Preparing Activity: USACE Superseding
UFGS-22 00 70 (November 2011)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 22 00 70

PLUMBING FOR HEALTHCARE FACILITIES

05/20

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SECTION 22 00 70

PLUMBING FOR HEALTHCARE FACILITIES
05/20

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NOTE: This specification covers the requirements for plumbing systems in healthcare facilities.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).

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PART 1 GENERAL

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NOTE: This guide specification includes plumbing fixtures, equipment, and piping which is located within, on, under, and adjacent to buildings. Plumbing system requirements must conform to Federal Standard FED-STD-795, "Uniform Federal Accessibility Standards (UFAS)," Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, and Department of Defense (DoD) adopted and approved International Plumbing Code (ICC IPC), as modified by UFC 1-200-1 "General Building Requirements", UFC 3-101-01 Architecture, UFC 4-510-01, "Design: Medical Military Facilities", and UFC 3-420-1, "Plumbing Systems". Equipment supports and connections, for either equipment on the ground or in the building, must conform to these

requirements.

Show following information on project drawings:

1. Only drawings (not specifications) must indicate capacity, efficiency, dimensions, details, plan view, sections, elevations, locations of fixtures and equipment, and space required to replace strainers, filters, and for maintenance of equipment.

2. Location of wye strainer on building side of water supply valve in each building; indicate wye strainer blow-off outlet with piping to adjacent exterior wall hydrant (this will clean the strainer each time the wall hydrant is used).

3. Configuration, slope, and location of each piping system such as: above or below floors, above or below ceilings, above or below roofs, above or below ground.

4. Location of each sectionalizing valve in each water system. Sectionalizing valves must be ball valves.

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1.1 REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a reference ID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z21.10.1/CSA 4.1 (2019) Gas Water Heaters Vol. I, Storage Water Heaters with Input Ratings of 75,000

	Btu Per Hour or Less
ANSI Z21.10.3/CSA 4.3	(2019) Gas-Fired Water Heaters Vol.III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous
ANSI Z21.22/CSA 4.4	(2015; R 2020) Relief Valves for Hot Water Supply Systems

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - SI	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A13.1	(2020) Scheme for the Identification of Piping Systems
ASME A112.1.2	(2012; R 2017; R 2022) Air Gaps in Plumbing Systems (For Plumbing Fixtures and Water-Connected Receptors)
ASME A112.6.1M	(1997; R 2017) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3	(2019) Standard for Floor and Trench Drains
ASME A112.6.4	(2003: R 2012) Roof, Deck and Balcony Drains
ASME A112.14.1	(2003; R 2017; R 2022) Backwater Valves
ASME A112.19.2/CSA B45.1	(2018; ERTA 2018) Standard for Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals
ASME A112.19.3/CSA B45.4	(2022) Stainless Steel Plumbing Fixtures
ASME A112.36.2M	(1991; R 2017) Cleanouts
ASME B1.20.1	(2013; R 2018) Pipe Threads, General Purpose (Inch)
ASME B1.20.2M	(2006; R 2011) Pipe Threads, 60 Deg. General Purpose (Metric)
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.18	(2021) Cast Copper Alloy Solder Joint Pressure Fittings

ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2021) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(2021) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.29	(2017) Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV
ASME B16.34	(2021) Valves - Flanged, Threaded and Welding End
ASME B31.1	(2022) Power Piping
ASME B31.5	(2022) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2022) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2017) BPVC Section IV-Rules for Construction of Heating Boilers
ASME BPVC SEC IX	(2017; Errata 2018) BPVC Section IX-Welding, Brazing and Fusing Qualifications
ASME BPVC SEC VIII D1	(2019) BPVC Section VIII-Rules for Construction of Pressure Vessels Division 1
ASME CSD-1	(2021) Control and Safety Devices for Automatically Fired Boilers

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1001	(2021) Performance Requirements for Atmospheric Type Vacuum Breakers
ASSE 1003	(2020) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)
ASSE 1010	(2021) Performance Requirements for Water Hammer Arresters
ASSE 1011	(2017) Performance Requirements for Hose Connection Vacuum Breakers
ASSE 1012	(2023) Performance Requirements for Backflow Preventer with an Intermediate Atmospheric Vent
ASSE 1013	(2021) Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies

ASSE 1017	(2023) Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems - (ANSI approved 2010)
ASSE 1018	(2001; R 2021) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002
ASSE 1019	(2011; R 2016) Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance
ASSE 1020	(2020) Performance Requirements for Pressure Vacuum Breaker Assemblies
ASSE 1037	(2015; R 2020) Performance Requirements for Pressurized Flushing Devices for Plumbing Fixtures
ASSE 1070	(2015) Performance Requirements for Water Temperature Limiting Devices

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA 10084	(2017) Standard Methods for the Examination of Water and Wastewater
AWWA B300	(2018) Hypochlorites
AWWA B301	(2018) Liquid Chlorine
AWWA C203	(2020) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA C606	(2022) Grooved and Shouldered Joints
AWWA C651	(2014) Standard for Disinfecting Water Mains
AWWA C652	(2019) Disinfection of Water-Storage Facilities
AWWA C700	(2020) Cold-Water Meters - Displacement Type, Metal Alloy Main Case
AWWA C701	(2019) Cold-Water Meters - Turbine Type for Customer Service
AWWA D100	(2021) Welded Steel Tanks for Water Storage

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2019) Specification for Filler Metals for Brazing and Braze Welding
AWS B2.1/B2.1M	(2021) Specification for Welding Procedure

	and Performance Qualification
AWS B2.2/B2.2M	(2016) Specification for Brazing Procedure and Performance Qualification

ASTM INTERNATIONAL (ASTM)

ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A74	(2021) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A105/A105M	(2021) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A183	(2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2023) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A312/A312M	(2022a) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A403/A403M	(2022b) Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
ASTM A515/A515M	(2017; R2022) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A518/A518M	(1999; R 2022) Standard Specification for Corrosion-Resistant High-Silicon Iron Castings
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A755/A755M	(2018) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A815/A815M	(2023) Standard Specification for Wrought

	Ferritic, Ferritic/Austenitic, and Martensitic Stainless Steel Piping Fittings
ASTM A861	(2004; R 2023) Standard Specification for High-Silicon Iron Pipe and Fittings
ASTM A888	(2021a) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B32	(2020) Standard Specification for Solder Metal
ASTM B36/B36M	(2018) Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
ASTM B75/B75M	(2020) Standard Specification for Seamless Copper Tube
ASTM B88	(2022) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2020) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM B111/B111M	(2018) Standard Specification for Copper and Copper-Alloy Seamless Condenser Tubes and Ferrule Stock
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B152/B152M	(2019) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B306	(2020) Standard Specification for Copper Drainage Tube (DWV)
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B584	(2022) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B813	(2016) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM C564	(2020a) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1053	(2000; R 2010) Standard Specification for Borosilicate Glass Pipe and Fittings for

	Drain, Waste, and Vent (DWV) Applications
ASTM D635	(2018) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM D1784	(2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	(2015; E 2018) Standard Specification for Poly(Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D2000	(2018) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2564	(2020) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2657	(2007; R 2015) Heat Fusion Joining Polyolefin Pipe and Fittings
ASTM D2665	(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2729	(2017) Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D2846/D2846M	(2019) Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
ASTM D2855	(2015) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D3139	(2019) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	(2020) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3311	(2017) Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
ASTM D4101	(2017) Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
ASTM D4586/D4586M	(2007; R 2018) Asphalt Roof Cement, Asbestos-Free

ASTM E1	(2014) Standard Specification for ASTM Liquid-in-Glass Thermometers
ASTM E2129	(2018) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM F402	(2005; R 2012) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F477	(2014; R 2021) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F656	(2021) Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM F1290	(2019) Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
ASTM F1412	(2022) Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems
ASTM F2618	(2021) Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2018) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(2012) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015	(2016; 14/17) Copper Tube Handbook

CSA GROUP (CSA)

CSA B45.5-17/IAPMO Z124	(2017; Errata 2017; Errata 2018) Plastic Plumbing Fixtures

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR Manual	(10th Edition) Manual of Cross-Connection Control

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

IAPMO Z124.5	(2013; E 2013; R 2018) Plastic Toilet Seats

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities
ICC IPC	(2021) International Plumbing Code

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z358.1	(2014; R 2020) American National Standard for Emergency Eyewash and Shower Equipment

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-25	(2018) Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-58	(2018) Pipe Hangers and Supports - Materials, Design and Manufacture, Selection, Application, and Installation
MSS SP-67	(2022) Butterfly Valves
MSS SP-70	(2011) Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-78	(2011) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(2019) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends
MSS SP-110	(2010) Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

NACE INTERNATIONAL (NACE)

NACE SP0169	(2013) Control of External Corrosion on Underground or Submerged Metallic Piping Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA MG 1	(2021) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors
NEMA Z535.1	(2022) Safety Colors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2021) National Fuel Gas Code
NFPA 58	(2020; TIA 20-1; TIA 20-2; TIA 20-3) Liquefied Petroleum Gas Code
NFPA 90A	(2024) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF/ANSI 14	(2022) Plastics Piping System Components and Related Materials
NSF/ANSI 42	(2022) Drinking Water Treatment Units - Aesthetic Effects
NSF/ANSI 53	(2019) Drinking Water Treatment Units
NSF/ANSI 61	(2022) Drinking Water System Components - Health Effects
NSF/ANSI 372	(2016) Drinking Water System Components - Lead Content

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA Fire Man	(2016) Firestopping: Plastic Pipe in Fire Resistive Construction

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI G 101	(2010) Testing and Rating Procedure for Hydro Mechanical Grease Interceptors with Appendix of Installation and Maintenance
PDI WH 201	(2010) Water Hammer Arresters Standard

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508	(2023) Hose Clamp Specifications

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

PL 93-523	(1974; A 1999) Safe Drinking Water Act

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

10 CFR 430	Energy Conservation Program for Consumer Products
29 CFR 1910.144	Safety Color Code for Marking Physical Hazards
40 CFR 50.12	National Primary and Secondary Ambient Air Quality Standards for Lead
40 CFR 141.74	(2019) National Primary Drinking Water Regulations
40 CFR 143	National Secondary Drinking Water Regulations

UNDERWRITERS LABORATORIES (UL)

UL 174	(2004; Reprint Dec 2021) UL Standard for Safety Household Electric Storage Tank Water Heaters
UL 399	(2017; Reprint May 2019) UL Standard for Safety Drinking Water Coolers
UL 499	(2014; Reprint May 2023) UL Standard for Safety Electric Heating Appliances
UL 508	(2018; Reprint Jul 2021) UL Standard for Safety Industrial Control Equipment
UL 732	(2018; Reprint Aug 2018) UL Standard for Safety Oil-Fired Storage Tank Water Heaters
UL 778	(2016; Reprint Jun 2021) UL Standard for Safety Motor-Operated Water Pumps
UL 1951	(2011; Reprint Jun 2020) UL Standard for Safety Electric Plumbing Accessories

1.2 SYSTEM DESCRIPTION

Provide complete and operable plumbing systems including sanitary and storm drainage, domestic water, plumbing fixtures, valves, pumps, water heaters, supports, and all associated appurtenances.

1.2.1 Performance Requirements

1.2.1.1 Cathodic Protection and Pipe Joint Bonding

Provide cathodic protection and pipe joint bonding systems in accordance with [Section 26 42 13 GALVANIC (SACRIFICIAL) ANODE CATHODIC PROTECTION (GACP) SYSTEM] [and] [Section 26 42 17 IMPRESSED CURRENT CATHODIC PROTECTION (ICCP) SYSTEM].

1.2.2 Accessibility of Equipment

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NOTE: The following requirement is intended to solicit the installer's help in the prudent location of equipment when he has some control over locations. However, designers should not rely on it at all since enforcing this requirement in the field would be difficult. Therefore, the system designer needs to layout and indicate the locations of equipment, control devices, and access doors so that most of the accessibility questions are resolved inexpensively during design.

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Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, and equipment requiring access, in locations freely accessible through access doors.

[1.2.3 Sustainable Design Requirements

1.2.3.1 Environmental Data

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NOTE: ASTM E2129 provides for detailed documentation of the sustainability aspects of products used in the project. This level of detail may be useful to the Contractor, Government, building occupants, or the public in assessing the sustainability of these products. This is optional for Army projects.

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Submit Table 1 of ASTM E2129 for products provided under work of this Section.

]1.3 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a “G” to an item,

if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Environmental Data; G[, [_____]]

SD-02 Shop Drawings

Plumbing System; G[, [_____]]

Domestic Water Systems Flushing Program; G[, [_____]]

SD-03 Product Data

Pipe and Fittings; G[, [_____]]

Pipe Hangers, Inserts, and Supports; G[, [_____]]

Valves; G[, [_____]]

Plumbing Fixtures; G[, [_____]]

Backflow Preventers; G[, [_____]]

Drains and Backwater Valves; G[, [_____]]

Cleanouts; G[, [_____]]

Interceptors; G[, [_____]]

Water Heaters; G[, [_____]]

Storage Tanks; G[, [_____]]

Pumps; G[, [_____]]

Water Pressure Booster System; G[, [_____]]

Water Service Meter; G[, [_____]]

Copper-Silver Ionization System; G[, [_____]]

Potable Water Monitoring System; G[, [_____]]

Vibration-Absorbing Features; G[, [_____]]

Recycled content for cast iron pipe; S

Recycled content for steel pipe; S

WaterSense label for shower head; S

Energy Star label for electric water cooler; S

WaterSense label for urinal; S

WaterSense label for water closet; S

Energy Star label for gas storage water heater; S

Energy Star label for gas instantaneous water heater; S

Plumbing System

SD-06 Test Reports

Tests, Flushing and Disinfection

Test of Backflow Prevention Assemblies

SD-07 Certificates

Materials and Equipment

Welding

Bolts

Pressure-Seal (Press-Fit) System Installation Training

Pressure-Seal (Press-Fit) Tools Calibration

EPA Registration for Copper-Silver Ionization

NSF Certification for Copper-Silver Ionization

SD-10 Operation and Maintenance Data

Plumbing System; G[, [_____]]

Maintenance Data Package; [1] [2] [3] [4] [5]

Submit in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATE; G[, [____]].

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Manufacturer Qualifications

Engage manufacturers regularly manufacturing, supplying, and servicing of specified products and equipment, as well as, providing engineering and/or start-up services as specified. Provide evidence demonstrating compliance for a minimum of 5 years, and on 5 projects of similar complexity.

1.4.1.2 Installer Qualifications

Installer must be licensed, and must provide evidence of the successful completion of at least five projects of equal or greater size and complexity. Provide tradespeople skilled in the appropriate trade. Installation of the following items/systems must be done by authorized representatives of respective manufacturers:

a. Water Pressure Booster Pump System.

b. Copper-silver Ionization System.

1.4.2 Welding

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NOTE: The designer will indicate welding requirements on the project drawings. Normally, delete the second bracketed statement. If the need exists for more stringent requirements for weldments, delete the first bracketed statement and the welding submittal.

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[Weld piping in accordance with qualified procedures using performance-qualified welders and welding operators. Submit a list of names and identification symbols of qualified welders and welding operators. Provide documentation that welders, and welding operators are certified in accordance with American Welding Society Standard AWS B2.1/B2.1M. Qualify procedures and welders in accordance with ASME BPVC SEC IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer, may be accepted as permitted by ASME B31.1. Notify the Contracting Officer 24 hours in advance of tests, and perform the tests at the work site if practicable. Welders or welding operators must apply their assigned symbols near each weld they make as a permanent record.] [Welding and nondestructive testing procedures are specified in Section 40 05 13.96 WELDING PROCESS PIPING.] [Weld structural members in accordance with Section 05 05 23.16 STRUCTURAL WELDING.]

1.4.3 Regulatory Requirements

1.4.3.1 International Code Council (ICC) Codes

Unless otherwise required herein, perform plumbing work in accordance with the ICC IPC.

a. For ICC Codes, interpret reference to the "code official" to mean the "Contracting Officer." For Government-owned property, interpret references to the "owner" to mean the "Contracting Officer." For leased facilities, interpret references to the "owner" to mean the "lessor." Interpret references to the "permit holder" to mean the "Contractor."

b. For ICC Codes referenced in the Contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this Contract and by the authority granted to the [Officer in Charge of Construction][Resident Engineer] to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, must be applied appropriately by the Contracting Officer as authorized by their administrative cognizance and the FAR.

1.4.4 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

1.4.5 Service Support

The equipment items must be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations must be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the Contract. Provide Maintenance Data Package [1] [2] [3] [4] [5]. Submit manuals in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.5 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

1.6 MAINTENANCE

Provide extra materials as follows:

a. Four additional cartridges for each waterless urinal installed along with any tools needed to remove/install the cartridge. Provide an additional quart of biodegradable liquid for each urinal installed.

b. One spare electrode cell for the copper-silver ionization system.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment must essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Provide standard products that have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

2.2 MANUFACTURER'S NAMEPLATE

Each item of equipment must have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable. See also paragraph "Nameplates" in PART 3.

2.3 MATERIALS AND EQUIPMENT

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NOTE: Some materials listed are superior to others for specific requirements. Therefore, information should be obtained from the using service for any special requirements before selection of material is made. The type of tubing or pipe required will be as determined by local experience. In the absence of actual experience with water characteristics, the selection of materials for pipe, tubing, and tanks will be made by reference to the classification of water into categories as listed in UFC 3-420-01. Chap 4. Preference will be given to the following materials for waste pipe: 100 percent recycled content cast iron. Preference should be given, in this order, to the following materials for supply pipe: copper, galvanized steel.

This specification allows drainage systems up to 375 mm 15 inch diameter only; designer will ensure the availability of materials when drainage line exceeds 375 mm 15 inch diameter.

Nonpressure pipe is an EPA designated product for recycled content. Use materials with recycled content where appropriate for use. Designer must verify suitability, availability within the region, cost effectiveness and adequate competition before specifying product recycled content requirements. A resource that can be used to identify products with recycled content is the "Comprehensive Procurement Guidelines (CPG)" page within the EPA's website at http://www.epa.gov. Other products with recycled content are also acceptable when meeting all requirements of this specification.

The use of plastic pipe for domestic water service is not acceptable. Plastic pipe is acceptable for pure water systems such as deionized water and reverse osmosis water systems.
****

Submit manufacturer's catalog data with highlighting to show model, size, options, and other features, that are intended for consideration. Provide adequate data to demonstrate compliance with Contract requirements. Submit certificate stating that the design, fabrication, and installation conform to the code, where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code.

a. Provide NSF/ANSI 14 and NSF listed plastic pipe, fittings, and solvent cement for the service intended. Provide plastic pipe, fittings, and solvent cement used for potable hot and cold water service bearing the NSF seal "NSF-PW." Provide polypropylene pipe and fittings conforming to dimensional requirements of Schedule 40, Iron Pipe size. Do not install plastic pipe in air plenums. Do not install plastic pipe in pressure piping systems in buildings greater than three stories including any basement levels.

b. [Provide cast-iron pipe containing a minimum of 95 percent recycled content. Provide data identifying percentage of recycled content for cast iron pipe.] Hubless cast-iron soil pipe installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors is not acceptable.

c. Provide cement pipe containing recycled content as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

d. Provide steel pipe containing a minimum of 25 percent recycled content, with a minimum of 16 percent post-consumer recycled content. Provide data identifying percentage of recycled content for steel pipe. Select pipe schedules based on service requirements. Provide pipe fittings compatible with the applicable pipe materials. Provide pipe threads (except dry seal) conforming to ASME B1.20.2M ASME B1.20.1. Provide grooved pipe couplings and fittings from the same manufacturer.

e. The use of lead containing materials or equipment in any potable water system is not acceptable. Comply with PL 93-523, NSF/ANSI 61, Section 8, and NSF/ANSI 372 for inline devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers. Comply with NSF/ANSI 61, Section 9, and NSF/ANSI 372 for endpoint devices such as water coolers, lavatory faucets, kitchen and bar faucets, ice makers, supply stops and endpoint control valves used to dispense water for drinking.

2.4 PIPE AND FITTINGS

2.4.1 Domestic Water Piping

Domestic water piping at service entrance (from 305 mm 1 foot inside building to 1525 mm5 feet outside): Provide same as indicated for outside utilities.

a. 50 mm2 inches and smaller after service entrance above grade:

(1) Provide copper tube conforming to ASTM B88M ASTM B88, type L, with

soldered joints and wrought copper ASME B16.22 or cast brass ASME B16.18 fittings.

(2) Provide stainless steel pipe conforming to ASTM A312/A312M, Schedule 40, with threaded and butt weld joints. Provide stainless steel fittings conforming to ASTM A815/A815M, stainless steel casting dimensions matching stainless steel pipe for threaded and butt weld connections.

****

NOTE: Do NOT use paragraphs 3 and 4 for Navy projects.

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(3) Pressure-seal (press-fit) fittings for Copper Pipe and Tube: Provide copper pressure-seal(press-fit) fittings conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. Provide EPDM, FKM, or HNBR sealing elements for copper pressure-seal (press-fit) fittings. Sealing elements must be factory installed or an alternative supplied fitting manufacturer. Select sealing elements based on manufacturer's approved application guidelines.

(4) Provide stainless steel pipe conforming to ASTM A312/A312M, Schedule 40, iron pipe size. Provide pressure-seal (press-fit) fittings for ASTM A312/A312M Schedule 40 stainless steel IPS pipe and tube. Stainless steel pressure-seal (press-fit) fittings conforming to the material and sizing requirements of ASTM A312/A312M or ASTM A403/A403M; NSF/ANSI 61 listed. Provide EPDM or FKM sealing elements for stainless steel pressure-seal (press-fit) fittings. Sealing elements must be factory installed or an alternative supplied fitting manufacturer. Select sealing elements based on manufacturer's approved application guidelines.

b. 65 mm 2 1/2-inch and larger after service entrance above grade:

(1) Provide copper tube conforming to ASTM B88MASTM B88, type L, with brazed joints and wrought copper ASME B16.22 or cast brass ASME B16.18 fittings.

(2) Provide stainless steel pipe conforming to ASTM A312/A312M, Schedule 40, with threaded and butt weld joints. Provide stainless steel fittings conforming to ASTM A815/A815M or ASTM A403/A403M, stainless steel casting dimensions matching stainless steel pipe for threaded and butt weld connections.

****

NOTE: Do NOT use paragraphs 3, 4, 5, and 6 for Navy projects.

****

(3) Provide copper tube conforming to ASTM B88M ASTM B88, type L, with roll-groove joints and manufactured grooved fittings conforming to ASTM A755/A755M C12200 or ASTM B152/B152M C11000 and ASME B16.22 for wrought copper, or in accordance with ASTM B584 copper alloy CDA 836 (85-5-5-5) in accordance with ASME B16.18.

(4) Provide copper tube conforming to ASTM B88M ASTM B88, type L. Provide pressure-seal (press-fit) fittings for copper pipe and

tube. Copper pressure-seal (press-fit) fittings conforming to the material and sizing requirements of ASME B16.18 or ASME B16.22. Provide EPDM, FKM, or HNBR sealing elements for copper pressure-seal (press-fit) fittings. Sealing elements must be factory installed or an alternative supplied fitting manufacturer. Select sealing elements based on manufacturer's approved application guidelines.

(5) Provide stainless steel pipe conforming to ASTM A312/A312M, Schedule 40, iron pipe size. Provide pressure-seal (press-fit) fittings for ASTM A312/A312M Schedule 40 stainless steel IPS pipe and tube. Stainless steel pressure-seal (press-fit) fittings conforming to the material and sizing requirements of ASTM A312/A312M or ASTM A403/A403M; NSF/ANSI 61 listed. Provide EPDM or FKM sealing elements for stainless steel pressure-seal (press-fit) fittings. Sealing elements must be factory installed or an alternative supplied fitting manufacturer. Select sealing elements based on manufacturer's approved application guidelines.

(6) Provide stainless steel pipe conforming to ASTM A312/A312M, Schedule 10, with roll-groove joints and manufactured grooved fittings conforming to ASTM A815/A815M with stainless steel casting dimensions matching stainless steel pipe.

c. Below grade:

(1) Provide copper tube conforming to ASTM B88MASTM B88, type K soft, with brazed joints and wrought copper ASME B16.22 fittings.

(2) Where below-grade run of piping is shorter than 15 m50 feet, below-grade joints are not acceptable.

d. Connections to Existing Galvanized Piping:

(1) Provide threaded, mechanical groove, mechanical plain-end, or flanged connections.

2.4.2 Deionized and Reverse Osmosis Water Piping

CPVC Plastic Pipe, Fittings, and Solvent Cement: Provide ASTM D2846/D2846M, Schedule 80 CPVC. Provide transition union connections or threaded gate valve between copper tubing and chlorinated polyvinyl chloride (CPVC) piping. Provide male threaded adapters with PTFE (polytetrafluoroethylene) pipe thread paste for threaded connections to valves, strainers, and equipment.

2.4.3 Drainage Piping (Soil, Waste, Vent, Indirect, and Storm)

a. Above grade:

(1) Provide cast-iron conforming to ASTM A74, hubbed pipe and fittings with ASTM C564 elastomeric push joints.

(2) Provide cast-iron conforming to CISPI 301 or ASTM A888, hubless pipe, fittings, and CISPI 310 elastomeric sealing sleeves with stainless-steel or cast iron clamps.

(3) Provide copper tube conforming to ASTM B306, type DWV or heavier, with soldered joints and wrought copper ASME B16.29 or cast brass

ASME B16.23 drainage and vent fittings. Provide copper piping systems within MRI shielding assemblies.

(4) Provide seamless or welded, hot-dipped galvanized steel conforming to ASTM A53/A53M or ASTM B36/B36M, cast iron drainage type fittings, galvanized malleable vent fittings and threaded joints.

b. Below grade:

(1) Provide cast-iron conforming to ASTM A 74, hubbed pipe and fittings with ASTM C564 elastomeric push joints.

(2) Provide PVC solid-wall pipe, iron pipe size (IPS), conforming to ASTM D1785 and ASTM D2665. PVC socket fittings conforming to ASTM D2665, made to ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. ASTM F656 adhesive primer and ASTM D2564 solvent cement. Provide PVC pipe and fittings manufactured from ASTM D1784 PVC compound cell class of 12454 and conforming to NSF/ANSI 14.

c. Foundation Drain:

(1) Provide PVC solid-wall pipe, iron pipe size (IPS), 100 mm 4 inches in diameter, perforated, conforming to ASTM D2729. PVC socket fittings conforming to ASTM D2665, made to ASTM D3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. ASTM F656 adhesive primer and ASTM D2564 solvent cement. Provide PVC pipe and fittings manufactured from ASTM D1784 PVC compound cell class of 12454 and conforming to NSF/ANSI 14.

2.4.4 Drainage Piping (Corrosive Waste)

a. Above grade:

****

NOTE: Provide cast-iron materials below grade where the discharge of waste water may be 60 degrees C 140 degrees F or greater (i.e. commercial dishwashers, sterilizers, boiler and water heater relief valve discharge and blowdown). Route cast-iron materials to a flowing main and transition to PVC materials (if applicable). Make transitions between cast-iron and PVC materials with compression joint sealers that insert into cast-iron piping; the use of over the pipe couplings are not acceptable. Note changes in materials on the Contract Drawings.

****

(1) Provide corrosive waste borosilicate glass conforming to ASTM C1053, with mechanical joints and borosilicate glass fittings.

(2) Provide corrosive waste cast iron (14 percent silica) pipe and fittings conforming to ASTM A518/A518M and ASTM A861. Mechanical joints, and bell and spigot joints are acceptable in exposed (accessible) locations. Bell and spigot joints only are acceptable in concealed (non-accessible) locations.

[(3) Provide corrosive waste Schedule 40 fire retardant polypropylene DWV pipe and fittings conforming to ASTM D4101, ASTM F1412,

ASTM D635, and ASTM D3311. Mechanical joints, and fused joints are acceptable in exposed (accessible) locations. Fused joints only are acceptable in concealed (non-accessible) locations.]

(4) Provide CPVC drainage pipe and drainage pattern fittings conforming to ASTM F2618. ASTM F656 adhesive primer and ASTM D2564 solvent cement. Provide CPVC pipe and fittings manufactured from ASTM D1784 CPVC Type IV compound cell class of 23447 and conforming to NSF/ANSI 14.

b. Below grade:

(1) Corrosive waste cast iron (14 percent silica) pipe and fittings conforming to ASTM A518/A518M and ASTM A861, with bell and spigot joints.

[(2) Corrosive waste Schedule 80 polypropylene DWV pipe and fittings conforming with ASTM D4101 and ASTM D3311 with fused joints.]

(3) Provide CPVC drainage pipe and drainage pattern fittings conforming to ASTM F2618. ASTM F656 adhesive primer and ASTM D2564 solvent cement. Provide CPVC pipe and fittings manufactured from ASTM D1784 CPVC Type IV compound cell class of 23447 and conforming to with National Sanitation Foundation (NSF) Standard 14..

2.4.5 Pressure Drainage Piping

[a. Cast iron pressure pipe and fittings, with mechanical joints.]

b. Galvanized steel, cast iron drainage fittings with threaded joints.

2.4.6 Exposed Piping in Finished Areas

a. Chrome or nickel plated brass to wall or floor.

b. Piping 50 mm2 inches and larger may be provided with chrome or nickel plated brass sleeves to cover pipe and fittings in lieu of plating.

[2.4.7 Trap Primer Pipe Between Primer Device and Drain

a. Above grade: Copper tube conforming to ASTM B88MASTM B88, type K or L, with soldered joints and wrought copper ASME B16.22 or cast brass ASME B16.18 fittings.

b. Below grade: Copper tube conforming to ASTM B88MASTM B88, type K soft, with soldered joints and wrought copper ASME B16.22 or cast brass ASME B16.18 fittings.

]2.5 PIPE JOINT MATERIALS

The use of grooved pipe and hubless cast-iron soil pipe underground is not acceptable. Mark cast iron soil pipe and fittings with the collective trademark of the Cast Iron Soil Pipe Institute. Provide joints and gasket materials conforming to the following:

a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310

b. Couplings for Stainless Steel Pipe: AWWA C606.

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NOTE: Do NOT use the following paragraph for Navy projects.

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c. Couplings for Grooved Pipe: [Ductile Iron ASTM A536 (Grade 65-45-12)] [Malleable Iron ASTM A47/A47M, Grade 32510]. [Copper ASTM A536].

d. Flange Gaskets: Provide gaskets of non-asbestos material in accordance with ASME B16.21. Provide flat gaskets, 1.6 mm1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Provide full face or self centering flat ring type gaskets. Provide gaskets bonded with NBR for hydrocarbon service.

e. Brazing Material: Conform to AWS A5.8/A5.8M, BCuP-5.

f. Brazing Flux: Provide flux in paste or liquid form appropriate for use with brazing material. Provide flux as follows: lead-free; have a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.

g. Solder Material: Solder metal conforming to ASTM B32 and Code approved "Lead Free" having a chemical composition equal to or less than 0.2 percent lead.

h. Solder Flux: Liquid form, non-corrosive, Code approved "Lead Free" and conforming to ASTM B813, Standard Test 1.

****

NOTE: Low corrosion flux for copper pipe can help reduce potentially toxic releases from soldered copper pipe.

****

i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.

j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.

k. Rubber Gaskets for Grooved Pipe: ASTM D2000, rated for a maximum temperature of not less than 110 degrees C230 degrees F.

l. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.

m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A183.

n. Flanged fittings including flanges, bolts, nuts, bolt patterns, and related features, in accordance with ASME B16.5 class 150 and having the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material conforming to ASTM A105/A105M. Blind flange material conforming to ASTM A516/A516M cold service and ASTM A515/A515M for hot service. Provide high strength or intermediate strength bolts with material conforming to ASTM A193/A193M. Submit written certification by the bolt manufacturer that the bolts furnished comply with the specified requirements.

2.6 MISCELLANEOUS MATERIALS

****

NOTE: For jobs at Newport, R.I. use diaphragm type only.

****

Miscellaneous materials conforming to the following:

a. Water Hammer Arrester: PDI WH 201. [Provide [diaphragm] [or] [piston] type water hammer arrester.]

b. Copper, Sheet, and Strip for Building Construction: ASTM B370.

c. Asphalt Roof Cement: ASTM D4586/D4586M.

d. Hose Clamps: SAE J1508.

e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.

f. Metallic Cleanouts: ASME A112.36.2M.

g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material must be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof, and verminproof properties.

h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.

i. Hypochlorites: AWWA B300.

j. Liquid Chlorine: AWWA B301.

k. Gauges - Pressure Indicating Dial Type - Elastic Element: ASME B40.100.

l. Thermometers: ASTM E1. Mercury in thermometers is not acceptable.

2.7 PIPE INSULATION MATERIAL

Provide insulation as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.8 PIPE HANGERS, INSERTS, AND SUPPORTS

Provide pipe hangers, inserts, and supports conforming to MSS SP-58. Provide non-ferrous (copper, aluminum, stainless steel hangers in MRI Suites.

2.9 VALVES

****

NOTE: Drawings will indicate equipment isolation, branch, and sectionalizing valves for water systems. Valves will be provided so that system maintenance can be performed without complete system shutdown. In general, valves should be provided in the following locations:

a. Each branch serving a group of fixtures.

b. Each riser serving a group of fixtures.

c. Isolation valves will be provided on the supply and discharge of booster and circulating pumps and on all water heaters.

****

Provide valves on supplies to equipment and fixtures. Valves 65 mm2-1/2 inches and smaller must be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 80 mm3 inches and larger must have flanged iron bodies and bronze trim. Base valve pressure ratings on the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Provide valves conforming to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70
Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4
Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers	ASME CSD-1 Safety Code, Part CW, Article 5

2.9.1 Thermostatic Mixing Valves

2.9.1.1 Master Mixing Valve Assemblies

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NOTE: Select appropriate master mixing valve specification.
****

[ASSE 1017. Provide lead-free high/low type mixing valve assembly with large type thermostatic water mixing valve and intermediate type thermostatic water mixing valve. Provide union angle strainers, checkstops on inlets outlets, and ball valves on outlets of mixing valves. Provide pilot actuated regulating valve with pressure gage, thermostat, adjustable limit stop, and dial thermometer (range -18 to 93 degrees C) (range 0 to 200 degrees F). Provide mixing valve components with rough bronze finish and mount on welded strut with corrosion resistant wall support and inlet piping manifold. Provide entire assembly factory assembled and tested. Pipe mixing valve assembly and domestic hot water return according to manufacturer's recommended piping method. Set mixing valve outlet temperature as indicated on Contract Drawings. Provide mixing valves which maintain water temperature within 2 degrees C 4 degrees F of setpoint.]

[ASSE 1017. Provide lead-free digital water temperature control and monitoring system with full-color touchscreen interface configurable on site without dedicated software, computer interface and no required factory pre-programming and control of water temperature setpoint within 1 degree C 2 degrees F through full flow range of mixing valve. Provide password protected controller with user-adjustable outlet temperature range of 27 to 82 degrees C 80 to 180 degrees F, digital monitoring of inlet water pressures and temperatures, mixed outlet temperature, mixed outlet setpoint, pressure, flow and return water temperature, user-set high-temperature sanitization mode. Provide controller with Bacnet and Modbus protocols for interface with building automation systems. Shutdown mixing valve assembly hot water supply upon the loss of cold water or power. Set mixing valve outlet temperature as indicated on Contract Drawings.]

2.9.1.2 Lavatory and Sink Mixing Valves

ASSE 1070. Provide line size mixing valves for each lavatory and/or sink faucet in restrooms. Provide mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced constructed with rough or finish bodies either with or without plating. Each valve must be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. Provide heavy cast bronze body, and interior parts of brass, bronze, corrosion-resisting steel or copper materials. Equip the valve with stop valves, check valves, unions, and sediment strainers on the inlets. Set mixing valves at 41 degrees C 105 degrees F. Mixing valves must maintain water temperature within 2 degrees C 4 degrees F of setpoint.

2.10 PLUMBING FIXTURES

****
NOTE: The systems specified for water use in a building can dramatically impact both the quantity of water resources used and the quality. Installed fixtures and systems should be life-cycle cost-effective. Low-flow and zero-flow fixtures and accessories (such as waterless urinals and sensor operators) may require special training. Because these technologies may be different from the systems and materials with which the Government personnel are familiar, education about the environmental qualities as well as the operation and maintenance

requirements may be necessary. Refer to Section 01 45 00 QUALITY CONTROL.

Reducing potable water consumption and wastewater discharge in buildings contributes to achieving sustainability requirements. Flow rates listed as options in this section are in accordance with ASHRAE 189.1 section 6.3.2.1 as required by UFC 1-200-02.

Water quality for most buildings is largely determined by the municipal water treatment facility. Most water treatment facilities rely upon chemicals, including chlorine, to combat pathogens. Chlorine is highly reactive and readily forms chlorinated compounds, many of which are considered to be dangerous. Chlorinated hydrocarbons, such as DDT, have been and are used as pesticides. If this is a concern for a given location, include the bracketed chlorine filter requirement in the lavatory, sink, cooler, shower and bathtub specification paragraphs below. The ARMY and the NAVY do not provide chlorine filters to their domestic water outlets.

These paragraphs cover fixtures most often specified. The selection of fixture requirements is based on MIL-STD-1691 to the most practicable extent. The fixture listing will be revised for each project by deleting inapplicable items. Tank type water closets are not typically utilized in healthcare settings and these requirements need to be added if these fixture types are used. The various types of fixtures will be identified by corresponding mark numbers shown on the drawings. A maximum of acceptable fixture and trim options should be allowed for materials in this specification, unless life cycle analysis or local experience indicates that one type of material is better suited than others. Use separate hot and cold water valves. For fixture mounting heights see paragraph FIXTURES AND FIXTURE TRIMMINGS.

****

2.10.1 General

Provide water conservation type fixtures. Provide fixtures for use by the physically handicapped in accordance with ICC A117.1. Provide vitreous china fixtures that are nonabsorbent, hard-burned, and vitrified throughout the body. No fixture will be accepted that shows cracks, crazes, blisters, thin spots, or other flaws. Equip fixtures with appurtenances such as traps, faucets, stop valves, and drain fittings. Equip each fixture and piece of equipment requiring connections to the drainage system with a trap. Provide brass expansion or toggle bolts capped with acorn nuts for supports, and provide polished chromium-plated pipe, valves, and fittings where exposed to view. Equip fixtures with the supply discharge below the rim with backflow preventers. Internal parts of flush and/or flushometer valves, shower mixing valves, shower head face plates, [may contain acetal resin, fluorocarbon, nylon,

acrylonitrile-butadiene-styrene (ABS) or other plastic material, if the material has provided satisfactory service under actual commercial or industrial operating conditions for not less than 2 years] [must be copper alloy with all visible surfaces chrome plated].[Plastic in contact with hot water must be suitable for 82 degrees C 180 degrees F water temperature.] Maximum allowable lead content in wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures, as determined by a weighted average must not exceed 0.25 percent. Provide water closets, urinals, flush valves, lavatory faucets, bathroom sink faucets, and shower heads with WaterSense label [or host nation equivalent labeling].

2.10.2 Flushometer Valves

Provide flushometer valves with an ADA compliant, metal oscillating, non-hold-open handle, backcheck angle control stop, and vacuum breaker. Flushometer valves must be either a large diaphragm, or fixed volume piston type with filtered metering bypass. Valve must not be able to be converted externally or internally to exceed a low consumption flush. Provide handle packing, main seat, stop seat and vacuum breaker molded from a chloramine resistant rubber compound. Provide valve body, cover, tailpiece and control stop in conformance with ASTM Alloy Classification for semi-red brass. Provide all exposed surfaces chrome plated. Provide handle with factory applied antimicrobial coating. Provide flushometer valves conforming to ASSE 1037.

2.10.3 Automatic Controls

Where specified with a fixture, provide automatic, sensor operated faucets complying with ASSE 1037 and UL 1951. Provide faucet systems consisting of solenoid-activated valves with light beam sensors.

2.10.4 Fixture Descriptions

2.10.4.1 Electric Water Coolers

****

NOTE: Designer will indicate location, type, and capacity of the water cooler on the drawings. All requirements will be indicated. Designer will add to the specification required data on construction, supports, and insulation.

****

Provide self-contained, mechanically refrigerated electric water coolers with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-hung, bubbler style, air-cooled condensing unit, stainless steel splash receptor and basin, and stainless steel cabinet. Provide 8.4 mL/s 8 gph minimum capacity of 10 degrees C 50 degrees F water when supplied with 27 degrees C 80 degrees F inlet water and a 32 degrees C 90 degrees F room temperature. Control bubblers by push levers or push bars, front mounted or side mounted near the front edge of the cabinet. Mount bubbler spouts at a maximum of 914 mm 36 inches above floor and at front of unit basin with 686 mm 27 inch minimum knee clearance from bottom of unit to finished floor. Spouts must direct water flow at least 102 mm 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide chrome plated 10 mm 3/8 inch OD soft-copper tube supplies with set-screw escutcheons, and loose key stops. Provide chrome plated 32 mm by 40 mm 1-1/4 by 1-1/2 inch semi-cast P-trap with cleanout with 1.1 mm by 40 mm 17 gage by 1-1/2

inch chrome plated copper tube trap arm with set-screw escutcheon.[Provide filters for chlorine in supply piping to faucets.] Provide ASME A112.6.1M concealed steel pipe chair carriers. Provide electric water cooler that is Energy Star labeled. Provide data identifying Energy Star label for electric water cooler. Mount electric water coolers for use by the physically handicapped at heights in accordance with ICC A117.1.

2.10.4.1.1 EWC-1 (JSN R2200)

In-wall recessed bottle filling station. Provide stainless steel construction with plastic ABS alcove and lower hinged grille panel for access and servicing. Sensor-activation with an auto 20-second shut-off timer. Provide display indicating count of plastic bottles saved from waste. Provide bottle filler with a flow rate of 4.2-5.7 lpm 1.1-1.5 gpm and laminar flow to minimize splashing. Provide 11,355 liters 3000-gallon capacity filter, certified to NSF/ANSI 42 and NSF/ANSI 53, with visual monitor to indicate when replacement is necessary. Provide integrated silver ion anti-microbial protection in key areas. Provide unit in conformance with ABA guidelines. Provide unit with lead free design certified to NSF/ANSI 61 and NSF/ANSI 372 and meets Federal and State low-lead requirements. Provide unit certified to UL 399.

2.10.4.1.2 EWC-2 (JSN R2201)

Self-contained, wall hung, mechanically refrigerated, dual-level, brushed stainless steel finish, top mounted bottle filler on non-accessible water cooler, receptors designed to eliminate splashing and standing waste water. Control bubblers by push levers or push bars, front mounted and side mounted near the front edge of the cabinet.

2.10.4.1.3 EWC-3 (Similar to JSN R2202)

Self-contained, wall hung, mechanically refrigerated, single-level, accessible, brushed stainless steel finish, top mounted bottle filler, receptor designed to eliminate splashing and standing waste water. Control bubbler by push levers or push bars, front mounted and side mounted near the front edge of the cabinet.

2.10.4.1.4 EWC-4 (JSN R2203)

Accessible (forward facing), dual-level, recessed, brushed stainless steel, recessed refrigeration unit, dual level extensions with oval receptors, recessed bottle filler, access panel cover, rounded corners, rounded edges, designed to eliminate splashing and standing waste water. Provide self-closing, semi-circular push bars with full 180 degree activation.

2.10.4.2 Emergency Fixtures

Provide copper alloy control valves. Provide an air-gap with the lowest potable eye and face wash water outlet located above the overflow rim by not less than the International Plumbing Code minimum. [Provide a pressure-compensated tempering valve, with leaving water temperature setpoint adjustable throughout the range 16 to 35 degrees C 60 to 95 degrees F.] [Provide packaged, UL listed, alarm system; including an amber strobe lamp, horn with externally adjustable loudness and horn silencing switch, mounting hardware, and waterflow service within NEMA Type 3 or 4 enclosures[and for explosion proof service within NEMA Type 7 or 9 enclosures].]

2.10.4.2.1 EW-1 (Similar to JSN P1965)

Eye/face wash, ANSI/ISEA Z358.1, deck-mounted, swing down, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valve. Spray heads swing down from storage to operational position activating water flow. Coordinate configuration with sink faucet location. Provide eye/face wash with a minimum flow rate of 0.19 L/s 3 gpm of aerated water at 207 kPa 30 psig flow pressure.

2.10.4.2.2 EW-2 (JSN P2000)

Eye/face wash, ANSI/ISEA Z358.1, wall-mounted self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, corrosion-resisting steel eye and face wash receptor. Provide unit with a minimum flow rate of 0.19 L/s 3 gpm of aerated water at 207 kPa 30 psig flow pressure, with eye and face wash nozzles 838 to 1143 mm 33 to 45 inches above finished floor. Provide 32 mm 1-1/4 inch standard chrome drain fitting.

EW-3 (Similar to JSN P2000)

Eye/face wash, ANSI/ISEA Z358.1. Recessed eye/face wash assembly. Eye/face wash, swing down, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valve. Spray heads swing down from storage to operational position activating water flow. Provide eye/face wash with a minimum flow rate of 0.19 L/s 3 gpm of aerated water at 207 kPa30 psig flow pressure. Mount eye/face wash actuator in [separate] [combined] stainless steel fully recessed cabinet with flanged rim and suitable for installation in a 92 mm 3 5/8 inch stud wall. Provide all exposed surfaces with stainless steel finishes. [Provide unit suitable for and installed for handicap access.]

2.10.4.2.3 ES-1 (Similar to JSN P5210)

****

NOTE: Intended for use in finished areas such as laboratories.

****

Combination drench shower and eye/face wash, ANSI/ISEA Z358.1. Recessed eye/face wash and shower actuator assembly. Eye/face wash, swing down, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valve. Spray heads swing down from storage to operational position activating water flow. Provide eye/face wash with a minimum flow rate of 0.19 L/s 3 gpm of aerated water at 207 kPa30 psig flow pressure. Provide a minimum 203 mm 8 inch diameter shower head designed for [vertical] [horizontal] [recessed] supply piping. Provide 25 mm 1 inch IPS brass stay-open shower valve with stainless steel "panic bar" actuator. Provide shower with a minimum flow rate of 1.26 L/s 20 gpm flow and 508 mm 20 inch pattern at 1524 mm 60 inches above floor. Mount eye/face wash and shower actuator in [separate] [combined] stainless steel fully recessed cabinet with flanged rim and suitable for installation in a 92 mm 3 5/8 inch stud wall. Provide all exposed surfaces with stainless steel finishes. [Provide unit suitable for and installed for handicap access.]

2.10.4.2.4 ES-2 (JSN P5210)

****
NOTE: Intended for use in unfinished areas such as mechanical rooms.
****

Combination drench shower and eye/face wash, ANSI/ISEA Z358.1. Mount components on a minimum 32 mm 1-1/4 inch diameter [stainless steel] [chrome plated brass] [galvanized steel] pipe stanchion with floor flange. Provide chrome plated split ring support to adjacent wall surface 305 mm 12 inches below shower arm connection. Eye/face wash, swing down, self-cleaning, non-clogging eye and face wash with quick opening, 15 mm1/2 inch IPS chrome-plated brass full-flow push to activate stay-open valve. Provide eye/face wash with a minimum flow rate of 0.19 L/s 3 gpm of aerated water at 207 kPa 30 psig flow pressure. Provide a minimum 203 mm 8 inch diameter shower head. Provide 25 mm 1 inch IPS chrome-plated brass stay-open shower valve with stainless steel actuating arm and pull rod. Provide shower with a minimum flow rate of 1.26 L/s 20 gpm flow and 508 mm 20 inch pattern at 1524 mm 60 inches above floor. [Provide unit suitable for and installed for handicap access.]

2.10.4.3 Lavatories

a. Provide ASME A112.19.2/CSA B45.1, white vitreous china, integral back type wall hung lavatories with supply openings for use with top mounted faucet, and openings for concealed arm carrier installation. Provide chrome plated 10 mm 3/8 inch OD soft-copper tube supplies with set-screw escutcheons, and loose key stops. Provide chrome plated 32 by 40 mm 1-1/4 by 1-1/2 inch semi-cast P-trap with cleanout with 1.1 by 40 mm 17 gage by 1-1/2 inch chrome plated copper tube trap arm with set-screw escutcheon. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 787 mm 31 inches above the floor, except 864 mm 34 inches maximum above floor and with 737 mm 29 inches minimum clearance from bottom of the front rim to floor for accessible lavatories.

****
NOTE: L-1, L-2, L-6 and L-7 are intended for use in public toilet rooms. Where sensor operation is indicated, battery (or solar with battery backup) operated unit is preferred but provide hard wired unit if desired by the using agency/facility. L-6 is a countertop mounted lavatory. L-2 is not sensor operated. L-1 is not intended for accessible locations.
****

(1) L-1 (Similar to JSN P3200): 508 by 457 mm 20 by 18 inches. Equip fixture with, electronic infra-red operated 102 mm 4 inch centerset combination faucet with aerator, drain fitting with grid strainer, "P" trap, and angle or straight stop valves. Automatic water flow starts electronically by proximity of individual. [Provide wiring box, 120/24 volt solenoid, remote mounted transformer. Transformer may be sized for multiple adjacent lavatories.] [Provide either a battery operated unit or a solar powered unit with battery backup.] Provide WaterSense labeled faucet with a maximum flow rate of 1.9 L/min 0.5 gpm at a flowing

pressure of 414 kPa 60 psig. Limit water volume to a maximum of 1.0 L 0.25 gal per metering cycle.

****
NOTE: Intended for use in public toilet rooms for accessible locations.
****

(2) L-2: Same as L-1 except accessible mounting height per ICC A117.1. Provide accessible protection on exposed water supplies and "P" trap and drain piping.

****
NOTE: Intended for use in patient/staff toilet rooms.
****

(3) L-3 (Similar to JSN P3100): 508 by 457 mm 20 by 18 inches. Equip fixture with combination faucet, elevated gooseneck spout with laminar flow outlet, 102 mm 4 inch wrist action handles, drain fitting with grid strainer, "P" trap, and angle or straight stop valves. Faucet bodies with a pop-up drain rod hole are not acceptable. Plugged holes are not acceptable. Limit faucet flow rate to a maximum of 5.7 L/min 1.5 gpm at a flowing water pressure of 414 kPa 60 psig.

****
NOTE: Intended for use in patient/staff toilet rooms for accessible locations.
****

(4) L-4: Same as L-3 except accessible mounting height per ICC A117.1. Provide accessible protection on exposed water supplies and "P" trap and drain piping.

****
NOTE: Intended for use in exam rooms for USACE projects. For Navy projects use S-1 in exam rooms.
****

(5) L-5 (Similar to JSN P3100): 508 by 457 mm 20 by 18 inches. Equip fixture with combination faucet, elevated gooseneck spout with laminar flow outlet, 102 mm 4 inch wrist action handles, drain fitting with grid strainer, "P" trap, and angle or straight stop valves. Faucet bodies with a pop-up drain rod hole are not acceptable. Plugged holes are not acceptable. Limit faucet flow rate to a maximum of 5.7 L/min 1.5 gpm at a flowing water pressure of 414 kPa 60 psig. Accessible mounting height per ICC A117.1. Provide accessible protection on exposed water supplies and "P" trap and drain piping.

b. ASME A112.19.2/CSA B45.1, white vitreous china, self-rimming counter-mounted lavatories with supply openings for use with top mounted faucet. Furnish template and mounting kit by lavatory manufacturer. Provide chrome plated 10 mm 3/8 inch OD soft-copper tube supplies with escutcheons, and loose key stops. Provide chrome plated 32 by 40 mm 1-1/4 by 1-1/2 inch semi-cast P-trap with cleanout with 1.1 by 40 mm 17 gage by 1-1/2 inch chrome plated copper tube trap arm with escutcheon.

****

NOTE: Intended for use in public toilet rooms. Battery operated unit (or solar powered unit with battery backup) is preferred, provide hard wired unit if desired by the using agency/facility.

****

(1) L-6 (Similar to JSN P3070): 508 by 457 mm 20 by 18 inches. Equip fixture with, electronic infra-red operated 102 mm 4 inch centerset combination faucet with spray outlet, drain fitting with grid strainer, "P" trap, and angle or straight stop valves. Automatic water flow starts electronically by proximity of individual. Provide wiring box, 120/24 volt solenoid, remote mounted transformer. Transformer may be sized for multiple adjacent lavatories. [Provide either a battery operated unit or a solar powered unit with battery backup.] Limit faucet flow rate to a maximum of 1.9 L/m 0.5 gpm at a flowing pressure of 414 kPa 60 psig. Limit water volume to a maximum of 1.0 L 0.25 gal per metering cycle.

****

NOTE: Intended for use in public toilet rooms for accessible locations.

****

(2) L-7: Same as L-6 except provide accessible protection on exposed water supplies and "P" trap and drain piping.

****

NOTE: Intended for use in patient toilet rooms.

****

(3) L-8 (Similar to JSN P3070): 508 by 457 mm 20 by 18 inches. Equip fixture with 100 mm 4 inch centerset combination faucet, elevated gooseneck spout with laminar flow outlet, 102 mm 4 inch wrist action handles, drain fitting with grid strainer, "P" trap, and angle or straight stop valves. Faucet body must not have a pop-up drain rod hole. Plugged holes are not acceptable. Flow must be limited to 5.7 L/m 1.5 gpm at a flowing pressure of 414 kPa 60 psig. Accessible mounting height per ICC A117.1. Provide accessible protection on exposed water supplies and "P" trap and drain piping.

2.10.4.4 Mop Service Basin

a. [Provide terrazzo mop sinks made of marble chips cast in white portland cement to produce 21 MPa 3000 psig minimum compressive strength 7 days after casting. Provide floor or wall outlet copper alloy body drain cast integral with terrazzo, with polished stainless steel strainers.]

b. MS-1 (JSN P4700): 914 by 610 by 305 mm 36 by 24 by 12 inches, precast terrazzo with integral stainless steel caps with tiling flange, 80 mm 3-inch cast brass drain with stainless strainer, lead caulk drain connection and 0.95 mm 20 gage, type 304 stainless steel 305 mm 12-inch high splash/wall guards. Provide chrome plated, 203 mm 8-inch centers, wall mounted cast brass service sink faucet with rigid spout with integral vacuum breaker, 20 mm 3/4-inch hose threads, pale hook, wall brace, indexed lever handles, hose, hose bracket, and mop hanger.

Provide ball type shutoff valves and check valves above ceiling in supply piping to mop sink faucet.

2.10.4.5 Plaster Traps

2.10.4.5.1 PT-1 (JSN P7600)

Large, 406 mm 16 inches high by 356 mm 14 inches wide by 356 mm 14 inches long; heavy gray cast-iron body, white porcelain-enamel inside and outside; clamps, cage of heavy galvanized material, and brass screens; with 50 mm 2 inch low inlet and 50 mm 2 inch high outlet fitted with hood seal.

2.10.4.5.2 PT-2 (JSN P7650)

Small, 305 mm 12 inches high by 152 mm 6 inches wide by 152 mm 6 inches long; cast aluminum, rectangular with solid top and hinged bottom having integral baffles and 6 mm 1/4 inch drain plug; provide bolted bottom for easy access for removal of screens for cleaning and recovery of items in sediment bucket.

2.10.4.6 Showers

****

NOTE: For Marine Air Corps Station, New River, and Camp LeJeune NC, use ball type control handles, not lever type control handle, when handicap accessibility is not required for the shower valves.

****

Provide single control pressure equalizing shower valves with body mounted from behind the wall with threaded connections. Provide tubing mounted from behind the wall between faucets and shower assembly. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide top of drain outlets of chromium-plated or polished stainless steel finish. [Provide shower valve with ball type control handle.] [Provide precast terrazzo shower floors made of marble chips cast in white portland cement to produce 21 MPa 3000 psi minimum compressive strength 7 days after casting. Provide floor or wall outlet copper alloy body drain cast integral with terrazzo floor, with polished stainless steel strainers.]

2.10.4.6.1 SH-1 (JSN P5040)

****

NOTE: Intended for use in patient toilet rooms with ceramic tile enclosures.

****

Wall mounted detachable spray assembly, 610 mm 24 inch wall bar, elevated vacuum breaker, supply elbow and flange and valve. All external trim, chrome plated metal. Plastic shower head 1525 mm 5 foot length of rubber lined corrosion resistant steel, chrome plated metal flexible, or white vinyl reinforced hose and supply wall elbow. Provide WaterSense labeled shower head with a maximum flow rate of 5.7 L/Min 1.5 gpm. Provide data identifying WaterSense label for shower head. Design showerhead to fit in palm of hand. Provide corrosion resistant steel or chrome plated metal wall bar with an adjustable swivel hanger for showerhead. Fasten wall bar securely to wall for hand support. Combination thermostatic and pressure anti-scald balancing valve, with chrome plated metal lever type operating

handle adjustable for rough-in variations and chrome plated metal or corrosion resistant steel face plate. Provide copper alloy valve body. Internal parts must be copper, nickel alloy, corrosion resistant steel or thermoplastic material. Provide 15 mm 1/2 inch IPS valve inlets and outlet. Provide external screwdriver check stops, vacuum breaker and temperature limit stops. Set stops for a maximum temperature of 40 degrees C 105 degrees F. Provide vandal resistant exposed fasteners. Provide valve with a maximum flow rate of 5.7 L/min 1.5 gpm at a flowing pressure of 552 kPa 80 psig.

2.10.4.6.2 SH-2 (Similar to JSN P5040)

****
NOTE: Intended for use in staff toilet rooms with ceramic tile enclosures.
****

Wall mounted, shower head connected to shower arm. Provide all external trim of chrome plated metal. Chrome plated metal head, adjustable ball joint, self cleaning with automatic flow control device to limit discharge to not more than 5.7 L/min 1.5 gpm. Provide valve body, internal parts of shower head and flow control fittings of copper alloy or corrosion resistant steel. Install showerhead 1829 mm 72 inches above finished floor. Combination thermostatic and pressure anti-scald balancing valve, with chrome plated metal lever with adjustment for rough-in variations, type operating handle and chrome plated brass or corrosion resistant steel face plate. Provide copper alloy valve body. Provide copper, nickel alloy, corrosion resistant steel or thermoplastic material internal parts. Provide 15 mm 1/2 inch IPS valve inlets and outlet. Provide external screwdriver check stops, and temperature limit stops. Set stops for a maximum temperature of 40 degrees C 105 degrees F. Install valve 1372 mm 54 inches from bottom of shower receptor. Provide vandal resistant exposed fasteners. Provide valve with a maximum flow rate of 5.7 L/min 1.5 gpm at a flowing pressure of 552 kPa 80 psig.

2.10.4.6.3 SH-3 (JSN P5350)

Psychiatric patient, vandal-resistant with thermostatic valve in cabinet; provide shower head designed for prison use. Provide fixture with smooth surfaces with no projection that can be used as a catch or hook; provide flat back arranged for bolting directly to the wall; tapped for 15 mm 1/2 inch pipe connection to tempered water line; provide tamperproof shower head with removable face not less than 90 mm 3-1/2 inch diameter; install shower head not less than 1829 mm 6 feet above the floor and with spray delivery within a 900 mm 3 foot circle. Limit flow to a maximum rate of 7.6 L/min 2.0 gpm at a flowing water pressure of 552 kPa 80 psig.

[2.10.4.6.4 Shower Enclosure

****
NOTE: Provide dimensions.
****

Provide [_____] mm [_____] inches wide, [_____] mm [_____] inches deep, and [_____] mm [_____] inches high shower enclosure. Provide reinforced acrylic cabinet conforming to CSA B45.5-17/IAPMO Z124.

]2.10.4.7 Sinks

****

NOTE: Confirm casework dimensions prior to selection of sinks.

Pedal valves provide savings in locations where water is unnecessarily left running continuously during use, like kitchens.

****

Provide ASME A112.19.3/CSA B45.4, Type 302(18-8) or 304(18-8) stainless steel sinks with integral mounting rim for flush installation, with undersides fully sound deadened, with supply openings for use with top mounted faucet, and with 89 mm 3.5 inch drain outlet. Provide 1.27 mm18 gage sinks for basin depths less than or equal to 254 mm 10 inch. Provide 1.59 mm16 gage sinks for basin depths greater than 250 mm 10 inch. [Provide faucet with gooseneck spout with plain-end and laminar flow fitting in base of gooseneck spout.] [Provide faucet with flow restrictor and non-aerated flow outlet.] Aerators are not acceptable. Provide faucets with a maximum flow rate of 5.7 L/min 1.5 gpm when measured at a flowing water pressure of 414 kPa 60 psig. Provide chrome plated 10 mm 3/8 inch OD soft-copper tube supplied with escutcheons, and loose key stops. Provide chrome plated 40 mm 1-1/2 inch semi-cast P-trap with cleanout with 1.1 by 40 mm 17 gage by 1-1/2 inch chrome plated copper tube trap arm with escutcheon. Provide separate 40 mm 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Coordinate hole quantities, locations, and centerings with faucet types indicated in fixture descriptions. Provide exact numbers of holes necessary. Use of faucet hole covers is not acceptable. Dimensions given are overall, and bowl in the following order: front to back, left to right, depth. [Provide filters for chlorine in supply piping to faucets.] Provide sinks located in casework designated as handicap accessible same as specified except basin depths not greater than 152 mm 6 inches and drain outlets located to the rear of basins.

2.10.4.7.1 S-1 (JSN CS010)

****

NOTE: S-1 is typically used for Navy projects as exam room sink.

****

Single bowl, counter-mounted, 457 by 381 by 165 mm 18 by 15 by 6-1/2 inches, bowl 305 by 305 by 152 mm 12 by 12 by 6 inches. Locate drain outlet to the rear of the basin. Provide 102 mm 4 inch centerset faucet with two 100 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.2 S-2 (JSN CS080)

Single bowl, counter-mounted, 508 by 559 by 191 mm 20 by 22 by 7-1/2 inches, bowl 356 by 457 by 191 mm 14 by 18 by 7-1/2 inches. Faucet must be 102 mm 4 inch centerset with two 102 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.3 S-3 (JSN CS090)

Single bowl, counter-mounted, 559 by 559 by 191 mm 22 by 22 by 7-1/2 inches, bowl 406 by 483 by 191 mm 16 by 19 by 7-1/2 inches. Provide 102 mm 4 inch

centerset faucet with two 102 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.4 S-4 (JSN CS140)

Single bowl, counter-mounted, 559 by 432 by 254 mm 22 by 17 by 10 inches, bowl 406 by 356 by 254 mm 16 by 14 by 10 inches. Provide 102 mm 4 inch centerset faucet with two 102 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.5 S-5 (JSN CS150)

Single bowl, counter-mounted, 559 by 559 by 254 mm 22 by 22 by 10 inches, bowl 406 by 483 by 254 mm 16 by 19 by 10 inches. Provide 102 mm 4 inch centerset faucet with two 102 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.6 S-6 (JSN CS180)

Single bowl, counter-mounted, 559 by 635 by 305 mm 22 by 25 by 12 inches, bowl 406 by 559 by 305 mm 16 by 22 by 12 inches. Provide 102 mm 4 inch centerset faucet with two 102mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.7 S-7 (JSN CS200)

Single bowl, counter-mounted, 559 by 787 by 305 mm 22 by 31 by 12 inches, bowl 406 by 711 by 305 mm 16 by 28 by 12 inches. Provide 102 mm 4 inch centerset faucet with two 102 mm 4 inch wristblades and 127 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.8 S-8 (JSN CS230)

Double bowl, counter-mounted, 559 by 838 by 254 mm 22 by 33 by 10 inches, each bowl 406 by 357 by 254 mm 16 by 14 by 10 inches. Provide 200 mm 8 inch spread faucet, single handle, swing spout.

2.10.4.7.9 S-9 (JSN CS250)

Single bowl, counter-mounted, 381 by 381 by 152 mm 15 by 15 by 6 inches, bowl 229 by 305 by 152 mm 9 by 12 by 6 inches. Provide 102 mm 4 inch centerset faucet with two 100 mm 4 inch wristblades and 125 mm 5 inch diameter fixed gooseneck spout.

2.10.4.7.10 S-10 (JSN P3520)

Sink, plaster, 559 by 762 by 241 mm 22 by 30 by 9-1/2 inches; vitreous china; faucet with 51 mm 2 inch spray, 152 mm 6 inch handles, screwdriver stops, grid drain 40 mm 1-1/2 inch tailpieces, 50 mm 2 inch O.D. drain connection to trap and wall; provide plaster-interceptor trap (PT-1), install plaster trap with manufacturer's recommended clearances above the unit for removal of screens. Provide with floor-mounted heavy-duty type sink carrier with acid-resisting white coated exposed arms and hanger support plate.

2.10.4.8 Sink, Flushing Rim SF-1 (JSN P6350)

[Wall mounted flushing rim sink with stainless steel spring type front and side rim guards, 100 mm 4 inch wall outlet, nominal dimensions of 635 by

533 by 445 mm 25 by 21 by 17 1/2 inches; vitreous china with an integral flushing rim. Provide floor mounted carrier.] [Floor mounted flushing rim sink with stainless steel spring type front and side rim guards, 100 mm 4 inch floor outlet, nominal dimensions of 711 by 508 by 457 mm 28 by 20 by 18 inches; vitreous china with an integral flushing rim. Provide 254 mm 10 inch high terrazzo base.] Provide faucet with fork brace 152 mm 6 inch handles, 260 mm 10-1/4 inches wall to spout outlet, and plain end spout with bucket hook. Provide 24.6 lpf 6.5 gpf flushometer valve.

[2.10.4.9 Service Sinks

ASME A112.19.2/CSA B45.1, white enameled cast iron with integral back and wall hanger supports, minimum dimensions of 559 mm 22 inches wide by 457 mm 18 inches front to rear, with two supply openings in 254 mm 10 inch high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards. Provide back mounted washerless service sink faucets with vacuum breaker and 19 mm 3/4 inch external hose threads.

]2.10.4.10 Sink, Surgeons Scrub

2.10.4.10.1 SSS-1 (JSN P6980)

Three station, wall-mounted, gooseneck spouts, knee push controls. Provide seamless welded 1.59 mm16 gage construction, Type 304, stainless steel. Sound-deaden cabinet with a fire-resistant material. Provide wall mounted unit using a mounting carrier. Provide removable front panels for access to the water control valves, waste connections, stops and strainers. Provide sloped sink bottoms to minimize splashing and a 40 mm 1-1/2 inch OD tailpiece with an 80 mm 3 inch flat strainer drain. Provide each compartment (station) with a gooseneck assembly with a 40 mm 1-1/2 inch sprayhead that can be removed for sterilization. Provide adjustable thermostatic mixing valve with anti-scald feature for each compartment and controlled from the top mounted control panel. Provide mechanical pilot type water control valves for each compartment actuated by one push of a knee-operated front panel and turned off by a second push. Provide plastic splash shield between each compartment. Provide knee-controlled soap dispensers at each compartment.

[2.10.4.10.2 SSS-2 (Similar to JSN P6990)

Two station, wall-mounted, gooseneck spouts, electronically timed with long (10 minute) and short (3, 4, 5 minute) cycles. Provide seamless welded 1.59 mm16 gage construction, Type 304, stainless steel. Sound-deaden cabinet with a fire-resistant material. Provide wall mounted unit using a mounting carrier. Provide removable front panels for access to the water control valves, waste connections, stops and strainers. Provide sloped sink bottoms to minimize splashing and a 40 mm 1-1/2 inch OD tailpiece with an 80 mm 3 inch flat strainer drain. Provide each compartment (station) with a gooseneck assembly with a 40 mm 1-1/2 inch sprayhead that can be removed for sterilization. Provide adjustable thermostatic mixing valve with anti-scald feature for each compartment and controlled from the top mounted control panel. Provide watertight and top mounted control panel. Provide internal timing device to reduce tampering. Provide plastic splash shield between each compartment. Provide foot-controlled soap dispensers at each compartment. Provide sink with 120 volt, 2 ampere power to an internal junction box.

]2.10.4.11 Urinals

Provide ASME A112.19.2/CSA B45.1, white vitreous china, wall-mounted, wall outlet, urinals with integral trap, drain line connection, and extended side shields. Provide urinals with trap design complying with the IPC. Install urinal rim 610 mm 24 inches above the floor at non-accessible locations. Mount urinals installed in compliance with ADA requirements with the rim 432 mm 17 inches above the floor. Provide ASME A112.6.1M concealed chair carriers. Provide urinals equipped with flush valves with a flushing volume of the urinal and flush valve combination not exceeding the fixture design rating. Mount flush valves not less than 279 mm 11 inches above the fixture.

2.10.4.11.1 U-1 (Similar to JSN P8150)

****

NOTE: Battery operated unit (or solar powered with battery backup) is preferred, but hard wired unit must be used if desired by the using agency/facility.

****

High efficiency washout for solenoid valve. Provide WaterSense labeled urinal with a maximum water use of 0.47 Lpf 0.125 gpf. Provide data identifying WaterSense label for urinal. Flushing cycle must be activated by an electronic infrared sensor operated by proximity of individual. [Provide wiring box, 120/24 volt solenoid, and transformer.] [Provide either battery operated unit or solar powered unit with battery backup.]

2.10.4.11.2 U-2

Same as U-1 except accessible mounting height per ICC A117.1.

2.10.4.11.3 U-3: (Similar to JSN P8150)

High efficiency washout for solenoid valve. Provide WaterSense labeled urinal with a maximum water use of 1.9 Lpf 0.5 gpf. Provide data identifying WaterSense label for urinal. Flushing cycle must be activated by an electronic infrared sensor operated by proximity of individual. [Provide wiring box, 120/24 volt solenoid, and transformer.] [Provide either battery operated unit or solar powered unit with battery backup.]

2.10.4.11.4 U-4

Same as U-3 except accessible mounting height per ICC A117.1.

2.10.4.12 Water Closets

Provide ASME A112.19.2/CSA B45.1, white vitreous china, elongated bowl, wall-hung water closets. Provide water closets with trap design complying with the IPC. Install top of toilet seat 356 to 381 mm 14 to 15 inches, above the floor at non-accessible locations. Mount water closets installed in compliance with ADA requirements with the rim 432 mm to 483 mm 17 to 19 inches above the floor. Provide water closets equipped with flush valves with a flushing volume of the water closet and flush valve combination not exceeding the fixture design rating. Provide water flushing volume of the water closet and flush valve combination not exceeding 4.85 liters 1.28 gallons per flush unless indicated otherwise. Provide white solid plastic elongated open-front seat without cover, with check hinge. Provide seats conforming to IAPMO Z124.5. Mount flush

valves not less than 279 mm 11 inches above the fixture. Mounted height of flush valve must not interfere with the hand rail in ADA stalls. Provide ASME A112.6.1M heavy duty 227 kg 500 pound capacity chair carriers.

2.10.4.12.1 WC-1 (Similar to JSN P9050)

****

NOTE: Intended for use in public/staff toilet rooms. Battery operated unit (or solar powered with battery backup) is preferred, but hard wired unit must be used if desired by the using agency/facility.

****

Siphon-jet for direct flushometer valve. Flushing cycle must be activated by an electronic infrared sensor operated by proximity of individual. [Provide wiring box 120/24 volt solenoid and transformer.] [Provide either a battery operated unit or a solar powered unit with battery backup.] Provide WaterSense labeled water closet with a maximum water use of 4.85 Lpf 1.28 gpf. Provide data identifying WaterSense label for water closet.

2.10.4.12.2 WC-2 (Similar to JSN P9050)

Same as WC-1 except accessible mounting height per ICC A117.1 Provide riser with grab bar offset.

2.10.4.12.3 WC-3 (Similar to JSN P9050)

High efficiency (HET), siphon-jet for flushometer valve. High efficiency washout for solenoid valve. Flushing cycle must be activated by an electronic infrared sensor operated by proximity of individual. Provide WaterSense labeled water closet with a maximum water use of 4.85 Lpf 1.28 gpf. Provide data identifying WaterSense label for water closet. [Provide wiring box, 120/24 volt solenoid, and transformer.] [Provide battery operated unit or solar operated unit with battery backup.]

2.10.4.12.4 WC-4 (Similar to JSN P9050)

Same as WC-3 except accessible mounting height per ICC A117.1. Provide riser with grab bar offset.

2.10.4.12.5 WC-5 (Similar to JSN P9050)

****

NOTE: Intended for use in patient toilet rooms.

****

Siphon jet with bowl provided with lugs or slots for holding bedpan. Provide bedpan cleaner (P1150) for mounting on exposed water closet flush valves; provide with wall support bracket; and brass valve body having a taper machined type leakproof, raise and lower spray arm; and using one-third of flush water volume to rinse pan, balance to flush waste. Water flushing volume of the water closet and flush valve/bedpan washer combination must not exceed 6.0 liters 1.6 gallons per flush.

2.10.4.12.6 WC-6 (Similar to JSN P9050)

Same as WC-5 except accessible mounting height per ICC A117.1. Provide riser with grab bar offset.

2.10.4.12.7 WC-7 (Similar to JSN P9050)

****
NOTE: Intended for use in PACU.
****

High efficiency (HET), siphon-jet for manual, lever operated flushometer valve, accessible mounting height per ICC A117.1. Provide riser with grab bar offset. Provide water closets with a maximum water use for the water closet and flush valve combination of 4.85 lpf 1.28 gallons per flush at a flowing water pressure of 552 kPa 80 psig. Provide WaterSense labeled water closet with a maximum water use of 4.85 lpf 1.28 gpf. Provide data identifying WaterSense label for water closet.

2.10.4.13 Hose Bibbs and Hydrants

****
NOTE: Indicate on the drawings height of hose bibbs and hydrants above finished grade. In locations where the 99.6 percent design temp is 0 degrees C 32 degrees F or less provide freezeproof hydrants.
****

2.10.4.13.1 HB-1

Hose bibb with vacuum-breaker backflow preventer, brass construction with 19 mm 3/4 inch male inlet threads, hexagon shoulder, and 20 mm 3/4 inch hose connection. Provide handle securely attached to stem.

2.10.4.13.2 HB-2

Wall hydrant (freezeproof) ASSE 1019 with vacuum-breaker backflow preventer and must have a nickel-brass or nickel-bronze wall plate or flange with nozzle and detachable key handle. Provide brass or bronze operating rod within a galvanized iron casing of sufficient length to extend through the wall so that the valve is inside the building, and the portion of the hydrant between the outlet and valve is self-draining. Provide brass or bronze valve with coupling and union elbow having metal-to-metal seat. Valve rod and seat washer must be removable through the face of the hydrant. Provide hydrant with 19 mm 3/4 inch exposed hose thread on spout and 20 mm 3/4 inch male pipe thread on inlet.

2.10.4.13.3 HB-3

Yard hydrant (non-freezeproof) of brass construction, with either straight or angle bodies, and must be of the compression type. Provide body flange with internal pipe thread to suit 20 mm 3/4 inch pipe. Provide bodies suitable for wrench grip. Provide faucet spout with 20 mm 3/4 inch exposed hose threads. Provide faucet handle securely attached to stem.

2.10.4.13.4 HB-4

Yard hydrants (freezeproof), yard box or post hydrants with valve housings located below frost lines. Water from the casing must be drained after valve is shut off. Provide bronze hydrant with cast-iron box or casing guard. Provide "T" handle key.

2.11 BACKFLOW PREVENTERS

****

NOTE: Indicate on the drawings all locations where backflow preventers are required (and type of device) to protect water supply and distribution system against backflow and backsiphonage in accordance with the International Plumbing Code. If a drain is required, ensure it is shown. Backflow prevention device requirements for connection to nongovernment potable water systems will be coordinated with the local jurisdiction and/or water service agency. Reduced-pressure principle assemblies must be used for all domestic water services.

****

Provide backflow preventers approved and listed by the Foundation For Cross-Connection Control & Hydraulic Research. Provide reduced-pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers tested, approved, and listed in accordance with FCCCHR Manual. Provide backflow preventers with intermediate atmospheric vent conforming to ASSE 1012. Provide reduced pressure principle backflow preventers conforming to ASSE 1013. Provide hose connection vacuum breakers conforming to ASSE 1011. Provide pipe applied atmospheric type vacuum breakers conforming to ASSE 1001. Provide pressure vacuum breaker assembly conforming to ASSE 1020. Provide air gaps in plumbing systems conforming to ASME A112.1.2.

2.12 DRAINS AND BACKWATER VALVES

****

NOTE: Where a trap seal is subject to loss by evaporation, a deep-seal trap consisting of a 102 mm 4 inch seal or a trap seal primer valve must be used. Deep-seal traps are the preferred method in lieu of trap primers. If a trap seal primer valve is chosen, provide electrically timed, solenoid valve type not dependent on pressure fluctuations to operate.

****

Provide drains and backwater valves installed in connection with waterproofed floors or shower pans equipped with bolted-type device to securely clamp flashing.

2.12.1 Area Drains

****

NOTE: Area drains intended for use in accessible areaways such as at the bottom of exterior stairs.

****

a. Provide area drains with coated [galvanized] cast iron bodies for embedding in the floor construction. Provide plain pattern perforated or slotted grate/strainer. Provide with threaded outlet connection. Between the outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically

designed for the rubber gasket compression type joint. Provide drains conforming to ASME A112.6.3. Grate/strainer weight loading classification is based on ASME A112.6.3. Dimensions are nominal.

b. AD-1: 305 mm 12 inch overall [diameter] [width], 203 mm 8 inch diameter grate, 152 mm 6 inch depth, with [removable] [hinged], light-duty cast iron grate with minimal free area of 2 times free area of outlet pipe size. Provide with backwater valve.

2.12.2 Floor and Shower Drains

Provide floor and shower drains with coated [galvanized] cast iron bodies, double drainage pattern for embedding in the floor construction, and seepage pan having weep holes or channels for drainage to the drainpipe. Provide adjustable grate/strainers to compensate for floor thickness. Provide an integral clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane when required. Provide with threaded outlet connection. Between the outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Provide floor and shower drains conforming to ASME A112.6.3. Grate/strainer weight loading classification is based on ASME A112.6.3. Dimensions are nominal.[Provide drain with trap primer connection, trap primer, and connection piping.]

2.12.2.1 FD-1

****
NOTE: FD-1 intended for use in mechanical equipment rooms and unfinished spaces.
****

305 mm 12 inch diameter flashing collar, 102 mm 4 inch deep body and 203 mm 8 inch diameter removable, non-tilt heavy-duty cast iron grate with minimal free area of 1.5 times free area of outlet pipe size.

2.12.2.2 FD-2

****
NOTE: FD-2 intended for use in toilet rooms, shower floors, and finished spaces.
****

254 mm 10 inch diameter invertible flashing collar, 51 mm 2 inch deep body, and minimum 152 mm 6 inch [square] [diameter] removable, secured, [stainless steel] [light-duty nickel bronze] strainer with minimum free area of 1.5 times free area of outlet pipe size.

[2.12.2.3 FD-3

****
NOTE: FD-3 intended for use in mechanical equipment rooms with isolated floor slabs.
****

305 mm 12 inch diameter flashing collar, 51 mm 2 inch deep body, and 203 mm 8 inch diameter non-tilt heavy-duty cast iron grate with minimal free area of 1.5 times free area of outlet pipe size.[Provide with 406 mm 16

inch diameter isolation floor drain body with flange, integral clamping collar, and standpipe.]

]2.12.2.4 FD-4

****
NOTE: FD-4 intended for use in kitchens.
****

305 mm 12 inch diameter invertible flashing collar, 178 mm 7 inch deep body, stainless steel sediment basket with 5 mm 3/16 inch perforations with lift handle, and minimum 305 mm 12 inch square, removable, stainless steel strainer with minimum free area of 1.5 times free area of outlet pipe size.

2.12.3 Floor Sinks

Provide floor sinks with [type 304 stainless steel bodies] [coated [galvanized] cast iron bodies, with acid-resisting interior,] and double drainage pattern for embedding in the floor construction, and seepage pan having weep holes or channels for drainage to the drainpipe. Provide an integral clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane when required. Provide with threaded outlet connection. Between the outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Provide floor sinks conforming to ASME A112.6.3. Provide aluminum sediment bucket. Grate/strainer weight loading classification is based on ASME A112.6.3. Dimensions are nominal. Provide full grate free area a minimum of 1.5 times the free area of the outlet pipe size. [Provide drain with trap primer connection, trap primer, and connection piping.]

2.12.3.1 FS-1

****
NOTE: FS-1 (square) intended for use in unfinished spaces such as below sterilizer locations, or concealed within an enclosure.
****

305 mm 12 inch square top, 254 mm 10 inch deep [with] [full] [3/4] [1/2] [type 304 stainless steel] [light-duty nickel bronze] [less] [grate].

2.12.3.2 FS-2

****
NOTE: FS-2 (round) intended for use in unfinished spaces such as below sterilizer locations, or concealed within an enclosure.
****

305 mm 12 inch diameter top, 254 mm 10 inch deep [with] [full] [3/4] [1/2] [type 304 stainless steel] [light-duty nickel bronze] [less] [grate].

2.12.3.3 FS-3

****
NOTE: FS-3 (square) intended for use in finished

exposed locations except kitchens.
****

305 mm 12 inch square top, 254 mm 10 inch deep [with] [full] [3/4] [1/2] [light-duty acid-resisting] [less] [grate].

2.12.3.4 FS-4

****
NOTE: FS-4 (round) intended for use in finished exposed locations except kitchens.
****

305 mm 12 inch diameter top, 254 mm 10 inch deep [with] [full] [3/4] [1/2] [light-duty acid-resisting] [less] [grate].

2.12.3.5 FS-5

****
NOTE: FS-5 intended for use in kitchens. Provide kitchen floor sinks with stainless steel bodies.
****

305 mm 12 inch square top, 254 mm 10 inch deep with stainless steel rim and [full] [3/4] [1/2] [stainless steel] [removable] [less] [grate] and suspended stainless steel sediment basket with 5 mm 3/16 inch perforations and lift handle.

2.12.4 Kettle Drain KD-1

****
NOTE: KD-1 intended for use where steam-jacketed kettles and tilt frying pans are used in kitchens.
****

Provide 457 mm 18 inches wide by [914 mm 36 inches] [1219 mm 48 inches] [1525 mm 60 inches] long kettle drain, 1.98 mm14 gage type 304 stainless steel kettle drain body with 100 mm 4 inch no-hub bottom outlet centered in kettle drain, removable stainless steel perforated sediment bucket, and stainless steel bar grating with 5 mm 3/16 inch by 25 mm 1 inch bars at 13 mm 1/2 inch bar spacing. Provide kettle drain pitched to bottom outlet

2.12.5 Roof Drains and Expansion Joints

Provide roof drains conforming to ASME A112.6.4, with dome and integral flange, with a device for making a watertight connection between roofing and flashing. Provide roof drains designated as secondary (emergency) overflow drains with 51 mm 2 inch high dam. Provide [galvanized] heavy pattern cast iron assemblies, including the dome strainer. Provide drain with a gravel stop. On roofs other than concrete construction, provide drains complete with underdeck clamp, sump receiver, and an extension for the insulation thickness where applicable. Provide a clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or membrane when present. Provide trainer openings with a combined area equal to twice that of the drain outlet. Provide roof drains with outlets equipped to make a proper connection to threaded pipe of the same size as the rain leader. Provide an expansion joint of proper size to receive each rain leader. Provide heavy cast-iron housing expansion joint, brass or bronze sleeve, brass or bronze fastening bolts

and nuts, and gaskets or packing. Provide sleeves with a nominal thickness of not less than 3.4 mm 0.134 inch. Provide close-cell neoprene gaskets and packing, Provide 70 durometer close-cell neoprene O-ring packing. Provide packing held in place by a packing gland secured with bolts.

2.12.5.1 RD-1

****
NOTE: RD-1 intended for use as primary roof drain. These can also be used at bottom of usually non-accessible areaways. See AD-1 for accessible areaways.
****

406 to 463 mm 16 to 19 inch diameter flashing clamp, 279 to 357 mm 11 to 14 inch diameter by 127 mm 5 inch high dome strainer.

2.12.5.2 RD-2

****
NOTE: RD-2 intended for use as secondary (emergency) roof drain.
****

406 to 483 mm 16 to 19 inch diameter flashing clamp, 279 to 357 mm 11 to 14 inch diameter by 127 mm 5 inch high dome strainer. Provide minimum 51 mm 2 inch high internal or external water dam.

2.12.6 Sight Drains

a. Provide sight drains with coated [galvanized] cast iron bodies, double drainage pattern for embedding in the floor construction, and seepage pan having weep holes or channels for drainage to the drainpipe. Provide adjustable grate/strainer to compensate for floor thickness. Provide an integral clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane when required. Provide with threaded outlet connection. Between the outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Provide sight drains conforming to ASME A112.6.3. Grate/strainer weight loading classification is based on ASME A112.6.3. Dimensions are nominal. [Provide drain with trap primer connection, trap primer, and connection piping.]

b. SD-1: 254 mm 10 inch diameter invertible flashing collar, 51 mm 2 inch deep body, and minimum 152 mm 6 inch [square] [diameter] removable, secured, light-duty nickel bronze strainer with minimum free area of 1.5 times free area of outlet pipe size with funnel extension. Provide minimum funnel dimensions as follows:

(1) Height of funnel 95 mm 3-3/4 inches.

(2) Diameter of lower portion of funnel 51 mm 2 inches.

(3) Diameter of upper portion of funnel 102 mm 4 inches.

2.12.7 Backwater Valves

Provide backwater valves either separate from the floor drain or a combination floor drain, P-trap, and backwater valve, as shown. Provide backwater valves with cast-iron bodies and cleanouts large enough to permit removal of interior parts. Provide valves of the flap type, hinged or pivoted, with revolving disks. Provide hinge pivots, disks, and seats of nonferrous metal. Provide backwater valves with disks slightly open in a no-flow, no-backwater condition. Extend cleanouts to finished floor fit with threaded countersunk plugs.

2.13 CLEANOUTS

a. Provide cleanouts with coated cast-iron bodies (unless otherwise noted) with extra-heavy, threaded, tapered, brass plug with solid square nut and American Standard pipe threads. Provide flashing collars and clamps for cleanout bodies being installed in floors with finishes installed over waterproofing. Cleanouts on piping completely accessible from within pipe chases do not require covers. Cleanouts in exposed piping in equipment rooms do not require covers.

b. Provide interior floor-mounted cleanouts with a two-piece, threaded, adjustable housing. Provide top and cover based on floor finish:

(1) Resilient tile and sheet finish: Round flange top with scoriated cover.

(2) Ceramic tile finish: Square flange top with scoriated cover.

(3) Poured finish: Round, wide-flange top with scoriated cover.

(4) Carpet finish: Round top with standard top tapped for carpet-marker bolt.

(5) Terrazzo finish: Round top with recessed-for-terrazzo cover.

(6) Quarry tile finish: Square, heavy-duty top with heavy-duty scoriated cover.

(7) Concrete finish (unfinished areas): Heavy, round frame; satin-bronze, scoriated tractor top, ANSI heavy duty load class.

****

NOTE: Isolation cleanouts are used in floating floors.

****

[c. Provide isolation cleanouts with a lower and an upper flashing collar, flashing clamps with seepage openings, and adjustable ferrule with 102 mm 4 inch diameter bronze top. Provide with ferrule must be tapped for cleanout plug. Seal ferrule to lower clamping collar with press-fit neoprene gasket. Seal cleanout plug with neoprene gasket.]

2.14 TRAPS

2.14.1 Fixture Traps

Unless otherwise specified, provide copper-alloy adjustable tube type traps with slip joint inlet and swivel. Provide traps [without] [with] a

cleanout. [Provide traps with removable access panels for easy clean-out at sinks and lavatories.] Provide tubes of copper alloy with walls not less than 0.81 mm 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Provide inlets with rubber washer and copper alloy nuts for slip joints above the discharge level. Provide swivel joints below the discharge level and must be of metal-to-metal type as required for the application. Provide nuts nuts flats for wrench grip. Provide outlets with internal pipe thread, except that when required for the application, the provide outlets with sockets for solder-joint connections. The depth of the water seal must be not less than 51 mm 2 inches and not more than 102 mm 4 inches. The interior diameter must be not more than 3 mm 1/8 inch over or under the nominal size, and interior surfaces must be reasonably smooth throughout. Provide a copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange for lavatories. The assembly must be a standard manufactured unit and may have a rubber-gasketed swivel joint.

2.14.2 Drain Traps

Unless otherwise specified, provide cast iron traps, one piece pattern, deep seal with depth of water seal of 102 mm 4 inches. The interior diameter must be not more than 3 mm 1/8 inch over or under the nominal size, and interior surfaces must be reasonably smooth throughout. Provide standard manufactured trap assemblies. Traps for drains located in fan and plenum housings must maintain seal against the static pressure.

[2.15 TRAP PRIMER ASSEMBLIES

Provide fully automatic trap primer assemblies, factory assembled and prepiped and including 20 mm 3/4 inch NPT female inlet, bronze body 20 mm 3/4 inch female NPT ball valve, 20 mm 3/4 inch water hammer arrester, ASSE 1001 atmospheric vacuum breaker, and ASTM B88 20 mm 3/4 inch Type L copper tubing distribution manifold. Provide calibrated distribution manifold to provide equal water distribution to each trap. Provide minimum supply of 60 mL 2 ounces of water to each trap. Provide manifold with 16 mm by 15 mm 5/8 inch by 1/2 inch compression fitting outlets. Provide solder joints made of lead free solder. Provide electronic assembly tested and certified per UL 73 and including circuit breaker, 5 second dwell function, manual override, 24 hour geared timer, and solenoid valve. Provide single point water supply and power supply connections. Provide components in a NEMA 250 Type 1 [surface mounted] [recessed] cabinet.

]2.16 INTERCEPTORS

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NOTE: Concrete pit must be detailed on structural drawings for exterior interceptor pits.

****

2.16.1 Grease Interceptor

Provide grease interceptor of the size indicated of reinforced concrete, [or precast concrete construction] [or equivalent capacity commercially available steel grease interceptor] with removable three-section, 10 mm 3/8 inch checker-plate cover, and installed outside the building. Install steel grease interceptors concrete pits and provide epoxy-coating to

resist corrosion as recommended by the manufacturer. Provide interceptors tested and rated in accordance with PDI G 101. Concrete must have 21 MPa 3,000 psi minimum compressive strength at 28 days. Provide flow control fitting.

2.16.2 Oil Interceptor

Cast iron or welded steel, coated inside and outside with white acid resistant epoxy, with internal air relief bypass, bronze cleanout plug, double wall trap seal, removable combination pressure equalizing and flow diffusing baffle and sediment bucket, horizontal baffle, adjustable oil draw-off and vent connections on either side, gas and watertight gasketed nonskid cover, and flow control fitting.

2.17 WATER HEATERS

****

NOTE: Coordinate with the HVAC engineer the availability of heating sources and control air in order to make proper selection of bracketed choices.

Show locations of water heaters on the drawings. Also show the type, capacity, and related features of each water heater on the drawings.

Except for gas-fired water heaters, water temperatures in excess of 60 degrees C 140 degrees F should be obtained by using a booster heater in series with a primary heater.

Provide thermostatic, pressure-balanced, or combination thermostatic and pressure-balanced type mixing valves to obtain water temperatures below60 degrees C 140 degrees F.

Ensure that efficiencies are equal to or greater than the latest "recommended" values currently released by the Department of Energy Federal Energy Management Program (FEMP). The latest values can be found on FEMP's Internet site: https://energy.gov/eere/femp.

Select expansion tank based on incoming water pressure, water heater volume and temperature rise of water. Consult expansion tank manufacturer for sizing recommendations. Show the expansion tank size and acceptance volume on the drawings.

Per Energy Independence and Security Act (EISA) Section 523, meet at least 30% of the annual domestic hot water requirement through the installation of solar water heating unless it is not life cycle cost effective.

****

Provide water heaters with replaceable anodes. Provide each primary water heater with controls having an adjustable range that includes 32 to 71 degrees C 90 to 160 degrees F. [Provide water heaters with BACnet or Modbus protocols for interface with building automation systems.] Provide

each gas-fired water heater and booster water heater with controls having an adjustable range that includes 49 to 82 degrees C 120 to 180 degrees F. Connect hot water systems utilizing recirculation systems into building off-hour controls. The thermal efficiencies and standby heat losses must conform to or exceed the requirements of ASHRAE 90.1 - SI ASHRAE 90.1 - IP, or 10 CFR 430 whichever is the most stringent for each type of water heater specified. The only exception is that storage water heaters and hot water storage tanks having more than 1893 liters 500 gallons storage capacity need not meet the standard loss requirement if the tank surface area is insulated to R-12.5 and if a standing pilot-light is not used. Plastic materials, polyetherimide (PEI) and polyethersulfone (PES), are forbidden to be used for vent piping of combustion gases. Provide a factory pre-charged expansion tank on the cold water supply to each water heater. Provide expansion tanks specifically designed for use on potable water systems and rated for 93 degrees C 200 degrees F water temperature and 1034 kPa 150 psig working pressure.

2.17.1 Performance of Water Heating Equipment

Standard rating condition terms are as follows:

ET	Thermal efficiency with 21 degrees C 70 degrees F delta T.
EC	Combustion efficiency, 100 percent - flue loss when smoke = 0 (trace is permitted).
SL	Standby loss in W/0.093 sq. m. W/sq. ft. based on 27 degrees C 80 degrees F delta T, or in percent per hour based on nominal 38 degrees C 90 degrees F delta T.
HL	Heat loss of tank surface area.
V	Storage volume in liters

2.17.1.1 Storage Water Heaters

2.17.1.1.1 Electric

Storage Capacity or Input Rating of		Rating Condition
454 liters 120 gallons or less	12 kW or less	minimum EF 0.93-0.00132V per 10 CFR 430

more than 454 liters 120 gallons	more than 12 kW	maximum SL (0.3 + 27Vm) per ANSI Z21.10.3/CSA 4.3

2.17.1.1.2 Gas

Storage Capacity or Input Rating of		Rating Condition
379 liters 100 gallons or less	21980 W 75,000 Btu/h or less	minimum EF 0.67-0.0019V per 10 CFR 430
more than 379 liters 100 gallons	more than 21980 W 75,000 Btu/h	ET 80 percent; maximum SL 0.2931(Q/800+110 square root of V), W Q/800+110 square root of V, Btu/h per ANSI Z21.10.3/CSA 4.3.

2.17.1.1.3 Oil

Storage Capacity or Input Rating of		Rating Condition
189 liters 50 gallons or less	30765 W 105,000 Btu/h or less	minimum EF 0.59-0.0019V per 10 CFR 430
more than 189 liters 50 gallons or less	more than 30765 W 105,000 Btu/h	ET 80 percent; maximum SL 0.2931(Q/800+110 square root of V), W Q/800+110 square root of V, Btu/h per ANSI Z21.10.3/CSA 4.3.

2.17.1.2 Unfired Hot Water Storage

All volumes and inputs: Provide tank surface thermally insulated to a minimum of R12.5.

2.17.1.3 Instantaneous Water Heater

2.17.1.3.1 Gas

Input Rating	Rating Condition	In accordance with
14655 to 58620 W 50,000 to 200,000 Btu/h	EF 0.62-0.0019V	10 CFR 430
more than 58620 W 200,000 Btu/h	ET 80 percent	ANSI Z21.10.3/CSA 4.3

2.17.1.3.2 Oil

Input Rating	Rating Condition	In accordance with
61551 W 210,000 Btu/h or less	minimum EF 0.59-0.0019V	10 CFR 430
more than 61551 W 210,000 Btu/h	ET 80 percent	ANSI Z21.10.3/CSA 4.3

2.17.2 Automatic Storage Type

****

NOTE: Gas-fired water heaters are more efficient in source energy use than electric resistance water heaters. Avoid use of electric type unless they are shown through calculations to be life cycle cost effective. Heat pump water heaters can use waste heat from air conditioners and heat pumps to produce hot water in an efficient manner. Consider this when waste heat is available.

****

Provide heaters complete with [control system,] [control system, temperature gauge, and pressure gauge,] and ASME rated combination pressure and temperature relief valve.

2.17.2.1 Oil-Fired Type

Provide oil-fired type water heaters conforming to UL 732.

2.17.2.2 Gas-Fired Type

****

NOTE: Include bracketed statements below when project includes gas storage water heater with a nominal input of 75,000 British thermal units (Btu) per hour or less and having a rated storage capacity of not less than 20 gallons nor more than 100 gallons.

****

Provide gas-fired water heaters conforming to ANSI Z21.10.1/CSA 4.1 when input is 22 KW 75,000 BTU per hour or less, or ANSI Z21.10.3/CSA 4.3 for heaters with input greater than 22 KW 75,000 BTU per hour.[Provide Energy Star labeled gas storage water heater. Provide data identifying Energy Star label for gas storage water heater.]

2.17.2.3 Electric Type

Provide electric type water heaters conforming to UL 174 with dual heating elements. Provide 4.5 kW elements. Provide elements wired for non-simultaneous operation so that only one element can operate at a time.

2.17.2.4 Indirect Heater Type

****

NOTE: The titles of the sections covering the applicable systems will be inserted in the blanks.

Cast-iron heads will be used in steam-to-steam or non fired boiler application. Bronze heads will be used in steam-to-water application. Carbon steel heads will be used in water-to-water applications. For most applications, copper coils will be acceptable. Copper-nickel coils will be used with high pressure steam, 1.034 MPa 150 psig or above, high temperature water, or salty water conditions.

Single wall type exchangers may be allowed if the requirements in the plumbing code are satisfied (one requirement is that the heat transfer medium is potable or recognized as safe).

Steam and high temperature hot water HTHW systems are NOT normally used in Air Force and almost never used in Navy jobs. When using these systems keep all steam and HTHW piping in the mechanical rooms and do not route the distribution piping through occupied portions of the facilities.

****

Steam and high temperature hot water (HTHW) heaters with storage system must be the assembled product of one manufacturer, and be ASME tested and "U" stamped to code requirements under ASME BPVC SEC VIII D1. Provide storage tank as specified in paragraph HOT-WATER STORAGE TANKS. Provide heat exchangers of the double wall type that separates the potable water from the heat transfer medium with a space vented to the atmosphere in accordance with ICC IPC.

2.17.2.4.1 HTHW Energy Source

Provide heater elements with a working pressure of 2758 kPa 400 psig with water at a temperature of 204 degrees C 400 degrees F. Base heating surface on 0.093 square meter 1 square foot of heating surface to heat 76 liters 20 gallons or more of water in 1 hour from 4 to 82 degrees C 40 to 180 degrees F using hot water at a temperature of 178 degrees C 350 degrees F. Provide carbon steel heads. Provide tubing conforming to ASTM B111/B111M, Copper Alloy No. 706 (90-10 copper-nickel). Provide heating elements able to withstand an internal hydrostatic pressure of 4137 kPa 600 psig for not less than 15 seconds without leaking or any evidence of damage.

2.17.2.4.2 Steam Energy Source

Provide heater elements with a working pressure of 1034 kPa 150 psig with

steam at a temperature of 185 degrees C 365 degrees F. Base heating surface on 0.093 square meter 1 square foot of heating surface to heat 76 liters 20 gallons or more of water in 1 hour from 4 to 82 degrees C 40 to 180 degrees F using steam at atmospheric pressure. Provide [cast iron] [bronze] heads. Provide light-drawn copper tubing conforming to ASTM B75/B75M. Provide heating elements able to withstand an internal hydrostatic pressure of 1551 kPa 225 psig for not less than 15 seconds without leaking or any evidence of damage.

2.17.3 Instantaneous Water Heater

Provide crossflow design type heater with service water in the coil and [steam] [hot water] in the shell. Provide an integral internal controller, anticipating a change in demand so that the final temperature can be maintained under all normal load conditions when used in conjunction with [pneumatic control system] [pilot-operated temperature control system]. Normal load conditions must be as specified by the manufacturer for the heater. Provide units manufactured in accordance with ASME BPVC SEC VIII D1, and certified for 1.03 MPa 150 psig working pressure in the shell and 1.03 MPa 150 psig working pressure in the coils. Provide carbon steel shell with copper lining. Provide [cast iron] [bronze] [carbon steel plate with copper lining] heads. Provide [copper] [copper-nickel] coils. Provide shell with metal sheathed fiberglass insulation, combination pressure and temperature relief valve, and thermometer. Provide insulation as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. For gas service, provide Energy Star labeled gas instantaneous water heater. Provide data identifying Energy Star label for gas instantaneous water heater.

2.17.4 Electric Instantaneous Water Heaters (Tankless)

UL 499 and UL listed flow switch activated, tankless electric instantaneous water heater for wall mounting below sink or lavatory.

2.17.5 Relief Valves

Provide water heaters and hot water storage tanks with a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve must have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve must have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Provide relief valves rated according to ANSI Z21.22/CSA 4.4. Provide relief valves for systems where the maximum rate of heat input is less than 59 kW 200,000 Btuh with 20 mm 3/4 inch minimum inlets, and 20 mm 3/4 inch outlets. Provide relief valves for systems where the maximum rate of heat input is greater than 59 kW 200,000 Btuh with 25 mm 1 inch minimum inlets, and 25 mm 1 inch outlets. Provide discharge pipe from the relief valve full size of the valve outlet to the termination point.

2.18 HOT-WATER STORAGE TANKS

Provide hot-water storage tanks constructed by one manufacturer, ASME stamped for the working pressure, and having the National Board (ASME) registration. Provide cement-lined or glass-lined steel type tanks in accordance with AWWA D100. Provide tanks with heat losses conforming to TABLE III as determined by the requirements of ASHRAE 90.1 - SI ASHRAE 90.1 - IP. Equip each tank with a thermometer, conforming to

ASTM E1, Type I, Class 3, Range C, style and form as required for the installation, and with 178 mm 7 inch scale. Provide thermometers having a separable socket suitable for a 20 mm 3/4 inch tapped opening. Equip tanks with a pressure gauge 152 mm 6 inch minimum diameter face. Provide insulation as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS. Provide storage tanks capacities as shown.

2.19 PUMPS

2.19.1 Sump Pumps

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NOTE: 1. Designer will indicate location, sizes, horsepower, and capacities of equipment on the drawings.
2. Delete "totally enclosed and fan cooled" when not required.
3. For Army and Air Force projects, provide duplex pumps, if discharge capacity is greater than 1.6 liters per second 25 gpm and total head is at least 6.1 m 20 feet.

****

Provide sump pumps of the automatic, electric motor-driven, submerged type, complete with necessary control equipment and with a split or solid cast-iron or steel cover plate. Provide pumps direct-connected by an approved flexible coupling to a vertical electric motor having a continuous oiling device or packed bearings sealed against dirt and moisture. Provide totally enclosed motors, fan-cooled of sizes as indicated and equipped with an across-the-line magnetic controller in a NEMA 250, Type 4 enclosure. Provide each pump fitted with a high-grade thrust bearing mounted above the floor. Provide each shaft with an alignment bearing at each end, and suction inlets between 76 and 152 mm 3 and 6 inches above the sump bottom. Provide the suction side of each pump with a strainer of ample capacity and [bronze] [or] [stainless steel] pump impeller. Provide a float switch assembly, with the switch completely enclosed in a NEMA 250, Type 4 enclosure, to start and stop each motor at predetermined water levels. Equip duplex pumps with an automatic alternator to change the lead operation from one pump to the other, and for starting the second pump if the flow exceeds the capacity of the first pump. Provide the discharge line from each pump with a union or flange, a nonclog swing check valve, and a stop valve in an accessible location near the pump.

2.19.2 Hydraulic Elevator Sump Pumps

Provide sump pump and control system capable of pumping water while containing oil. The system must function automatically and provide an alarm in the event of the presence of oil in the sump, high liquid in the sump, or high amps or a locked rotor condition. An alarm that sounds only in the event of a high liquid condition is not acceptable. Provide submersible type pump. Provide pumps conforming to UL 778 standards and include thermal and overload protection. Provide motor capable of operating continuously or intermittently. Provide motor housing constructed of 304 stainless steel, and mechanical seals housed in a separate oil-filled compartment. Provide controls approved to UL 508 standards and housed in a NEMA 4X enclosure with stainless steel hinged hardware. Provide controls with dual relays with variable sensitivity

settings, magnetic contactor with separate over-current relay, self-cleaning stainless steel sensor probe, high decibel warning horn with illuminated red light and alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. Provide all cables between the pump and control unit a minimum of 4.9 meters 16 feet long and the cable and plug from the control unit a minimum of 2.4 meters 8 feet long. Provide control unit, pump, floats, and sensor probe factory assembled as a complete, ready to use system and tested and approved by a nationally recognized testing laboratory such as ENTELA.

2.19.3 Sewage Pumps

Provide duplex type with automatic controls to alternate the operation from one pump to the other pump and to start the second pump in the event the first pump cannot handle the incoming flow. Provide high water alarm and check valve.

2.19.4 Circulating Pumps

Provide electrically driven, single-stage, centrifugal domestic hot water circulating pumps with mechanical seals, suitable for the intended service and capacities not less than indicated. Provide pumps with revolutions per minute not exceeding 3600. Provide pump and motor [integrally mounted on a cast-iron or steel subbase,] [close-coupled with an overhung impeller,] [or] [supported by the piping on which it is installed]. Provide one-piece, heat-treated, corrosion-resisting steel shaft with [bronze] [or] [stainless steel] impeller, sleeve bearings and glands of bronze to accommodate mechanical seals and the housing of close-grained cast iron. Provide pump seals capable of withstanding 115 degrees C 240 degrees F temperature without external cooling. Provide motors with sufficient wattage horsepower for the service required, of a type approved by the manufacturer of the pump, and suitable for the available electric service. Provide pump motors smaller than 746 watts 1 horsepower with integral thermal overload protection in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide guards to shield exposed moving parts.

2.19.5 Booster Pumps

2.19.5.1 Centrifugal Pumps

Provide horizontal split-case centrifugal-type booster pumps. Provide pumps with revolutions per minute not exceeding 1800. Provide pump casings of close-grained iron or steel with smooth water passages. Provide a gasket between the upper and lower halves of the casing. Provide flanged suction and discharge connections. Provide nonoverloading, [bronze][stainless steel] impellers, balanced to eliminate vibration, and keyed to corrosion-resisting steel shafts. Provide casings fitted with bronze wearing or sealing rings. Provide cartridge type bearings, enabling the entire rotating element to be removed without disturbing alignment or exposing the bearings to dirt, water, and other foreign matter. Provide pumps with mechanical seals. Provide seal boxes machined in the pump casing and at both sides of the pump, and of sufficient depth to include a conventional bronze seal ring and rows of shaft packing. Provide close-grain cast iron or steel bedplates with ribs and lugs, complete with foundation bolts, and a drip lip with drain hole. Provide pumps tested at the manufacturer's plant for operating characteristics at the rated capacity and under specified operating conditions. Provide test curves showing capacity in liters per second gpm, head in meters feet, efficiency, brake wattage horsepower, and operation

in parallel with similar pumps. Provide multiple pump installations with pump characteristics compatible for operation in parallel with similar pumps. Provide electric motors sized for non-overload when operating at any point along the characteristic curve of the pump. Provide guards to shield exposed belts and moving parts.

2.19.5.2 Controls

Provide each pump motor with enclosed across-the-line-type magnetic controller complete in a NEMA 250 Type 1 enclosure with three position, "HAND-OFF-AUTOMATIC," selector switch in cover. Pumps must be automatically started and stopped by float or pressure switches. The pumps must start and stop at the levels and pressures indicated. Provide a multiposition sequence selector switch so that any two pumps may be operated simultaneously keeping a third pump as a standby.

2.19.6 Flexible Connectors

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NOTE: Flexible connectors should be provided for the suction and discharge of each centrifugal pump only as a solution to alignment problems to accommodate retrofits and/or for fluid media temperatures in access of 82 degrees C 180 degrees F.
****

Provide flexible connectors at the suction and discharge of each pump that is 746 watts 1 horsepower or larger. Provide connectors constructed of neoprene, rubber, or braided bronze, with Class 150 standard flanges. Provide line size flexible connectors and suitable for the pressure and temperature of the intended service.

2.20 WATER PRESSURE BOOSTER SYSTEM

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NOTE: One of the following systems will be used to boost the water pressure to the value required for service within the building. Indicate location, sizes, horsepower, and capacities of equipment on drawings. Provide duplex pumps, if discharge capacity is greater than 1.6 liter per second 25 gpm and total head is at least 59.78 kPa 20 feet.
****

[2.20.1 Constant Speed Pumping System

Provide constant speed pumping system with pressure-regulating valves employing one lead pump for low flows, and one or more lag pumps for higher flows. Provide pressure-regulating valves with nonslam check feature. Provide factory prepiped and prewired assembly mounted on a steel frame, complete with pumps, motors, automatic controls, and ASME code constructed hydro-pneumatic tank. Provide current sensing relays to stage the pumps. Protect pumps from thermal buildup, when running at no-flow, by a common thermal relief valve. Provide pressure gauges mounted on the suction and discharge headers. Provide control panels bearing the UL listing label for industrial control panels and in a NEMA 250, Type 1 enclosure. Provide control panels with the following: no-flow shutdown; 7-day time clock; audiovisual alarm; external resets; manual alternation; magnetic motor controllers; time delays; transformer;

current relays; "HAND-OFF-AUTOMATIC" switches for each pump; minimum run timers; low suction pressure cutout; and indicating lights for power on, individual motor overload, and low suction pressure. Interlock control circuits so that the failure of any controller must energize the succeeding controller. Provide an ASME code constructed hydro-pneumatic tank stamped for 862 kPa 125 psig water working pressure. Provide the tank with a flexible diaphragm made of material conforming to FDA requirements for use with potable water and factory precharged to meet required system pressure.

][2.20.2 Variable Speed Pumping System

Provide variable speed pumping system to provide system pressure by varying speed and number of operating pumps. Provide factory prepiped and prewired assembly mounted on a steel frame complete with pumps, variable speed drives, motors, automatic controls, and ASME code constructed hydro-pneumatic tank. Provide oil-filled type variable speed drives, capable of power transmission throughout their complete speed range without vibration, noise, or shock loading. Provide variable speed drives run-tested by the manufacturer for rated performance, and manufacturer furnished written performance certification. Provide system with suppressors to prevent noise transmission over electric feed lines. Required electrical control circuitry and system function sensors must be supplied by the variable speed drive manufacturer. The primary power controls and magnetic motor controllers must be installed in [the controls supplied by the drive manufacturer] [the motor control center]. Locate sensors in the system to control drive speed as a function of [constant pump discharge pressure] [constant system pressure at location indicated]. Provide connection between the sensors and the variable speed drive controls with [hydraulic sensing lines] [copper wiring] [telemetry]. Provide controls in NEMA 250, Type 1 enclosures. Provide an ASME code constructed hydro-pneumatic tank stamped for 862 kPa 125 psig water working pressure. Provide tank with a flexible diaphragm made of material conforming to FDA requirements for use with potable water and factory precharged to meet required system pressure.

]2.21 DOMESTIC WATER SERVICE METER

Provide positive displacement type cold water meters 50 mm 2 inches and smaller conforming to AWWA C700. Provide turbine type cold water meters 65 mm 2-1/2 inches and larger conforming to AWWA C701. Meter register may be round or straight reading type, [indicating [_____]] [as provided by the local utility]. Provide meters with pulse generators, remote readout registers and all necessary wiring and accessories.

2.22 COPPER-SILVER IONIZATION SYSTEM

a. Provide a complete copper-silver ionization system consisting of a controller, electrode cell(s), and flow meter.

b. Provide a microprocessor-based controller that automatically controls the rate of copper and silver ion release. Provide controllers able to generate a minimum concentration of 0.25 mg/L 25 ug/L copper on a continuous basis. Controller must perform under all types of water conditions without limiting its current due to lack of voltage. Provide controller which operate primarily in proportional copper and silver ion level control mode to prevent over or under ionization, and capable of operating in secondary control modes, to include continuous, timer, and flow switch. Provide controllers which

incorporate anti-scaling features.

c. Provide on-board and remote alarm connection capabilities. Provide auxiliary contacts for remote monitoring capability. Provide controllers conforming to UL 508 for Industrial Control Panels.

d. Provide electrode cell(s) incorporating reduced scaling features. Provide CPVC, epoxy coated aluminum, or Schedule 40 stainless steel housing. Provide with electrical quick connections. Provide sacrificial electrodes of an extruded alloy of 99.99 percent pure copper and 99.99 percent pure medical grade silver, with minimum ratio of 30 percent silver to 70 percent copper.

e. Provide a flow meter with a transmitter that displays the flow rate and total water usage. Provide clamp on transducers (non pipe invasive) with a flow response time of 0.3 seconds and flow sensitivity of 0.0003 m/s 0.001 fps.

f. Submit EPA registration for Copper-Silver Ionization as pesticide product (disinfectant).

g. Submit written NSF certification for Copper-Silver Ionization that the system (or components in contact with potable water) are certified.

2.23 POTABLE WATER MONITORING SYSTEM

For each potable cold-water and hot-water system, provide the following:

a. Skid mounted system for automatic monitoring of free or total chlorine residuals, temperature, pH, and pressure. The system must continuously monitor potable water systems. Provide components in direct contact with water conforming to NSF/ANSI 61 approved. Provide pre-wired and pre-plumbed unit on a single skid in a NEMA 4X enclosure.

b. Chlorine monitor minimum requirements:

(1) Measure free residual oxidant or total residual oxidant in potable water systems using the EPA accepted DPD colorimetric test method for measuring chlorine.

(2) Measure chlorine residuals at configurable frequencies as short as 110 seconds.

(3) Support water sample temperatures directly of up to 55 degrees C 131 degree F, and up to 66 degrees C 150 degree F using a sample cooler.

(4) Comply with US EPA regulation, 40 CFR 141.74 Standard Method 4500-CLG, and US EPA method 334.0 "Determination of Residual Chlorine in Drinking Water Using an Online Chlorine Analyzer."

(5) Support a Modbus interface.

c. Temperature, pH, and pressure sensors minimum requirements:

(1) Compact and Programmable sensors with built-in transmitters programmed by a computer.

(2) 4 mA to 20 mA output signals.

(3) 13 mm to 25 mm 1/2-inch to 1-inch probe lengths.

(4) Type 316L stainless steel bodies.

(5) Operational temperature range of -50 degrees C to 120 degrees C -58 degrees F to 248 degrees F for each sensor.

(6) Provide cables for hard wiring of sensors to Potable Water Monitoring System.

d. Data logging device minimum requirement:

(1) Automatically collect and log data at user selected intervals.

(2) Log device data date/time stamps and store in non-volatile memory.

(3) Store interval data locally until the next scheduled upload.

(4) Support a Modbus interface plus eight additional analog or pulse input signals.

e. Provide a minimum of one sampling point from each potable cold-water and hot-water system.

2.24 ELECTRICAL WORK

****

NOTE:

1. Show the electrical characteristics, motor starter type(s), enclosure type, and maximum rpm in the equipment schedules on the drawings.

2. Where reduced-voltage motor starters are recommended by the manufacturer or required otherwise, specify and coordinate the type(s) required in Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Reduced-voltage starting is required when full voltage starting will interfere with other electrical equipment and circuits and when recommended by the manufacturer.

3. Use the bracketed item specifying high efficiency single-phase motors for applications where the use of high efficiency motors is determined to be cost effective.

4. Use the second bracketed item where polyphase motors are part of an assembly, and the use of premium efficiency motors is cost-effective. Premium efficiency motors are required by Section 26 20 00 for individual motors that are not part of a packaged system.

****

a. Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM. Provide internal

wiring for components of packaged equipment as an integral part of the equipment. Provide [high efficiency type,] single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. [In addition to the requirements of Section 26 20 00, INTERIOR DISTRIBUTION SYSTEM, provide polyphase, squirrel-cage medium induction motors with continuous ratings, including motors that are part of a system, that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1.] Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

b. Provide motors rated for continuous duty with the enclosure specified. Motor duty requirements must allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque must be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor bearings fitted with grease supply fittings and grease relief to outside of the enclosure.

c. Provide controllers and contactors with auxiliary contacts for use with the controls provided. Provide manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown. For packaged equipment, the manufacturer must provide controllers, including the required monitors and timed restart.

d. Power wiring and conduit for field installed equipment must be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.25 FACTORY PAINTING

a. Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 3 mm 1/8 inch on either side of the scratch mark.

b. The film thickness of the factory painting system applied on the equipment must not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 49 degrees C 120 degrees F, the factory painting system must be designed for the temperature service.

2.26 IDENTIFICATION MATERIALS

General: Provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for application, selection is Installer's option, but provide single selection for each product category.

2.26.1 Plastic Pipe Markers

Provide snap-on or adhesive type pipe markers with nomenclature that closely matches Contract Drawings. Comply with designations indicated on Contract Drawings for piping system nomenclature and abbreviate only as necessary for each application length. Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as a separate unit of plastic.

a. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ASME A13.1.

b. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ASME A13.1.

c. Application: For exterior diameters greater than 50 mm2-inch (including insulation if any), provide continuous directional flow arrow tape around pipe circumference; two places, before and after pipe marker. Provide adhesive plastic pipe markers. For external diameters less than 50 mm 2-inch (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:

   (1) Snap-on application of pre-tensioned semi-rigid plastic pipe marker.

   (2) Adhesive lap joint in pipe marker overlap.

   (3) Laminated or bonded application of pipe marker to pipe (or insulation).

2.26.2 Valve Tags

Provide 1.11 mm19 gage polished brass valve tags with stamp-engraved piping system abbreviation in 6 mm 1/4-inch high letters and sequenced valve numbers 13 mm 1/2-inch high, and with hole for fastener, or engraved plastic laminate valve tags, with piping system abbreviation in 6 mm 1/4-inch high letters and sequenced valve numbers 13 mm 1/2-inch high, and with hole for fastener. Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose. Compile valve schedule for each service. For each page of valve schedule, provide laminated plastic coated cardboard stock sheets.

a. Provide 38 mm 1 1/2-inch diameter tags, except as otherwise indicated.

b. Provide size and shape as specified or scheduled for each piping system.

c. Fill tag engraving with black enamel.

2.26.3 Engraved Plastic Laminate Signs

Provide engraving stock melamine plastic laminate, in the sizes and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color)

except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

2.26.4 Plasticized Tags

Provide pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately, 51 mm by 152 mm 2-inch by 6-inch with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples; DANGER, CAUTION, DO NOT OPERATE).

2.26.5 Lettering and Graphics

Coordinate names, abbreviations and other designations used in plumbing identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of plumbing systems and equipment. Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Mixing Valve No. 2, Pump No. 1).

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 GENERAL INSTALLATION REQUIREMENTS

a. Provide piping located in air plenums conforming to NFPA 90A requirements. [Installation of plastic pipe in air plenums is prohibited.] Piping located in shafts that constitute air ducts or that enclose air ducts must be noncombustible in accordance with NFPA 90A. [Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA Fire Man.] Install the plumbing system complete with necessary fixtures, fittings, traps, valves, and accessories. Piping must be concealed wherever possible. Under no circumstances reduce pipe size on Contract Documents without written consent of Contracting Officer. Extend water and drainage piping 1525 mm 5 feet outside the building, unless otherwise indicated. Provide a [OS&Y valve] [full port ball valve] and drain on the water service line inside the building approximately 152 mm 6 inches above the floor from point of entry. Piping must be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Lay sewer and water pipes in separate trenches, except when otherwise shown. Exterior underground utilities must be at least 305 mm 12 inches below the average local frost depth or 457 mm 18 inches below finish grade whichever is greater. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, mark the location of the end of each plumbing utility with a stake or other acceptable means. Install valves with control no lower than the valve body.

b. Provide piping to fixtures, outlets, and equipment requiring drainage,

vent, and water utilities. Arrange and install hot-water and cold-water piping systems to permit draining. Equip the supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Anchor supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices to prevent movement.

c. The work must be carefully laid out in advance, and unnecessary cutting of construction must be avoided. Repair damage to building, piping, wiring, or equipment as a result of cutting by mechanics skilled in the trade involved.

d. Close pipe openings with caps or plugs during installation. Fixtures and equipment must be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, thoroughly clean, adjust and operate the fixtures, materials, and equipment. Provide safety guards for exposed rotating equipment.

e. Branch sizes to individual fixtures must be as scheduled. Consult manufacturer's data, Architectural drawings, and/or Plumbing drawings of rooms containing equipment and plumbing fixtures prior to roughing in piping. Stub piping through wall directly behind equipment item, or fixture being served. Connect equipment furnished by Owner or other divisions of the specification in accordance with this section.

f. Piping must not be routed over communications, electrical and server rooms unless dedicated to serving the room.

3.3 DOMESTIC WATER PIPING SYSTEMS

3.3.1 General

Accurately cut and work piping into place without springing or forcing. Weakening of structural portions of the building is not acceptable. Run aboveground piping parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings must be kept a sufficient distance from other work and other services to permit not less than 13 mm 1/2 inch between finished covering on the different services. Bare and insulated water lines must not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Do not bury water pipe in or under floors unless specifically indicated or approved. Make changes in pipe sizes with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are furnished to accommodate specific accepted installation practice. Make changes in direction with fittings.

3.3.2 Service Entrance

Provide service entrance installation through [below grade exterior wall with water-stop pipe sleeves.] [slab on grade with reaction anchor at buried elbow where water service pipe turns up below floor. Terminate end of exterior piping material with flange connection and tie flange back to buried elbow with tie rods of same diameter as flange bolts. Provide minimum of one tie rod for each two flange bolt holes. Provide permanent

corrosion protection for below-grade tie rods.]

3.3.3 Pipe Drains

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NOTE: Designer will indicate location of pipe drains on the drawings.

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Provide pipe drains consisting of 20 mm 3/4 inch hose bibb with renewable seat and [gate] [full port ball] [ball] valve ahead of hose bibb. At other low points, provide 20 mm 3/4 inch brass plugs or caps. Disconnection of the supply piping at the fixture is an acceptable drain.

3.3.4 Valves

Provide manual isolation valves at base of risers, on branch runouts from piping mains, on each branch serving a rest room, on each branch serving an equipment item, and on each branch to hose bibb or wall hydrant. [Wire isolation valves on emergency fixture supply open and tag "Do Not Close".] Balance hot water circulation system.

3.3.5 Expansion and Contraction of Piping

Allowance must be made throughout for expansion and contraction of water pipe. Provide each hot-water and hot-water circulation riser with expansion loops or other provisions such as offsets, changes in direction, or manufactured expansion fittings. Securely anchor risers to force expansion to loops. Make branch connections from risers with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Anchor horizontal runs of pipe over 15 m 50 feet in length to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility must be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility must be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

3.3.6 Thrust Restraint

Provide thrust blocks at plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 100 mm 4 inches in diameter or larger to prevent movement. Provide thrust blocking concrete of a mix not leaner than: 1 cement, 2.5 sand, 5 gravel; and having a compressive strength of not less than 14 MPa 2000 psi after 28 days. Place blocking between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, pour the base and thrust bearing sides of the thrust block against undisturbed earth. Pour t side of the thrust block not subject to thrust against forms. The area of bearing will be as shown. Place blocking so that the joints of the fitting are accessible for repair. Provide steel rods and clamps, protected by galvanizing or by coating with bituminous paint, to anchor vertical down bends into gravity thrust blocks.

3.3.7 Commercial-Type Water Hammer Arresters

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NOTE: Designer will indicate location, quantity and size of commercial-type water hammer arresters on the drawings. Commercial-type water hammer arresters will be sized and located in accordance with PDI WH 201. Piping serving equipment having quick-closing valves must have suitably sized arresters. The ICC International Plumbing Code defines a quick-closing valve and the Codes 1997 Commentary provides examples of what are and are not considered quick-closing valves. PDI-WH 201 also defines quick valve closure. Review of these documents will help the designer provide the proper number of arresters.

For pressures of 450 kPa 65 psig or less, commercial water hammer arresters may be reduced by the designer in number and size, if the system does not contain quick-acting valves. Water pressure regulating or reducing valves may be provided in lieu of commercial-type water hammer arresters, if local use has provided satisfactory performance. When required, install arresters as close as possible to quick-acting valves, ends of long pipe runs, and near batteries of fixtures.

****

Provide commercial-type water hammer arresters on hot- and cold-water supplies. Locate arresters as generally indicated, with precise location and sizing to be in accordance with PDI WH 201 Sizing and Placement Data. Water hammer arresters, where concealed, must be accessible by means of access doors or removable panels. Provide commercial-type water hammer arresters conforming to ASSE 1010. Vertical capped pipe columns (air chambers) are not be permitted.

3.3.8 Water Meter Remote Readout Register

a. Provide true absolute remote readout encoder register providing direct electronic transfer of meter reading information from water meter to automatic meter reading device. Mount the remote register at the location indicated, or as directed by the Contracting Officer.

b. Provide permanently sealed register to exclude dirt and/or moisture infiltration. Provide with a straight reading odometer-type display, and 360 degree test circle with center sweep hand and low flow (leak) detector. Provide tamperproof locking feature to resist tampering with the register. Provide factory potted moisture resistant wire assembly for pit applications.

c. Provide registers with full 6-wheel encoding, and a 6-wheel odometer assembly for direct manual reading. The register must transmit data using open architecture variable length protocol in ASCII format (American Standard Code for Information Interchange). Provide with capacity of remote installation up to 91.4 meters 300 feet to an outside wall mounted touch pad.

d. The register must use an absolute encoder to directly read the actual position of the index odometer wheels, when interrogated by a reading device. The reading device must provide all necessary power. Pulse outputs and/or memory must not require programming. Battery powered

registers are not acceptable. When a reading device interrogates the register, the translator encoder must communicate to the device in ASCII computer language the absolute meter reading, and an eight-digit identification number. Any error or nonread must be immediately indicated by the meter reading equipment.

3.3.9 Backflow Prevention Devices

Do not cross connect or interconnect plumbing fixtures, equipment, and pipe connections between a potable water supply and any source of nonpotable water. Install backflow preventers where indicated and in accordance with ICC IPC at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition, install backflow preventers at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Locate backflow preventers so that no part of the device will be submerged. Provide backflow preventers of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Do not provide bypass piping around backflow preventers. Maintain backflow preventers manufacturers access clearances for maintenance and testing. Each device must be a standard commercial unit. Install reduced pressure principle backflow prevention devices horizontally and located in an accessible location not more than 1219 mm 4 feet above finished floor. Pipe drain from reduced pressure principle backflow prevention devices to the exterior, or a floor drain of adequate capacity, or a mop sink.

3.3.10 Copper-Silver Ionization Systems

3.3.10.1 System Bypass

Provide 3 valve bypass around system.

3.3.10.2 System Startup

Start-up and activation of the copper-silver ionization system must include testing and documenting the baseline (pre-activation) water quality and ionization levels and the post-activation ionization levels. These tests must be performed by an independent laboratory in addition to any field testing required/performed by the manufacturer. A plan for on-going distal flushing and monitoring of ion levels must be established in accordance with the manufacturer's recommendations and implemented immediately upon system activation (prior to turnover or building occupancy). The plan must initially be implemented by the construction contractor and then integrated into the facility's ongoing maintenance plans.

3.3.10.3 Testing

After the facility has been turned over to the Government, provide one year of laboratory testing from [_____] distal sites for copper and silver ion levels to demonstrate appropriate levels for copper and silver. Copper level must be 0.2 to 0.4 mg/L over baseline not to exceed Safe Drinking Water Act (40 CFR 143) level of 1.0 mg/L (1.3 mg/L is enforceable limit by EPA unless the applicable State has established a lower level). Silver level must be 0.03 to 0.05 mg/L over baseline not to exceed Safe Drinking Water Act (40 CFR 143) of 0.1 mg/L (no maximum enforceable

limit). Provide one test per quarter during the first year following Government acceptance of the facility. Provide factory test certifications attesting unit performance is meeting the requirements of this specification.

3.3.11 Potable Water Monitoring System

Install equipment on concrete housekeeping pads[as indicated on the Contract Drawings]. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor base-mounted accessories to substrate. Provide interconnecting control wiring for sensors and Potable Water Monitoring System. Provide sensors in piping circuits. Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installation, including connections.

3.4 DRAINAGE AND VENT PIPING SYSTEMS

3.4.1 General

a. Provide wye fittings and eighth bends, or combination wye and eighth fittings at changes of direction and junctions. Provide sanitary tee fittings only in vertical pipe. Sanitary crosses are not permitted. Provide P-trap for each direct waste-pipe connection to equipment. Provide ice makers with an indirect drain consisting of either a floor sink or a dedicated, under-counter P-trap. Provide air gaps at indirect drains.

b. Install horizontal soil, waste, and storm piping with the following minimum slopes; 80 mm 3 inch and smaller pipes must be 20 mm/m 1/4 inch per foot; 100 mm 4 inch to 150 mm 6 inch must be 10 mm/m 1/8 inch per foot; 200 mm 8 inch and larger pipes: 5 mm/m 1/16 inch per foot. Slopes indicated on plans override those indicated here.

c. Provide vent stacks parallel to soil and waste stacks to receive branch vents from fixtures. Each vent stack must originate from a soil or waste stack at its base. To permit proper flashing, offset through-the-roof piping away from walls on roof before passing through roof. Carry vent stacks 100 mm 4 inch and larger full size through roof. Install vent lines so they will drain and not trap water. Where possible, combine soil, waste or vent stacks before passing through roof to minimize roof openings. Where minimum vent-through-roof size is larger than vent size, provide an increaser a minimum of 305 mm 12 inch below roof line.

d. Provide drip pans under drainage piping installed over critical areas to include but not limited to: operating rooms, recovery rooms, delivery rooms, nurseries, food preparation areas, food serving areas, food storage areas, central service areas, and electronic data processing areas. Provide drain piping from drip pans. Discharge drain piping to drain in exposed area.

e. Do not insulate, conceal, or fur around installed piping until it has been tested to satisfaction of the Contracting Officer. If inspection or test indicates defects, replace such defective work or material and repeat inspection and tests. Make repairs with new materials. Peening and chiseling of holes or screwed joints is not allowed.

f. Install underground PVC piping according to ASTM D2321. Clean and dry

joining surfaces of PVC piping. Join PVC piping according to ASTM D2855 and ASTM D2665 appendixes. Comply with ASTM D2564 for solvent cements. Comply with ASTM F656 for PVC primers. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements. Provide all pipe and fittings produced by a single manufacturer and install in accordance with manufacturer's recommendations. Do not test with or transport/store compressed air or gas in PVC pipe or fittings.

g. Install PVC waste piping underground or below slab. PVC piping installed aboveground or slab is not acceptable.

h. Install foundation drainage piping as indicated. Lay perforated drain pipe with perforations facing down.

3.4.2 Pipe Cleanouts

****

NOTE: Specify cast-iron adjustable heads where heads are subject to loads, cleaning agents, and chemicals which will destroy heads made of plastic materials.

****

Provide pipe cleanouts of the same size as the pipe except that cleanout plugs larger than 100 mm 4 inches will not be required. Provide cleanouts installed in connection with cast-iron soil pipe consisting of a long-sweep 1/4 bend or one or two 1/8 bends extended to the location shown. Caulk an extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug into the hub of the fitting and flush with the floor. Cleanouts in connection with other pipe must be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs[, except install plastic plugs in plastic pipe]. Provide plugs of the same size as the pipe up to and including 100 mm 4 inches. Provide cleanout tee branches with screw plug at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drains where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 457 mm 18 inches of crawl space is provided under the floor. Provide cleanouts on pipe concealed in partitions with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Provide round access covers secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls must have access covers and frames installed flush with the finished wall. Provide cleanouts installed in finished floors subject to foot traffic with a [stainless steel], [chrome-plated cast brass],[nickel brass], or [nickel bronze] cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws must not project above the cover surface. Where cleanouts are provided with adjustable heads, provide cast iron heads. Provide cleanout extensions through floor above where cleanouts are required in piping above critical areas, or to an accessible location outside of critical area.

3.4.3 Sight Drains

Install sight drains so that the indirect waste will terminate a minimum of 51 mm 2 inches above the flood rim of the funnel to provide an acceptable air gap.

3.4.4 Traps

Place traps as near the fixture as possible, and no fixture must be double-trapped. Provide cast-iron traps on cast-iron soil pipe. Traps installed on steel pipe or copper tubing must be recess-drainage pattern, or brass-tube type.[Traps installed on plastic pipe may be plastic conforming to ASTM D3311.] Traps for acid-resisting waste must be of the same material as the pipe.

3.5 JOINTS

****
NOTE: Where environmental conditions do not warrant the use of dielectric unions or flanges the requirement for such unions and flanges will be deleted.
****

Install pipe and fittings in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees is not be permitted. Make joints with fittings of compatible material and made for the specific purpose intended.

3.5.1 Threaded

Provide threaded joints with American Standard taper pipe threads conforming to ASME B1.20.2MASME B1.20.1. Coat only male pipe threads with graphite or with an approved graphite compound, or with an inert filler and oil, or have polytetrafluoroethylene tape applied.

3.5.2 Mechanical Couplings

****
NOTE: Do NOT use the following paragraph for Navy projects.
****

Prepare grooved mechanical joints according to the coupling manufacturer's instructions. Pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. Measure the diameter of grooves made in the field using a "go/no-go" gauge, vernier or dial caliper, or narrow-land micrometer. Measure and record groove width and dimension of groove from end of the pipe for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Do not use grooved joints in concealed locations. Grooved joints are only permissible in mechanical rooms.

3.5.3 Unions and Flanges

Do not conceal unions, flanges and mechanical couplings in walls, ceilings, or partitions. Provide unions on pipe sizes 65 mm 2-1/2 inches and smaller; provide flanges on pipe sizes 80 mm 3 inches and larger.

3.5.4 Grooved Mechanical Joints

****
NOTE: Do NOT use the following paragraph for Navy projects.

****

Prepare grooves according to the coupling manufacturer's instructions. Provide grooved fittings, couplings, and grooving tools of the same manufacturer. Pipe and groove dimensions must comply with the tolerances specified by the coupling manufacturer. Measure the diameter of grooves made in the field using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Measure and record groove width and dimension of groove from end of pipe for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Do not use grooved joints. Grooved joints are only permissible in mechanical rooms.

3.5.5 Cast Iron Soil Pipe

Install bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping per the manufacturer's recommendations.

3.5.6 Copper Tube and Pipe

3.5.6.1 Brazed Joint

In conformance with AWS B2.2/B2.2M and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints must include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) must include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.

3.5.6.2 Soldered Joint

Make with flux. Provide soldered joints conforming to ASME B31.5 and CDA A4015.

3.5.6.3 Pressure-Seal (Press-Fit) Connections

****

NOTE: Do NOT use the following paragraph for Navy projects.

****

Calibrate pressure-seal (press-fit) tools within 24 months of pipe installation. Submit calibration certification prior to commencing with pressure-seal (press-fit) piping system installation. Maintain 24-month pressure-seal (press-fit) tools calibration certification during installation of piping systems. Pressure-seal (press-fit) piping system installers must be trained by the manufacturer of the pressure-seal (press-fit) system to be installed. Submit pressure-seal (press-fit) system installation training certificates prior to commencing with pressure-seal (press-fit) piping system installation. Make copper pressure-seal (press-fit) connections in strict accordance with the manufacturer's installation instructions for manufactured rated size. Press joints using the tool(s) approved by the manufacturer of that joint. Maintain minimum distances between fittings in accordance with the manufacturer's requirements.

[3.5.7 Glass Pipe

Make joints for corrosive waste glass pipe and fittings with corrosion-resisting steel compression-type couplings with acrylonitrile rubber gaskets lined with polytetrafluoroethylene.

][3.5.8 Corrosive Waste Plastic Pipe

Make joints for polypropylene pipe and fittings by mechanical joint or electrical fusion coil method in accordance with ASTM D2657 and ASTM F1290.

][3.5.9 Other Joint Methods

****
NOTE: Coordinate with paragraph MATERIALS.
****

Make connections between ferrous and non-ferrous copper water pipe with dielectric unions or flange waterways. Provide dielectric waterways with temperature and pressure rating equal to or greater than that specified for the connecting piping. Provide waterways with metal connections on both ends suited to match connecting piping. Provide dielectric waterways internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges must meet the performance requirements described herein for dielectric waterways. Make connecting joints between plastic and metallic pipe with transition fitting for the specific purpose.

]3.6 CORROSION PROTECTION FOR BURIED PIPE AND FITTINGS

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NOTE: Both cathodic protection and protective coatings, regardless of soil resistivity, are to be provided for steel, ductile iron, and cast iron pressurized piping under floor (slab on grade) in soil. The results of an economic analysis and recommendations by a "corrosion expert" will govern the application of cathodic protection and protective coatings on gravity sewer lines, regardless of soil resistivity, and for potable water lines in resistivities above 10000 ohm-centimeters. For a large majority of new facilities, a sacrificial type of cathodic protection system, as specified in Section 26 42 13 GALVANIC (SACRIFICIAL) ANODE CATHODIC PROTECTION (GACP) SYSTEM, would be the applicable section to reference; however, the plumbing designer must coordinate with the cathodic protection designer for selection of one or both of the CP specification options.
****

Ductile iron, cast iron, and steel pipe, fittings, and joints must have a protective coating. Additionally, provide ductile iron, cast iron, and steel pressure pipe with a cathodic protection system and joint bonding. Provide the cathodic protection system, protective coating system, and joint bonding for cathodically protected pipe in accordance with [Section 26 42 13 GALVANIC (SACRIFICIAL) ANODE CATHODIC PROTECTION (GACP) SYSTEM] [and] [Section 26 42 17 IMPRESSED CURRENT CATHODIC PROTECTION (ICCP)

SYSTEM]. Select, apply, and inspect coatings in accordance with NACE SP0169 and as otherwise specified. Clean piping and apply the coating system prior to pipe tightness testing. Clean joints and fittings and apply the coating system after pipe tightness testing. For tape coating systems, provide tape conforming to AWWA C203 and apply with a minimum 50 percent overlap. Provide primer utilized with tape type coating systems as recommended by the tape manufacturer.

3.7 PIPE SLEEVES AND FLASHING

Provide pipe sleeves set in their proper and permanent location.

3.7.1 Sleeve Requirements

****

NOTE: The designer will detail type of pipe sleeves on the drawings, illustrating method of sealing annular space between pipe and sleeve. The designer will coordinate requirements for clearances around sleeves with Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT for Army/Air Force projects and 22 05 48.00 20 MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL for Navy projects.

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Provide pipes passing through concrete or masonry walls or concrete floors or roofs with pipe sleeves fitted into place at the time of construction. Sleeves are not required for supply, drainage, waste and vent pipe passing through concrete slab on grade, except where penetrating a membrane waterproof floor. A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals must consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links must be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt must cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Size each seal assembly as recommended by the manufacturer to fit the pipe and sleeve involved. Do not install sleeves in structural members, except where indicated or approved. Rectangular and square openings must be as detailed. Extend each sleeve through its respective floor, or roof, and cut flush with each surface, except for special circumstances. Extend pipe sleeves passing through floors, exposed or within partitions, in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas a minimum of 102 mm 4 inches above the finished floor. Unless otherwise indicated, provide sleeves of a size to provide a minimum of 6 mm 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Provide steel pipe or cast-iron pipe sleeves in bearing walls and concrete slab on grade floors. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic. Except as otherwise specified, seal the annular space between pipe and sleeve, or between jacket over insulation and sleeve, with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00 JOINT SEALANTS. Do not seal the annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over

insulation and sleeve for interior walls which are not designated as fire rated. Recess sleeves through below-grade walls in contact with earth 13 mm 1/2 inch from wall surfaces on both sides. Fill annular space between pipe and sleeve with backing material and sealants in the joint between the pipe and [concrete] [masonry] wall as specified above. Sealant selected for the earth side of the wall must be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant. Pipe sleeves in fire-rated walls must conform to the requirements in Section 07 84 00 FIRESTOPPING.

3.7.2 Flashing Requirements

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NOTE: The applicable details will be completed and included on the contract drawings. Sleeve thickness and square and rectangular opening details will be determined and indicated on the drawings. Indicate pipe chase areas on the drawings.

****

Install pipes passing through roof through a 0.55 mm 16 ounce copper flashing, each within an integral skirt or flange. Flashing must be suitably formed, and extend the skirt or flange not less than 203 mm 8 inches from the pipe and set over the roof or floor membrane in a solid coating of bituminous cement. Extend the flashing up the pipe a minimum of 254 mm 10 inches. For cleanouts, the turn down the flashing into the hub and caulked after placing the ferrule. Flash pipes passing through pitched roofs, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 203 mm 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. Seal the annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation as indicated. Turn down flashing for dry vents into the pipe to form a waterproof joint. Pipes, up to and including 250 mm 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Fit flashing shield into the sleeve clamping device. Sleeve pipes passing through wall waterproofing membranes as described above. Install a waterproofing clamping flange.

3.7.3 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

a. A standard roof coupling for threaded pipe up to 150 mm 6 inches in diameter.

b. A tack-welded or banded-metal rain shield around the pipe.

3.7.4 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs Flashing Requirements and Waterproofing, form a groove 6 to 13 mm 1/4 to 1/2 inch wide by 6 to

10 mm 1/4 to 3/8 inch deep around the pipe, fitting or drain. Fill the groove with a sealant as specified in Section 07 92 00 JOINT SEALANTS.

3.7.5 Pipe Penetrations

Provide sealants for all pipe penetrations. Seal all pipe penetrations to prevent infiltration of air, insects, and vermin.

3.7.6 Fire Seal

****
NOTE: Normally, fire walls and fire partitions will be designated on the architectural drawings.
****

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, provide a fire seal as specified in Section 07 84 00 FIRESTOPPING.

3.8 PIPE HANGERS, INSERTS, AND SUPPORTS

****
NOTE: Mechanical and electrical layout drawings and specifications for ceiling suspensions should contain notes indicating that hanger loads between panel points in excess of 22.7 kg 50 pounds must have the excess hanger loads suspended from panel points.
****

Install pipe hangers, inserts and supports conforming to MSS SP-58, except as modified herein.

a. Type 1, provide with adjustable type steel support rods.

b. Types 5, 12, and 26 are not be permitted.

c. Type 3 is not permitted on insulated pipe.

d. Secure Type 18 inserts to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for Type 18 inserts.

e. Provide Type 19 and 23 C-clamps for attachment to steel joists and torque per MSS SP-58. Provide both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.

f. Provide Type 20 attachments on steel angles and vertical web steel channels and furnish with an added malleable-iron heel plate or adapter. Attach to horizontal web steel channel with drilled hole on centerline and double nut and washer.

g. Provide Type 21, 28, 29, and 30 clamps for attachment to steel W or S beams.

h. Type 24 may be used only on trapeze hanger systems or on fabricated frames.

i. Provide Type 39 saddles on insulated pipe 100 mm 4 inches and larger when the temperature of the medium is 16 degrees C 60 degrees F or higher. Provide Type 39 saddles welded to the pipe.

j. Provide Type 40 shields:

(1) On insulated pipe less than 100 mm 4 inches.

(2) On insulated pipe 100 mm 4 inches and larger when the temperature of the medium is 16 degrees C 60 degrees F or less.

(3) Have a high density insert for all pipe sizes. High density inserts must have a density of 128 kg per cubic meter 8 pcf or greater.

k. Space horizontal pipe supports as specified in MSS SP-58 and install a support not over 305 mm 1 foot from the pipe fitting joint at each change in direction of the piping. Space pipe supports not over 1.5 m 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe must be 49 degrees C 120 degrees F for PVC and 82 degrees C 180 degrees F for CPVC. Include allowances for expansion and contraction in horizontal pipe runs.

l. Support vertical pipe at each floor, except at slab-on-grade, at intervals of not more than 4.6 m 15 feet nor more than 2.4 m 8 feet from end of risers, and at vent terminations. Include allowances for expansion and contraction in vertical pipe risers.

m. Provide Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides to allow longitudinal pipe movement. Slide materials must be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints must be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:

(1) On pipe 100 mm 4 inches and larger when the temperature of the medium is 16 degrees C 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.

(2) On pipe less than 100 mm 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

(3) On pipe 100 mm 4 inches and larger carrying medium less than 16 degrees C 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

n. Pipe hangers on horizontal insulated pipe must be the size of the outside diameter of the insulation. The insulation must be continuous through the hanger on all pipe sizes and applications.

o. Where there are high system temperatures and welding to piping is not desirable, the Type 35 guide must include a pipe cradle, welded to the guide structure and strapped securely to the pipe. Separate the pipe from the slide material by at least 102 mm 4 inches or by an amount adequate for the insulation, whichever is greater.

p. Hangers and supports for plastic pipe must not compress, distort, cut or abrade the piping, and must allow free movement of pipe except where otherwise required in the control of expansion/contraction.

q. Hangers used to support piping 50 mm 2 inches and larger must be fabricated to permit adequate adjustment after erection while still supporting the load. Install pipe guides and anchors to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Support piping subjected to vertical movement when operating temperatures exceed ambient temperatures by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, provide a clip or clamp where each pipe crosses the base support member. Spacing of the base support members must not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Formed or bent threaded sections of rods are not permitted.

3.8.1 Seismic Requirements

****

NOTE: Provide seismic requirements or piping and related equipment supports and show on the drawings.

****

Support and brace piping and attached valves to resist seismic loads as specified in Section 13 48 73 SEISMIC CONTROL FOR MISCELLANEOUS EQUIPMENT and [Section 22 05 48.00 20 MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL] [as shown]. Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, must be provided. Provide materials used for supports as specified in[Section 05 12 00 STRUCTURAL STEEL] [Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS].

3.8.2 Structural Attachments

Provide attachment to building structure concrete and masonry by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Provide inserts and anchors with a safety factor not less than 5. Supports attached to metal decking is not permitted. Supports to the underside of concrete filled floor or concrete roof decks is not permitted, unless approved by the Contracting Officer. Construct masonry anchors for overhead applications of ferrous materials only.

3.9 FIXTURES AND FIXTURE TRIMMINGS

Provide polished chromium-plated pipe, valves, and fittings where exposed to view. Provide angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, use a beading tool to mechanically deform the tubing above the compression fitting. Connect exposed traps and supply pipes for fixtures and equipment to the rough piping systems at the wall, unless otherwise specified under the item. Insulate drain lines and hot water lines of fixtures for handicapped/accessible fixtures and do not require polished chrome finish. Install plumbing fixtures and accessories within the space shown.

3.9.1 Fixture Connections

Make connections between earthenware fixtures and flanges on soil pipe

gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty is not be permitted. Set fixtures with outlet flanges the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

3.9.2 Flushometer Valves

****
NOTE: Delete sentence describing location of flush valve handle when an automatic flushing system is provided.
****

Secure flushometer valves to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Arrange flushometer valves for water closets to avoid interference with grab bars. In addition, for water closets intended for handicap use, install the flush valve handle on the wide side of the enclosure. Install bumpers for water closet seats on the wall.

3.9.3 Height of Fixture Rims Above Floor

Unless otherwise noted, mounting heights must be as indicated. Comply with ICC A117.1 for the installation of fixtures for use by the physically handicapped.

3.9.4 Shower Bath Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate must be made watertight by caulking or gasketing.

3.9.5 Fixture Supports

****
NOTE: Project drawings will detail methods of hanging lavatories and wall-hung urinals. Normally, these fixtures will be supported by one of the methods described.
****

Provide fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, of the chair-carrier type. The carrier must provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability must be provided to locate the fixture at the desired height and in proper relation to the wall. The use of support plates, in lieu of chair carrier, fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

3.9.5.1 Support for Solid Masonry Construction

Anchor chair carrier to the floor slab. Where a floor-anchored chair carrier cannot be used, imbed a suitable wall plate in the masonry wall.

3.9.5.2 Support for Concrete-Masonry Wall Construction

Anchor chair carrier to floor slab. Where a floor-anchored chair carrier

cannot be used, fasten a suitable wall plate to the concrete wall using through-bolts and a back-up plate.

3.9.5.3 Support for Steel Stud Frame Partitions

Provide chair carriers. The anchor feet and tubular uprights must be of the heavy duty design; and feet (bases) must be steel and welded to a square or rectangular steel tube upright. The use of wall plates, in lieu of floor-anchored chair carriers, are permitted only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

3.9.5.4 Support for Wood Stud Construction

Where floor is a concrete slab, provide a floor-anchored chair carrier. Where entire construction is wood, install wood crosspieces. Fasten fixture hanger plates, supports, brackets, or mounting lugs with not less than No. 10 wood screws, 6 mm 1/4 inch thick minimum steel hanger, or toggle bolts with nut. Extend wood crosspieces the full width of the fixture and securely support.

3.9.5.5 Wall-Mounted Water Closet Gaskets

Where wall-mounted water closets are provided, provide reinforced wax, treated felt, or neoprene gaskets. Provide gasket type as recommended by the chair-carrier manufacturer.

3.9.6 Access Panels

Provide access panels for concealed valves and controls, or any item requiring inspection or maintenance. Provide access panels of sufficient size and located so that the concealed items may be serviced, maintained, or replaced. Provide access panels as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

3.9.7 Escutcheons

Provide escutcheons at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Fasten escutcheons securely to pipe or pipe covering and must be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Provide one-piece escutcheons held in place by silicon caulk.

3.10 WATER HEATERS AND HOT WATER STORAGE TANKS

3.10.1 Relief Valves

****

NOTE: A discharge pipe the full size of the relief valve outlet will be shown connected to the outlet and shown on the drawings terminated at a safe location. The discharge pipe must not be directly connected to the drainage system and will conform to the requirements of the International Plumbing Code (for commercial and industrial hot water heaters ASME BPVC SEC IV also applies).

****

Valves installed between a relief valve and its water heater or storage tank are not permitted. Install pressure and temperature relief valves where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, install the relief valve directly in a tapping in the tank or heater; otherwise, install the pressure and temperature valve in the hot-water outlet piping. Provide a vacuum relief valve on the cold water supply line to the hot-water storage tank or water heater and mounted above and within 152 mm 6 inches above the top of the tank or water heater.

3.10.2 Connections to Water Heaters

Make connections of metallic pipe to water heaters with dielectric unions or flanges.

3.10.3 Expansion Tank

Install a pre-charged expansion tank on the cold water supply between the water heater inlet and the cold water supply shut-off valve. Adjust the expansion tank air pressure, as recommended by the tank manufacturer, to match incoming water pressure.

3.10.4 Gas- and Oil-Fired Water Heaters

Install in accordance with [NFPA 54] [NFPA 58] for gas fired and NFPA 31 for oil fired.

[3.10.5 Direct Fired Domestic Water Heaters

****

NOTE: For Navy projects, any boilers or direct fired domestic water heaters over 117,124 Watts 400,000 BTU/hour are required to be inspected and certified in accordance with Unified Facilities Criteria UFC 3-430-7, "Operations and Maintenance: Inspection and Certification of Boilers and Unfired Pressure Vessels". If the inspection is performed by Contract, the inspector must be certified by one of the NAVFAC Senior Boiler Inspectors. If this project has a water heater meeting these requirements, add the following paragraph.

****

Notify the Contracting Officer when any direct fired domestic water heater over 117,124.2 Watts (400,000 BTU/hour) is operational and ready to be inspected and certified.

]3.11 IDENTIFICATION SYSTEMS

Identify piping and physical hazards in accordance with 29 CFR 1910.144, ASME A13.1, NEMA Z535.1. Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment. Identify each piping system and item of equipment indicated on contract drawings.

3.11.1 Piping System Identification

Install plastic pipe markers on each system, and include arrows to show normal direction of flow. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, crawl spaces) and exterior non-concealed locations.

a. Near each valve and control device.

b. Near each branch; mark each pipe at branch, where there could be question of flow pattern.

c. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.

d. At access doors, manholes and similar access points which permit view of concealed piping.

e. Near major equipment items and other points of origination and termination.

f. Spaced intermediately at maximum spacing of 6.1 meters 20 feet along each piping run, except reduce spacing to 3 meters 10 feet in congested areas of piping and equipment. Provide a minimum of one pipe label in each space where partitions extend to structure.

3.11.2 Valves

Provide valve tag on every valve, cock and control device in each piping system. List each tagged valve in valve schedule for each piping system. Mount laminated valve schedules under glass in mechanical equipment rooms. Coordinate location with Contracting Officer. Provide 13 mm1/2-inch red adhesive identification dots on ceiling tiles located immediately below balancing valves and shutoff valves.

3.11.3 Plumbing Equipment

Install engraved plastic laminate sign or plastic equipment marker on or near each major item of plumbing equipment and each operational device. Provide minimum 6 mm 1/4-inch high lettering for name of unit where viewing distance is less than 0.9 meters 3 feet; 13 mm 1/2-inch high for distances up to 1.8 meters 6 feet, and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering. In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.11.4 Identification Tags

****

NOTE: Delete when identification tags are not considered necessary on small projects.

****

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number must be installed on valves, except those valves installed on supplies at plumbing

fixtures. Tags must be 35 mm 1-3/8 inch minimum diameter, with stamped or engraved marking. Provide black indentations, for reading clarity. Attach tags to valves with No. 12 AW, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

3.11.5 Nameplates

Provide 3 mm 1/8 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 6 mm 1/4 inch high normal block lettering into the white core. Minimum size of nameplates must be 25 by 64 mm 1 by 2-1/2 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

3.11.6 Labels

****
NOTE: Labeling of components is an inexpensive and effective method for helping building occupants properly operate the systems and for helping facilities personnel properly maintain the systems. The labels should be easy to read when standing next to the equipment, and durable to match the life of the equipment to which they are attached. Delete item c for non-battery operated units.

This is optional for Army projects.
****

Provide labels for sensor operators at flush valves and faucets. Include the following information on each label:

a. Identification of the sensor and its operation with [graphic] [written] [Braille] description.

b. Range of the sensor.

c. Battery replacement schedule.

3.11.7 Pipe Color Code Marking

****
NOTE: Designer will coordinate color code marking with Section 09 90 00. Color code marking for piping not listed in Table I of Section 09 90 00, will be added to the table.
****

Provide color code marking of piping as specified in Section 09 90 00 PAINTS AND COATINGS.

3.11.8 Color Coding Scheme for Locating Hidden Utility Components

****
NOTE: The Color Code Table will be developed to suit the installation. The colors of metal disks

used in Army projects will be as directed by the Facilities Engineer. Identification plate specified in Section 09 90 00 PAINTS AND COATINGS will be deleted if color coding scheme is specified.
****

Provide scheme in buildings having suspended grid ceilings. The color coding scheme must identify points of access for maintenance and operation of operable components which are not visible from the finished space and installed in the space directly above the suspended grid ceiling. Operable components include valves. The color coding scheme must consist of a color code board and colored metal disks. Each colored metal disk must be approximately 10 mm 3/8 inch in diameter and secured to removable ceiling panels with fasteners. Insert fasteners into the ceiling panels so that the fasteners will be concealed from view. The fasteners must be manually removable without tools and must not separate from the ceiling panels when panels are dropped from ceiling height. Installation of colored metal disks must follow completion of the finished surface on which the disks are to be fastened. Provide the color code board with approximate dimensions of 914 mm 3 foot width, 762 mm 30 inches height, and 13 mm 1/2 inch thickness. Provide board made of wood fiberboard and framed under glass or 1.6 mm 1/16 inch transparent plastic cover. Unless otherwise directed, the color code symbols must be approximately 19 mm 3/4 inch in diameter and the related lettering in 13 mm 1/2 inch high capital letters. Mount and locate the color code board in the mechanical or equipment room. Provide color code system as indicated below:

Color	System	Item	Location
[_____]	[_____]	[_____]	[_____]

3.12 PAINTING

3.12.1 General

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS. Provide new equipment with factory applied or shop applied paint, and as specified herein or in PART 2 paragraph FACTORY PAINTING, and provided under each individual section.

3.12.2 Shop Painting Systems for Metal Surfaces

a. Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 49 degrees C 120 degrees F must be cleaned to bare metal.

b. Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat must be aluminum or light gray.

(1) 950 Degrees C 120 Degrees F: Immediately after cleaning, the metal surfaces must receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.0076 mm 0.3 mil, one coat of primer applied to a minimum dry film thickness of 0.0255 mm one mil;

and two coats of enamel applied to a minimum dry film thickness of 0.0255 mm one mil per coat.

(2) Temperatures Between 49 and 204 Degrees C 120 and 400 Degrees F: Metal surfaces must receive two coats of 204 degrees C 400 degrees F heat-resisting enamel applied to a total minimum thickness of 0.05 mm 2 mils.

(3) Temperatures Greater Than 204 Degrees C 400 Degrees F: Metal surfaces must receive two coats of 316 degrees C 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 0.05 mm 2 mils.

[3.13 VIBRATION-ABSORBING FEATURES

****

NOTE: Indicate on the drawings where equipment should be mounted resiliently. Details for proper mounting of equipment will be indicated on the drawings. Insert required isolation efficiency in the blank space for installations where specific values for reduction of noise and vibration transmission are necessary; otherwise the sentence will be deleted. For areas where the maximum tolerable transmissibility in percent is considered necessary, the isolation efficiency will be given. Recommended transmissibility in percentages is as follows: 10 percent for equipment mounted in very critical areas, 10 to 20 percent for critical areas, and 20 to 40 percent for noncritical areas. The drawings should be checked to ensure that all structural and equipment connection factors or conditions surrounding the equipment, which is to be provided with vibration isolation units, favorably influence the effectiveness of the isolators. Where many items of equipment require different transmission values, because of different equipment locations, the paragraph may be revised to indicate the appropriate values on the drawings.

Delete submittal of Vibration-Absorption Features when not required.

****

Isolate mechanical equipment, including pumps, from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation must include an adequate number of standard isolation units. Each unit must consist of machine and floor or foundation fastening, together with intermediate isolation material, and must be a standard product with printed load rating. Provide piping connected to mechanical equipment with flexible connectors. Isolation unit installation must limit vibration to [_____] percent of the lowest equipment rpm. Submit details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications.

]3.14 TRAINING

a. Provide the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation,

and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors must be thoroughly familiar with all parts of the installation and must be trained in operating theory as well as practical operation and maintenance work.

b. Provide instruction during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished must be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

c. When significant changes or modifications in the equipment or system are made under the terms of the Contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

3.15 POSTED INSTRUCTIONS

Post framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system where directed. Prepare condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. Post the framed instructions before acceptance testing of the systems.

3.16 TESTS, FLUSHING AND DISINFECTION

****

NOTE: Some facilities may require a conditioning/flushing of water fountains and faucets that are listed as end point devices by NSF/ANSI 372, Section 9. This is to meet possible customer expectations that these devices produce drinking water that meets the lead leaching requirements of NSF/ANSI 372 immediately upon beneficial occupancy. If the customer is not willing to allow the end point devices to "self-condition" after project turn-over, then the designer should edit the paragraph titled System Flushing, requiring the Contractor to flush the drinking water fountains and faucets.

****

Submit test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Indicate the final position of controls in each test report.

3.16.1 Plumbing System

****

NOTE: For Air Force projects backflow prevention equipment and installation must meet the IAPMO UPC code.

****

Perform the following tests on the plumbing system in accordance with the ICC IPC , except that the drainage and vent system final test must include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, submit a testing procedure to the Contracting Officer for approval.

a. Drainage and Vent Systems Test. Include a smoke test in the final test.

b. Building Sewers Tests.

c. Water Supply Systems Tests.

3.16.1.1 Test of Backflow Prevention Assemblies

Test backflow prevention assemblies using gauges specifically designed for the testing of backflow prevention assemblies. Certification of proper operation must be as accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. Submit written documentation of the tests performed and signed by the individual performing the tests. Gauges must be tested annually for accuracy in accordance with the University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works Association Manual of Cross Connection (Manual M-14). Report form for each assembly must include, as a minimum, the following:

Data on Device	Data on Testing Firm
Type of Assembly	Name
Manufacturer	Address
Model Number	Certified Tester
Serial Number	Certified Tester No.
Size	Date of Test
Location	
Test Pressure Readings	Serial Number and Test Data of Gauges

If the unit fails to meet specified requirements, the unit must be repaired and retested.

3.16.1.2 Submittal Requirements

Submit the following:

a. Detail drawings for the complete plumbing system including piping layouts and locations of connections; dimensions for roughing-in,

foundation, and support points; schematic diagrams and wiring diagrams or connection and interconnection diagrams. Indicate clearances required for maintenance and operation on the detail drawings. Where piping and equipment are to be supported other than as indicated, include loadings and proposed support methods details. Draw plan, elevation, view, and detail drawings to scale.

b. Diagrams, instructions, and other sheets proposed for posting. Manufacturer's recommendations for the installation of bell and spigot and hubless joints for cast iron soil pipe.

c. Manuals in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

3.16.2 Defective Work

If inspections or test shows defects, replace or repair such defective work or material as necessary and repeat inspections and tests. Make repairs to piping with new materials. Caulking of screwed joints or holes is not acceptable.

3.16.3 Pressure-Seal (Press-Fit) Fittings Connection Tests

****

NOTE: Do NOT use the following paragraph for Navy projects.

****

Perform a step-test on all piping systems containing pressure-seal (press-fit) connections. Test may utilize air, water, or dry nitrogen, to pressurize the system at a pressure not to exceed 586 kPa85 psig. Examine and check each joint in the pressurized piping system for leaks. If a leaking joint is identified, relieve the pressure from the system, ensure the tube is full inserted into the fitting and proceed to press the fitting. Remove and replace any fitting that has already been pressed but is identified as leaking. Repeat the step-test until the system is determined to be leak-free.

3.16.4 System Flushing

3.16.4.1 During Flushing

****

NOTE: Hot water flushing dissolves most excess petrolatum-based flux inside piping, helping to avoid future corrosion problems.

****

Before operational tests or disinfection, flush potable water piping system with [hot] potable water. Sufficient water must be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 1.2 meters per second 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) must specify the number of fixtures to be operated during flushing. Provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the

facility. Contractor is responsible for any flood damage resulting from flushing of the system. Continue flushing until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. [Flush all faucets and drinking water fountains, including any device considered as an end point device by NSF/ANSI 372, a minimum of 1 L 0.25 gallons per 24 hour period, ten times over a 14 day period.]

3.16.4.2 After Flushing

Drain system at low points. Remove, clean, and replace strainer screens. After flushing and cleaning, prepare systems for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system must be repaired. When the system flushing is complete, adjust the hot-water system for uniform circulation. Adjust flushing devices and automatic control systems for proper operation according to manufacturer's instructions. Flow rates on fixtures must not exceed those stated in Part 2 of this Section.[Unless more stringent local requirements exist, lead levels must not exceed limits established by 40 CFR 50.12 Part 141.80(c)(1). Test the water supply to the building separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.]

3.16.5 Operational Test

Upon completion of flushing and prior to disinfection procedures, subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests must cover a period of not less than 8 hours for each system and include the following information in a report with conclusion as to the adequacy of the system:

a. Time, date, and duration of test.

b. Water pressures at the most remote and the highest fixtures.

c. Operation of each fixture and fixture trim.

d. Operation of each valve, hydrant, and faucet.

e. Pump suction and discharge pressures.

f. Temperature of each domestic hot-water supply.

g. Operation of each floor and roof drain by flooding with water.

h. Operation of each vacuum breaker and backflow preventer.

i. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.

3.16.6 Disinfection

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NOTE: If government laboratory facilities are available to conduct the bacterial examination of the test samples, revise this paragraph accordingly. The option of having the Contracting

Officer perform the sampling and testing will be selected only if Government laboratory facilities are available and with concurrence from appropriate laboratory personnel. At some locations, either county or installation health officers inspect the disinfection process. If this is required, add a notification requirement and give the office to be notified, including phone number. For modification of existing systems, provide special procedures for disinfection of new equipment.
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After operational tests are complete, disinfect the entire domestic hot- and cold-water distribution system. Flush the system as specified, before introducing chlorinating material. Provide hypochlorites or liquid chlorine chlorinating materials. Except as herein specified, water chlorination procedure must be in accordance with AWWA C651 and AWWA C652. Feed the chlorinating material into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Use a properly adjusted hypochlorite solution injected into the main with a hypochlorinator, or liquid chlorine injected into the main through a solution-feed chlorinator and booster pump. If after the 24 hour and 6 hour holding periods, the residual solution contains less than 25 ppm and 50 ppm chlorine respectively, flush the piping and tank with potable water, and repeat the above procedures until the required residual chlorine levels are satisfied. Flush the system, including the tanks, with clean water until the residual chlorine level is reduced to less than one part per million. During the flushing period, open and close each valve and faucet several times. Obtain samples of water in disinfected containers from several locations selected by the Contracting Officer. The samples of water must be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA 10084. The testing method used must be either the multiple-tube fermentation technique or the membrane-filter technique. Repeat disinfection procedure until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

[3.16.7 Optional Disinfection Method

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NOTE: For Iceland projects only, include the following option.
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Disinfect new potable water piping and affected portions of existing potable water piping with geothermal water. Geothermal water must be not less than 90 degrees C 194 degrees F and contact time must be not less than 30 minutes. After disinfection, thoroughly flush new portable water piping and affected portions of existing potable water piping with the chlorinated base water supply for a minimum of two hours.

]3.16.8 Domestic Water Systems Flushing Program

Perform System Flushing, Operational Test, and Disinfection within three weeks of turnover of the facility to the Government. Develop and institute a Domestic Water Systems Flushing Program for domestic water systems. Institute the Program during the period between the conclusion of domestic

water systems disinfection and turnover of the facility to the Government. Measure each domestic water system residual oxidant (disinfectant) level with a digital colorimeter at distal plumbing fixtures on each building [floor] [level] daily. Distal plumbing fixtures must be as selected by the Contracting Officer. Measurement of residual oxidant levels by pool test kits or color-wheel test kits is not acceptable. Flush each domestic water system with fresh water when residual oxidant levels fall below or exceed the limits prescribed in PL 93-523. Retest residual levels and continue flushing until oxidant levels are within the limits prescribed by PL 93-523. Provide test results to the Government upon [building] [_____] turnover to the Government.

-- End of Section --