
USACE / NAVFAC / AFCEA UFGS-15400N (November 2003)

Preparing Activity: NAVFAC Superseding
UFGS-15400N (June 2001)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

Changes indicated by CHG tags

References are in agreement with UMRL dated 25 June 2004

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SECTION 15400N

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SECTION 15400N

PLUMBING SYSTEMS

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NOTE: This guide specification covers the requirements for building plumbing systems including aboveground and buried DWV piping and water piping within and under each building and within 1.50 meters 5 feet outside of the building walls.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

NOTE: When new exterior distribution systems are not in the project, specifications may include buried piping beyond 1.50 meters 5 feet outside of the building walls and connections to existing exterior distribution systems. Plumbing systems requirements must conform to Military Handbook MIL-HDBK-1003/1 "Plumbing Systems" and Military Handbook MIL-HDBK-1190, "Facility Planning and Design Guide."

NOTE: The following information shall be shown on the project drawings:

1. Configuration and sizes of piping systems.

2. Locations of hot water and cold water shut-off gate valves for each toilet room.
3. Location and type of each plumbing fixture.
4. Typical details for attaching wall-hung fixtures to walls.
5. Whether piping is run above or below ground, floors, and ceilings and whether concealed or exposed.
6. Capacity and efficiency of each item of equipment.
7. Locations and details for special supports for piping.
8. Locations, sizes, and types of cleanouts
9. Locations, sizes, and typical details for extended rim floor drains.
10. Detail sections through each roof drain, floor sink, and grease interceptor (trap).
11. Location of acid-resistant DWV piping, cleanouts, traps, drains and accessories.
12. Cleanouts in crawl spaces or exterior of buildings shall be not less than one meter 3 feet from building wall.
13. Exterior buried piping shall not be run parallel to and 1.50 meters 5 feet from exterior building wall.
14. Location and size of water hammer arresters or air chambers.
15. Scale ranges for gages and thermometers.
16. Capacity, size, by-pass valves, and piping for water meters and detail of water meter box.
17. Locations and sizes of access panels for valves.
18. Details of pipe penetrations in outside walls.
19. Locations of fire walls and fire floors.
20. Location of wye strainer (with blow-off outlet, pipe nipple, and gate valve) in water supply to each building.

PART 1 GENERAL

1.1 REFERENCES

NOTE: Issue (date) of references included in
project specifications need not be more current than
provided by the latest guide specification. Use of
SpecsIntact automated reference checking is
recommended for projects based on older guide
specifications.

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.

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 1010 (2002) Self-Contained, Mechanically
Refrigerated Drinking-Water Coolers

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A112.21.2M (1983) Roof Drains

ANSI A112.36.2M (1991; R 2002) Cleanouts

ANSI B16.18 (1984; R 1994) Cast Copper Alloy Solder
Joint Pressure Fittings

ANSI B16.23 (1992; Errata 1994) Cast Copper Alloy
Solder Joint Drainage Fittings - DWV

ANSI B16.24 (1991; Errata 1991) Cast Copper Alloy Pipe
Flanges and Flanged Fittings Class 150,
300, 400, 600, 900, 1500, and 2500

ANSI Z124.1 (1995) Plastic Bathtub Units

ANSI Z124.2 (1995) Plastic Shower Units

ANSI Z21.10.1 (2001; R 2002) Gas Water Heaters Vol. I,
Storage Water Heaters with Input Ratings
of 75,000 Btu Per Hour or Less

ANSI Z21.10.3 (2001) Gas Water Heaters Vol.III, Storage
Water Heaters With Input Ratings Above
75,000 Btu Per Hour, Circulating and
Instantaneous

ANSI Z21.22 (1999; A 2001) Relief Valves for Hot Water
Supply Systems

ANSI Z358.1 (1998) Emergency Eyewash and Shower
Equipment

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

ASHRAE 90.1 (2001; various Errata) Energy Standard for
Buildings Except Low-Rise Residential
Buildings

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003 (2001) Water Pressure Reducing Valves

ASSE 1014 (1989) Hand-Held Showers

ASSE 1019 (1997) Vacuum Breaker Wall Hydrants,
Freeze Resistant, Automatic Draining Type

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104 (1995) Cement-Mortar Lining for
Ductile-Iron Pipe and Fittings for Water

AWWA C105 (1999) Polyethylene Encasement for
Ductile-Iron Pipe Systems

AWWA C110 (1998) Ductile-Iron and Gray-Iron
Fittings, 3 In. Through 48 In. (76 mm
through 1219 mm), for Water

AWWA C111 (2000) Rubber-Gasket Joints for
Ductile-Iron Pressure Pipe and Fittings

AWWA C115 (1999) Flanged Ductile-Iron Pipe With
Ductile-Iron or Gray-Iron Threaded Flanges

AWWA C151 (2002) Ductile-Iron Pipe, Centrifugally
Cast, for Water

AWWA C500 (2002; A C500a-95) Metal-Seated Gate
Valves for Water Supply Service

AWWA C651 (1999) Disinfecting Water Mains

AWWA C701 (2002) Cold-Water Meters - Turbine Type,
for Customer Service

AWWA D100 (1996) Welded Steel Tanks for Water Storage

ASME INTERNATIONAL (ASME)

ASME A112.18.1M (2000) Plumbing Fixture Fittings

ASME A112.19.1M (1994; R 1999) Enameled Cast Iron Plumbing
Fixtures

ASME A112.19.2M (1998) Vitreous China Plumbing Fixtures

ASME A112.19.3M (2001) Stainless Steel Fixtures (Designed
for Residential Use)

ASME A112.19.4M	(1994; R 1999) Porcelain Enameled Formed Steel Plumbing Fixtures
ASME A112.19.5	(1999) Trim for Water-Closet Bowls, Tanks and Urinals
ASME A112.21.1M	(1991; R 1998) Floor Drains
ASME A112.6.1M	(1997; R 2002) Floor Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use
ASME B16.1	(1998) Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.22	(2002) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(1988) Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B16.29	(2002) Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME B16.32	(1992) Cast Copper Alloy Joint Fittings for Solvent Drainage Systems
ASME BPVC SEC IV	(2001) Boiler and Pressure Vessel Code; Section IV, Recommended Rules for the Care and Operation of Heating Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A 183	(2003) Carbon Steel Track Bolts and Nuts
ASTM A 47	(1999) Ferritic Malleable Iron Castings
ASTM A 47M	(1990; R 1996) Ferritic Malleable Iron Castings (Metric)
ASTM A 518	(1992) Corrosion-Resistant High-Silicon Iron Castings
ASTM A 518M	(1992; R 1997) Corrosion-Resistant High-Silicon Iron Castings (Metric)
ASTM A 53	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 74	(2003b) Cast Iron Soil Pipe and Fittings
ASTM B 306	(2002) Copper Drainage Tube (DWV)
ASTM B 32	(2003) Solder Metal

ASTM B 42	(2002) Seamless Copper Pipe, Standard Sizes
ASTM B 584	(2000) Copper Alloy Sand Castings for General Applications
ASTM B 88	(2002) Seamless Copper Water Tube
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM C 1053	(2000) Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM C 564	(2003) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D 2000	(2001) Rubber Products in Automotive Applications
ASTM D 2665	(2002ae1) Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2846/D 2846M	(1999) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems
ASTM F 441/F 441M	(1999e1) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(2000) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(1997) Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI HSN-85	(1985) Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings

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

FCCCHR List	(continuously updated) List of Approved Backflow Prevention Assemblies
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INTERNATIONAL CODE COUNCIL (ICC)

ICC IPC	(2003) International Plumbing Code
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	(2002) Pipe Hangers and Supports - Materials, Design and Manufacture
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MSS SP-69	(2002) Pipe Hangers and Supports - Selection and Application
MSS SP-70	(1998) Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(1997) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-80	(2003) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2002) Cast Iron Globe & Angle Valves, Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2003) Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 54	(2002) National Fuel Gas Code

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI G 101	(1996) Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI WH 201	(1992) Water Hammer Arresters

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-R-6855	(Rev E; Notice 2; Supp 1) Rubber, Synthetic, Sheets, Strips, Molded or Extruded Shapes
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U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS A-A-50555	(Basic) Pumping Units, Sewage, Duplex, Centrifugal, Automatic Wet-Pit Type
FS A-A-50560	(Basic) Pumps, Centrifugal, Water Circulating, Electric-Motor-Driven
FS A-A-50562	(Basic) Pump Units, Centrifugal, Water, Horizontal; General Service and Boiler-Feed: Electric-Motor- or Steam-Turbine-Driven
FS WW-H-191	(Rev E) Heater, Fluid, Industrial (Instantaneous, Steam, Water Converter Type)

UNDERWRITERS LABORATORIES (UL)

UL 1453	(1995; Rev thru Sep 1998) Electric Booster and Commercial Storage Tank Water Heaters
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UL 174	(1996; Rev thru Oct 1999) Household Electric Storage Tank Water Heaters
UL 430	(1994; Rev thru Mar 2001) Waste Disposers
UL 732	(1995; Rev thru Jan 1999) Oil-Fired Storage Tank Water Heaters

1.2 RELATED REQUIREMENTS

Section 15050N BASIC MECHANICAL MATERIALS AND METHODS, applies to this section with the additions and modifications specified herein.

1.3 SYSTEM DESCRIPTION

NOTE: The design engineer should contact the
 Engineering Field Division, Naval Facilities
 Engineering Command, Mechanical Design Branch, to
 determine which Plumbing Code applies to the project.

Provide [new and modify existing] plumbing systems, complete and ready for operation. Plumbing systems including manufacturer's products shall be in accordance with the required and advisory provisions of the ICC IPC. Plumbing systems include piping less than 1.50 meters 5 feet outside of building walls [and piping beyond 1.50 meters 5 feet outside of building walls including connections to existing exterior distribution systems].

1.4 SUBMITTALS

NOTE: Submittals must be limited to those necessary
 for adequate quality control. The importance of an
 item in the project should be one of the primary
 factors in determining if a submittal for the item
 should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation 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 projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Pipe and fittings
Valves
Plumbing fixtures
Water heaters
Pipe hangers and supports
Pumps
Pressure gages
Water meters
Strainers
Drains
Water hammer arresters
Backflow preventers
Electric water coolers
Thermometers

For pumps, include certified pump test curves.

SD-06 Test Reports

Backflow Preventers Test Report

SD-10 Operation and Maintenance Data

Water heaters, Data Package 2
Pumps, Data Package 2
Electric water coolers, Data Package 2

Submit in accordance with Section 01781 OPERATION AND

MAINTENANCE DATA.

1.5 QUALITY ASSURANCE

Plumbing systems including fixtures, equipment, materials, installation, and workmanship shall be in accordance with the Plumbing Code except as modified herein. In the Plumbing Code referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for the word "should" wherever it appears; reference to the "authority having jurisdiction," the Administrative Authority, the Plumbing Official, and the Design Engineer shall be interpreted to mean the Contracting Officer. Capacity of equipment shall be not less than that indicated.

PART 2 PRODUCTS

2.1 DRAIN, WASTE, AND VENT (DWV) PIPE AND FITTINGS

Fittings shall be long radius fittings, except fittings in vent piping may be short radius fittings. Minimum size piping shall be 50 mm 2 inches for buried piping and 40 mm 1.5 inches for aboveground piping.

2.1.1 Buried Piping

Provide piping up to but not more than 150 mm 6 inches aboveground or floor slab on grade.

2.1.1.1 Cast-Iron Hubless Pipe and Fittings

**NOTE: Delete paragraph for localities where buried
hubless fittings are considered inappropriate due to
failure of clamps by corrosion.**

CISPI 301 with CISPI 310 couplings.

2.1.1.2 Cast-Iron Hub and Spigot Pipe and Fittings

ASTM A 74 with ASTM C 564 or CISPI HSN-85 rubber compression gasket joints.

2.1.1.3 Plastic Pipe, Fittings, and Solvent Cement

- a. Polyvinyl Chloride (PVC) System: ASTM D 2665.

2.1.2 Aboveground Piping

2.1.2.1 Cast-Iron Hubless Pipe and Fittings

CISPI 301 with CISPI 310 couplings.

2.1.2.2 Cast-Iron Hub and Spigot Pipe and Fittings

ASTM A 74 with ASTM C 564 or CISPI HSN-85 rubber compression gasket joints.

2.1.2.3 Plastic Pipe, Fittings, and Solvent Cement

- a. Polyvinyl Chloride (PVC) System: ASTM D 2665[; do not use aboveground in more than two-story buildings].

2.1.2.4 Copper Tubing

ASTM B 306, with ANSI B16.23, ASME B16.29, or ASME B16.32 solder joint fittings using ASTM B 32, 95-5 tin-antimony or Grade Sn96 tin-silver solder, and flux containing not more than 0.2 percent lead.

2.1.2.5 Grooved-End Steel Piping for Roof Drainage Only

ASTM A 53, Schedule 40, hot-dip galvanized, cut grooved-end steel pipe; ASTM A 47M ASTM A 47 or ASTM A 536, hot-dip galvanized, grooved-end fittings, and mechanical couplings; ASTM A 183 coupling nuts and bolts; ASTM D 2000 rubber gaskets for water service. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer.

2.1.3 Cleanouts

ANSI A112.36.2M; provide threaded bronze or thermoplastic or PVC plastic cleanout plugs.

2.1.3.1 Floor Cleanouts

Provide cast-iron or ductile-iron floor cleanout with [anchor] flange, adjustable height polished bronze, nickel bronze, stainless steel, or chromium-plated copper alloy rim and scoriated floor plate with "CO" cast in the plate, and countersunk screws for installing floor plate flush with finished floor.

2.1.3.2 Wall Cleanouts

Provide polished stainless steel or chromium-plated copper alloy cover plate and secure to cleanout plug with countersunk stainless steel screw.

2.1.3.3 Cleanouts Exterior to Buildings

Provide cast-iron or polyvinyl chloride (PVC) cleanouts and countersunk plugs. [Provide 600 by 600 by 100 mm 24 by 24 by 4 inch thick concrete slab with top 25 mm one inch above grade with cleanout located in center of slab.] [Provide cast-iron cleanout box with cover.] [Provide cleanouts flush with finished grade or concrete slab.]

2.1.4 Drains

ASME A112.21.1M; provide cast-iron or ductile-iron drains and clamping rings for use with membrane waterproofing. Provide P-traps for each floor drain.

2.1.4.1 Flush Strainer Floor Drains

Provide with double drainage flange, perforated or slotted cast bronze or nickel bronze, polished stainless steel, or chromium-plated copper alloy strainer, and adjustable collar. Drains of sizes 50, 80, and 100 mm 2, 3, and 4 inches shall have strainers with minimum free drainage area of 3225, 7100, 11,610 square mm 5, 11, and 18 square inches, respectively.

2.1.4.2 Shower Floor Drains

Provide as specified for flush strainer floor drains, except that [finish shall be polished stainless steel or chromium-plated copper alloy] [and]

[PVC drains may be provided for fiberglass shower stalls] where fire separation requirements are not violated.

2.1.4.3 Extended Rim Floor Drains

Provide as specified for flush strainer floor drains, except strainer body shall have 25 mm one inch extended rim installed flush with finished floor.

2.1.4.4 Roof Drains

ANSI A112.21.2M; provide hot-dip galvanized cast-iron or ductile-iron drains, with minimum of 250 mm 10 inch diameter body, nonpuncturing flashing clamp device with integral gravel stop and deck clamp, and removable cast-iron or ductile-iron or polypropylene locking dome. Free area of dome shall be not less than two times the free area of drain outlet. Provide drain flashing ring seat flush with adjacent roof deck, and secure rigidly in place with deck clamp.

2.1.4.5 Floor Sinks (Drains)

Provide cast-iron body with white acid-resisting porcelain enameled or epoxy interior, double drainage flange, nickel bronze rim and slotted grate, removable stainless steel or aluminum slotted buckets, and P-trap.

2.1.5 Grease Interceptors (Traps)

PDI G 101.

2.1.6 Oil Interceptors

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.

2.1.7 Acid Resistant DWV Pipe, Fittings, and Couplings

**NOTE: For medical facility laboratories, do not use
PVC pipe for waste disposal piping and vents.**

Provide acid-resistant DWV pipe, fittings, and couplings of the mechanical, bell and spigot, or fusion type joints. Material for buried piping and aboveground piping shall be ASTM A 518M ASTM A 518, silicon-iron composition. ASTM C 1053, borosilicate glass pipe and fitting may be provided for aboveground piping, except vent piping through and above roofs shall be silicon-iron composition. Provide cleanouts and drains as specified for DWV piping, except material shall be silicon-iron composition. [ASTM D 2665, PVC plastic pipe, fittings, and solvent cement may be provided for buried piping and aboveground piping.]

2.2 DOMESTIC WATER PIPING

2.2.1 Buried Piping and Aboveground Piping

2.2.1.1 Copper Tubing

ASTM B 88M, ASTM B 88, Type L or M for aboveground piping, Type K for buried piping, with ANSI B16.18 or ASME B16.22 solder joint fittings; or with ASME B16.26 flared joint fittings. Provide ASTM B 42 copper pipe nipples with threaded end connections. Provide ASTM B 32, 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder. Provide copper tubing for pipe sizes 100 mm 4 inches or smaller.

[2.2.1.2 CPVC Plastic Pipe, Fittings, and Solvent Cement

ASTM D 2846/D 2846M, may be provided for sizes 50 mm 2 inches and smaller. 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. [Provide CPVC piping for salt water flushing system.]

]2.2.1.3 Cast Ductile-Iron Piping

Sizes larger than 100 mm 4 inches, outside coated, AWWA C104 cement mortar lined, AWWA C151 ductile-iron pipe, AWWA C111 rubber gasket joints, and AWWA C110 fittings. Provide concrete thrust blocks at the elbow where the buried piping turns up toward the floor, and restrain the pipe riser with steel rods from the elbow to the flange above the floor. Aboveground piping shall have flanged end connections conforming to AWWA C115 for flanged pipe and AWWA C110 for flanged fittings.

2.2.2 Water Valves

Provide valves suitable for minimum of [860] [690] kPa (gage) [125] [100] psig and minimum of 82 degrees C 180 degrees F hot water. Valves shall have [flanged end connections, except sizes smaller than 65 mm 2.5 inches may have] threaded end connections with a union on all but one side of the valve, or solder end connections for connections between bronze valves and copper tubing. Ball valves may be provided in lieu of gate valves. [Provide blue finish and red finish on handwheels for valves in cold domestic water piping and hot domestic water piping, respectively.]

2.2.2.1 Gate Valves

MSS SP-80, Class 125[, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-70, Class 125].

2.2.2.2 Globe and Angle Valves

MSS SP-80, Class 125[, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-85, Class 125].

2.2.2.3 Check Valves

MSS SP-80, Class 125, swing check[, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-71, Class 125, swing check, cast-iron or bronze body].

2.2.2.4 Ball Valves

Full port design, copper alloy[, except sizes 65 mm 2.5 inches and larger shall be ductile-iron body or cast-iron body]. Valves shall have two-position lever handles.

2.2.2.5 Hose Bibbs

Provide angle type copper alloy hose bibb with lockshield and [removable] handwheel [or tee-handle]. Inlet shall have internal threads. Outlet shall have vacuum breaker with 20 mm 0.75 inch external hose threads.

2.2.2.6 Nonfreeze Wall Hydrant

ASSE 1019, cast bronze, with lockshield and [removable] handwheel [or tee-handle], 25 mm one inch external thread inlet, 20 mm 0.75 inch external hose thread outlet with automatic draining vacuum breaker. Hydrant shall be of sufficient length to extend through walls and place the valve seat inside the building or in the crawl space. Bonnet and valve stem shall be removable from outside of the building.

2.2.2.7 Combination Pressure and Temperature Relief Valves

ANSI Z21.22 [copper alloy body, automatic reseating,] test lever, and discharge capacity based on AGA temperature steam rating.

2.2.2.8 Pressure Relief Valves

ANSI Z21.22 [copper alloy body, automatic reseating with test lever].

2.2.2.9 Water Temperature Regulating Valves

Provide copper alloy or cast-iron body valve with adjustable range to allow settings between 43 and [71] [82] degrees C 110 and [160] [180] degrees F.

2.2.2.10 Water Temperature Mixing Valves

Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be listed in the current FCCCHR List.

2.2.2.11 Water Pressure Reducing Valves

ASSE 1003.

2.2.3 Water Meters

AWWA C701 turbine type, with register reading in liters U.S. gallons.

2.2.4 Strainers

Strainers shall have blow off outlet with pipe nipple and gate valve and discharge pipe nipple. Copper alloy or cast-iron body. Provide stainless steel strainer element with perforations of 1.20 mm 0.047 inch.

2.2.5 Pressure Gages

Provide single style pressure gage for water with 113 mm 4.5 inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and

siphon. Provide scale range suitable for the intended service.

2.2.6 Thermometers

Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 125 mm 5 inch diameter dial with glass face gasketed within the case; accuracy within 2 percent of scale range. Provide scale range suitable for the intended service.

2.2.7 Dielectric Connections

Provide at connections between copper and ferrous metal piping materials. ASTM F 441/F 441M, Schedule 80, CPVC threaded pipe nipples, 100 mm 4 inch minimum length, may be provided for dielectric connections in pipe sizes 50 mm 2 inches and smaller.

2.2.8 Water Hammer Arresters

PDI WH 201.

2.2.9 Valve Boxes

For each buried valve provide cast-iron, ductile-iron, or plastic box of a suitable size. Provide cast-iron, ductile-iron, or plastic cover for the box with the word "WATER" cast on the cover. Plastic boxes shall be constructed of ABS plastic or inorganic fiber-reinforced black polyolefin plastic. Coat cast-iron and ductile-iron boxes with bituminous paint.

2.2.10 Backflow Preventers

Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be listed in the current FCCCHR List.

2.3 MISCELLANEOUS PIPING MATERIALS

2.3.1 Flanges

ASME B16.1, Class 125, for use in ferrous piping; ASME B16.22 or ANSI B16.24 for use in copper tubing; with MIL-R-6855 full face flat type synthetic rubber gaskets.

2.3.2 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated or polished stainless steel finish on copper alloy plates in finished spaces. Provide paint finish on metal in unfinished spaces.

2.3.3 Pipe Sleeves

2.3.3.1 Sleeves in Masonry and Concrete Walls, Floors, Roofs

ASTM A 53, Schedule 40 or Standard Weight, hot-dip galvanized steel [, ductile-iron or cast-iron] pipe sleeves.

2.3.3.2 Sleeves in Non-Masonry or -Concrete Walls, Floors, and Roofs

Provide 26 gage hot-dip galvanized steel sheet.

2.3.4 Pipe Sleeves

NOTE: Use the pipe sleeve description below, as appropriate, for LANTNAVFACENGCOM projects; delete when editing for projects in any other area.

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide 25 mm one inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

- a. Sleeves in masonry and concrete walls, floors, and roofs: Provide steel pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.
- b. Sleeves in other than masonry and concrete walls, floors, and roofs: Provide 26 gage galvanized steel sheet.

2.3.5 Pipe Hangers and Supports

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.3.6 Access Doors

Provide 300 by 300 mm 12 by 12 inch factory prefabricated and primed flush face steel access doors including steel door frame with continuous hinges and turn-screw-operated latch. Door frame shall be for installation in plaster and masonry walls. Furnish doors under this section to provide proper access to concealed valves; install doors under the appropriate section of this specification.

2.3.7 Washing Machine Connector Box

Provide recessed wall box fabricated of aluminum, [PVC plastic] stainless steel, or hot-dip galvanized steel. Provide hot-dip galvanized steel with epoxy or baked-on enamel finish. Provide drain nipple and locknut with cover nut for locking drain outlet to box. Provide brass pipe fittings for connecting each supply pipe to valve and locking to box. Provide hot water

and cold water supply valves similar to hose bibbs[, except valve inlet connections shall be of the compression type or union type].

2.4 FIXTURES, FITTINGS, ACCESSORIES, AND SUPPLIES

**NOTE: Use the plumbing fixture descriptions below,
as applicable, for projects which are not in the
LANTNAVFACENGCOM area; delete for LANTNAVFACENGCOM
projects.**

Provide control-stop valves in each supply to each fixture. The finish of fittings, accessories, and supplies exposed to view shall be chromium-plated per ASME A112.18.1M. Centerset faucets shall be top-mounted with inlets on not greater than 100 mm 4 inch centers. [Provide special roughing-in for wheelchair fixtures.]

2.4.1 Flush Valve Type Water Closets (P-[____])

NOTE: Use for public toilets and Marine Corps BEQ.

ASME A112.19.2M, white vitreous china, [floor-mounted], [wall-hung], siphon jet, elongated bowl, black solid plastic elongated open-front seat, and ASME A112.19.5 trim. Provide large diaphragm (not less than 67 mm 2.625 inches upper chamber inside diameter at the point where the diaphragm is sealed between the upper and lower chambers) nonhold-open flush valve of chrome plated cast brass, including vacuum breaker and angle (control-stop) valve with back check, mounted approximately 990 to 1117 mm 39 to 44 inches above floor[, except at water closets intended for use by the physically handicapped where nonhold-open flush valves shall be mounted at approximately 760 mm 30 inches above the floor and arranged to avoid interference with grab bars. In addition, for water closets intended for handicap use, the flush valve handle shall be installed on the wide side of the enclosure]. The water flushing volume of the flush valve and water closet combination shall not exceed 6 liters 1.6 gallons per flush. [Provide ASME A112.6.1M carrier with feet.]

2.4.2 Tank Type Water Closets (P-[____])

**NOTE: Use for private and semiprivate use and for
BEQ other than Marine Corps BEQ where water pressure
is too low for flush valve. Provide open-front seat
without cover only for public use.**

ASME A112.19.2M, close-coupled, white vitreous china, water conservation type, floor-mounted, floor or wall outlet as indicated, siphon jet [or reverse trap], elongated bowl, black solid plastic elongated [closed] [open]-front seat [with cover], and ASME A112.19.5 trim. [Water flushing volume shall not exceed 6 liters 1.6 gallonsper flush.]

2.4.3 Wheelchair Water Closets (P-[____])

Provide same as specified for water closets (P-[____]) except water closet height to top of seat shall be 432 to 483 mm 17 to 19 inches above floor.

2.4.4 Flush Valve Type Urinals (P-[____])

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, extended side shields, and ASME A112.19.5 trim. Provide large diaphragm (not less than 66 mm 2.625 inches upper chamber inside diameter at the point where the diaphragm is sealed between the upper and lower chambers), nonhold-open flush valve of chrome plated cast brass, including vacuum breaker and angle (control-stop) valve with back check. Water flushing volume of the flush valve and urinal combination shall not exceed 3.8 liters one gallon per flush. Provide ASME A112.6.1M concealed [chair carriers.] [wall hangers with thru-bolts and back plates for mounting.]

2.4.5 Wheelchair Flush Valve Type Urinals

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, blowout action, integral trap, elongated projecting bowl, 508 mm 20 inches long from wall to front of flare, and ASME A112.19.5 trim. Provide large diaphragm (not less than 66 mm 2.625 inches upper chamber inside diameter at the point where the diaphragm is sealed between the upper and lower chambers), nonhold-open flush valve of chrome plated cast brass conforming to ASTM B 584, including vacuum breaker and angle (control-stop) valve with back check. The water flushing volume of the flush valve and urinal combination shall not exceed 3.8 liters one gallon per flush. Furnish urinal manufacturer's certification of conformance. Provide ASME A112.6.1M concealed chair carriers. Mount urinal with front rim a maximum of 432 mm 17 inches above floor and flush valve handle a maximum of 1118 mm 44 inches above floor for use by handicapped on wheelchair.

2.4.6 Lavatories (P-[____])

NOTE: Use pop-up drain fittings for private and semiprivate toilets; use self-closing metering centerset faucets and perforated grid strainers for public toilets.

ASME A112.19.1M, white enameled cast-iron, [or ASME A112.19.2M white vitreous china with ASME A112.6.1M concealed arm carrier support,] [straight] [shelf] back type, minimum dimensions of [508 mm wide by 457] [483 mm wide by 406] mm [20 inches wide by 18] [19 inches wide by 16] inches front to rear. Provide ASME A112.18.1M copper alloy [self-closing metering] [centerset faucets] [combination faucets with body mounted from behind the vertical surface of shelf back lavatory] with [aerator,] [gooseneck spout with aerator 125 mm 5 inches above rim,] [pop-up drain fittings] [perforated grid strainers], and 32 mm 1.25 inch adjustable P-traps. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Provide ASME A112.6.1M concealed [chair carriers.] [wall hangers with thru-bolts and back plates for mounting.]

2.4.7 Countertop Lavatories (P-[____])

NOTE: Use pop-up drain fittings for private and semiprivate toilets; use self-closing metering

**centerset faucets and perforated grid strainers for
public toilets.**

ASME A112.19.1M, white enameled cast-iron, minimum [oval] dimensions of [508 mm wide by 457] [483 mm wide by 406] mm [20 inches wide by 18] [19 inches wide by 16] inches front to rear, and [stainless steel mounting rim] [self-rimming] [under counter] type. Provide ASME A112.18.1M copper alloy [self-closing metering] centerset faucets with [aerator,] [goose-neck spout with aerator 125 mm 5 inches above rim,] [pop-up drain fittings] [perforated grid strainers] [with offset tailpiece], and 32 mm 1.25 inch adjustable P-traps. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Furnish template and mounting kit by lavatory manufacturer.

2.4.8 Wheelchair Lavatories (P-[____])

ASME A112.19.1M, white vitreous china, contoured front rim, front concealed overflow, ASME A112.6.1M concealed arm carrier support and chair carrier, minimum dimensions of 508 mm 20 inches wide by 686 mm 27 inches front to rear, 737 mm 29 inch minimum clearance from bottom of front rim to floor, 864 mm 34 inch front rim height above floor. Provide ASME A112.18.1M copper alloy centerset faucets, gooseneck spout with aerator 125 mm 5 inches above rim, 100 mm 4 inch wrist action handles, perforated grid strainers with offset tailpiece, and 32 mm 1.25 inch adjustable P-trap. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Faucets with wrist action handles shall open within one-quarter turn in opposite directions.

2.4.9 Lavatories for Wheelchairs (P-[____])

**NOTE: Use when space will not permit use of
wheelchair lavatories.**

ASME A112.19.1M, white enameled cast-iron [or ASME A112.19.2M white vitreous china with ASME A112.6.1M concealed arm carrier support], straight back type, minimum dimensions of 483 mm 19 inches wide by 406 mm 16 inches front to rear, 737 mm 29 inches minimum clearance from bottom of front rim to floor, 864 mm 34 inches front rim height above floor. Provide ASME A112.18.1M copper alloy centerset faucets, gooseneck spout with aerator 125 mm 5 inches above rim, 100 mm 4 inch wrist action handles, perforated grid strainers with offset tailpiece, and 32 mm 1.25 inch adjustable P-trap. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Faucets with wrist action handles shall open within one-quarter turn in opposite directions. Provide ASME A112.6.1M concealed chair carriers.

2.4.10 Lavatories in Kitchen Toilets (P-[____])

NOTE: Use in toilets for kitchen and serving line

personnel in direct contact with food.

ASME A112.19.1M, white enameled cast-iron [or ASME A112.19.2M white vitreous china with ASME A112.6.1M concealed arm carrier support], straight back type, minimum dimensions of [508 mm wide by 457] [483 wide by 406] mm [20 inches wide by 18] [19 inches wide by 16] inches front to rear. Provide ASME A112.18.1M copper alloy centerset faucets, gooseneck spout with aerator 125 mm 5 inches above rim, perforated grid strainers, and 32 mm 1.25 inch adjustable P-traps. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Provide wall-mounted, self-closing hot and cold water mixing valve, foot operated, controlled from under front of lavatory. Provide ASME A112.6.1M concealed [chair carriers.] [wall hangers with thru-bolts and back plates for mounting.]

2.4.11 Service Sink (P-[____])

ASME A112.19.1M, white enameled cast-iron [or ASME A112.19.2M white vitreous china], wall mounted and floor supported by wall outlet cast-iron P-trap, minimum dimensions of 560 mm 22 inches wide by 457 mm 18 inches front to rear with 230 mm 9 inch splashback, and stainless steel rim guard. Provide ASME A112.18.1M copper alloy back-mounted combination faucets with vacuum breaker and 20 mm 0.75 inch external hose threads.

2.4.12 Countertop [Kitchen] Sinks (P-[____])

ASME A112.19.3M, 20 gage stainless steel with integral mounting rim, minimum dimensions of 840 mm 33 inches wide by 560 mm 22 inches front to rear, two compartments with ledge back and undersides coated with sound dampening material. Provide top-mounted ASME A112.18.1M copper alloy faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers. Flow shall not exceed 9.5 liters per minute at 549 kPa 2.5 gpm at 80 psi flow pressure. [Faucet that limit the period of water discharge shall not exceed one liter per cycle at 549 kPa 0.25 gallon per cycle at 80 psi flow pressure.] Provide 40 mm 1.5 inch adjustable P-trap with drain piping to vertical vent stack. Provide UL 430 waste disposer unit in right compartment.

2.4.13 Electric Water Cooler (P-[____])

ARI 1010, [floor] [wall]-mounted, bubbler style, air-cooled condensing unit, 4.20 mL per second 4.0 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet. [Provide ASME A112.6.1M concealed [chair carriers] [wall hangers with thru-bolts and back plates for mounting on wall hung coolers].]

2.4.14 Wheelchair Electric Water Cooler (P-[____])

ARI 1010, wall-mounted bubbler style with ASME A112.6.1M concealed chair carrier, air-cooled condensing unit, 5 mL per second 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 686 mm 27 inch minimum knee clearance from front bottom of unit to floor and 914 mm 36 inch maximum spout height above floor. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.4.15 Shower Supply Fittings (P-[____])

**NOTE: Use vandalproof type for barracks type
buildings with gang showers.**

ASME A112.18.1M, [vandalproof,] [ball joint,] self-cleaning [adjustable spray pattern] [hand-held] shower heads connected to concealed pipe connected to copper alloy pressure balance single control type mixing valves with front access integral screwdriver stops. Anchor the mixing valves and the pipe to each shower head in wall to prevent movement. Flow shall not exceed 9.5 L/m at 549 kPa 2.5 gpm at 80 psi flow pressure. [Secure vandalproof shower heads to the wall using anchor plates and interrupted-slot head type exposed screws.]

2.4.16 Hand-Held Shower Head

ASSE 1014, [fixed] [adjustable] spray hand-held shower head with swivel fitting, [pushbutton flow control,] 1524 mm 60 inch minimum flexible [chrome plated copper alloy] [polished stainless steel] hose and in-line vacuum breaker [wall bracket to mount hand spray] [[635 mm] [25 inch] [____] grab bar with sliding spray holder that locks at any height] to allow the use of the unit as either a hand-held spray or a fixed shower head. Flow shall not exceed 9.5 L/m at 549 kPa 2.5 gpm at 80 psi flow pressure.

[2.4.17 Shower Floors (P-[____])] [and] [Mop Sink (P-[____])]

Precast terrazzo [Shower Floors (P-[____])] [and] [Mop Sink (P-[____])]: Terrazzo shall be made of marble chips cast in white Portland cement to produce a compressive strength of not less than 25 MPa 3000 psi 7 days after casting. Provide brass body drains with nickel bronze strainers cast integral with terrazzo. [Provide stainless steel rim guard for mop sink.

]2.4.18 Laundry Tubs (P-[____])

ANSI Z124.1, plastic, two compartment, minimum dimensions of 1016 mm wide by 533 mm 40 inches wide by 21 inches front to rear, with floor-supported steel mounting frame secured to wall. Provide ASME A112.18.1M copper alloy centerset faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers, and 40 mm 1.5 inch adjustable P-trap with drain piping to vertical vent stack.

2.4.19 Bathtubs (P-[____])

**NOTE: Use plastic bathtubs and shower stall units
and formed steel bathtubs for temporary buildings
and for other types of buildings as approved by the
Engineering Field Division, Naval Facilities
Engineering Command, Mechanical Design Branch.**

[ASME A112.19.1M, white enameled cast-iron bathtub] [or ASME A112.19.4M, white porcelain enameled formed steel with structural composite reinforced conforming to ANSI Z124.1 ignition test requirements] [ASME A112.19.4M white porcelain enameled formed steel bathtub with undersides coated with sound dampening material] [ANSI Z124.1 white plastic bathtub with three

walls integrally molded in one piece or made in sections for field assembly], recessed type, with slip-resistant bathing surfaces, minimum dimensions of 1524 mm wide by 762 mm 60 inches wide by 30 inches front to rear by [355 mm14 inches high] [406 mm16 inches high for above-floor drain installation]. Provide pop-up drain fittings and 40 mm 1.5 inch adjustable P-trap. Outlet shall be [left hand] [right hand] [as indicated]. Provide copper alloy pressure balance single control type mixing valves with front accessible integral screwdriver stops. Bathtub and shower supply fittings shall be [transfer or diverter type] with body mounted from behind the wall. Provide ASME A112.18.1M, ball joint, self-cleaning [adjustable spray pattern] shower heads with flow control devices and tub fill overrim spout [with] [without] diverter. Flow shall not exceed 9.5 L/m at 549 kPa 2.5 gpm at 80 psi flow pressure. Anchor the pipe, shower arm, and mixing valves in the wall to prevent movement.

2.4.20 Plastic Shower Stall Units (P-[____])

NOTE: Use plastic bathtubs and shower stall units and formed steel bathtubs for temporary buildings and for other types of buildings as approved by the Engineering Field Division, Naval Facilities Engineering Command, Mechanical Design Branch.

ANSI Z124.2, white plastic receptor with slip-resistant bathing surfaces and three walls integrally molded in one piece or made in sections for field assembly. Provide brass body shower drains with nickel bronze perforated grid strainers and 50 mm 2 inch adjustable P-trap. Provide shower supply fittings as specified herein.

2.4.21 Emergency Shower (P-[____])

NOTE: Where required by local or other authorities, or where necessary, provide a pressure-compensated tempered water supply, with temperature held between 15.5 and 35 degrees C 60 and 95 degrees F, for all ES/EWS connected to the potable water system, including those installed outdoors. Ensure the water heater system is sized to include the full flow of at least one ES/EWS for not less than 15 minutes. Water too cold may cause the victim to leave the shower too soon, thereby increasing the risk of injury. Water too warm may scald the victim, who needs to stay in the shower, and any chemical reactions present will increase in rate with increasing temperature.

NOTE: Where freezing conditions are anticipated, add the following to the appropriate specification sections: "Provide thermostat-controlled self-limiting heat tape and PVC-covered elastomeric cellular pre-formed pipe insulation for freeze protection, where indicated. Freeze protection is required for water supply and waste drain piping, in addition to the Emergency Shower and Eye and Face

**Wash assembly." "Provide a dedicated ground fault
protected electrical circuit for the heat tape."**

ANSI Z358.1, wall-mounted self-cleaning, nonclogging 250 mm 10 inch diameter [copper alloy] [stainless steel] deluge shower head with elbow, 25 mm one inch full-flow stay-open ball valve with pull rod and 200 mm 8 inch diameter ring or triangular handle, 25 mm one inch interconnecting fittings, with shower head 2 meters 7 feet above floor and 610 mm 2 feet from wall. Shower shall deliver a minimum of 2 L/s 30 gpm of water at an inlet supply of 207 kPa 30 psi. [Provide privacy curtain and rail, for indoor use.] [Provide packaged, UL listed, alarm system; including an amber strobe lamp, horn with externally adjustable loudness and horn silencing switch, mounting hardware, and waterflow switch, assembled and prewired for waterproof service within NEMA Type 3 or 4 enclosures [and for explosion proof service within NEMA Type 7 or 9 enclosures].] [Provide a pressure-compensated tempering valve, with leaving water temperature setpoint adjustable throughout the range 15.5 to 35 degrees C 60 to 95 degrees F]. [Provide privacy curtain and rail, for indoor use.] [Provide an privacy enclosure for outdoor use; with roof, if a floor drain is provided.]

2.4.22 Emergency Eye and Face Wash (P-[____])

ANSI Z358.1, wall-mounted self-cleaning, nonclogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor. Unit shall deliver 0.19 L/s 3 gpm of aerated water at 207 kPa (gage) 30 psig flow pressure, with eye and face wash nozzles 838 to 1143 mm 33 to 45 inches above finished floor. 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, per IPC Table 608.15.1. [Provide packaged, UL listed, alarm system; including an amber strobe lamp, horn with externally adjustable loudness and horn silencing switch, mounting hardware, and waterflow switch, assembled and prewired for waterproof service within NEMA Type 3 or 4 enclosures [and for explosion proof service within NEMA Type 7 or 9 enclosures].] [Provide a pressure-compensated tempering valve, with leaving water temperature setpoint adjustable throughout the range 15.5 to 35 degrees C 60 to 95 degrees F.]

2.4.23 Combination Emergency Shower and Eyewash (P-[____])

ANSI Z358.1, column mounted on a floor flange. Design combination unit so components can be operated individually from a common fixture supply line. Provide a self-cleaning, non-clogging 250 mm 10 inch diameter [copper alloy] [stainless steel] deluge shower head with elbow, full flow stay-open ball valve with pull rod and 200 mm 8 inch diameter ring or triangular handle 25 mm one inch interconnecting fittings, with shower head 2 meters 7 feet above floor and 610 mm 2 feet from wall. Shower shall deliver a minimum of 2 L/s 30 gpm of water at an inlet supply of 207 kPa 30 psi. Provide a self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor. Unit shall deliver 0.19 L/s 3 gpm of aerated water at 207 kPa (gage) 30 psig flow pressure, with eye and face wash nozzles 838 to 1143 mm 33 to 45 inches above finished floor. 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, per IPC Table 608.15.1. [Provide packaged, UL listed, alarm system; including an amber strobe lamp, horn with externally adjustable

loudness and horn silencing switch, mounting hardware, and waterflow switch, assembled and prewired for waterproof service within NEMA Type 3 or 4 enclosures [and for explosion proof service within NEMA Type 7 or 9 enclosures].] [Provide a pressure-compensated tempering valve, with leaving water temperature setpoint adjustable throughout the range 15.5 and 35 degrees C 60 to 95 degrees F.] [Provide privacy curtain and rail, for indoor use.] [Provide privacy curtain and rail, for indoor use.] [Provide an privacy enclosure for outdoor use; with roof, if a floor drain is provided.]

2.5 PLUMBING FIXTURES

**NOTE: The following conforms to FED-STD-795,
"Uniform Federal Accessibility Standards." Use the
plumbing fixture descriptions below, as applicable,
for LANTNAVFACENGCOM projects; delete when editing
for projects in any other area.**

Provide the following types of plumbing fixtures as indicated. Provide plumbing fixture faucets, fittings, trim, accessories, and supplies as specified in paragraph entitled "Plumbing Fixture Faucets, Trim, and Fittings."

2.5.1 Flush Valve Plumbing Fixtures

- a. Flush Valves: [Provide large (not less than 67 mm 2.625 inches in diameter minimum upper chamber inside diameter where the diaphragm is sealed between the upper and lower chambers) diaphragm flush valves for domestic water service.] [Provide piston type, oil operated, flush valve and wall support for saltwater service.] Provide vacuum breakers and angle control-stop valves for each flush valve. Exposed to view and pressure containing components of flush valves, vacuum breaker, angle control-stop valve, tail pieces, slip nuts, escutcheon plates, and wall plates shall be chromium-plated copper alloy or polished stainless steel. Mount flush valves not less than 280 mm 11 inches above the fixture. Water flushing volume of the flush valve shall be factory set as required by the fixture.
- b. Flush Valve Urinals: ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Water flushing volume of the flush valve and urinal combinations shall not exceed 3.8 liters one gallon per flush. Provide ASME A112.6.1M concealed chair carriers. Mount urinal with the rim approximately 432 mm 17 inches above the floor.

**NOTE: Use for public toilets and Marine Corps
Bachelor Enlisted Quarters (BEQ).**

- c. Flush Valve Water Closets: ASME A112.19.2M, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor or wall outlet as indicated. Water flushing volume of the flush valve and water closet combination shall not exceed [6.0 liters1.6 gallons per flush for floor outlet water closet; flush valve shall be factory set at 6.0 liters 1.6 gallons per flush.] [23 liters6 gallons per

flush for wall outlet water closet; flush valves shall be factory set at 23 liters 6 gallons per flush.] Water closet rim height above floor shall be approximately 381 mm 15 inches, except wheelchair water closet rim height above floor shall be 432 to 483 mm 17 to 19 inches. Provide [black] [white] solid plastic elongated open-front seat [with cover].

2.5.2 Flush Tank Water Closets

NOTE: Use for private toilets and for BEQ other than Marine Corps BEQ.

ASME A112.19.2M, white vitreous china, siphon jet, round bowl, floor-mounted, floor or wall outlet as indicated. Nonfloat swing type flush tank valves are not acceptable. The water flushing volume shall not exceed 15 liters 4 gallons per flush for floor outlet water closet and 20 liters 5 gallons per flush for wall outlet water closet. Water closet rim height above floor shall be approximately 381 mm 15 inches, except wheelchair water closet rim height above floor shall be 432 to 483 mm 17 to 19 inches. Provide [black] [white] solid plastic round close-front seat with cover.

2.5.3 Wall Hung Lavatory

ASME A112.19.2M, white vitreous china, straight back type, minimum dimensions of 483 mm wide by 432 mm 19 inches wide by 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide ASME A112.6.1M concealed chair carriers with concealed arms for the lavatory. Mount lavatory with the front rim 864 mm 34 inches above floor and with 737 mm 29 inches minimum clearance from bottom of the front rim to floor.

2.5.4 Countertop Lavatories

[ASME A112.19.2M, white vitreous china, self-rimming,] [ASME A112.19.3M, stainless steel with integral mounting rim for flush installation, with undersides fully sound deadened], minimum dimensions of 483 mm wide by 406 mm 19 inches wide by 16 inches front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Mount counter with the top surface 864 mm 34 inches above floor and with 737 mm 29 inches minimum clearance from bottom of the counter face to floor.

2.5.5 Countertop [Laundry] Sinks

ASME A112.19.3M, stainless steel with integral mounting rim for flush installation, minimum dimensions of [533] [838] mm wide by 533 mm [21] [33] inches wide by 21 inches front to rear, [one] [two] compartment[s], with undersides fully sound deadened, with three supply openings for use with top mounted sink faucets, and with 90 mm 3.5 inch drain outlet. Provide stainless steel drain outlets and stainless cup strainers. [Provide UL 430 waste disposer in right compartment.]

2.5.6 Service Sinks

ASME A112.19.2M, white vitreous china with integral back and wall hanger supports, minimum dimensions of 559 mm wide by 508 mm 22 inches wide by 20

inches front to rear, with two supply openings in 250 mm 10 inch high back.
Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer.

2.5.7 Precast Terrazzo [Shower Floors] [Mop Sinks]

Terrazzo shall be made of marble chips cast in white portland cement to produce a compressive strength of not less than 25 MPa 3000 psi 7 days after casting. Provide floor or wall outlet copper alloy body drains as indicated, cast integral with terrazzo, with nickel bronze, chromium-plated copper alloy, or polished stainless steel strainers.

2.5.8 Electric Water Coolers

ARI 1010 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, 5 mL per second 4.75 gph minimum capacity, stainless steel splash receptor and basin, and stainless steel cabinet. Bubblers shall be controlled by push levers or push bars, front mounted or side mounted near the front edge of the cabinet. Bubbler spouts shall be mounted at maximum of 914 mm 36 inches above floor and at front of unit basin. Spouts shall direct water flow at least 102 mm 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide ASME A112.6.1M concealed chair carriers.

2.5.9 Bathtubs

ASME A112.19.1M, white enameled cast iron, recessed type, minimum dimensions of 1524 mm wide by 762 mm 60 inches wide by 30 inches front to rear by 406 mm 16 inches high with drain outlet for above-the-floor drain installation. Provide left or right drain outlet bathtub as indicated.

2.5.10 Emergency [Eyewash] [and] [Shower] Equipment

ANSI Z358.1, floor supported free standing unit. [Provide deluge shower head, stay-open ball valve operated by pull rod and ring or triangular handle.] [Provide eyewash and stay-open ball valve operated by foot treadle or push handle.]

[2.6 PLUMBING FIXTURE FAUCETS, TRIM, AND FITTINGS

NOTE: The following conforms to FED-STD-795
"Uniform Federal Accessibility Standards" April
1988. Use the plumbing fixture faucet descriptions
below, as applicable, for LANTNAVFACENGCOM projects;
delete for projects in other areas.

ASME A112.18.1M for plumbing fixture faucets. The finish of plumbing fixture faucets, trim, valves, and fittings exposed to view shall be chromium-plated or polished stainless steel except as modified herein. Handles may be clear plastic. Bolts, nuts, and screws shall be copper alloy or stainless steel. Provide globe valves or angle valves, and union connections in each supply to each faucet; chromium-plated finish is not required. Faucets shall be washerless type and shall have threaded type end connections, coupling nuts, or union connections. Faucets may be of the single control type. Provide washers and locknuts to secure faucets to lavatories and sinks.

- a. Traps: Provide P-traps for each plumbing fixture which does not have integral traps. Provide 40 mm 1.5 inch white PVC adjustable P-traps and tubing with slip nuts and gaskets; chromium-plated finish is not required.
- b. Lavatory Faucets: Provide washerless faucets including aerators, drain outlets, and drain tail pieces for each lavatory. Provide perforated grid strainers for each lavatory[, except provide pop-up drains and push-pull knob above centerset faucets for each lavatory in bedrooms or in bathrooms adjacent to bedrooms]. Faucet handles shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist; maximum force required to operate faucet handles shall be 22 Newton 5 pounds of force. Faucets for indicated wheelchair lavatories shall have gooseneck spout with aerator 127 mm 5 inches above rim and shall have handles which open within one-quarter turn in opposite directions.
- c. Sink Faucets: Provide washerless faucets including swing spouts with aerators. Provide top mounted faucets for countertop sinks.
- d. Shower Faucets: Provide single control pressure equalizing shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide tubing mounted from behind the wall between shower faucets and shower heads. Provide front access integral screwdriver globe valves or separate globe valves or angle valves with union connections in each supply to faucet.
- e. Bathtub and Shower Faucets and Drain Fittings: Provide single control pressure equalizing bathtub and shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub spouts. Provide front access integral screwdriver globe valves or separate globe valves or angle valves with union connections in each supply to faucet. Provide trip-lever pop-up drain fittings for above-the-floor drain installations. The top of drain pop-ups, drain outlets, tub overflow outlet, and; control handle for pop-up drain shall be chromium-plated or polished stainless steel. Linkage between drain pop-up and pop-up control handle at bathtub overflow outlet shall be copper alloy or stainless steel. Provide 40 mm 1.5 inch copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required.
- f. [Service Sink] [and] [Mop Sink] Faucets: Provide copper alloy back or wall mounted faucets with vacuum breaker and 20 mm 0.75 inch external hose threads.

] [2.7 DOMESTIC WATER HEATERS

NOTE: Select the applicable paragraph(s) for water heaters from the following:

2.7.1 Storage Tanks

AWWA D100, cement- or glass-lined vertical steel tanks, minimum of 862 kPa (gage) 125 psig working pressure.

2.7.2 Water Heaters

NOTE: Choose one of the following options:

[FS WW-H-191, U-tube, two pass, with steam in the shell, designed to raise the temperature of a continuous flow of water from 4 to 82 degrees C 40 to 180 degrees F.]

[Provide double wall copper tube domestic water heating elements constructed with air gap to atmosphere between the two walls using steam as the heating medium exterior of the heating elements. Provide posted operating instructions for water heaters.]

2.7.3 Water Temperature Regulating Valves

Copper alloy or cast-iron with adjustable range thermostat to allow hot water settings between 43 and 82 [71] degrees C 110 and 180 [160] degrees F.

] [2.8 DOMESTIC WATER HEATERS ([ELECTRIC] [GAS] [OIL-FIRED])

[UL 174, electric water heaters with [single] [double] heating element,] [ANSI Z21.10.1, gas-fired water heaters,] [UL 732 oil-fired water heaters] glass-lined steel tanks, high efficiency type [insulated with polyurethane foam insulation, replaceable anodes,] with adjustable range thermostat to allow hot water settings between 43 and 82 [71] degrees C 110 and 180 [160] degrees F. Provide posted operating instructions for water heaters.

2.8.1 Gas Vents

NFPA 211, Type B, of the prefabricated multi-wall UL listed type.

2.8.2 Gas Piping System

NFPA 54. Provide threaded fittings and end connections.

2.8.2.1 Steel Pipe

ASTM A 53. Schedule 40, hot-dip galvanized.

2.8.2.2 Threaded Fittings

ASME B16.3, Class 150, hot-dip galvanized.

2.8.2.3 Gas Valves

Provide cast-iron or bronze body valves, with bronze plug or ball and two position lever handles. Valves shall be suitable for 862 kPa (gage) 125 psig working pressure. UL listed ball valves may be provided in lieu of plug valves.

]2.9 [ELECTRIC] [GAS] [OIL-FIRED] WATER HEATERS, COMMERCIAL TYPE

NOTE: Fuel oil systems are covered under Section
15192, "Fuel Oil Piping."

NOTE: Use for water heaters with over 58.6 kW
200,000 Btu per hour heat input or over 455 liters
120 gallons storage.

ASME BPVC SEC IV and [UL 1453 for electric heaters] [ANSI Z21.10.3 for gas heaters] [UL 732 for oil-fired heater requirements not covered by the boiler code] with heat input, recovery, and storage capacity as indicated. Tank shall be rated for a working pressure of 1034 kPa 150 psi, ASME stamped, and [nickel and] glass lined or cement lined. Provide thermometer in thermometer well. Insulate water heater with fiberglass insulation and trim with baked enamel finished steel sheet jacket. Standby heat loss shall conform to ASHRAE 90.1 high efficiency requirements. Water temperature shall be adjustable between 43 and 82 degrees C 110 and 180 degrees F. Provide ASME temperature and pressure relief valve. Water heater shall bear UL Label Service Listing and National Board of Boiler and Pressure Vessel Inspection (NBBPVI) registration and stamp.

2.10 PUMPS

Select the pump so that the operating point on the characteristic performance curve for the impeller size to be furnished will be to the left (shut-off side) of and not more than 5 percent below the point of maximum efficiency for the impeller to be furnished. Provide lifting attachments on pumps larger than 1.50 kW 2 horsepower. Provide posted operating instructions for pumps.

2.10.1 Inline Water Pumps

FS A-A-50560, standard head capacity, service water distribution system. [Provide factory assembled and tested pumps constructed of materials suitable for hot domestic water service.]

2.10.2 Base-Mounted Water Pumps

FS A-A-50562, general service, mechanical seals and drip-proof electric motors.

2.10.3 Submersible Sump Pumps

Provide factory assembled and tested submersible type pumps for operation under water. Pump shall be complete with cast-iron casing, bronze impeller, stainless steel shaft, sealed heavy-duty ball bearings, water-cooled hermetically-sealed motor, built-in automatic reset thermal protection, float switches, and waterproof three-conductor cables and grounding plugs. Provide high water alarm [and check valve].

2.10.4 Sewage Pumps

FS A-A-50555, [single type] [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].

PART 3 EXECUTION

3.1 INSTALLATION

Installation of plumbing systems including fixtures, backflow preventers, equipment, materials, and workmanship shall be in accordance with the Plumbing Code, except as modified herein. When fixtures require both hot water and cold water supplies, provide the hot water supply to the left of the cold water supply. Plastic piping shall not penetrate fire walls or fire floors and shall be used on one side of fire walls and fire floors not closer than 152 mm 6 inches to the penetration. [Plastic DWV piping shall not be permitted in more than two-story buildings. Cast-iron DWV piping only shall be provided in more than two-story buildings.]

3.1.1 Threaded Connections

Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread paste, pipe cement and oil, or PTFE powder and oil; apply only on male threads. Provide exposed ferrous pipe threads with one coat of primer applied to a minimum dry film thickness of 0.025 mm 1.0 mil. [Do not thread metal pipe into plastic piping.]

3.1.2 Solder End Valves

Remove stems and washers and other item subject to damage by heat during installation. Reassemble valve after soldering is completed. Valves without heat sensitive parts do not require disassembly but shall be opened at least two turns during soldering.

3.1.3 Pipe Supports (Hangers)

Provide additional supports at the concentrated loads in piping between supports, such as for inline water pumps and flanged valves. Maximum of 1.50 meters 5 foot apart at valves and pumps.

3.1.3.1 Piping to Receive Insulation

Provide temporary wood spacers between the insulation protection shield and the pipe in order to properly slope the piping and to establish final elevations. Temporary wood spacers shall be of the same thickness as the insulation to be provided under Section 15080N MECHANICAL INSULATION.

3.1.3.2 Maximum Spacing Between Supports

- a. Vertical Piping: Support metal piping at each floor, but at not more than 3 meters 10 foot intervals[, with pipe riser clamps or offset pipe clamps.] [Support plastic and glass piping at each floor and at midpoint between floors, but at not more than 1.50 meters 5 foot intervals.]
- b. Horizontal Piping: Support cast-iron piping at 1.50 meters 5 foot intervals, except for pipe exceeding 1.50 meters 5 foot length, provide supports at intervals equal to the pipe length but not exceeding 3 meters 10 feet. Locate supports within 300 mm one foot of joints at each change of direction and with 450 mm 18 inches of joints for straight runs. [Support plastic and glass piping at

1.22 meters [1.50 meters] 4 foot [5 foot] intervals and support plastic piping at each change of direction.] Support steel piping and copper tubing as follows:

MAXIMUM SPACING (METERS)

Nominal Pipe Size (mm)	25 and under	32	40	50	65	80	90	100	125	150
Steel Pipe	2	2.5	2.75	3	3.25	3.62	4	4.25	4.75	5
Copper Tube	1.75	2	2.50	2.50	2.75	3	3.25	3.62	4	4.25

MAXIMUM SPACING (FEET)

Nominal Pipe Size (inches)	One and under	1.25	1.5	2	2.5	3	3.5	4	5	6
Steel Pipe	7	8	9	10	11	12	13	14	16	17
Copper Tube	6	7	8	8	9	10	11	12	13	14

3.1.4 Ductile Iron Pipe Aboveground

Provide flanged joints.

3.1.5 Encased Buried Piping

NOTE: Use polyethylene tube or sheet when electrical resistivity of soil is less than 2000 ohms-cm.

Completely encase buried copper water piping and cast iron DWV and water piping with polyethylene tube or sheet in accordance with AWWA C105.

3.1.6 Installation of Pipe Sleeves

Provide pipe sleeves where piping passes through walls, floors, roofs, and partitions. Secure sleeves in proper position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors, roofs, and partitions. Provide not less than 6 mm [25 mm] 0.25 inch [one inch] space between exterior of piping or pipe insulation and interior of sleeve [or core-drilled hole]. Firmly pack space with [mineral wool] insulation. Seal at both ends of the sleeve [or core-drilled hole] with plastic waterproof cement which will dry to a firm but pliable mass, or provide a [mechanically adjustable] segmented elastomeric seal. Seal both ends of penetrations through fire walls and fire floors to maintain fire resistive integrity with UL listed fill, void, or cavity material. Extend sleeves in floor slabs 80 mm 3 inches above the finished floor, except sleeves are not required where DWV piping passes through concrete floor slabs located on grade.

3.1.7 Copper Tube Extracted Joint

An extracted mechanical tee joint may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to ensure a free flow joint. Braze extracted joints using a copper phosphorus classification brazing filler metal. Soldered joints shall not be permitted.

3.2 NAMEPLATES

Provide laminated plastic nameplates for equipment, gages, thermometers, and valves; stop valves in supplies to fixtures will not require nameplates. Laminated plastic shall be 3 mm 0.125 inch thick melamine plastic, black with white center core. Surface shall be a matte finish. Corners shall be square. Accurately align lettering and engrave into the white core. Minimum size of nameplates shall be 25 by 65 mm 1.0 by 2.5 inches. Lettering shall be minimum of 6 mm 0.25 inch high normal block lettering. 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. Each inscription shall identify its function. Equipment nameplates shall show the following information:

- a. Manufacturer, type, and model number
- b. Contract number and accepted date
- c. Capacity or size
- d. System in which installed
- e. System which it controls

3.3 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to the branch. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service. Notify the Contracting Officer in writing at least [_____] [15] days prior to the date the connections are required; receive approval before any service is interrupted. Provide materials required to make connections into the existing water supply systems and perform excavating, backfilling, and other incidental labor as required. [Furnish] [Government will furnish only] the labor and the tapping or drilling machine for making the actual connections to the existing systems.

3.4 FIELD QUALITY CONTROL

3.4.1 Inspections

Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's submittals.

3.4.2 Field Testing

Before final acceptance of the work, test each system as in service to demonstrate compliance with the contract requirements. Perform the following tests in addition to the tests specified in the Plumbing Code, except as modified herein. Correct defects in the work provided by the Contractor, and repeat tests until work is in compliance with contract requirements. Furnish water, electricity, instruments, connecting devices, and personnel for performing tests.

3.4.2.1 Domestic Water Piping

Before applying insulation, hydrostatically test each piping system at not less than [690 kPa (gage)] [827 kPa (gage)] [100 psig] [120 psig] [system working pressure] with no leakage or reduction in gage pressure for 2 hours.

3.4.2.2 DWV Piping

Before the installation of fixtures, cap ends of each system, fill piping with water to the roof, and allow to stand until a thorough inspection has been made. If the system is tested in sections, each opening shall be plugged and each section tested with not less than a 30 kPa 10 foot head of water. After plumbing fixtures have been set and their traps filled with water, subject the entire sanitary system to a final air pressure test of not more than 249 Pa 1.0 inch of water column [and a smoke or peppermint test]. Perform the air and smoke test with an approved smoke testing machine which shall show a clear passage of smoke and air throughout the entire system. The entire system shall be proven absolutely tight under such test.

3.4.2.3 Backflow Preventers Test Report

Backflow preventers shall be tested by a locally approved and certified backflow assembly tester. A copy of the test report shall be provided to the Contracting Officer prior to placing the domestic water system into operation, or no later than 5 days after the test.

NOTE: For Iceland projects, include the following option.

[3.5 OPTIONAL DISINFECTION METHOD

Disinfect new potable water lines and affected portions of existing potable water lines with geothermal water. Geothermal water shall be not less than 90 degrees C 194 degrees F and contact time shall be not less than 30 minutes. After disinfection, thoroughly flush new potable water lines and affected portions of existing potable water lines with the chlorinated base water supply for a minimum of two hours.

]3.6 DISINFECTION

Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 milligram per kilogram (m/g) parts per million (ppm) of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5

m/g ppm, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplied by nonportable water is not required.

3.7 SCHEDULE

Some metric measurements in this section are based on mathematical conversion of inch-pound measurement, and not on metric measurement commonly agreed to by the manufacturers or other parties. The inch-pound and metric measurements shown are as follows:

<u>Products</u>	<u>Inch-Pound</u>	<u>Metric</u>
Water Closet	1.6 gallons/flush	6 liters/flush
Urinal	1.0 gallons/flush	3.8 liters/flush
Lavatory	20 in. wide x 18 in.	508 mm x 457 mm
Service Sink	22 x 18 in.	560 x 457 mm
Water Cooler	4.0 gal/hr	4.20 mL/sec
Shower Heads	3 gpm	0.19 L/s
Bathtubs	60 x 30 x 14 in. high	1524 x 762 x 355 mm
Deluge Shower Heads	10 in. diameter	250 mm diameter

-- End of Section --