

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

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends or solder-joint valve-end.

2. For Copper Tubing, NPS 2-1/2 and larger: Flanged ends.

3. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.

4. For Steel Piping, NPS 2-1/2 and larger: Flanged ends.

C. Use gate valves for shutoff service only.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.

2. Two-piece, bronze ball valves with full port and bronze or brass trim.

3. Two-piece, bronze ball valves with regular port and bronze trim.

B. Pipe NPS 2-½ (DN 65) and Larger:

1. Steel and Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100):

2. Class 150, iron ball valves.

3. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

4. Stainless steel, High-Performance Butterfly Valves: 150 psig.

C. Pipe NPS 2 (DN 50) and Smaller: Bronze swing check valves, Class 150, nonmetallic disc with soldered or threaded end connections.

D. Pipe NPS 2-½ (DN 65) and Larger Check Valves:

1. Iron swing check valves, Class 125, nonmetallic-to-metal seats with flanged end connections.

2. Iron, center-guided check valves, Class 125, compact wafer.

3. Iron, center-guided check valves, Class 125, globe or resilient seat with flanged end connections.

4. Iron, dual-plate check valves, Class 125, metal or resilient seat with flanged end connections.

5. Iron, single-plate check valves, Class 125, resilient seat with flanged end connections.

E. Pipe NPS 2 (DN 50)and Smaller: Bronze gate valves, Class 125, NRS RS with soldered or threaded ends.

F. Pipe NPS 2-½ (DN 65) and Larger: Iron gate valves, Class 125, OS&Y with flanged ends.

END OF SECTION 22 05 23

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SECTION 22 05 29 - HANGERS, SUPPORTS AND MISCELLANEOUS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 22 05 16 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.

3. Pipe stands.

4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.

2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates: Copy of certificates for welding procedures and operators.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

1. Pipe Hangers:

a. Anvil International

b. Cooper B-Line

c. Carpenter & Paterson, Inc.

d. National Pipe Hanger Corp.

2. Metal Framing System:

a. Anvil International

b. Cooper B-Line

c. Unistrut Corp.

d. Allied Tube and Conduit

e. Nibco Inc.

3. Thermal-Hanger Shield Inserts:

a. Carpenter & Paterson, Inc.

b. National Pipe Hanger Corp.

4. Powder-Actuated Fastener Systems:

a. Hilti, Inc.

b. ITW Ramset/Red Head.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.

3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of galvanized steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.

2. Standard: MFMA-4.

3. Channels: Continuous slotted steel channel with inturned lips.

4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.

6. Metallic Coating: Electroplated zinc Hot-dipped galvanized Mill galvanized In-line, hot galvanized or Mechanically-deposited zinc.

7. Paint Coating: Vinyl Vinyl alkyd Epoxy Polyester Acrylic Amine or Alkyd.

8. Combination Coating: <Insert coating materials in order of application>.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

2. Standard: Comply with MFMA-4.

3. Channels: Continuous slotted steel channel with inturned lips.

4. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.

6. Coating: Zinc Paint.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig (688-kPa) ASTM C 552, Type II cellular glass with 100-psig (688-kPa) or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig (862-kPa) minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece plastic, stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

2. Base: Plastic, Stainless steel.

3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.

4. Horizontal Member: Protective-coated-steel channel.

5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 07 72 00 "Roof Accessories" for curbs.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.

    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.

    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.

    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 13 "Exterior Painting." Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).

12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).

    b. Medium (MSS Type 32): 1500 lb (680 kg).

    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

   a. Horizontal (MSS Type 54): Mounted horizontally.

   b. Vertical (MSS Type 55): Mounted vertically.

   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

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SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section 22 05 00 “Common Work Results for Plumbing”.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.

2. Warning signs and labels.

3. Pipe labels.

4. Stencils.

5. Valve tags.

6. Warning tags.

7. Access panel and door markers

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) Stainless steel, 0.025-inch (0.64-mm) Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

4. Fasteners: Stainless-steel rivets or self-tapping screws.

5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

6. Location: Accessible and visible.

7. Data:

a. Manufacturer, product name, model number, and serial number.
b. Capacity, operating and power characteristics, and essential data.
c. Labels of tested compliances.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

2. Letter Color: Black Blue Red White or Yellow.

3. Background Color: Black Blue Red White or Yellow.

4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

7. Fasteners: Stainless-steel rivets or self-tapping screws.

8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

9. Location: Accessible and visible.

10. Data:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

C. Label Content: In addition to the data requirements identified above, include equipment's Drawing designation or unique equipment number. Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 3 by 5 1/4 inch (75 by 133 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Brass grommet and wire.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions. Include large size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1-1/2 inches (38 mm)high.

E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils (0.08 mm) thick with pressure-sensitive, permanent-type, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 inches (150 mm) : 3/4 inch (19 mm) minimum.

2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches (150 mm) or Larger: 1-1/2 inches (38 mm) minimum.

F. Colors: Comply with ASME A13.1, unless otherwise indicated.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal

2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.

3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers. Provide 5/32 inch (4 mm) hole for fastener.

1. Tag Material: Brass, 0.032-inch (0.8-mm) or Stainless steel, 0.03752-inch (1mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.

2. Frame: Finished hardwood or Extruded aluminum.

3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches (75 by 133 mm) minimum.

2. Fasteners: Reinforced grommet and wire or string.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

2.7 ACCESS PANEL AND DOOR MARKERS

A. Access Panel and Door Markers: 1/16 inch (1.6 mm) thick, engraved laminated plastic, with abbreviated terms and numbers corresponding to identification. Provide 1/8 inch (3.2 mm) center hole for attachment.

1. Fasteners: Self-tapping, stainless-steel screws or contact-type, permanent adhesive.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPING IDENTIFICATION

A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.

1. Pipes with OD, Including Insulation, Less Than 6 inches (150 mm) : Pretensioned pipe markers. Use size to ensure a tight fit.

2. Pipes with OD, Including Insulation, Less Than 6 inches (150 mm): Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 3/4 inch (19 mm) 1-1/2 inches (38 mm) wide, lapped at least 1-1/2 inches (38 mm) at both ends of pipe marker, and covering full circumference of pipe.

3. Pipes with OD, Including Insulation, 6 inches (150 mm) and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.

4. Pipes with OD, Including Insulation, 6 inches (150 mm) and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches (38 mm) wide, lapped at least 3 inches (75 mm) at both ends of pipe marker, and covering full circumference of pipe.

B. Stenciled Pipe Marker Option: Stenciled markers may be provided instead of manufactured pipe markers, at Installer's option. Install stenciled pipe markers complying with ASME A13.1 on each piping system.

1. Identification Paint: Use for contrasting background.

2. Stencil Paint: Use for pipe marking.

C. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior nonconcealed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and nonaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 mm) in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

   a. Cold Water: 2 inches (50 mm), round.
   b. Hot Water: 2 inches (50 mm), round.
   c. Gas: 2 inches (50 mm), round.

2. Valve-Tag Color:

   a. Cold Water: Natural.
   b. Hot Water: Natural.
   c. Gas: Natural.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: White.
   c. Gas: White.

3.5 VALVE-SCHEDULE INSTALLATION

A. Mount valve schedule on wall in accessible location in each major equipment room.

3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

3.7 ADJUSTING

A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.8 CLEANING

A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 22 05 53

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SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. Recycled water: Non-potable water from any source (storm, sanitary, ground, surface, etc.) which is collected, treated in accordance with applicable standards and authorities requirements, stored, distributed, and used for building water supply needs, including but not limited to water closets and urinal flushing, irrigation, cooling tower or other mechanical make-ups, laundry, window washing, etc.

B. See section 22 05 00 “Common Work Results for Plumbing” for other definitions.

1.3 SUMMARY

A. Section Includes:

1. Under-building-slab, in-ground and aboveground water pipes, tubes, and fittings inside buildings and up to the connection to water main or civil trade service.

2. Encasement for piping.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

C. Related Sections:

1. Section 22 11 19, “Domestic Water Piping Specialties”

D. Performance Requirements

1. Provide components and installation capable of producing domestic water piping systems with a minimum pressure rating, unless otherwise indicated:

a. Water service piping 160 psig (1100 kPa).

b. Water distribution piping – 125 psig (860 kPa).

E. UL Grounding And Bonding

1. Metal water piping shall be bonded to the grounding electrode in accordance with the requirements of the NEC (250.104-A-1). Groove lock fittings that are UL listed for grounding and bonding shall be permitted without either a jumper across each fitting or a ground loop to ground each section of pipe. Groove lock fittings that are not UL listed for grounding and bonding shall not be permitted. All domestic water piping of dissimilar materials shall be grounded independent of other materials; do not connect across the di-electric fittings.

1.4 GENERAL

A. Refer to the schedule of materials on drawings for materials and components acceptable for each system.

B. Use only approved fire proofing methods that shall match the piping materials for each system and shall be approved for such installation.

C. Use only fire proofing materials compatible with the piping materials and all other components in contact with the fire proofing.

D. Any request to use alternate materials must be approved in writing by Ownership and must identify clearly where the alternate materials will be installed.

E. When using alternate materials, coordinate additional requirements such as material compatibility, expansion and contraction, fire proofing, etc.

1.5 PRODUCT SUBMITTALS

A. Product Data: All products specified for this project as listed in Section 2.

1.6 LEED SUBMITTALS

A. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.

B. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.7 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Welders installing domestic water piping shall be qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section IX.

B. Welder qualification testing shall be performed by an approved agency and the inspector witnessing the test shall be an authorized American Welding Society - Certified Welding Inspector.

C. Copies of the certified welder qualification reports shall be maintained by both the approved agency and the licensed master plumber employing the welder(s) for at least six years and shall be made available upon request.

1.9 FIELD CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt existing water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.

2. Do not interrupt water service without Construction Manager's written permission.

3. Provide fire watch during fire service interruptions as required by local authorities, building rules or insurance.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 61.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type K and L (ASTM B 88M, Type B) water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper. This tube only permitted for ice-makers or coffee makers connection or similar.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.

2. Cast-copper-alloy, hexagonal-stock body.

3. Ball-and-socket, metal-to-metal seating surfaces.

4. Solder-joint or threaded ends.

G. Copper-Tube, Extruded-Tee Connections:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. T-Drill Industries Inc.

2. Description: Tee formed in copper tube according to ASTM F 2014.

H. Appurtenances for Grooved-End Copper Tubing:

1. General: Permitted only for non-pumped systems with less than 80 psi pressure.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Anvil International.

   b. Shurjoint Piping Products.

   c. Victaulic Company.

3. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.

4. Mechanical Couplings for Grooved-End Copper Tubing:

   a. Copper-tube dimensions and design similar to AWWA C606.

   b. Ferrous housing sections.

   c. EPDM-rubber gaskets suitable for hot and cold water.

   d. Bolts and nuts.

   e. Minimum Pressure Rating: 300 psig (2070 kPa).

2.3 COPPER TUBING FOR ELEVATED PRESSURE

A. For pump discharge or gravity line for pressures up to 250 psi: Copper tubing seamless drawn or extruded tubing Type "L" hard tempered as scheduled, in accordance with ASTM B-88 with brazed end fittings.

2.4 DUCTILE-IRON PIPE AND FITTINGS – FOR WATER SERVICES ONLY

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.

2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.

2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51.

2. Push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

E. Standard-Pattern, Push-on-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.

2. Gaskets: AWWA C111/A21.11, rubber.

F. Compact-Pattern, Push-on-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.

2. Gaskets: AWWA C111/A21.11, rubber.

G. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.5 STAINLESS-STEEL PIPING

A. Potable-water piping and components shall comply with NSF 61.

B. Stainless-Steel Pipe: ASTM A 312/A 312M, Schedule 40.

C. Stainless-Steel Pipe Fittings: ASTM A 815/A 815M.

D. Appurtenances for Grooved-End, Stainless-Steel Pipe:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Anvil International.

b. Grinnell Mechanical Products; Tyco Fire Products LP.

c. Shurjoint Piping Products.

d. Victaulic Company.

2. Fittings for Grooved-End, Stainless-Steel Pipe: Stainless-steel couplings with dimensions matching stainless-steel pipe.

3. Mechanical Couplings for Grooved-End, Stainless-Steel Pipe:

a. AWWA C606 for stainless-steel-pipe dimensions.

b. Stainless-steel housing sections.

c. Stainless-steel bolts and nuts.

d. EPDM-rubber gaskets suitable for hot and cold water.

e. Minimum Pressure Rating: 600 psig (4137 kPa).

2.6 COPPER PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.

2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.7 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.

2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Cascade Waterworks Manufacturing.

b. Dresser, Inc.; Piping Specialties Products.

c. Ford Meter Box Company, Inc. (The).

d. JCM Industries.

e. Romac Industries, Inc.

f. Smith-Blair, Inc.; a Sensus company.

g. Viking Johnson.

2.8 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Central Plastics Company.

b. Hart Industries International, Inc.

c. Jomar International.

d. McDonald, A. Y. Mfg. Co.

e. Watts; a division of Watts Water Technologies, Inc.

f. Wilkins; a Zurn company.

2. Standard: ASSE 1079.

3. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).

4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Central Plastics Company.

b. Watts; a division of Watts Water Technologies, Inc.

c. Wilkins; a Zurn company.

2. Standard: ASSE 1079.

3. Factory-fabricated, bolted, companion-flange assembly.

4. Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).

5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Advance Products & Systems, Inc.

b. Calpico, Inc.

c. Central Plastics Company.

d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.

3. Pressure Rating: 150 psig (1035 kPa).

4. Gasket: Neoprene or phenolic.

5. Bolt Sleeves: Phenolic or polyethylene.

6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Elster Perfection Corporation.

b. Grinnell Mechanical Products; Tyco Fire Products LP.

c. Precision Plumbing Products, Inc.

d. Victaulic Company.

2. Standard: IAPMO PS 66.

3. Electroplated steel nipple complying with ASTM F 1545.

4. Pressure Rating and Temperature: 300 psig (2070 kPa) at 225 deg F (107 deg C).

5. End Connections: Male threaded or grooved.

6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 31 20 00 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5, see drawings for extent of installation.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties" and requirements of local authorities.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Where indicated on the drawings, install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."

R. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 22 11 23 "Domestic Water Pumps."

S. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 22 05 19 "Meters and Gages for Plumbing Piping."

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

W. Install piston type expansion joints and/or expansion loops for all plastic piping per manufacturer's recommendations; install expansion joints or loops on every vertical metal piping riser longer than 100 feet.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Joint Construction for Grooved-End Copper Tubing (Permitted only in non-pumped applications, less than 80 psi Pressure): Make joints according to AWWA C606. Roll groove ends of tubes. Lubricate and install gasket over ends of tubes or tube and fitting. Install coupling housing sections over gasket with keys seated in tubing grooves. Install and tighten housing bolts.

H. Welded Joints for Stainless Steel Piping: Construct joints according to AWS Standards, using qualified processes and welding operators according to "Quality Assurance" Article. Shop weld pipe joints where welded piping is indicated. Use welded joints for piping within 50 feet height of the house pump or main water booster.

I. Joint Construction for Grooved-End Stainless Steel Piping: (Permitted only higher than 50 feet above the house pump or booster) Make joints according to AWWA C606. Roll groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

J. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

K. All joints shall be welded in accordance with ASME B31.9, inspected and tested in accordance with the Plumbing Code.

L. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.

2. Fittings for NPS 2 (DN 50) and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings, couplings or nipples, or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100) Use dielectric flanges, flange kits or nipples.

D. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.

   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.

   c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.

2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.

3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.

6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

E. Install supports for vertical copper tubing every floor, but no more than 10 feet (3 m).

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect water risers piping to horizontal distribution and water-service piping with shutoff valves; extend and connect to the following:

1. Tanks and Water Heaters: Cold water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater or tank connections.

2. Plumbing Fixtures: Cold and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3. Equipment and Appliances Required Water Connections: Cold and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

C. Provide warning signs “Non-Potable Water, Do Not Drink” at every 15 feet of recycled water piping length, unless warning signs are factory applied.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.

2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

   d. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, but not less than 150 PSI, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

   f. Prepare reports for tests and for corrective action required.

   g. In multizone highrise buildings, each pressure zone piping shall be tested separately from the other zone. Temporary pipe jumpers between different zones and between cold and hot piping are not permitted.

   h. Air test is not permitted as final test. Air test could be performed by the contractor as preliminary test for self-check purpose only.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.

   b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Unless other method required by local authorities, clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Repeat procedures if biological examination shows contamination.

e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Clean non-potable domestic or recycled water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Building-domestic water only service piping, NPS 1 to NPS 8 (DN 25 to DN 200) and larger, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.

2. Mechanical-joint, ductile-iron pipe; standard- or compact- pattern, mechanical-joint fittings; and mechanical joints.

3. Push-on-joint, ductile-iron pipe; standard- or compact- pattern, push-on-joint fittings; and gasketed joints.

4. Plain-end, ductile-iron pipe; flanged-joint, ductile-iron-pipe appurtenances; and flanged joints.

5. Stainless steel piping Type 304/304L or 316/316L ASTM A312 ASTMA778.

E. Combined domestic water, building-service and fire-service-main piping, NPS 6 to NPS 12 (DN 150 to DN 300), shall be one of the following:

1. Mechanical-joint, ductile-iron pipe; standard- or compact- pattern, mechanical-joint fittings; and mechanical joints.

2. Push-on-joint, ductile-iron pipe; standard- or compact- pattern, push-on-joint fittings; and gasketed joints.

3. Plain-end, ductile-iron pipe; flanged-joint, ductile-iron-pipe appurtenances; and flanged joints.

4. Stainless steel piping Type 304/304L or 316/316L ASTM A312 ASTMA778.

F. Aboveground water piping, NPS 2 (DN 50) and smaller shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B) ASTM B 88; cast- or wrought- copper, solder-joint fittings; and brazed soldered joints.

2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); copper push-on-joint fittings; and push-on joints.

3. Hard copper tube – grooved fittings, grooved joints, keyed couplings – to be used only on non-pumped systems, maximum 80 psi pressure.

4. ½" piping permitted only for individual fixtures connections less than five feet long.

G. Aboveground water piping, NPS 2-1/2 to NPS 8 (DN 65 to DN 200), shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

2. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); grooved-joint, copper-tube appurtenances; and grooved joints. Permitted only for non-pumped systems less than 80 psi pressure.

3. Stainless-steel pipe Schedule 40; cut grooved-joint, stainless-steel-pipe appurtenances; cut grooved joints permitted only fifty feet an higher above house pump level, welded joints at house pump level and up to fifty feet above.

3.13 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use full port ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly, full port ball, or gate valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

2. Throttling Duty: Use full port ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or full port ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.

3. Hot-Water Circulation Piping, Balancing Duty: Calibrated or Memory-stop balancing valves.

4. Drain Duty: Hose-end drain valves, standard port permitted.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Use dual check valves with air gap complying with ASSE 1022 for water supply connections to carbonated, non-carbonated beverage dispensers, coffee makers.

END OF SECTION 22 11 16

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SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Applicable NSF and ASSE Standards, latest edition, unless different edition referred by local authorities.

C. Local code and Health Department rules and regulations.

1.2 DEFINITIONS

A. Recycled water: Non-potable water from any source (storm, sanitary, ground, surface, etc.) which is collected, treated in accordance with applicable standards and authorities requirements, stored, distributed, and used for building water supply needs, including but not limited to water closets and urinal flushing, irrigation, cooling tower or other mechanical make-ups, laundry, window washing, etc.

B. See section 22 05 00 “Common Work Results for Plumbing” for other definitions.

1.3 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Primary backflow preventers.
3. Secondary backflow preventers.
4. Water pressure-reducing valves.
5. Balancing valves.
6. Pressure sustaining valve.
7. Temperature-actuated, water mixing valves.
8. Strainers.
9. Clothes washer and ice maker outlet boxes.
10. Hose stations.
11. Hose bibbs.
12. Hydrants.

13. Drain valves.

14. Water-hammer arresters.

15. Air vents.

16. Trap-seal primer systems.

17. Flexible connectors.

18. Water submeters.

19. Remote registration system

20. Point of use water filters.

21. Pressurized water storage tanks.

B. Related Requirements:

1. Section 22 05 19 "Meters and Gauges for Plumbing Piping" for thermometers, pressure gauges, and flow meters in water piping.

2. Section 22 32 00 "Water Filtration Equipment" for central water filters in domestic water piping.

3. Section 22 41 00 "Plumbing Fixtures" for water filters for water coolers and drinking fountains.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Distribution Piping: 125 psig (860 kPa).

2. Domestic Water Express Risers as required, see riser diagrams.

1.5 PRODUCT SUBMITTALS

A. Project specific product data for each product listed in Section 1.2: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections:

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Water hammer arresters submittal shall include manufacturer sizing installation and selection guide with specific models selected and indicated. Selection shall be based on actual field conditions, pipe length, size, fixtures, manufacturer’s recommendations, etc.

1.6 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For project specific water piping specialties to include in emergency, operation, and maintenance manuals.

B. Testing reports.

1.8 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, date and other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 01 through 09," for potable domestic water plumbing specialties.

2. ASME Compliance for Steel Tanks: Fabricate and label steel, ASME-code, water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

F. Test and inspect water storage tanks according to the following tests and inspections and prepare test reports:

1. Pressure Testing for ASME-Code, Water Storage Tanks: Hydrostatically test to ensure structural integrity and freedom from leaks. Fill tanks with water, vent air, pressurize to 1-1/2 times tank pressure rating, disconnect test equipment, hold pressure for 30 minutes with no drop in pressure, and check for leaks.

2. Pressure Testing for Non-ASME-Code, Pressure, Water Storage Tanks: Hydrostatically test to ensure structural integrity and freedom from leaks at pressure of 50 psig (345 kPa) above system operating pressure, but not less than 150 psig (1035 kPa). Fill tanks with water, vent air, pressurize tanks, disconnect test equipment, hold pressure for two hours with no drop in pressure, and check for leaks.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Water Filter Cartridges: Equal to 200 percent of amount installed for each type and size indicated.

2. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers for non-continuous upstream pressure.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

b. Apollo Valves

c. Watts Regulator Company.

d. Wilkins Water Control Products.

2. Standard: ASSE 1001.

3. Operation: Non-continuous pressure, no back pressure.

4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.

5. Body: Bronze.

6. Inlet and Outlet Connections: Threaded.

7. Finish: Rough bronze in back of the house or concealed Chrome plated if exposed to public view.

8. Accessories: Shut-off valves not permitted downstream.

B. Hose-Connection Vacuum Breakers for non-continuous upstream pressure:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Apollo Valves

   b. MIFAB, Inc.

   c. Watts Regulator Company.

   d. Woodford Manufacturing Company.

   e. Wilkins Water Control Products

2. Standard: ASSE 1011.

3. Operation: Non-continuous pressure, no back pressure.

4. Body: Bronze, nonremovable, with manual drain.

5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.

6. Finish: Chrome or nickel plated.

7. Accessories: Shut-off valves not permitted downstream.

C. Pressure Vacuum Breakers for continuous upstream pressure:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

   b. Apollo Valves

   c. Watts Regulator Company.

   d. Wilkins Water Control Products.

2. Standard: ASSE 1020.

3. Operation: Continuous-pressure applications, no back pressure.

4. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.

5. Accessories: Ball type, on inlet and outlet.

D. Laboratory-Faucet Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Apollo Valves

   b. Watts Regulator Company.

   c. Woodford Manufacturing Company.

   d. Wilkins Water Control Products.

2. Standard: ASSE 1035.

3. Size: NPS 1/4 or NPS 3/8 (DN 8 or DN 10) matching faucet size.

4. Body: Bronze.

5. End Connections: Threaded.

6. Finish: Chrome plated.

E. Spill-Resistant Vacuum Breakers for indoor applications where spillage is not acceptable:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Conbraco Industries, Inc.

   b. Watts Regulator Company.

   c. Wilkins Water Control Products.

2. Standard: ASSE 1056.

3. Operation: Continuous-pressure applications, no back pressure.

4. Accessories: Ball type, on inlet and outlet.

2.3 PRIMARY BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with utility company requirements, provide products approved by the utility company.

2. With absence of utility requirements provide the product indicated on Drawings or a comparable product by one of the following:

a. Ames Fire & Waterworks.

b. Apollo Valves

c. Watts Water Technologies, Inc.

d. Wilkins; a Zurn company.

e. Cla-Val

3. Standard: ASSE 1013 or AWWA C511.

4. Operation: Continuous-pressure applications.

5. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

6. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 (DN 65) and larger.

7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

8. Accessories:

a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products approved by utility company.

2. With absence of provide the product indicated on Drawings or a comparable product by one of the following:

a. Ames Fire & Waterworks.

b. Apollo Valves.

c. Watts Water Technologies, Inc.

d. Wilkins; a Zurn company.

3. Standard: ASSE 1015 or AWWA C510.

4. Operation: Continuous-pressure applications, unless otherwise indicated.

5. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

6. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 (DN 65) and larger.

7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

8. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

C. Reduced-Pressure-Detector, Fire-Protection Backflow Preventer Assemblies:

1. Manufacturers: Subject to compliance with utility company requirements, provide products approved by utility company.

2. With absence of requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Ames Fire & Waterworks; a division of Watts Regulator Co.

   b. Apollo Valves.

   c. Watts Water Technologies, Inc.

   d. Wilkins; a Zurn company.

3. Standards: ASSE 1047 and UL listed or FMG approved.

4. Operation: Continuous-pressure applications.

5. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

6. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved or Stainless steel.

7. End Connections: Flanged.

8. Accessories:

   a. Valves: UL 262, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.

   b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

   c. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

D. Double-Check, Detector-Assembly Backflow Preventers:

1. Manufacturers: Subject to compliance with utility company requirements, provide products acceptable by utility company.

2. With absence of requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Ames Fire & Waterworks; a division of Watts Regulator Co.

   b. Apollo Valves.

   c. Watts Water Technologies, Inc.

   d. Wilkins; a Zurn company.

3. Standards: ASSE 1048 and UL listed or FMG approved.

4. Operation: Continuous-pressure applications.

5. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

6. Body: Cast iron with interior lining complying with AWWA C550 or that is FDA approved or Stainless steel.

7. End Connections: Flanged.

8. Accessories:

   a. Valves: UL 262, FMG-approved, OS&Y gate type with flanged ends on inlet and outlet.

   b. Bypass: With utility company displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

E. Backflow Preventer Test Kits:

1. Manufacturers: Same as selected backflow preventer manufacturer.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.4 SECONDARY BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers for certain types of kitchen equipment, but not for carbonated beverage dispensers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Apollo Valves.

b. Honeywell International Inc.

c. Watts Regulator Company.

d. Wilkins Water Control Products.

2. Standard: ASSE 1012.

3. Operation: Continuous-pressure applications.

4. Size: NPS 1/2 (DN 15) or NPS 3/4 (DN 20).

5. Body: Bronze.

6. End Connections: Union, solder or Solder joint.

7. Finish: Chrome plated or Rough bronze.

8. Accessories:

a. Fixed air gap and drain.

b. Shut-off valve.

B. Reduced-Pressure-Principle Backflow Preventers, for certain types of kitchen equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

b. Apollo Valves

c. Watts Water Technologies, Inc.

2. Standard: ASSE 1013.

3. Operation: Continuous-pressure applications, subject to back pressure.

4. Pressure Loss: 12 psig (83 kPa) maximum, through middle third of flow range.

5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 (DN 65) and larger.

6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged or grooved for NPS 2-1/2 (DN 65) and larger.

7. Configuration: Designed for horizontal, straight-through vertical-inlet, horizontal-center-section, and vertical-outlet flow.

8. Accessories:

   a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.

   b. Valves NPS 2-1/2 (DN 65) and Larger: Non-rising stem (NRS) gate type with flanged ends on inlet and outlet.

   c. Fixed Air-Gap Fitting: ASME A112.1.2, size matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.

   b. Apollo Valves.

   c. Watts Regulator Company.

   d. Wilkins Water Control Products.

2. Standard: ASSE 1015.

3. Operation: Continuous-pressure applications unless otherwise indicated.

4. Pressure Loss: 5 psig (35 kPa) maximum, through middle third of flow range.

5. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved or stainless steel for NPS 2-1/2 (DN 65) and larger.

6. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged, or grooved for NPS 2-1/2 (DN 65) and larger.

7. Accessories:

   a. Valves NPS 2 (DN 50) and Smaller: Ball type with threaded ends on inlet and outlet.

   b. Valves NPS 2-1/2 (DN 65) and Larger: Non-raising stem (NRS) gate type with flanged ends on inlet and outlet.

D. Dual check valves with atmospheric port for Carbonated and Non-Carbonated, Beverage-Dispensing-Equipment Backflow Preventers, espresso machines backflow preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company. Model SD-2,

      Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products. Model 740

   b. Anderson Brass Co Model ABF-1

2. Backflow preventer supplied as integral part of beverage dispenser will be acceptable, if the device meets requirements of this section.

3. Standard: ASSE 1022.

4. Operation: Continuous-pressure applications.

5. Size: NPS 1/4 or NPS 3/8 (DN 8 or DN 10) only.

6. Body: Stainless steel.

7. End Connections: Threaded.

8. Accessories:

   a. Fixed air gap and drain.

   b. Shut-off valve

   c. Plastic tubing downstream of the backflow preventer.

E. Dual-Check-Valve Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Apollo Valves

   b. Mueller Water Products Inc.

   c. Watts Regulator Company.

   d. Wilkins Water Control Products.

2. Standard: ASSE 1024.

3. Operation: Continuous-pressure applications.

4. Size: NPS 1/2 (DN 15) NPS 3/4 (DN 20) NPS 1 (DN 25) NPS 1-1/4 (DN 32).

5. Body: Bronze with union inlet.

F. Dual-Check-Valve Standard ASSE 1032-shall not be used as backflow preventer:

G. Hose-Connection Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Apollo Valves

b. Watts Regulator Company.

c. Woodford Manufacturing Company.

d. Wilkins

2. Standard: ASSE 1052.

3. Operation: Up to 10-foot head of water (30-kPa) back pressure.

4. Inlet Size: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).

5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.

6. Capacity: At least 3-gpm (0.19-L/s) flow.

H. Backflow-Preventer Test Kits:

1. Manufacturers: Same as selected backflow preventer manufacturer.

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.5 WATER PRESSURE-REDUCING VALVES

A. Branch Water Pressure Reducing Valves:

1. General: Shall maintain a constant downstream pressure (plus or minus 3 PSI) regardless of changing inlet pressures and/or flow rates. All flow conditions from zero to full flow are to be handled in a stable manner. The valve shall close drop tight when the downstream pressure rises to the setting of the spring. No pressure "creep" or leak can be tolerated. Valve body and cover shall be of an all bronze construction. The trim shall be 416 stainless steel. The valve shall contain an integral chrome nickel stainless steel strainer.

All repairs shall be possible without removing the valve body from the line. The valve body shall be constructed of NPT union tail pieces at the inlet and outlet of the valve.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Apollo Valves

   b. Honeywell International Inc.

   c. Watts Regulator Company.

   d. Wilkins Water Control Products.

3. Standard: ASSE 1003.

4. Pressure Rating: Maximum working pressure of 300 psig (2070 kPa).

5. Design Outlet Pressure Setting: 25 to 75psi.

6. Body: Bronze with chrome-plated finish for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

7. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 and NPS 3 (DN 65 and DN 80).

B. Main Pressure Reducing Valves:

1. General:

   a. Provide zones pressure regulating valve rigs to control the water pressure sizes as indicated on the drawings and detail. Valve rigs shall consist of the following: Shall maintain a constant downstream pressure plus or minus 1% of the set pressure regardless of fluctuations in demand and/or varying inlet pressures. The valve shall be capable of keeping the outlet pressure constant from zero flow to maximum rated flow. No low flow chatter or hunting will be acceptable.

2. Provide a nickel stainless steel strainer before each assembly.

3. Low-Flow main pressure reducing valve shall be the same as noted here-in for branch pressure reducing valves.

4. See detail on drawings for valve arrangement and sizes.

5. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. CLA-VAL.

b. Bermad.

c. Watts Water Technologies, Inc..

d. Wilkins Water Control Products.

e. Singer

6. Hi-Flow main pressure reducing valves are to be pilot operated, hydraulically controlled, diaphragm type globe valves. Valves to have a single removable seat and a resilient disc. The stem shall be guided at both ends by a bearing in the cover and a bearing in the valve seat.

7. Pressure Rating: Maximum working pressure of 300 psig (2070 kPa) minimum with AWWA C550 or FDA-approved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.

8. Main Valve Body: Cast- or ductile-iron or all bronze body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.

   a. Size: See drawings.

   b. Pattern: Angle or Globe-valve design.

   c. Trim: Stainless steel.

9. Design Flow: See drawings.

10. Design Inlet and Outlet Pressure: See drawings

11. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

C. Excess Pressure Shutoff Valve:

1. Excess pressure shutoff valve shall close drop tight if the pressure at the valve inlet rises above the set point of the pilot control and shall remain closed until the inlet pressure drops below the set point of the control and the manual reopening control has been opened to reset the main valve. The valve shall be cast iron with bronze trim and all cast iron wetted parts shall be epoxy-coated by the fusion process.

2. The pilot control shall be a direct-acting adjustable, springloaded, normally open diaphragm valve, designed to permit flow when inlet controlling pressure is less than the spring setting.

3. The control system shall incorporate a manual locking valve designed to keep the valve in the closed position when it has once been actuated to the closed position. The valve shall be so mounted that if the main valve diaphragm ruptures the valve will go closed.

4. Excess Pressure Shutoff Safety Valve Operation

   a. Under normal conditions the excess shutoff safety valve will be open. The pressure relief control is normally closed and responds to inlet pressure changes. An increase in inlet pressure tends to open the control. When inlet pressure is higher than the set point of the control, the control opens. This pressurizes the cover of the main valve and the main valve closes, and remains closed until it is reset.

   b. The main valve shall be sized and located as shown on the drawings and as described in these specifications. The valve body and cover shall be cast bronze ASTM B-62. The valve shall be supplied with 150 ASA screwed ends, and bronze trim.

   c. The main valve shall be hydraulically operated and diaphragm-actuated and shall contain a resilient, synthetic rubber disc, having a rectangular cross-section, contained on three sides by a disc retainer and forming a tight seal, against a single removable seat insert. The diaphragm assembly containing a valve stem shall be fully guided at both ends by a bearing in the cover an integral bearing in the valve seat. This diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. The diaphragm shall consist of nylon fabric bonded with synthetic rubber. Packing glands and/or stuffing boxes are not permitted in the main valve or any of the controls. All necessary repairs shall be possible without removing the main valve body from the line.

   d. The pilot control shall be a direct-acting, adjustable, spring-loaded, diaphragm valves, designed to permit flow when controlling pressure exceeds the spring setting, it shall be adjustable from 0-75 psi.

   e. Provide hi-pressure flow switch wired back to remote building alarm panel when valve is closed.

2.6 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

      a. Armstrong International, Inc.

      b. Nexus.

      c. ITT Corporation; Bell & Gossett Div.

      d. NIBCO Inc.

      e. TACO Incorporated.

f. Watts Regulator Company.

2. Type: Ball or Y-pattern globe valve with two readout ports and memory-setting indicator.

3. Body: Brass or bronze.

4. Size: Same as connected piping, but not larger than NPS 2 (DN 50).

5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Apollo Valves.

b. Nexus.

c. ITT Corporation; Bell & Gossett Div.

d. NIBCO Inc.

e. TACO.

f. Watts Regulator Company.

2. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.

3. Size: Same as connected piping, but not smaller than NPS 2-1/2 (DN 65).

4. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

C. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Apollo Valves

b. Crane Valves.

c. Stockham Valves.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO Inc.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.

3. Pressure Rating: 400-psig (2760-kPa) minimum CWP.

4. Size: NPS 2 (DN 50) or smaller.

5. Body: Copper alloy.

6. Port: Standard or full port.

7. Ball: Chrome-plated brass.

8. Seats and Seals: Replaceable.

9. End Connections: Solder joint or threaded.

10. Handle: Vinyl-covered steel with memory-setting device.

2.7 PRESSURE SUSTAINING VALVES

A. Fast Opening, Slow Closing Completely Automatic Pressure Sustaining Valve:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. CLAVAL Model 550-01, 6550-01.

b. Bermad. Model 73D

c. Singer. Model 106-DG

2. Type: Hydraulically operated, pilot controlled modulating valve.

3. Body: 316 Series stainless steel, electropolished, full port.

4. Pressure Rating: ANSI Class 150 max 285 psi.

2.8 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Armstrong International, Inc.

b. Apollo Valves

c. Honeywell International Inc.

d. Leonard Valve Company.

e. Symmons Industries, Inc.

f. TACO Incorporated.

g. Watts Regulator Company.

h. Wilkins Water Control Products.

2. Standard: ASSE 1070.

3. Pressure Rating: 125 psig (860 kPa).

4. Type: Thermostatically controlled, water mixing valve.

5. Material: Bronze body with corrosion-resistant interior components.

6. Connections: Threaded or union inlets and outlet.

7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.

8. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves and Valve Stations:

1. Manufacturers: Subject to compliance with all project requirements (flow, pressure rating, allowable pressure loss, space requirements), provide one of the following:

a. Holby.

b. Armstrong International, Inc.

c. Lawler Manufacturing Company, Inc.

d. Leonard Valve Company.

e. Powers; a division of Watts Water Technologies, Inc. (Base of design)

f. Symmons Industries, Inc.

2. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets to each valve and shutoff valve on each outlet.

3. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.

4. Pressure Rating: 150 psig minimum working pressure unless otherwise indicated.

5. Type: Exposed-mounted or Cabinet-type, thermostatically controlled, water mixing valve stations. Where required by the design conditions provide water mixing-valve assembly in two or three-valve parallel arrangement to accommodate low/high flow conditions.

6. Maximum allowable pressure drop through the mixing valve station: 5 PSI.

7. Material: Bronze or stainless steel body with corrosion-resistant interior components. All wetted parts to be ANSI/NSF 372 compliant.

8. Connections: Threaded, union or flanged inlets and outlet.

9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle or controller. Provide pressure gages on inlet and outlet of all mixing valves and mixing valve stations.

10. Valve Finish: Polished, chrome plated.

11. Cabinet: Factory fabricated, stainless steel, for recessed or surface mounting and with hinged, stainless-steel door.

12. Provide anti-scald measures as recommended by the valve manufacturer in case of valve failure.

C. Individual-Fixture, Water Tempering Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Apollo Valves

   b. Honeywell International Inc.

   c. Lawler Manufacturing Company, Inc.

   d. Leonard Valve Company.

   e. Watts Water Technologies, Inc.

   f. Wilkins Water Control Products.

2. Standard: ASSE 1016, thermostatically controlled, water tempering valve.

3. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.

4. Body: Bronze body with corrosion-resistant interior components.

5. Temperature Control: Adjustable.

6. Inlets and Outlet: Threaded.

7. Finish: Rough or chrome-plated bronze.

2.9 STRAINERS FOR WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig (860 kPa) minimum unless otherwise indicated.

2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 (DN 65) and larger.

3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.

4. Screen: Stainless steel with round perforations unless otherwise indicated.

5. Perforation Size:

a. Strainers NPS 2 (DN 50) and Smaller: 0.020 inch (0.51 mm).

b. Strainers NPS 2-1/2 to NPS 4 (DN 65 to DN 100): 0.045 inch (1.14 mm).

c. Strainers NPS 5 (DN 125) and Larger: 0.10 inch (2.54 mm).

6. Drain: Pipe plug.

7. Strainers installed with water meters shall be of the same manufacturer as the water meter.

8. Strainers at the water meters shall be of the same manufacturer as the water meter itself.

2.10 OUTLET BOXES

A. Clothes Washer Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Acorn Engineering Company.

b. Oatey.

c. Symmons Industries, Inc. – Base of Design.

d. Watts Regulator Company.

e. Acorn Engineering Company.

f. Zurn Industries, LLC.

2. Mounting: Recessed.

3. Material and Finish: Enameled-steel or epoxy-painted-steel or Stainless-steel box and faceplate. Plastic box is not permitted.

4. Faucet: Combination valved fitting or separate hot- and cold-water valved fittings complying with ASME A112.18.1. Include garden-hose thread complying with ASME B1.20.7 on outlets.

5. Supply Shutoff Fittings: NPS 1/2 (DN 15) gate, globe, or ball valves and NPS 1/2 (DN 15) copper, water tubing.

6. Drain: NPS 2 (DN 50) standpipe and P-trap for direct waste connection to drainage piping.

7. Inlet Hoses: Two 60-inch- (1500-mm-) long, heavy duty branded stainless steel clothes washer inlet hoses with female, garden-hose-thread couplings. Include rubber washers.

8. Drain Hose: One 48-inch- (1200-mm-) long, rubber household clothes washer drain hose with hooked end.

9. Automatic Washing Machine Water Shutoff Valves with Leak Sensor.

    a. General automatic washing machine solenoid shutoff valves with Leak Sensor to protect against water damage from a burst inlet hose connected to a washing machine in use or unattended.

    b. The system shall be similar to Watts Series A2C IntelliFlow or approved equal. The system shall:

        1) Sense when the washing machine is on or off

        2) Opens or close the hot and cold inlet valves as needed to allow or prevent water from flowing to the washer.

        3) Detect water leak, close both solenoid valves on cold and hot water supply if the leak detected.

    c. The system consists of an electrical three-prong outlet to receive a washing machine power cable, leak sensor, a power cord and a replaceable internal strainer screen.

B. Icemaker Outlet Boxes:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

    a. Acorn Engineering Company.

b. IPS Corporation.

c. LSP Products Group, Inc.

d. Oatey.

2. Mounting: Recessed.

3. Material and Finish: Enameled-steel or epoxy-painted-steel Stainless-steel box and faceplate. Plastic box is not permitted.

4. Faucet: Valved fitting complying with ASME A112.18.1. Include NPS 1/2 (DN 15) or smaller copper tube outlet.

5. Supply Shutoff Fitting: NPS 1/2 (DN 15) gate, globe, or ball valve and NPS 1/2 (DN 15) copper, water tubing.

2.11 HOSE STATIONS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

1. Armstrong International, Inc.

2. Leonard Valve Company.

3. T & S Brass.

B. Single-Temperature-Water Hose Stations:

1. Standard: ASME A112.18.1.

2. Cabinet: Stainless-steel enclosure with exposed valve handle, hose connection, and hose rack. Include thermometer in front.

3. Hose-Rack Material: Stainless steel.

4. Body Material: Bronze with stainless-steel wetted parts.

5. Body Finish: Rough bronze.

6. Mounting: Wall, with reinforcement or Floor, with stainless-steel pedestal.

7. Supply Fittings: gate, globe, or ball valve and check valve and copper, water tubing. Omit check valve if check stop is included with fitting.

8. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 50 feet (15 m) long.

9. Nozzle: With hand-squeeze, on-off control.

10. Vacuum Breaker:

    a. Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

C. Hot- and Cold-Water Hose Stations or Steam and Cold Water Stations:

1. Standard: ASME A112.18.1.

2. Faucet Type: Blending Thermostatic mixing valve.

3. Cabinet: Stainless-steel enclosure with exposed valve handles, hose connection, and hose rack. Include thermometer in front.

4. Hose-Rack Material: Stainless steel.

5. Body Material: Bronze with stainless-steel wetted parts.

6. Body Finish: Rough bronze.

7. Mounting: Wall, with reinforcement or Floor, with stainless-steel pedestal.

8. Supply Fittings: Two gate, globe, or ball valves and check valves and copper, water tubing. Omit check valves if check stops are included with fitting.

9. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 50 feet (15 m) long.

10. Nozzle: With hand-squeeze, on-off control.

11. Vacuum Breaker: Integral or factory-installed, nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052; and garden-hose thread complying with ASME B1.20.7 on outlet.

2.12 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.

2. Body Material: Bronze.

3. Seat: Bronze, replaceable.

4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.

5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.

6. Pressure Rating: 125 psig (860 kPa).

7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.

8. Finish for Equipment Rooms and service areas: Rough bronze.

9. Finish for Finished Rooms: Chrome or nickel plated.

10. Operation: Wheel handle or operating key.

11. Include operating key with each operating-key hose bibb.

12. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.13 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Josam Company.

b. MIFAB, Inc.

c. Wade.

d. Watts Drainage Products.

e. Woodford Manufacturing Company.

f. Zurn Industries, LLC; Plumbing Products Group.

2. Standard: ASME A112.21.3M for self-draining wall hydrants.

3. Pressure Rating: 125 psig (860 kPa).

4. Operation: Loose key.

5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.

6. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).

7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.

8. Box: Deep, flush mounted with cover.

9. Wall hydrants without integral vacuum breaker permitted for non-potable water only.

10. Box and Cover Finish: By Architect.

11. Operating Keys(s): With each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company.

   b. Tyler Pipe; Wade Div.

   c. Watts Drainage Products.

   d. Woodford Manufacturing Company.

   e. Zurn Industries, LLC; Plumbing Products Group.

2. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.

3. Pressure Rating: 125 psig (860 kPa).

4. Operation: Loose key.

5. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.

6. Inlet: NPS 3/4 or NPS 1 (DN 20 or DN 25).

7. Outlet: Concealed.

8. Box: Deep, flush mounted with cover.

9. Box and Cover Finish: Polished nickel bronze or Chrome plated.

10. Vacuum Breaker:

   a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

   b. Garden-hose thread complying with ASME B1.20.7 on outlet.

11. Operating Keys(s): One with each wall hydrant.

C. Vacuum Breaker Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Watts Regulator Company.

   b. Woodford Manufacturing Company; a division of WCM Industries, Inc.

   c. Zurn Industries, LLC; Plumbing Products Group.

2. Standard: ASSE 1019, Type A or Type B.

3. Type: Freeze-resistant, automatic draining with integral air-inlet valve.

4. Classification: For automatic draining with hose removed.

5. Pressure Rating: 125 psig (860 kPa).

6. Operation: Loose key or wheel handle.

7. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.

8. Inlet: NPS 1/2 or NPS 3/4 (DN 15 or DN 20).

9. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.14 GROUND HYDRANTS

A. Nonfreeze Ground Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Josam Company.

   b. MIFAB, Inc.

   c. Wade Div.

   d. Watts Drainage Products.

   e. Woodford Manufacturing Company.

   f. Zurn Industries, LLC; Plumbing Products Group.

2. Standard: ASME A112.21.3M.

3. Type: Nonfreeze, concealed-outlet ground hydrant with box.

4. Operation: Loose key.

5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.

6. Inlet: NPS 3/4 (DN 20).

7. Outlet: Garden-hose thread complying with ASME B1.20.7.

8. Drain: Designed with hole to drain into ground when shut off.

9. Box: Standard or Deep pattern with cover.

10. Box and Cover Finish: By Architect.

11. Operating Key(s): Two with each ground hydrant.

12. Vacuum Breaker:

    a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

2.15 POST HYDRANTS

A. Nonfreeze, Draining-Type Post Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

    a. MIFAB, Inc.

    b. Simmons Manufacturing Co.

    c. Wade Div.

    d. Watts Drainage Products.

    e. Woodford Manufacturing Company.

    f. Zurn Industries, LLC.

2. Standard: ASME A112.21.3M.

3. Type: Nonfreeze, exposed-outlet post hydrant.

4. Operation: Loose key.

5. Casing and Operating Rod: Of at least length required for burial of valve below frost line.

6. Casing: Bronze with casing guard.

7. Inlet: NPS 3/4 (DN 20).

8. Outlet: Garden-hose thread complying with ASME B1.20.7.

9. Drain: Designed with hole to drain into ground when shut off.

10. Vacuum Breaker:

    a. Nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.

    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

11. Operating Key(s): One with each loose-key-operation wall hydrant.

B. Nonfreeze, Nondraining-Type Post Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

    a. Murdock-Super Secur; a division of Acorn Engineering Company.

    b. Wood Ford

2. Operation: Lever-piston operating mechanism and nondraining water-storage reservoir, designed without drain.

3. Length: As required for burial of valve below frost line.

4. Inlet: NPS 1 (DN 25) threaded.

5. Outlet:

    a. NPS 1 (DN 25) outlet and coupling plug for 1-inch (25-mm) hose.

    b. NPS 1 by NPS 3/4 (DN 25 by DN 20) adapter with nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.

    c. Garden-hose thread complying with ASME B1.20.7 on outlet.

    d. NPS 1 by NPS 3/4 (DN 25 by DN 20) adapter with nonremovable, drainable, hose-connection backflow preventer complying with ASSE 1052.

    e. Garden-hose thread complying with ASME B1.20.7 on outlet.

C. Freeze-Resistant Sanitary Non-Drinking Yard Hydrants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

   a. Hoeptner Products.

   b. Wood-Ford

2. Standard: ASSE 1057, Type 5 for nondraining hydrants.

3. Operation: Wheel handle.

4. Head: Copper alloy, with pail hook.

5. Inlet: NPS 3/4-inch (DN 20) threaded inlet and inlet nozzle, galvanized-steel riser, and venturi.

6. Canister: Zinc-plated steel with atmospheric-vent device.

7. Vacuum Breaker:

   a. Removable hose-connection backflow preventer complying with ASSE 1052.

   b. Garden-hose thread complying with ASME B1.20.7 on outlet for field installation.

2.16 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.

2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.

3. Size: NPS 1 (DN 25), unless larger size indicated on the drawings.

4. Body: Copper alloy.

5. Ball: Chrome-plated brass.

6. Seats and Seals: Replaceable.

7. Handle: Vinyl-covered steel.

8. Inlet: Threaded or solder joint.

9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-80 for gate valves.
2. Pressure Rating: Class 125.
3. Size: NPS 1 (DN 25), unless larger size indicated on the drawings.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
3. Size: NPS 3/4 (DN 20).
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 (DN 6) side outlet with cap.

2.17 WATER-HAMMER ARRESTERS (SHOCK ABSORBERS)

A. Manufacturers:

1. Josam Company.
2. MIFAB, Inc.
3. Precision Plumbing Products, Inc.
4. Sioux Chief Manufacturing Company, Inc.
5. Tyler Pipe; Wade Div.
6. Watts.
7. Zurn Industries, LLC.

B. Standard: ASSE 1010 or PDI-WH 201.

C. Type: Metal bellows or Copper tube with piston.

D. Size and amount: As per manufacturer's recommendations and PDI-WH-201 standard, but no less than 1" pipe size. Exception: ¾" permitted on ¾" piping.

2.18 AIR VENTS

A. Bolted-Construction Automatic Air Vents:

1. Body: Bronze.

2. Pressure Rating and Temperature: 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C).

3. Float: Replaceable, corrosion-resistant metal.

4. Mechanism and Seat: Stainless steel.

5. Size: NPS 1/2 (DN 15) minimum inlet.

6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents:

1. Body: Stainless steel.

2. Pressure Rating: 150-psig (1035-kPa) minimum pressure rating.

3. Float: Replaceable, corrosion-resistant metal.

4. Mechanism and Seat: Stainless steel.

5. Size: NPS 3/8 (DN 10) minimum inlet.

6. Inlet and Vent Outlet End Connections: Threaded.

2.19 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. MIFAB, Inc.

b. Precision Plumbing Products, Inc.

c. Sioux Chief Manufacturing Company, Inc.

d. Watts Regulator Company.

e. Kohler

2. Standard: ASSE 1018.

3. Pressure Rating: 125 psig (860 kPa) minimum.

4. Body: Bronze.

5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.

6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.

7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. MIFAB Inc.

b. Zurn

c. Precision Plumbing Products, Inc.

d. Kohler

2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.

3. Size: NPS 1-1/4 (DN 32) minimum.

4. Material: Chrome-plated, cast brass.

2.20 ELECTRONIC TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Precision Plumbing Products, Inc.

b. Zurn

c. MIFAB

2. Standard: ASSE 1044.

3. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing.

4. Cabinet: Surface-mounted steel box with stainless-steel cover.

5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.

   a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

6. Vacuum Breaker: ASSE 1001.

7. Size Outlets: NPS 1/2 (DN 15).

2.21 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

1. Flex-Hose Co., Inc.

2. Flexicraft Industries.

3. Flex Pression, Ltd.

4. Flex-Weld Incorporated.

5. Metraflex, Inc.

6. Unaflex.Universal Metal Hose.

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).

2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.

3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig (1380 kPa).

2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.

3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

D. Flexible connectors used for domestic water shall be NSF-61 approved.

2.22 WATER SUBMETERS

A. All submeters and their accessories shall comply with the latest edition of "Water company regulations".

B. Displacement-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Metron-Farnier.

b. Hersey.

c. Badger.

d. Sensus.

e. Neptune.

2. Description:

a. Standard: AWWA C700.

b. Pressure Rating: 150-psig (1035-kPa) working pressure.

c. Body Design: Nutating disc; totalization meter.

d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.

e. Case: Bronze.

f. End Connections: Threaded.

C. Turbine-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Badger Meter, Inc.

b. Sensus.

c. Neptune Inc.

2. Description:

a. Standard: AWWA C701.

b. Pressure Rating: 150-psig (1035-kPa) working pressure.

c. Body Design: Turbine; totalization meter.

d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.

e. Case: Bronze.

f. End Connections for Meters NPS 2 (DN 50) and Smaller: Threaded.

g. End Connections for Meters NPS 2-1/2 (DN 65) and Larger: Flanged.

D. Compound-Type Water Meters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Metron-Farnier.

b. Badger Meter, Inc.

c. Master Meter, Inc.

d. Mueller Co. Ltd.

e. Schlumberger Limited.

f. Sensus.

g. Neptune, Inc.

2. Description:

a. Standard: AWWA C702.

b. Pressure Rating: 150-psig (1035-kPa) working pressure.

c. Body Design: With integral mainline and bypass meters; totalization meter.

d. Registration: In gallons (liters) or cubic feet (cubic meters) as required by utility company.

e. Case: Bronze.

f. Pipe Connections: Flanged.

E. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

F. Remote Registration System: Encoder type complying with AWWA C707; modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company.

2.23 REMOTE REGISTRATION FOR UTILITY METERS AND SUB-METERS

A. Direct-Reading Type:

1. Description: Utility company standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

a. Standard: AWWA C706.

b. Registration: Flow in gallons (liters) or cubic feet (cubic meters) as required by utility company.

c. This contractor is responsible for coordinating of wiring between water meter and remote reading device. Wiring by electrical trade.

B. Encoder Type:

1. Description: Utility company standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

a. Standard: AWWA C706, C707.

b. Registration: Flow in gallons (liters) cubic feet (cubic meters) as required by utility company.

c. Data-Acquisition Units: Comply with utility company requirements for type and quantity.

d. Visible Display Units: Comply with utility company requirements for type and quantity.

2. All main building water meters shall use radio-based automatic meter reading system using AMR transmitters. Transmitters shall be mounted on the exterior surface of a building wall above ground level, unless otherwise specified by the water department AMR radio transmitters for cooling tower make-up water meters located on an upper floor of a building shall be mounted on the exterior of the building wall at a roof parapet or other location to remit effective transmission of the radio signal.

3. Meter Attachments

a. No customer shall attach any device to the water meter unless such device has been submitted to, and approved by, the department.

b. No device submitted for approval shall interfere with or affect the operation, inspection or reading of the meter in any way.

c. Any device approved shall be solely the responsibility of the customer unless it is installed by the Department. The Department shall not be liable for any maintenance or replacement of any approved attachments to the meter, and shall not perform any additional steps to salvage the devices should the meter require replacement.

2.24 POINT OF USE WATER FILTERS

A. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Filtrine Manufacturing Company.

b. U.S. Filter; Filterite Div.

c. Watts Industries, Inc.

d. Better Waters

B. General: Cartridge-type assemblies suitable for potable water. Include housing, fittings, filter cartridges, and cartridge end caps.

C. Wall-Mounting Type: Housing head section with threaded inlet and outlet, mounting bracket, and removable lower section for 10-inch- (250-mm-) long filter cartridge.

1. Housing Material: Stainless steel, 150-psig (1035-kPa) Plastic, 125-psig (860-kPa) minimum operating pressure.

2. Cartridge: Manufacturer Standard filter media, 10 inches (250 mm), 10-micron-particulate removable rating.

D. Floor-Mounting Type: Stainless-steel housing rated at 150-psig (1035-kPa) minimum operating pressure.

1. Base Section: Floor-mounting section with inlet and outlet connections and removable top section for one or more 10-micron-particulate, removable-rating cartridges.

2. Connections, NPS 2 (DN 50) and Smaller: Threaded.

3. Connections, NPS 2-1/2 (DN 65) and Larger: Flanged.

4. Cartridges: Manufacturer Standard filter media.

2.25 STEEL, PRECHARGED, WATER STORAGE TANKS

A. Steel, Precharged, Diaphragm, Water Storage Tanks:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. AMTROL, Inc.

b. Armstrong Pumps, Inc.

c. Flexcon Industries; Plumbing & Heating Division.

d. Flo Fab Inc.

e. Myers; Pentair Pump Group.

f. State Industries, Inc.

g. Taco, Inc.

h. Wessels Company.

2. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.

3. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.

4. Operation: Factory-installed, butyl-rubber diaphragm.

B. Steel, Precharged, Bladder, Water Storage Tanks:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Armstrong Pumps, Inc.

b. Taco, Inc.

c. Wessels Company.

d. Wood, John Co.

2. Description: Steel, vertical, pressured-rated tank with cylindrical sidewalls and with air-charging valve and air precharge.

3. Fabricate supports and attachments to tank with reinforcement strong enough to resist tank movement during seismic event when tank supports are anchored to building structure.

4. Operation: Factory-installed, butyl-rubber bladder.

C. Construction: ASME code, steel, constructed with nontoxic welded joints, for 125-psig (860-kPa) 150-psig (1035-kPa) working pressure.

D. Tappings: Factory-fabricated stainless steel, welded to tank before testing and labeling.

1. NPS 2 (DN 50) and Smaller: ASME B1.20.1, with female thread.

2. NPS 2-1/2 (DN 65) and Larger: ASME B16.5, flanged.

E. Specialties and Accessories: Include tappings in tank and the following:

1. Pressure gage.

2. Shut Off Valve

F. Vertical Tank Supports: Factory-fabricated steel legs or steel skirt, welded to tank before testing and labeling.

G. Tank Interior Finish: Materials and thicknesses complying with NSF 61 barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.

1. Coating: Epoxy resin Galvanized Glass or Nickel.

H. Exterior Coating: Manufacturer's standard enamel paint.

PART 3 - EXECUTION

3.1 DEVICES INSTALLATION

A. Install secondary backflow preventers in each water supply connection to mechanical, and kitchen, equipment, systems, appliances and to other equipment and water systems that may be sources of contamination and as required by local codes. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system, unless equipment (cooling tower) is in un-heated space.

2. Install drain for backflow preventers with atmospheric-vent drain connection with fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate fixed air-gap device attached to backflow preventer. Simple air breaks are unacceptable for this application.

3. Do not install bypass piping around backflow preventers.

4. Install vacuum breakers at least 12" above highest point of water use.

5. Do not install copper tubing between backflow preventer and carbonated beverage dispenser.

B. Install water pressure regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet of each regulator.

C. Install all types of water-control valves with inlet and outlet shutoff valves and bypass with globe valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

F. Install pre-manufactured cabinet-type units recessed in or surface mounted on wall or ceiling as specified.

G. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve solenoid valve water heater and filter.

H. Install outlet boxes recessed in wall or surface mounted on wall. Install wall reinforcement between studs.

I. Install hose stations with check stops or shutoff valves on inlets and with thermometer on outlet.

J. Install pre-manufactured cabinet-type units recessed in or surface mounted on wall as specified. Install wall reinforcement between studs.

K. Install ground hydrants with 1 cu. yd. (0.75 cu. m) of crushed gravel around drain hole. Set ground hydrants with box flush with grade.

L. Install draining-type post hydrants with 1 cu. yd. (0.75 cu. m) of crushed gravel around drain hole. Set post hydrants in concrete paving or in 1 cu. ft. (0.03 cu. m) of concrete block at grade. Provide drain valve, drain piping, spill indirectly over nearest floor drain or janitors sink.

M. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.

N. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

O. Provide "non-potable water" warning signs for all hydrants supplied of recycled water systems.

P. Install water meters and their accessories in accordance to are latest edition of Utility water company regulations.

Q. Install air vents at high points of water piping unless high point is active water supply connection. Install drain tubing at relief valve discharge port and spill onto floor drain via air gap.

R. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

S. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

T. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

U. Install main pressure reducing valves assemblies as per detail on the drawings.

V. Install pressure sustaining valves on the high demand branches.

W. Provide water hammer arresters (shock absorbers) where required and immediately adjacent to all pieces of equipment wherein quick closing valves including: single lever shower valves and flush valves are installed, including all equipment with solenoid valves such as but not limited to laundry washers, dish washers, pot washers, cooling tower make-up, etc. Install water hammer arresters between last two fixtures served, if branch piping is less than 20 feet long. For piping longer than 20 feet, size and locate shock absorbers shall be as recommended by the manufacturer whose product is used. The system shall be tested prior to the walls closing, to ensure no water hammer occurs in it.

X. Install check valves upstream of every water filter to prevent filter housing rupture in case of vacuum in the system.

3.2 TANKS INSTALLATION

A. Install vertical water storage tanks on minimum 4” high concrete bases, or dunnage level and plumb, firmly anchored. Arrange so devices needing servicing are accessible. Install horizontal tanks on concrete piers and factory-fabricated or fabricated steel supports and saddles.

B. Anchor tank supports and tanks to substrate. Use steel or FRP straps over or around plastic tanks.

C. Install tank seismic restraints.

D. Install thermometers and pressure gages on water storage tanks and piping. Thermometers and pressure gages are specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

E. Install the following devices on tanks:

1. Temperature and pressure relief valves.

2. Vacuum relief valves.

3. Tank vents and overflows on nonpressure tanks.

4. Connections to accessories.

F. After installing tanks with factory finish, inspect finishes and repair damages to finishes.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water storage tanks to allow service and maintenance.

C. Connect water piping to water storage tanks with unions or flanges and with shutoff valves. Connect tank drains with shutoff valves and discharge over closest floor drains.

1. Water Piping Connections: Make connections to dissimilar metals with dielectric fittings. Dielectric fittings are specified in Section 22 11 16 "Domestic Water Piping."

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or permanent sign on or near each of the following:

1. Pressure vacuum breakers.

2. All backflow preventers.

3. Water pressure-reducing and pressure-sustaining valves.

4. Balancing valves.

5. Thermostatic water mixing valves.

6. Hose stations.

7. Trap-seal primer valves.

8. Water hammer arresters.

9. Tanks.

10. Visible manufacturer’s logo is not permitted in public areas.

11. Include date of installation on all nameplates.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker backflow preventer and meter according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.6 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing and pressure-sustaining valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

3.7 CLEANING

A. Clean and disinfect water storage tanks.

B. Use purging and disinfecting procedure for potable water tanks prescribed by authorities having jurisdiction or, if method is not prescribed, use procedure described in AWWA C652 or as described below:

1. Purge water storage tanks with potable water.

2. Disinfect tanks by one of the following methods:

a. Fill tanks with water-chlorine solution containing at least 50 ppm (50 mg/L) of chlorine. Isolate tanks and allow to stand for 24 hours.

b. Fill tanks with water-chlorine solution containing at least 200 ppm (200 mg/L) of chlorine. Isolate tanks and allow to stand for three hours.

3. Flush tanks, after required standing time, with clean, potable water until chlorine is not present in water coming from tank.

4. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination made by authorities having jurisdiction shows evidence of contamination.

C. Prepare written reports for purging and disinfecting activities.

END OF SECTION 22 11 19

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SECTION 22 13 16 – STORM AND SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.

2. Specialty pipe fittings.

3. Encasement for underground metal piping.

B. Related Sections:

1. Section 22 13 19 “Sanitary Waste and Storm Piping Specialties”.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Gravity Piping: 10-foot head of water (30 kPa).

2. Force-Main Piping: 50 psig (345 kPa).

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, couplings, hangers, supports, hardware, inserts, etc.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For solvent cements and primers, documentation including printed statement of VOC content.

2. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.6 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control inspections and test reports.

1.7 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp or other markings of specified testing agency.

B. All cast iron soil pipe and fittings shall be marked with the trademark of the Cast Iron Soil Pipe Institute (CISPI).

C. Installer – Company specializing in plumbing systems with 7 (seven) years minimum experience.

D. All cast iron pipe and fittings shall meet the CISPI 301 or ASTM A-888 quality standard and shall be listed and certified by IAPMO, ISS and NSF.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Sewers, and drains: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:

1. Notify Architect Construction Manager and Owner no fewer than two days in advance of proposed interruption of sewer.

2. Do not proceed with interruption of sewer without Architect's Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article and schedule on the drawings for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. This contractor will be required to submit a list for approval for all piping to be used, manufacturers name and pressure ratings for all systems.

C. Listed below are references to the specification standards of recognized authorities to which pipe and fitting materials must conform to be acceptable. All reference shall be the latest edition in force at the time of bidding.

D. Materials indicated are subject to approval of local governing authorities.

E. Each pipe length shall have the manufacturer's name, country of origin, date, pipe diameter and relevant testing agency stamp the information shall be permanently cast, stamped or rolled on.

F. Each fitting shall have the manufacturer's symbol and pressure rating cast, stamped or rolled on, and shall be pressure rated and suitable for the respective system.

G. Material Test Reports: Suppliers of cast iron soil pipe shall be able to supply material tests reports in accordance with the relevant ASTM standard and shall include testing and analysis on: radioactivity, dimensional characteristics, tensile strength and chemical/metallurgical content. Suppliers shall also supply MSDS sheets on all coatings.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service or Extra Heavy class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: CISPI 301 or ASTMA A-888.

B. CISPI 310 or ASTMA A-888, Standard Duty Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. ANACO.
b. Mission Rubber Company

c. Ideal.
d. Tyler Coupling.

2. Standards: ASTM C 1277 ASTM C1540 and CISPI 310. Standard duty couplings shall be certified by NSF International and shall have the NSF Mark on each coupling

3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. ASTM C1540 Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. ANACO.
b. Clamp-All Corp.
c. Mission Rubber Company
d. Ideal.
e. Tyler Coupling.

2. Standards: ASTM C 1540.

3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Galvanized Cast-Iron Drainage Fittings: ASME B16.12, threaded.

C. Steel Pipe Pressure Fittings:

1. Galvanized Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.

2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.

3. Galvanized Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Cast-Iron Flanges: ASME B16.1, Class 125.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

   a. Anvil International.
   b. Grinnell Mechanical Products.
   c. Victaulic Company.
   d. Ward Manufacturing.
   e. Star Pipe Products.

2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47/A 47M malleable-iron castings, ASTM A 234/A 234M forged steel fittings, or ASTM A 106/A 106M steel pipes with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.

3. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

2.5 STAINLESS-STEEL PIPE AND FITTINGS

A. Pipe and Fittings: ASME A112.3.1, drainage pattern with socket and spigot ends.

B. Internal Sealing Rings: EPDM Elastomeric gaskets shaped to fit socket groove with plastic back-up ring NBR gaskets where indicated.

2.6 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron, Mechanical-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2. Ductile-Iron Fittings: AWWA C110/A21.10, mechanical-joint, ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

3. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Ductile-Iron, Push-on-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2. Ductile-Iron Fittings: AWWA C110/A21.10, push-on-joint ductile- or gray-iron standard pattern or AWWA C153/A21.53, ductile-iron compact pattern.

3. Gaskets: AWWA C111/A21.11, rubber.

C. Ductile-Iron, Grooved-Joint Piping:

1. Ductile-Iron Pipe: AWWA C151/A21.51 with round-cut-grooved ends according to AWWA C606.

2. Ductile-Iron-Pipe Appurtenances:

a. Manufacturers: Subject to compliance with requirements, provide one of the following:

(i) Anvil International.
(ii) Star Pipe Products.
(iii) Victaulic Company.

b. Grooved-End, Ductile-Iron Fittings: ASTM A 536 ductile-iron castings with dimensions matching AWWA C110/A 21.10 ductile-iron pipe or AWWA C153/A 21.53 ductile-iron fittings and complying with AWWA C606 for grooved ends.
c. Grooved Mechanical Couplings for Ductile-Iron Pipe: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber center-leg gasket suitable for hot and cold water; and bolts and nuts.

2.7 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Unshielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

(i) Dallas Specialty & Mfg. Co.
(ii) Fernco Inc.
(iii) Mission Rubber Company.
(iv) NDS, Inc.
(v) Logan Clay Products Company.

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. Sleeve Materials:

(i) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
(ii) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

(i) Cascade Waterworks Mfg. Co.
(ii) Mission Rubber Company; a division of MCP Industries, Inc.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

5. Pressure Transition Couplings:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

(i) Cascade Waterworks Mfg. Co.
(ii) Dresser, Inc.
(iii) EBAA Iron, Inc.
(iv) JCM Industries, Inc.
(v) Romac Industries, Inc.
(vi) Smith-Blair, Inc.
(vii) The Ford Meter Box Company, Inc.
(viii) Viking Johnson.

b. Standard: AWWA C219.
c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
d. Center-Sleeve Material: Manufacturer's standard Carbon steel Stainless steel Ductile iron or Malleable iron.
e. Gasket Material: Natural or synthetic rubber.
f. Metal Component Finish: Corrosion-resistant coating or material.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

2. Dielectric Unions:

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

      (i) Watts Regulator Co.
      (ii) Wilkins.
      (iii) EPCO.

   b. Description:

      (i) Standard: ASSE 1079.
      (ii) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
      (iii) End Connections: Solder-joint copper alloy and threaded ferrous.

3. Dielectric Flanges:

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

      (i) Watts Regulator Co. .
      (ii) Wilkins; a Zurn company.
      (iii) EPCO.

   b. Description:

      (i) Standard: ASSE 1079.
      (ii) Factory-fabricated, bolted, companion-flange assembly.
      (iii) Pressure Rating: 125 psig (860 kPa) minimum at 180 deg F (82 deg C).
      (iv) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

      (i) Advance Products & Systems, Inc.
      (ii) Calpico, Inc.
      (iii) Central Plastics Company.
      (iv) Pipeline Seal and Insulator, Inc.
      (v) EPCO.

   b. Description:

      (i) Nonconducting materials for field assembly of companion flanges.

(ii) Pressure Rating: 150 psig (1035 kPa).
(iii) Gasket: Neoprene or phenolic.
(iv) Bolt Sleeves: Phenolic or polyethylene.
(v) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

(i) Elster Perfection.
(ii) Grinnell Mechanical Products.
(iii) Matco-Norca, Inc.
(iv) Precision Plumbing Products, Inc.
(v) Victaulic Company.

b. Description:

(i) Standard: IAPMO PS 66
(ii) Electroplated steel nipple complying with ASTM F1545
(iii) Pressure Rating: 300 psig (2070 kPa) at 225 deg F (107 deg C).
(iv) End Connections: Male threaded or grooved.
(v) Lining: Inert and noncorrosive, propylene.

6. Flexible Ball Joints: Ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include gasketed ball-joint section and ductile-iron gland, rubber gasket, and steel bolts.

a. Manufacturer:

(i) Metraflex
(ii) Red Valve

7. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

a. Manufacturers:

(i) Red Valve
(ii) Metraflex
(iii) Flexicraft

8. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

a. Manufacturer:

(i) SIGMA Corp.

2.8 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Standard: ASTM A 674 or AWWA C105/A 21.5.

B. Material: Linear low-density polyethylene film of 0.008-inch (0.20-mm) or high-density, cross-laminated polyethylene film of 0.004-inch (0.10-mm) minimum thickness.

C. Form: Sheet.

D. Color: Black.

PART 3 - EXECUTION

3.1 LAYING OF PIPE IN GROUND

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 31 20 00 "Earth Moving."

B. Lay and maintain required grade and lines, all bells or hubs upgrade.

C. Sleeve piping passing through masonry walls and rigid structures provide minimum one inch clearance around pipe to permit caulking. Caulk watertight.

D. Inspect each pipe length and fitting for defects before placing in trench, remove defective pieces from site.

E. Do not drop or dump; carefully lower pipe and fittings into place.

F. Trenches shall be kept free of water until all pipe joints are made and jointing material has set.

G. Do not lay pipe on frozen trench bottom unless specifically approved by Architect.

H. Keep lines free of foreign material and open ends covered when work is not in progress.

I. Take precautions as required to prevent empty pipe from floating. Remove any floated pipe from trench and properly relay.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install underground cast iron piping in accordance with Cast Iron Soil Pipe Handbook as published by CISPI.

L. Encase piping in PE Film where soil is corrosive or where indicated on the drawings.

M. Piping buried in concrete shall not touch rebars.

3.2 PIPING INSTALLATION WITHIN THE BUILDING ABOVE SLAB

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. All pipes passing through roofs shall be provided with an extra heavy cast iron flashing fittings, set at a suitable level above roof to terminate the flashing to be installed by another trade. Any piping passing through roofs shall be so arranged to be a minimum of 12" from walls or other obstructions so as to permit proper flashing.

G. Install vent through roof terminals minimum ten feet away from any air intakes or building openings. Terminate minimum 24” above finished roof or 7’-0” if the roof is used for other than weather protection.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping and hangers to allow application of insulation, where required.

K. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

L. Install drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Drains: 1 percent downward in direction of flow.

2. Horizontal Drainage Piping NPS 2" (DN 50) and smaller: 2 percent NPS 3" (DN 80) and larger 1 percent downward in direction of flow.

3. Vent Piping: 0.5 percent down toward vertical fixture vent or up toward vent stack for proper condensate drainage.

4. Piping to be installed at slopes more than minimum, if indicated on the drawings.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings." or manufacturers recommendations.

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.

N. Install steel piping according to applicable plumbing code.

O. Install stainless-steel piping according to ASME A112.3.1 and applicable plumbing code.

P. Install underground, ductile-iron, force-main piping according to AWWA C600. Install buried piping inside building between wall and floor penetrations and connection to sanitary sewer piping outside building with restrained joints. Anchor pipe to wall or floor. Install thrust-block supports at vertical and horizontal offsets.

1. Install encasement on piping according to ASTM A 674 or AWWA C105/A 21.5.

Q. Install force mains at elevations indicated, provide pressure type cleanouts. Slope force mains to the drain points at minimum 1 percent slope.

R. Plumbing Specialties:

1. Install backwater valves in gravity-flow piping and house sewer. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary and Storm Waste Piping Specialties." Back water valves are required for all buildings located on flood zones.

2. Install cleanouts at grade and extend to where building drains connect to building sewers in drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in drainage force-main piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary and Storm Waste Piping Specialties."

3. Install drains in drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 13 19 "Sanitary and Storm Waste Piping Specialties."

S. Do not enclose, cover, or put piping into operation until it is tested, inspected and approved by authorities having jurisdiction.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" or manufacturer's recommendation for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" or manufacturer's recommendation for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Join stainless-steel pipe and fittings with gaskets according to ASME A112.3.1.

E. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

F. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

G. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.

2. In Drainage Piping: Unshielded Shielded, nonpressure transition couplings.

3. In Aboveground Force Main Piping: Fitting-type transition couplings.

4. In Underground Force Main Piping:

a. NPS 1-1/2 (DN 40) and Smaller: Fitting-type transition couplings.
b. NPS 2 (DN 50) and Larger: Pressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric nipples and/or unions.

3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges, flange kits or nipples.

4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

C. Flexible connectors – install on sanitary vent piping when crossing building seismic or expansion joints. Drainage piping shall not cross expansion joints.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping" and Section 22 13 19 “Sanitary and Storm Waste Piping Specialties.”

B. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves.

2. House Sewer: At the building wall.

3. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.

4. Install backwater valves in accessible locations.

5. Comply with requirements for backwater valve specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install galvanized carbon-steel pipe hangers for horizontal piping in noncorrosive environments.

2. Install stainless-steel pipe hangers for piping in corrosive environments.

3. Install galvanized carbon-steel pipe support clamps for vertical piping in noncorrosive environments.

4. Vertical Piping: MSS Type 8 or Type 42, clamps.

5. Install individual, straight, horizontal piping runs:

   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet (30 m) if indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

7. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting valve and coupling. Each pipe segment between two couplings or hubs shall have at least one support.

C. Support all vertical piping and tubing at base and at each floor and between floors, if floor to floor distance exceed maximum distance between supports required by the code.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Unless otherwise indicated in the code or manufacturer's recommendations, install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.

2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.

3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.

4. NPS 6 and NPS 8 (DN 150 and DN 200): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.

5. NPS 10 and NPS 12 (DN 250 and DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.

6. Spacing for 10-foot (3-m) lengths may be increased to 10 feet (3 m). Spacing for fittings is limited to 60 inches (1500 mm).

7. Each pipe segment between two couplings shall have an individual hanger, regardless of segment length.

F. Unless otherwise indicated in the code, install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 84 inches (2100 mm) with 3/8-inch (10-mm) rod.

2. NPS 1-1/2 (DN 40): 108 inches (2700 mm) with 3/8-inch (10-mm) rod.

3. NPS 2 (DN 50): 10 feet (3 m) with 3/8-inch (10-mm) rod.

4. NPS 2-1/2 (DN 65): 11 feet (3.4 m) with 1/2-inch (13-mm) rod.

5. NPS 3 (DN 80): 12 feet (3.7 m) with 1/2-inch (13-mm) rod.

6. NPS 4 and NPS 5 (DN 100 and DN 125): 12 feet (3.7 m) with 5/8-inch (16-mm) rod.

7. NPS 6 and NPS 8 (DN 150 and DN 200): 12 feet (3.7 m) with 3/4-inch (19-mm) rod.

8. NPS 10 and NPS 12 (DN 250 and DN 300): 12 feet (3.7 m) with 7/8-inch (22-mm) rod.

G. Unless otherwise indicated in the code, install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 (DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.

2. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.

3. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.

4. NPS 3 and NPS 5 (DN 80 and DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.

5. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

6. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect house drains to house sewers. Use transition fitting to join dissimilar piping materials.

C. Connect piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Water closets connection shall be 4 inch (100 mm).

2. Lavatory connection shall be 2 inch (50 mm), if the lavatory does not have an overflow.

3. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

4. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.

5. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

6. Comply with requirements for backwater valves cleanouts and drains specified in Section 22 13 19 "Sanitary and Storm Waste Piping Specialties."

7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

8. Connect storm drainage piping to roof drains and storm drainage specialties.

D. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed and concealed piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa). Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil, sanitary waste and vent piping any size shall be the following:

1. Service class, hub-and-spigot cast-iron soil pipe and fittings.

2. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints. Standard couplings permitted for Horizontal vent Branches up to 3” size.

3. Galvanized-steel pipe, drainage fittings, and threaded joints.

4. Stainless-steel pipe and fittings, sealing rings, and gasketed joints.

5. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground storm drainage piping any size shall be the following:

1. Service class, hub-and-spigot cast-iron soil pipe and fittings.

2. Ductile iron piping with mechanical, push-on or grooved joint, hubless-piping couplings; and coupled joints.

3. Dissimilar Pipe-Material Couplings: Unshielded Shielded, nonpressure transition couplings.

D. Underground storm soil, waste, and vent piping any size shall be the following:

1. Extra Heavy or Service class, cast-iron soil piping; and calked joints.

2. Ductile iron piping with mechanical, push-on or grooved joints.

3. Stainless-steel pipe and fittings, gaskets, and gasketed joints.

4. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

3.12 DRIP PANS:

A. Examine the drawings and in cooperation with the Electrical Trade confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric motors and controllers, switchboards, panelboards, or similar equipment. Piping is not permitted in Electric Equipment, Transformer, Switch Gear, and Telephone Gear Rooms.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.

C. Provide drip pans with leak detectors for drainage piping whether exposed or above ceilings in operating and delivery rooms, nurseries, food preparation and storage areas, kitchens or other sensitive areas.

D. Furnish gutters as follows:

1. Provide and erect a gutter of 16 ounce cold rolled copper or 18 gauge galvanized steel, under every pipe which is within 2'-0" from a vertical line to any motor, electrical controllers, switchboards, panelboards, or the like.

2. Each gutter shall be reinforced, rimmed, soldered and made watertight, properly suspended and carefully pitched to a convenient point for draining. Provide a 3/4" drain, with valve as directed, to nearest floor drain or slop sink, as approved.

3. In lieu of such separate gutters, a continuous protecting sheet of similar construction adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 2'-0" in all directions beyond the motor, over which such piping has to run.

END OF SECTION 22 13 16

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SECTION 22 13 19 - SANITARY WASTE AND STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof, open areas and Terrace Drains.
5. Trench drains.
6. Channel drainage systems.
7. Air-admittance valves.
8. Washing machine wall box.
9. Roof flashing assemblies.
10. Through-penetration firestop assemblies.
11. Miscellaneous sanitary and storm drainage piping specialties.
12. Flashing materials.
13. Grease interceptors, except grease interceptors installed outside of the building or under building slab.
14. Prefabricated Solids interceptors.

B. Related Requirements:

1. Section 22 13 23 “Waste Interceptors” for precast concrete, plastic or steel interceptors installed outside of the building or within the building in-ground.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. (C) PVC: (Clorinated) Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. FOG disposal systems.

2. Grease interceptors.

3. Grease removal devices.

4. Oil interceptors.

B. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.

2. Wiring Diagrams: Power, signal, and control wiring for all specialties that require power.

1.5 INFORMATIONAL SUBMITTALS

A. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

B. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.8 COORDINATION

A. Coordinate size and location of concrete bases, slab openings and pits. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete" and Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

B. Coordinate size and location of roof; deck and shear walls penetrations.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cultures: Provide 1-gal. bottles of bacteria culture recommended by manufacturer of FOG disposal systems equal to 200 percent of amount installed, but no fewer than 2 1-gal. bottles.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Wade
d. Watts Drainage Products Inc.
e. Zurn Plumbing Products Group.
f. Tideflex
g. Claval

2. Standard: ASME A112.14.1.

3. Size: Same as connected piping.

4. Body: Cast iron.

5. Cover: Cast iron with bolted or threaded access check valve.

6. End Connections: Hub and spigot or hubless match the pipe.

7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition or elastomer check sleeve.

8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves :

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company.
   b. Watts Drainage Products Inc.
   c. Zurn Plumbing Products Group.
   d. MIFAB Inc.
   e. Wade
   f. Tideflex
   g. Claval

2. Size: Same as floor drain outlet.

3. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.

4. Check Valve: Removable ball float Drain Strainer

5. Inlet: Match the Pipe

6. Outlet: Spigot

2.2 CLEANOUTS

A. General

1. Provide cleanouts at the base of all soil, waste and storm water leaders and at all changes in direction on horizontal piping. Distance between cleanouts on horizontal runs shall be made accessible by means of approved deck plates, access covers and doors.

2. Cleanouts in vertical stacks shall consist of tapped tees capable of receiving a rough brass raised head cleanout plug.

3. Access doors and frames for cleanouts located behind walls will be furnished by the Plumbing Trade and installed under another section of the work. A complete list of wall cleanout locations shall be furnished to the installing contractor prior to erection of walls.

4. Where cleanouts occur in floors they shall be compatible with the surrounding finished surface.

5. All cleanout plugs shall be lubricated with graphite before installation.

6. Cleanouts occurring in cast iron soil pipe above floor at change in direction of pipe run and at ends of horizontal runs shall be with cast iron ferrule for caulk connection and fitted with a straight threaded, tapered bronze plug with raised hex head.

7. All cleanout plugs shall be up with graphite and oil to facilitate easy removal. No pipe compound is to be used on plugs.

8. Cleanouts shall be provided with adjustable clamping collar devices where flashing and/or waterproof floor and slabs occur.

B. Metal Cleanouts:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Josam Company.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Wade.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group.

2. Size: Same as drain pipe, up to 6" maximum for pipes 8" and larger.

3. Type: Adjustable housing.

4. Body or Ferrule: Cast iron or Stainless steel.

5. Adjustable Housing Material: Cast iron stainless steel with threads set-screws or other device.

6. Frame and Cover Material and Finish: Nickel-bronze, copper alloy Painted cast iron Polished bronze Rough bronze or Stainless steel.

7. Frame and Cover Shape: Round.

8. Top Loading Classification: Extra Heavy Heavy or Medium Duty as requested per location.

9. Riser: ASTM A 74, Extra-Heavy or Service class, cast-iron stainless steel drainage pipe fitting and riser to cleanout.

10. Masonry Access: Round, deep, chrome-plated bronze or flat, chrome-plated brass or stainless-steel cover plate with screw.

11. Drywall Access: Round or Square, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 DRAINS

A. General

1. This paragraph applies to all floor and roof drains.

2. The drain schedule on the drawings indicates the particular drain desired at the various locations indicated. The drains selected are representative of the quality, design and finish desired. Drains of other manufacturers may be submitted provided they meet fully in every respect (such as materials, weight open areas, clamping features, grate surface and finish, etc.) the characteristics and quality of the drain specified.

3. All drains shall include adjustable clamping device where membrane, flashing, or other waterproof floors or decks occur.

4. All drains shall include suitable extension collars, sump receivers, under deck clamps, as required to suit roof, floor or deck construction.

5. On all areas requiring flashing, provide flashing extending at least 12" beyond drainage flange and connections made water tight.

B. Metal Floor Drains Cast Iron or Stainless Steel:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Wade.
d. Watts Drainage Products Inc.
e. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.3 cast iron; and ASME A 112.3.1, 112.6.3 Stainless Steel.

3. Pattern: Area Floor Funnel floor or Funnel drain.

4. Body Material: Cast iron Stainless Steel.

5. Integral Backwater Valve: Where indicated.

6. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel must be used for kitchen, laboratory, laundry and pool equipment room drains. Standard factory coating for all other locations.

7. Top Shape: Round.

8. Top Loading Classification: Extra Heavy-Duty Heavy Duty or Medium Duty Suitable for location.

2.4 CONCRETE TRENCH DRAIN GRATES

A. Trench Drains:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Wade.
d. Watts Drainage Products Inc.
e. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.3 for trench drains.

3. Flange: as required.

4. Grate Material: Ductile iron Ductile iron or gray iron.

5. Grate Finish: Painted or Galvanized All grates in areas accessible by general public shall be heel-proof.

6. Top Loading Classification: Extra Heavy-Duty Heavy Duty Medium Duty suitable for location.

2.5 CHANNEL DRAINAGE SYSTEMS

A. Stainless-Steel Channel Drainage Systems:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. Zurn Plumbing Products Group.
c. ACO Drain.
d. Gatic

2. Type: Modular system of stainless-steel channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.

a. Standard: ASME A112.3.1, for trench drains.
b. Channel Sections: Interlocking-joint, stainless-steel with level invert.

c. Grates: Manufacturer's designation “Extra heavy heavy medium duty," with heel proof slots or perforations, and of width and thickness that fit recesses in channels.

1) Material: Ductile iron Fiberglass Galvanized steel Gray iron or Stainless steel.
2) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

d. Covers: Solid ductile or gray or galvanized iron, of width and thickness that fit recesses in channels, and of lengths indicated.
e. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.
f. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.6 ROOF DRAINS

A. Cast-Iron, General-Purpose Main Roof Cornice Gutter Terrace Area or Deck Drains:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Josam Company.
b. MIFAB, Inc.
c. Wade.
d. Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.4, for general-purpose roof drains.

3. Body Material: Cast iron.

4. Combination Flashing Ring and Gravel Stop: Install where indicated.

5. Flow-Control Weirs: For controlled flow drains.

6. Dome Material: Aluminum Cast iron or Stainless steel.

7. Perforated Gravel Guard; where required Stainless steel.

8. Water Dam: Where required 2 inches high.

2.7 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.

2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; and shop-applied bituminous coating.

2. Size: Inlet size to match downspout.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.

2. Size: Same as connected conductor.

2.8 AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Sioux Chief
b. Durgo, Inc.
c. Oatey.
d. ProSet Systems Inc.
e. RectorSeal.
f. Studor, Inc.

2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.

3. Operation: Mechanical sealing diaphragm.

4. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Durgo, Inc.
b. Oatey.
c. Studor, Inc.
d. Sioux Chief

2. Standard: ASSE 1050 for vent stacks.

3. Operation: Mechanical sealing diaphragm.

4. Size: Same as connected stack vent or vent stack.

C. Washing Machine Wall Box:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Symmons.
b. Oatey.
c. RectorSeal.
d. Studor, Inc.

2. Description: White metal housing with white metal grille, made for recessed installation. Include bottom pipe connection and water shut-off valves.

2.9 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies :

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Acorn Engineering Company; Elmdor/Stoneman Div.
b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 6 inches, but not less than pipe diameter. from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.

2. Low-Silhouette Vent Cap: With vandal-proof vent cap.

3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.10 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ProSet Systems Inc.

b. Hilti.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.

3. Size: Same as connected soil, waste, or vent stack.

4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.

5. Special Coating: Corrosion resistant on interior of fittings.

2.11 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains :

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.

2. Size: Same as connected waste piping with increaser funnel of size indicated or with fixed air gap fitting.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.

2. Size: Same as connected waste piping.

a. NPS 2: 4-inch-minimum water seal.
b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.

2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Fixed Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.

2. Body: Bronze or galvanized cast iron.

3. Inlet: Opening in top of body.

4. Outlet: Larger than inlet.

5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.

2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.

2. Size: Same as connected stack vent or vent stack.

H. Frost-Resistant Vent Terminals:

1. Description: Manufactured or shop-fabricated assembly constructed of copper, lead-coated copper, or galvanized steel.

2. Design: To provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

I. Expansion Joints:

1. Standard: ASME A112.21.2M.

2. Body: Cast iron with bronze sleeve, packing, and gland.

3. End Connections: Matching connected piping.

4. Size: Same as connected vent piping. Note: Do not use on drain piping, which should not have expansion joints.

2.12 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft..

2. Vent Pipe Flashing: 8 oz./sq. ft..

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.13 GREASE INTERCEPTORS

A. Grease Interceptors:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Applied Chemical Technology, Incorporated.
b. Josam Company.
c. MIFAB, Inc.
d. Rockford Sanitary Systems, Inc.
e. Wade.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group.
h. Green Turtle.

2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food-preparation or -processing wastewater.

3. Plumbing and Drainage Institute Seal: Required.

4. Body Material: Cast iron Cast iron or steel or Stainless steel.

5. Interior Lining: Corrosion-resistant enamel Not required for stainless steel.

6. Exterior Coating: Corrosion-resistant enamel.

7. Body Dimensions: See drawings.

8. Body Extension: Provide where required.

9. Grease Retention Capacity: See drawings.

10. Inlet and Outlet Size: See drawings.

11. Cleanout: Integral or field installed on outlet.

12. Mounting: Above floor Recessed in acid-resistant, coated steel frame and cradle or Recessed, flush with floor.

13. Flow-Control Fitting: Required.

14. Operation: Manual cleaning.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting: Install interceptors and removal devices on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases specified in Section 03 30 00 "Cast-in-Place Concrete" and Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

1. Coordinate sizes and locations of concrete bases with actual equipment provided.

2. Construct concrete bases 6 inches high and extend base not less than 6 inches in all directions beyond the maximum dimensions of specified equipment, unless otherwise indicated or unless required for seismic anchor support.

3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.

5. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

6. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Install backwater valves in building drain piping and house sewer. Provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

C. Install cleanouts in aboveground piping and building drain piping according to the Plumbing Code Requirements: Coordinate with building structure, HVAC trade and other building system to make sure access clearance is provided in front of cleanout as required by code.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor or carpet markers where required.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance, not obstructed by equipment and concrete pads.

2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the Architectural drawings:

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.

4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Assemble and install ASME A112.3.1, channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.

H. Assemble non-ASME A112.3.1, channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

I. Install fixture air-admittance valves on fixture drain piping.

J. Install stack air-admittance valves at top of stack vent and vent stack piping.

K. Install air-admittance-valve wall boxes recessed in wall.

L. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. The extension lengths shall be at least 6” above roofs not used for public access and at least 7’-0” above roofs used for public access – unless otherwise indicated in the code.

M. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

N. Install through-penetration firestop assemblies at floor penetrations.

O. Assemble open drain fittings and install with top of hub funnel or fixed air gap above floor.

P. Install deep-seal traps on floor drains and other waste outlets, if indicated.

Q. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.

2. Size: Same as floor drain inlet.

R. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

S. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

T. Install expansion joints on vent piping crossing building expansion joint. Position expansion joints for easy access and maintenance.

U. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on elevated concrete pad, unless otherwise indicated.

2. Flush with Floor Installation: Set unit and extension, with cover flush with finished floor. Cover bolts heads shall be recessed flush with floor level; bolt heads above floor level are not acceptable.

3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.

4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

V. Install grease removal devices on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction. Install control panel adjacent to unit, unless otherwise indicated.

W. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary drainage and vent systems.

X. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 ROOF DRAINS INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange or roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

2. Install expansion joints, if indicated, in roof drains outlets.

3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 12 inches (305 mm) above grade. Secure to building wall. Provide concrete splash blocks on the roof.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

3.3 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Storm and Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.

2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.

3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07 62 00 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.5 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Grease interceptors.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.7 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

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SECTION 22 32 00 - DOMESTIC WATER FILTRATION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Screen filters.

B. Related Sections:

1. Division 22 Section 22 05 00 “Common Work Results for Plumbing”.

2. Section 22 11 19 "Domestic Water Piping Specialties" for plumbing piping strainers and for small cartridge-type water filters.

3. This Section is a part of each Division 22.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for filters. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For water filtration equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Certificates of Shop Inspections and Data Reports: For products required to have ASME label, signed by product manufacturer.

B. Welding certificates.

C. Source quality-control reports.

D. Field quality-control reports.

E. Startup service test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water filtration equipment to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of water filtration equipment through one source from a single manufacturer.

B. Welding Qualifications: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NSF 61, "Drinking Water System Components - Health Effects," for all components that will be in contact with potable water.

1.7 COORDINATION

A. Coordinate size and location of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 AUTOMATIC SCREEN FILTERS, ELECTRIC:

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Omicron Water Technologies (www.omicronwater.com)

2. Basis-of-Design Product: Subject to compliance with requirements, provide Omicron 3500-25(V) PN10 316L or comparable product that meets specifications.

3. Description: Factory-fabricated and -tested, simplex, 316L stainless steel housing with weave wire screen rated at 18 micron and accordingly providing near total reduction of total suspended solids (TSS) above 18 microns, and additional reduction of TSS smaller than 10 microns as is characteristic of screen filtration technology in municipal water conditions. With 6-inch inlet and outlet, raised face flange connections pressure rated to meet the system requirements.

4. Operation Description: The water flows into the filter body and through the stainless steel coarse filter element outside in, keeping large debris from entering the fine screen. Once water flows through the coarse screen, the water enters the stainless steel fine filter element inside out, allowing the dirt to accumulate on the inside surface of the element. A Differential Pressure Switch (DPS) senses the pressure differential across the filter as filter cake builds up on the element. The DPS shall signal the PLC control panel to initiate the cleaning cycle of the filter when the filter cake causes a pressure differential of 0.3 bar (4.4 psi), visible on the PD display. PD set point shall be user adjustable via the HMI touchscreen. During the flushing cycle, there shall be no interruption of flow. With a clean screen at the maximum flow rate, the filter shall lose less than 1 psi. The filter operation and flushing shall be controlled and monitored by a touchscreen PLC control panel. The panel, and its related circuitry, shall be housed in a NEMA 4X-rated enclosure. A single point power connection controls operation.

5. Cleaning Mechanism: The filter cleaning mechanism shall consist of a spiral-moving suction scanner, constructed of a 316 stainless steel assembly. By opening a 1" flush valve, the scanner shall create high efficiency suction force on each of the 4 cleaning nozzles. During that time, the nylon brush nozzles shall clean the total area of the screen. The nozzle head shall contact the screen surface at a constant pressure in order to maximize cleaning efficiency. At 45 PSI, the flushing flow rate shall not exceed 90 gallons per minute.

6. Assuring a maximum flush flow rate of 110 gpm, regardless of pressure, shall be enabled by a flow control valve in the drain line. The cleaning cycle shall be completed in 32 seconds or less, consuming approximately 59 gallons. The minimum pressure required for flushing shall be 58 PSI during the flush cycle.

7. Driving Mechanism: The suction scanner shall be driven by a 0.5 hp (0.37 kW) electric motor that is connected to the suction scanner through a threaded shaft that travels inside a threaded bearing. The movement created by the electric motor shall cause the scanner to move in a spiral motion at a speed of 17 RPM (@208V AC 60 Hz). The control of the scanner by the electric motor shall be limited by two normally closed limit switches and monitored by the control panel.

8. Filtration Element: The filter element shall be of a construction of a combination of wedge and weave wire screens, consisting of four layers. The collective screen shall be made of 316L stainless steel. The screen's external support shall be constructed of wedge-wire. The fine weaved-wire screen shall be sandwiched (protected) between two 2000-micron weaved-wire additional layers. The total surface area of each screen shall be 5300 cm2 (822 sq in) and shall be able to withstand an internal to external pressure differential of 100 PSI without any damage.

9. Housing Construction (high pressure): The filter housing shall be of 316L stainless steel. The filter body shall have a maximum operating pressure of 360 PSI, and a maximum operating temperature of 120° F. The filter housing shall have the capability to accept filter elements with varying micron degrees, which are totally interchangeable in the same housing.

10. Control System: The filter control system shall consist of a NEMA4 PLC with HMI that controls all aspects of the filter's operation including: Monitoring the DPS and limit switches, and operating the flush valve, electric motor, flush line pump and by-pass valves. The control panel shall include a flush counter to monitor average flush intervals. Control features shall include dry contact outputs to remotely indicate flush in progress and fault situations, and inputs to remotely initiate a start or stop of the filtration system. The filter shall conform to international quality code ISO-14001.

11. Meets or exceeds all current US domestic quality requirements for filtration devices including, but not limited to, NSF Standard 61, ANSI, AWWA, ASE, and others.

12. Detention tank to receive backwash water: Capacity not less than 200 gallons. Filter discharge to tank connection via 2" flange to copper pipe into vented tank.

13. Construction: Filter components are integrated onto single skid that may be bolted to floor to resist filter movement during a seismic event.

14. Controls: Automatic for control of flush cycles and backwash; factory wired for single, external electrical connection.

15. Support: Skid mounting.

16. Capacity and Characteristics:

17. Filter Design: Continuous Flow: <135 gpm at up to 150 psi with pressure drop from 1 psi with clean screen up to 4.4 psi upon which backwash of screen is triggered. (See operations.)

B. Filter Operation Description

1. The filter is comprised of a housing with two separate chambers within. The first chamber, with the filtration screen, connects to the water inlet port; the second is the backwashing chamber.

2. Water circulates through the body of the filter from the inside out. The collected solids in suspension are retained within the filtering component (the screen). This chamber connects to the filtered water outlet to supply the intended operation: potable water, process water, cooling tower water, etc.

3. The outlet of the backwashing chamber is connected to the drainage valve that enables rinse water run off, once the self-cleaning process has been initiated. The backwashing chamber is otherwise sealed from the filtration chamber.

4. The suction scanner is located on the central axis of the filtration element, and is hydraulically connected to the backwashing chamber. The scanner's suction nozzles terminate in nylon bristles that extend to within a few microns of the screen mesh. Nozzle positioning is calibrated to effect contact with the entire inner surface of the mesh as a consequence of the motorized spiral motion of the scanner, combining longitudinal motion with rotation.

C. Operation Summary

1. The water enters the filtration chamber and passes through the fine screen to produce surface mechanical filtration at the filtration degree according to the selected screen rating, from 10 to 2000 microns.

2. As the collected particles accumulate on the inner surface of the fine mesh, their build-up causes a progressive loss of pressure between the filter inlet and outlet. When the differential pressure reaches about 4.4 psi, two analog transducers initiate the backwashing sequence. Other backwash methods are available, including time delay, combined pressure and time delay, or continuous backwashing.

3. When the differential pressure switch reaches 4.4 psi, the drainage valve is signaled to open. This generates a pressure differential between outside (atmospheric pressure) and inside the filter (working pressure), which induces a current of fast-flowing water that rushes through the mesh and out through the inner hole of the suction scanner nozzles. At this point a signal is sent to the motor to start operating.

4. The result of simultaneous spiral movement of the suction scanner inside the filter and the suction effect from the nozzles on the accumulated filter cake enables successful cleaning of the fine screen.

5. During the 32-second self-cleaning process, filtered water flows without interruption to the intended application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of filters.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

C. Examine walls and floors for suitable conditions where filters will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT MOUNTING

A. Equipment Mounting: Ancor filters on concrete bases.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of concrete base.

2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.3 AUTOMATIC SCREEN FILTER INSTALLATION

A. Install filter tanks on concrete base.

1. Exception: Omit concrete bases if installation directly on floor is indicated.

B. Install seismic restraints for automatic screen filters tanks and accessories and anchor to building structure.

3.4 CONNECTIONS

A. Comply with requirements for piping specified in Section 22 11 16 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between water filtration equipment and dissimilar-metal water piping with dielectric fittings. Comply with requirements for dielectric fittings specified in Section 22 11 16 "Domestic Water Piping."

D. Install shutoff valves on feedwater-inlet and filtrate-outlet piping of each water filtration equipment filter and on inlet and outlet headers.

1. Comply with requirements for metal general-duty valves specified in Section 22 05 23 "Valves for Plumbing Piping."

2. Comply with requirements for plastic valves specified in Section 22 11 16 "Domestic Water Piping."

3. Exception: Water filtration equipment with factory-installed shutoff valves at locations indicated.

E. Install pressure gages on feedwater-inlet and filtrate-outlet piping of each water filtration equipment filter. Comply with requirements for pressure gages specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

1. Exception: Water filtration equipment with factory-installed pressure gages at locations indicated.

F. Install valved bypass water piping around each water filtration equipment filter.

1. Comply with requirements for metal general-duty valves specified in Section 22 05 23 "Valves for Plumbing Piping."

2. Comply with requirements for plastic valves specified in Section 22 11 16 "Domestic Water Piping."

3. Comply with requirements for water piping specified in Section 22 11 16 "Domestic Water Piping."

G. Install backward holding tanks as needed.

H. Install drains as indirect wastes to spill into open drains or over floor drains.

3.5 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Domestic water filtration equipment will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.7 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

B. Sample filter filtrate after startup and at three consecutive seven-day intervals (total of four samples), and prepare certified test reports for required water performance characteristics.

3.8 DEMONSTRATION

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

END OF SECTION 22 32 00

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SECTION 22 33 00 - DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Commercial storage domestic-water heaters.

2. Instantaneous tankless domestic-water heaters.

3. Domestic water heater accessories.

B. Section does not include requirements for outdoor water storage tank heaters. See specification 221219 for information.

1.3 ACTION SUBMITTALS

A. Shop Drawings:

1. For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Wiring Diagrams: For power, signal, and control wiring.

B. LEED Submittals:

1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of domestic-water heater, from manufacturer.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.7 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test domestic-water heat exchangers to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heat exchangers will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

1.8 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate heaters location with other equipment, ductwork, architectural and structural elements. Provide clearances required for heater maintenance and parts pull-out without relocating other equipment or building elements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.

b. Faulty operation of controls.

c. Deterioration of metals, metal finishes, and other materials beyond normal use.

d. Insert.

B. Warranty Periods: From date of Substantial Completion.

1. Electric Heaters

a. Commercial, Domestic-Water Booster Heaters:

1) Controls and Other Components: Three years.

b. Commercial, Storage, Domestic-Water Heaters:

1) Storage Tank: Five years.

2) Controls and Other Components: Three years.

c. Commercial, Light-Duty, Storage, Domestic-Water Heaters:

1) Storage Tank: Three years.

2) Controls and Other Components: Two years.

d. Tankless, Domestic-Water Heaters: Two year(s).

e. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Electric, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. American Water Heaters.

   b. Bradford White Corporation.

   c. Cemline Corporation.

   d. Electric Heater Company (The).

   e. GSW Water Heating.

   f. HESco Industries, Inc.

   g. Lochinvar Corporation.

   h. Precision Boilers, Inc.

   i. PVI Industries, LLC.

   j. RECO USA.

   k. Rheem Manufacturing Company.

   l. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.

3. Standard: UL 1453 – Larger than 120 gallon capacity and UL 174 120 gal. capacity and less

4. Storage-Tank Construction: ASME-code for 120 gallons and greater steel ferritic alloy vertical arrangement.

   a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

      1) ASME B1.20.1 for threaded piping NPS 2-1/2 (DN 65) and smaller

      2) NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.

      3) NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.

   b. Pressure Rating: 150 psig (1035 kPa).

   c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

5. Factory-Installed Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.

   b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.

   c. Insulation: Comply with ASHRAE/IESNA 90.1. or ASHRAE 90.2

   d. Jacket: Steel with enameled finish.

   e. Heating Elements: Electric, screw-in or bolt-on immersion type.

   f. Temperature Control: Adjustable thermostat.

   g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.

   h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

6. Special Requirements: NSF 5 construction.

7. Features and Equipment for Heavy Duty Heaters Larger than 120 gal and 12 KW:

   a. Heating Elements

      Heavy-duty heating elements rated at 20 40 80 Watts per square inch heat density.

   b. Electrical Circuitry

      1) 120V control circuit (distributed from 208/240V supply, where required)

      2) Control circuit transformer (480V supply)

      3) Supply voltage 480V, 3Ø

      4) Fused magnetic contactors for each power circuit (50 amp maximum per circuit on 3Ø units)

      5) Control circuit switch, fuse, and pilot light

      6) Remote on-off terminals

   c. Operating And Safety Controls

      1) Upper and lower immersion operating thermostats (one on horizontal tanks of 250 gallons or less)

      2) Immersion temperature limiting device (high limit)

3) Electronic low water cutoff

d. Electronic Operating Control Options

1) Programmable electronic operating control with digital temperature readouts

2) Cable to connect the electronic operating control to a Building Automation System

3) Alarm, including local audible alarm

4) Local audible alarm for noisier environments, includes silencing switch

5) Protocol gateway: Coordinate with control contractor.

e. Optional Features and Equipment

1) Intra-tank circulator (INTRA)

a) < 1000 gallon tank: 1/25 hp, 115V, 3/4 amp, factory wired

b) ≥ 1000 gallon tank: 1/3 hp, 115V, 8 amp, separate supply required

2) Shunt trip circuit interrupter with on/off handle

3) Safety door interlock

4) Water pressure gauge on drain piping

5) Manual-reset immersion temperature limiting device

6) Dial temperature and pressure gauges – panel mounted

7) Tridicator on outlet piping

8) Audible alarm with silencing switch

9) Switched contacts for remote alarm notification

10) Digital seven-day time clock with battery backup

11) 120V control circuit transformer (208V and 240V)

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Thermostat Control Electric, Tankless, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, are limited to, the following:

a. Bosch Water Heating.

b. Chronomite Laboratories, Inc.

c. Eemax, Inc.

d. E-Tankless Water Heaters Corp.

e. Keltech, Inc.

f. Niagara Industries, Inc.

g. Rheem.

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.

3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.

a. Connections: ASME B1.20.1 pipe thread.

b. Pressure Rating: 150 psig (1035 kPa) .

c. Heating Element: Resistance heating system.

d. Temperature Control: Flow-control fitting.

e. Safety Control: High-temperature-limit cutoff device or system.

f. Jacket: Aluminum or Steel with enameled finish or Stainless Steel Housing.

g. Wiring: Hard wired.

4. Support: Bracket for wall mounting.

5. Additional Accessories

a. Digital microprocessor for temperature control.

b. Assembly kit for multiple heaters.

c. Integral in-line strainer upstream of the water heater.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. AMTROL Inc.

b. Flexcon Industries.

c. Honeywell International Inc.

d. Pentair Pump Group (The); Myers.

e. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.

f. State Industries.

g. Taco, Inc.

h. Wessels Co.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.

b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

c. Air-Charging Valve: Factory installed.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 (DN 20) with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

D. Heat-Trap Fittings: ASHRAE 90.2.

E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water.

1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping."

2. Comply with requirements for balancing valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2. Other, Domestic-Water Heaters: ASME rated and stamped.

G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2. Other, Domestic-Water Heaters: ASME rated and stamped.

H. Vacuum Relief Valves: ASME rated and stamped. ANSI Z21.22/CSA 4.4-M.

I. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater a minimum of 18 inches (457 mm) above the floor.

J. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base at least 4” (100 mm) high. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete" and Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."

1. Exception: Omit concrete bases for domestic-water heaters if installation on stand, bracket, suspended platform is indicated.

2. Maintain manufacturer's recommended clearances, including space for pull-out heater parts without relocating other equipment.

3. Arrange units so controls and devices that require servicing are accessible.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

7. Install anchor bolts to elevations required for proper attachment to supported equipment.

8. Anchor domestic-water heaters to substrate.

B. Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters at least 18 inches (457 mm) above floor on wall bracket .

1. Maintain manufacturer's recommended clearances.

2. Arrange units so controls and devices that require servicing are accessible.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

4. Install anchor bolts to elevations required for proper attachment to supported equipment.

5. Anchor domestic-water heaters to substrate.

C. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping."

D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 22 11 19 "Domestic Water Piping Specialties."

G. Install thermometer on inlet and outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

H. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each domestic-water heater outlet. Comply with requirements for valves specified in Section 22 05 23 "General-Duty Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 22 05 19 "Meters and Gages for Plumbing Piping."

I. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig (172 kPa) . Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 22 11 19 "Domestic Water Piping Specialties."

J. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

K. Fill domestic-water heaters with water.

L. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Section 22 11 16 "Domestic Water Piping."

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Where installing piping adjacent to domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in

B. Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 01 40 00 "Quality Requirements" for retesting and reinspecting requirements and Section 01 73 00 "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain installed domestic-water heaters. Provide start-up report to the ownership.

END OF SECTION 22 33 00

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SECTION 22 41 00 – FIXTURES AND APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following plumbing fixtures, appliances and related roughing:

1. Faucets for lavatories, and sinks.
2. Laminar-flow faucet-spout outlets.
3. Flushometers.
4. Toilet seats.
5. Protective shielding guards.
6. Fixture supports.
7. Interceptors for individual fixtures.
8. Disposers.
9. Drinking fountains.
10. Electric water coolers.
11. Water-station coolers.
12. Water closets.
13. Urinals.
14. Lavatories.
15. Commercial sinks.
16. Wash fountains.
17. Kitchen sinks.
18. Service sinks.
19. Mop receptors.
20. Laundry trays.

B. This section does not include:

1. Interceptors serving multiple fixtures and appliances.

2. Food service fixtures and appliances. Sanitary plumbing fixtures located within food service areas are included.

C. For the purpose of this specification, the term “plumbing fixture” also includes appliances that require plumbing connections. Requirements listed below for plumbing fixtures also apply to the appliances that require plumbing connections.

1.2 RELATED DOCUMENTS

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

B. Related Sections include the following:

1. Division 02 Section "Water Distribution" for exterior plumbing fixtures and hydrants.

2. Division 10 Section "Toilet and Bath Accessories."

3. Division 22 Section 22 05 00 “Common Work Results for Plumbing”.

4. Division 22 Section 22 11 19 "Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.

5. Division 22 Section 22 32 00 "Water Filtration Equipment" for water filters.

6. This section is a part of each Division 22.

7. Division 26 “Electrical” for fixtures and appliances requiring power supply.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

E. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

F. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

G. Fixture: drinking fountain or water cooler unless one is specifically indicated.

H. FRP: Fiberglass-reinforced plastic.

I. PMMA: Polymethyl methacrylate (acrylic) plastic.

J. PVC: Polyvinyl chloride plastic.

K. Remote Water Cooler: Electrically powered equipment for generating cooled drinking water.

L. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

M. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" and local code; for plumbing fixtures for people with disabilities.

D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

G. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers: for style classifications.

H. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

I. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers.

J. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.

2. Plastic Lavatories: ANSI Z124.3.

3. Plastic Laundry Trays: ANSI Z124.6.

4. Plastic Mop-Service Basins: ANSI Z124.6.

5. Plastic Sinks: ANSI Z124.6.

6. Plastic Urinal Fixtures: ANSI Z124.9.

7. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.

8. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.

9. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.

10. Vitreous-China Fixtures: ASME A112.19.2M.

11. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

12. Water-Closet, Flushometer Tank Trim: ASSE 1037.

K. Comply with the following applicable standards and other requirements specified for lavatory and/or sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.

2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.

3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.

4. Faucets: ASME A112.18.1.

5. Hose-Connection Vacuum Breakers: ASSE 1011.

6. Hose-Coupling Threads: ASME B1.20.7.

7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.

8. NSF Potable-Water Materials: NSF 61.

9. Pipe Threads: ASME B1.20.1.

10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.

11. Supply Fittings: ASME A112.18.1.

12. Brass Waste Fittings: ASME A112.18.2.

L. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.

2. Brass and Copper Supplies: ASME A112.18.1.

3. Dishwasher Air-Gap Fittings: ASSE 1021.

4. Manual-Operation Flushometers: ASSE 1037.

5. Plastic Tubular Fittings: ASTM F 409.

6. Brass Waste Fittings: ASME A112.18.2.

7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

M. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Floor Drains: ASME A112.6.3.
5. Grab Bars: ASTM F 446.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Off-Floor Fixture Supports: ASME A112.6.1M.
8. Pipe Threads: ASME B1.20.1.
9. Plastic Toilet Seats: ANSI Z124.5.
10. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of plumbing fixtures that fail in materials or workmanship within specified warranty period.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.
4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
5. Flushometer Tank, Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than 2 of each type.
6. Water-Closet Tank, Repair Kits: Equal to 5 percent of amount of each type installed.

7. Toilet Seats: Equal to 5 percent of amount of each type installed.

8. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

    a. Filter Cartridges: Equal to 20 percent of amount installed for each type and size indicated, but no fewer than 5 of each.

PART 2 - PRODUCTS

2.1 FAUCETS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

    a. American Standard Companies, Inc.

    b. Central Brass Manufacturing Company.

    c. Delta Faucet Company.

    d. Eljer.

    e. Gerber Plumbing Fixtures LLC.

    f. Grohe America, Inc.

    g. Hansgrohe Inc.

    h. Kohler Co.

    i. Moen, Inc.

    j. Speakman Company.

    k. Symmons Industries, Inc.

    l. T & S Brass and Bronze Works, Inc.

    m. Wolverine Brass, Inc.

B. Descriptions:

1. Lavatory Faucets: Single-control mixing or Single-control non-mixing or Two-handle mixing valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

2. Bathtub Faucets: Single-control mixing or Two-handle mixing or Three-handle mixing or Push-button, metering, non-mixing valve. Include hot- and cold-water indicators and tub spout. Coordinate faucet inlets with supplies.

3. Combination Bathtub/Shower Faucets: Single-handle pressure-balance or thermostatic or thermostatic/pressure-balance valve for bathtub and for shower. Include hot- and cold-water indicators; check stops; tub spout; and shower head, arm, and flange. Coordinate faucet inlets with supplies; coordinate outlet with diverter valve.

4. Shower Faucets: Single-handle pressure-balance or thermostatic or thermostatic and pressure-balance valve. Include hot- and cold-water indicators; check stops; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.

5. Sink Faucets: Kitchen faucet with spray, three-hole fixture or Kitchen faucet with spray, four-hole fixture or Kitchen faucet without spray or Laundry tray faucet or Service sink faucet with stops in shanks, vacuum breaker, hose-thread outlet, and pail hook or Bar sink faucet. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

2.2 FLUSHOMETERS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Delany Co.

b. Delta Faucet Company.

c. Sloan Valve Company.

d. Zurn Plumbing Products Group.

e. TOTO USA, Inc.

3. Description: Flushometer for urinal and water-closet-type fixture. Include brass body with corrosion-resistant internal components, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

2.3 TOILET SEATS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a product comparable with specified water closet, manufacturer's standard.

B. Seats for public toilets shall be open-front, no cover.

2.4 PROTECTIVE SHIELDING GUARDS

A. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following:

a. Engineered Brass Co.

b. McGuire Manufacturing Co., Inc.

c. TRUEBRO, Inc.

d. Zurn Plumbing Products Group.

B. Description:

1. Manufactured wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

2.5 FIXTURE SUPPORTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.

2. MIFAB Manufacturing Inc.

3. Tyler Pipe; Wade Div.

4. Watts Drainage Products Inc.

5. Zurn Plumbing Products Group.

B. Descriptions:

1. Water Closets: Combination carrier designed for accessible or standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space. Provide compact non-adjustable supports for individual toilets. Provide adjustable supports for two and more toilets in a row, unless noted otherwise on the drawings.

2. Urinals: Urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture for wall-mounting, urinal-type fixture. Include steel uprights with feet.

3. Lavatories: Lavatory carrier with exposed arms and tie rods, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.

   a. Accessible-Fixture Support: Include rectangular steel uprights.

4. Sinks: Sink carrier with exposed arms and tie rods for sink-type fixture. Include steel uprights with feet.

2.6 INTERCEPTORS FOR INDIVIDUAL FIXTURES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Josam Company.

2. MIFAB Manufacturing Inc.

3. Tyler Pipe; Wade Div.

4. Watts Drainage Products Inc.

5. Zurn Plumbing Products Group.

2.7 DISPOSERS

A. Manufacturer:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

   a. American Standard Companies, Inc.

b. General Electric.

c. In-Sink-Erator; a div. of Emerson Electric Co.

d. KitchenAid.

e. Maytag Co.

f. WhiteRock Corp.

B. Description: Batch or Continuous-feed household, food-waste disposer. Include reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-½ (DN 40) outlet; dishwasher drain connector, quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.

1. Type: Batch or Continuous-feed household.

2. Model: Sound-insulated chamber and stainless-steel outer shell.

3. Motor: with overload protection.

2.8 DRINKING FOUNTAINS

A. Exterior Drinking Fountains:

1. Manufacturers: Subject to compliance with requirements, provide products specified by the Architect or Landscape Designer.

2. If no product specified by the Architect or Landscape Designer: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Filtrine Manufacturing Company.

b. Halsey Taylor.

c. Haws Corporation.

d. Most Dependable Fountains, Inc.

e. Murdock, Inc.

f. Oasis Corporation.

3. Description: Free standing exterior drinking fountain with weather proof finish. Bi-level, where specified.

B. Interior Drinking Fountains:

1. Manufacturers: Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Elkay Manufacturing Co.

b. Filtrine Manufacturing Company.

c. Halsey Taylor.

d. Haws Corporation.

e. Murdock, Inc.

f. Oasis Corporation.

3. Description: Wall mounted, recessed or semi-recessed type; bi-level where specified.

2.9 ELECTRIC WATER COOLERS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Elkay Manufacturing Co.

b. Halsey Taylor.

c. Haws Corporation.

d. Larco, Inc.

e. Oasis Corporation.

f. Sunroc Corp.

B. Description:

1. Wall mounted, recessed or semi-recessed as specified.

2. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.

3. Drain(s): Grid with NPS 1-¼ (DN 32) minimum horizontal waste and trap complying with ASME A112.18.1.

4. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

   a. Capacity: As specified.

   b. Electrical Characteristics: 120-V ac; single phase; 60 Hz.

5. Provide remote water cooler where specified.

2.10 WATER CLOSETS AND URINALS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

   a. Crane.

   b. American Standard Companies, Inc.

   c. Zurn

   d. Gerber.

   e. Eljer.

   f. Kohler Co.

   g. TOTO USA, Inc.

2.11 LAVATORIES

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. American Standard Companies, Inc.

b. Eljer.

c. Kohler Co.

d. Crane Plumbing, L.L.C./Fiat Products.

e. Gerber Plumbing Fixtures LLC.

f. Sterling Plumbing Group, Inc.

g. TOTO USA, Inc.

2.12 SINKS - STAINLESS STEEL

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Advance Tabco.

b. Elkay Manufacturing Co.

c. Just Manufacturing Company.

d. Zurn.

2.13 KITCHEN AND BAR SINKS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Elkay Manufacturing Co.

b. Eljer.

c. Kohler Co.

d. Gerber Plumbing Fixtures LLC.

e. American Standard Companies, Inc.

f. Just Manufacturing Company.

g. Moen, Inc.

h. Sterling Plumbing Group, Inc.

2.14 SERVICE SINKS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. American Standard Companies, Inc.

b. Crane Plumbing, L.L.C./Fiat Products.

c. Eljer.

d. Kohler Co.

2.15 MOP RECEPTOR

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Acorn Engineering Company.

b. Crane Plumbing, L.L.C./Fiat Products.

c. Florestone Products Co., Inc.

d. Precast Terrazzo Enterprises, Inc.

e. Zurn Plumbing Products Group.

2.16 LAUNDRY TRAYS

A. Manufacturers:

1. Subject to compliance with requirements, provide products specified by the Architect.

2. If no product specified by the Architect: Subject to compliance with requirements, provide a comparable product by one of the following:

a. Commercial Enameling Company.

b. Eljer.

c. Crane Plumbing, L.L.C./Fiat Products.

d. Florestone Products Co., Inc.

e. Gerber Plumbing Fixtures LLC.

f. Zurn Plumbing Products Group.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.

B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.

2. Use carrier supports without waste fitting for fixtures with tubular waste piping.

3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

4. Use mounting frames for recessed water coolers, unless otherwise indicated.

5. Set remote water coolers on floor, unless otherwise indicated.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

G. Install counter-mounting fixtures in and attached to casework.

H. Install fixtures level and plumb according to roughing-in drawings.

I. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Provide ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Section 22 05 23 "Valves for Plumbing Piping" of this Division.

J. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

K. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

L. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

M. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

N. Install toilet seats on water closets.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

S. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Section 22 05 00 “Common Work Results for Plumbing” of this Division.

T. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

U. Coordinate with electrical contractor power supply required for hard-wired fixtures and appliances and locations of receptacles required for plug-in appliances.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections of this Division. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding."

D. Electrical Contractor to connect wiring according to Division 26 Section "Conductors and Cables." This contractor shall provide and coordinate required connection points and receptacles.

3.4 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

F. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

1. Remove and replace malfunctioning units and retest as specified above.

2. Report test results in writing.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot-water dispensers and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.

D. Replace washers and seals of leaking and dripping faucets and stops.

E. Install fresh batteries in sensor-operated mechanisms.

F. Adjust drinking fountain/water cooler fixture flow regulators for proper flow and stream height.

G. Adjust water coolers and hot water disposers temperature settings.

3.6 CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.

2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

C. Clean fixtures, on completion of installation, according to manufacturer’s written instructions.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of permanent plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 41 00

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