

SECTION D2000

PLUMBING SYSTEM  
07/02

1. D2000 GENERAL

1.1 SYSTEM DESCRIPTION

- a. Plumbing system shall include:

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- b. [Plumbing systems shall include piping outside of the building walls up to connections to existing exterior distribution systems.]

1.2 SYSTEM REQUIREMENTS

- a. [Provide reduced pressure backflow preventer on main building water supply.]
- b. [Provide a water service meter located outside of the building.]
- c. [Provide a domestic hot water recirculating pump and piping to maintain hot water supply temperature at all fixtures.]

1.3 CRITERIA

Plumbing system design and installation shall comply with SWDIV SECTION SECTION D2000TG "TECHNICAL GUIDANCE FOR PLUMBING SYSTEM. Adhere to the technical guide preference where applicable and as modified by this document.

SWDIV TECHNICAL GUIDANCE can be found on Southwest Division Internet at

<http://www.efds.w.navy.mil/CapitalImprovements/swdaeg00.pdf>

1.4 COMPLIANCE VERIFICATION

Compliance with the requirements will be determined by a review of the design and construction submittals and by field inspection. See Document 00911, "Project Kickoff And Design Completion", for submittal requirements. See Section 01330, "Submittal Procedures", for Submittal Descriptions (SD-xx) and requirements.

1.5 DESIGN SUBMITTALS

1.5.1 Design Analyses and Drawings

SD-02 Design Drawings

Mechanical room layouts

Plumbing plans of floors and roof showing equipment, piping layout and roof penetrations

Riser diagrams for hot and cold water and DWV piping

Fixture and equipment schedules

Equipment connection diagrams/details

[Riser diagrams for compressed air/breathing air piping]

#### SD-05 Design Data

Domestic hot water demand calculations

Water supply system calculations

Drain, waste, and vent system calculations

Natural gas system calculations

[Compressed air/breathing air supply system calculations]

#### 1.5.2 Specifications

Submit manufacturer's data sheets per Document 00911, "Project Kickoff And Design Completion" for all items of the Plumbing System if available. If manufacturer's data is unavailable, submit prescriptive construction specifications per Document 00911 to specify the quality, characteristics, performance factors, efficiency, installation procedures, and testing and certification requirements.

### 1.6 CONSTRUCTION SUBMITTALS

#### SD-03 Product Data

Water closets

Urinals

Lavatories

Sinks

Shower

Emergency shower

Emergency eyewash

Electric Water coolers

Faucets, shower heads, mixing valves, thermostatic control

Domestic water pipe and fittings

Water valves, hydrant and hose bibbs

Water hammer arrestor  
Pressure gage and thermometer  
Backflow preventer  
Water meter  
Water heaters  
Pumps, include certified pump test curves  
Pipe insulation  
Drain, waste and vent pipe and fittings  
Floor drains  
Roof drainage pipe and fittings  
Roof drains  
Natural gas pipe and fittings  
Natural gas valves  
Natural gas meter  
Warning and identification tape  
[Air compressors  
Air receiver  
Station outlets and terminal units  
Refrigerated air dryers  
Quick disconnect couplings  
Filter/moisture separators  
Regulators  
Air purifiers  
Carbon monoxide monitors ]

#### SD-06 Test Reports

Backflow preventers test  
[Final purging and testing of breathing air system  
System contaminant level tests of breathing air system]

SD-07 Certificates

Welders qualifications

PE Welders qualifications

Welders identification symbol

SD-08 Manufacturer's Instructions

PE pipe and fittings

[Air compressors

Refrigerated air dryers

Quick disconnect couplings

Filter/moisture separators

Regulators]

SD-10 Operation and Maintenance Data

Water heater

Pumps

Electric water cooler

[Air compressor

Refrigerated air dryer]

SD-11 Closeout Submittals

Posted operating instructions

1.7 CORROSION PROTECTION FOR BURIED PIPE AND FITTINGS

- a. Cast iron and ductile iron pressure pipe shall have protective coating, a cathodic protection system, and joint bonding.
- b. Steel pipe shall have protective coating and a cathodic protection system.
- c. Cathodic protection system shall be designed by a NACE Certified Cathodic Protection Engineer.

1.8 PLUMBING SYSTEMS TESTING

Upon completion of the installation test all systems. Purge and disinfect potable water piping prior utilization. [Provide a letter (signed by a registered Mechanical Engineer) certifying that plumbing system functions properly and complies with the IPC].

## 2. D2010 PLUMBING FIXTURES

### 2.2 D2011 WATER CLOSETS

#### 2.2.1 Flush Valve Type Water Closets

[floor-mounted] [wall-mounted]. Provide [white] [black] solid plastic open-front seat [with] [without] cover. Provide [electronic sensor][manually] operated flushing device.

#### 2.2.2 Tank Type Water Closets

Provide tank type water closets in all modules. [siphon jet] [or reverse trap]. Provide white solid plastic-front seat with cover. [Toilet tank shall have pressure assisted flushing.]

#### 2.2.3 Handicapped [Flush Valve Type][Tank Type] Water Closets

[floor-mounted] [wall-mounted]. Provide [white] [black] solid plastic open-front seat [with] [without] cover Provide [[electronic sensor][manually] operated flushing device.] [toilet tank with pressure assisted flushing.] Conform to the handicapped mounting height requirements of the seat and flush valve.

### 2.3 D2012 URINALS

#### 2.3.1 Flush Valve Type Urinals

Provide [sensor][manually] operated flushing device.

#### 2.3.2 Handicapped Flush Valve Type Urinals

Provide [electronic sensor][manually] operated flushing device.

### 2.4 D2013 LAVATORIES

#### 2.4.1 Countertop Lavatories

[White enameled cast iron] [White vitreous china], [self-rimming type] [under counter type]. Minimum dimensions shall be [508 mm ( 20 inches ) wide x 457 mm ( 18 inches )] [483 mm wide by 496 mm (19 inches wide by 16 inches)] front to rear. Provide [self-closing metering] copper alloy centerset faucets with [aerator] [goose-neck spout with aerator] and [pop-up drain fittings] [perforated grid strainers].

#### 2.4.2 Handicapped Lavatories

[White enameled cast iron] [White vitreous china with concealed arm carrier support]. Minimum dimensions of [483 mm wide by 496 mm (19 inches wide by 16 inches)] front to rear.

### 2.5 D2014 SINKS

#### 2.5.1 Countertop Kitchen Sinks (Single Compartment

Minimum dimensions of [381 mm (15 inches) wide by 381 mm (15 inches)] front to rear. [Provide UL 430 waste disposer unit in right compartment.]

### 2.5.2 Countertop Kitchen Sinks (Double Compartment)

Minimum dimensions of [840 mm (33 inches) wide by 560 mm (22 inches)] front to rear. [Provide UL 430 waste disposer unit in right compartment.]

### 2.5.3 Mop Sinks

Minimum dimensions [914 mm x 914 mm x 305 mm (36 inches x 36 inches x 12 inches)]. [Provide mop hanger on wall above sink suitable for four mops.]

## 2.6 D2015 BATHTUBS

### 2.6.1 Bathtubs

[White enameled cast-iron] [white porcelain enameled formed steel bathtub with undersides coated with sound dampening material] bathtubs, minimum dimensions of [1424 mm wide by 762 mm front to rear by 406 mm high (56 inches wide by 30 inches front to rear by 16 inches high)].

### 2.6.2 Bath and Shower Modules

[Fiberglass (FRP)] [One piece] [made in sections for field assembly].

## 2.7 D2017 SHOWERS

### 2.7.1 Shower Supply Fittings

[Vandalproof] [ball joint], [adjustable spray pattern] shower heads.

### 2.7.2 Handheld Shower Head

[Fixed] [adjustable] spray, [pushbutton flow control], [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]

### 2.7.3 [Emergency Eyewash (EW)] [Emergency Eyewash and Shower (EWS)]

- a. [Copper alloy] [Stainless steel] [Provide a floor drain at each emergency eyewash/shower station.] [Provide a pressure-compensated tempered water supply with temperature held between 60°F and 95°F (15.6°C and 35°C). Size water heater system to include full flow supply of tempered water of at least one EW/EWS for not less than 15 minutes.]
- b. [Provide a waterflow-initiated alarm for each ES/EWS.] [Include central reporting of the alarm to a continuously manned location.]

## 2.7 D2018 DRINKING FOUNTAINS AND COOLERS

### 2.8.1 Wheelchair Electric Water Cooler

[One level] [Bi-level].

## 3. D2020 DOMESTIC WATER DISTRIBUTION

### 3.1 D2021 COLD WATER SERVICE

3.1.1 Copper tubing and fittings use for pipe sizes 100 mm (4 inches) or smaller.

3.1.2 [Chlorinated Polyvinyl Chloride (CPVC) plastic pipe, fittings, and solvent cement use for sizes 100 mm (4 inches) and smaller.]

3.1.3 Ductile-iron piping use for piping larger than 100 mm (4 inches).

3.1.4 Valves, hydrant and hose bibbs.

3.1.4.1 Gate Valves

3.1.4.2 Globe and Angle Valves

3.1.4.3 Check Valves

3.1.4.4 Ball Valves

3.1.4.5 Non-freeze Wall Hydrant

3.1.4.6 Hose Bibbs; [Removal] handwheel [Tee handle]

3.1.4.7 Combination Pressure and Temperature Relief Valves

3.1.4.8 Pressure Relief Valves

3.1.4.9 Water Temperature Regulating Valves- Maximum temperature range [71°C (160°F) [82°C(180°F) ]

3.1.4.10 Water Temperature Mixing Valves: [Thermostatic] [Pressure equalizing]

3.1.4.11 Water Pressure Reducing Valves

3.1.4.12 Strainer

3.1.4.13 Water hammer arrestors

3.1.4.14 Pressure gages

3.1.4.15 Thermometer

### 3.2 D2022 HOT WATER SERVICE

Same as D2021

### 3.3 D2023 DOMESTIC WATER SUPPLY EQUIPMENT

3.3.1 Backflow Preventers.

Reduced pressure principle type. [Provide reduced pressure backflow preventer at the main building water supply. [Provide freeze protection, metal traffic bollards and architectural screening for aboveground exterior installation]].

### 3.3.2 Water Meter

[With a non-resettable remote read-out.]

### 3.3.3 Washing Machine Connection Box

[Aluminum] [PVC plastic] [stainless steel], or [hot-dip galvanized steel]. [Provide washing machine emergency drainage system with ABS plastic back and side panel and floor pan with drainage.] [Provided braided stainless hoses of sufficient length for hot and cold water connections to washing machine.]

### 3.3.4 Water Heaters

#### 3.3.4.1 [[Natural Gas][Propane] Fired Water Heaters

Provide high efficiency storage type gas fired water heaters. Water heater warranty shall be a minimum of [5][9] years.

#### 3.3.4.2 [Electric Water Heaters

[Storage type electric water heaters with double heating element. Water heater warranty shall be a minimum of [5][9] years.]

#### 3.3.4.3 [Instantaneous Water Heater (Propane or Natural Gas)

Unit(s) shall have a minimum of 82 percent efficiency with a 10-year warranty.]

#### 3.3.4.4 [Instantaneous Water Heater (Electric)

Unit(s) shall have a 10-year warranty.]

### 3.3.5 Inline Circulator Pumps

Standard head capacity, service water distribution pump.

### 3.3.6 Domestic Water Booster Pressure Pumping System (IF REQUIRED)

Complete package water service booster pump system.

## 3.4 D2024 WATER SUPPLY INSULATION

Provide [mineral fiber] [cellular glass] insulation.

## 4. D2030 SANITARY WASTE SYSTEMS

### 4.1 D2031 WASTE PIPING

#### 4.1.1 Below-ground piping

[Provide cast iron hub and spigot pipe and fittings.] [Provide [Polyvinyl Chloride (PVC)] [Acrylonitrile Butadiene Styrene (ABS)] plastic pipe, fittings, and solvent cement]

#### 4.1.2 Above-ground piping

- a. [Provide cast iron hub and spigot pipe and fittings or cast-iron hubless pipe and fittings.] [Provide [Polyvinyl Chloride (PVC)] [Acrylonitrile Butadiene Styrene (ABS)] plastic pipe, fittings, and solvent cement]
- b. Provide hard drawn copper for condensate drain piping.

#### 4.2 D2032 VENT PIPING

See D2031.

#### 4.3 D2033 FLOOR DRAINS

4.3.1 Floor drains shall be with automatic trap primers.

4.3.1.1 Flush strainer type: Perforated or slotted [cast bronze] [nickel bronze] [polished stainless steel] [chromium plated copper alloy] strainer.

4.3.1.2 Floor sink: [Porcelain enameled] [Epoxy coated] interior

#### 4.4 D2034 SANITARY WASTE EQUIPMENT

4.4.1 Submersible Sump Pumps: Factory assembled and tested for operation. [Provide high water alarm.]

4.4.2 Sewage pumps: [Single type] [duplex type]. Factory assembled and tested for operation. [Provide high water alarm.]

#### 4.5 D2035 PIPE INSULATION

Provide [Mineral fiber] [Cellular glass] insulation.

### 5. D2040 RAIN WATER DRAINAGE

#### 5.1 D2041 PIPE & FITTINGS

##### 5.1.1 Above-ground Piping

Provide [cast iron hub and spigot pipe and fittings or cast-iron hubless pipe and fittings.] [PVC plastic pipe and fittings]

##### 5.1.2 Below-ground Piping

[Provide [Polyvinyl Chloride (PVC)] plastic pipe, fittings, and solvent cement]. [Provide ductile iron pipe for pipes that cross traffic pavements if there is less than 610mm (24 inches) of cover.]

#### 5.2 D2042 ROOF DRAINS

Hot dip galvanized [cast iron] [ductile iron]. with dome and integral flange, and shall have a device for making a watertight connection between roofing and flashing.

#### 5.3 D2043 RAINWATER DRAINAGE EQUIPMENT

Expansion joint of proper size to receive the conductor pipe shall be provided.

#### 5.4 D2044 PIPE INSULATION

Provide [mineral fiber] [cellular glass] insulation

### 6. D2090 OTHER PLUMBING SYSTEMS

#### 6.1 D2091 GAS DISTRIBUTION

##### 6.1.1 Natural Gas Piping

Obtain natural gas pressures from the [local utility company, \_\_\_\_\_] [Base Utilities]. The point of connection is at \_\_\_\_\_. [Coordinate application or permit and provision of gas meter and/or pressure regulator with local utility company]

##### 6.1.2 Materials And Equipment

6.1.2.1 Aboveground Within Buildings: [Black steel] [Corrugated stainless steel tubing with polyethylene jacketing and fittings]

6.1.2.2 Underground: Polyethylene (PE) pipe. Provide [detectable aluminum for plastic backed tape] or [detectable magnetic plastic tape]

6.1.2.3 Steel Pipe Fittings: [Threaded fittings [Butt-welding fittings]. [Flanges and flanged fittings]

6.1.2.4 Polyethylene Fittings: [Socket fittings] [Molded butt-fusion fittings]

6.1.2.5 Risers: [Remote bolt-on or bracket] [Wall mounted]

6.1.2.6 Below Ground Valves: {Metallic ball valve} [PE ball or plug valve]

6.1.2.7 Aboveground Valves:

- a. Shut-off valves [Lockable]
- b. .Pressure regulator
- c. .Earthquake automatic shut-off valve

6.1.2.8 Gas Meter. [Pipe] [Pedestal] mounted

6.1.2.9 Valve Box. [Heavy duty type]

##### 6.1.3 Natural Gas Pressure Testing and System Purging

Pressure tests all piping system. After completing pressure test and before testing a gas contaminated line, purge line with nitrogen to remove air and gas.

#### 6.2 D2092 ACID WASTE SYSTEMS

Provide acid resistance DWV pipe, fittings and couplings of mechanical bell spigot or fusion type joints.

### 6.3 D2093 INTERCEPTORS

6.3.1 Grease Interceptors.

6.3.2 Oil/Water Separator.

Provide an oil/water separator for the [\_\_\_\_\_] with a minimum flow capacity of [\_\_\_\_\_] liters per minute ([\_\_\_\_\_] GPM). The separator shall tie into the sanitary sewer system [through a 7580 liter (2000 gal) holding tank that can be bypassed if desired.]

### 6.4 D2099 OTHER PIPING SYSTEMS

6.4.1 General Use Compressed Air Systems

Provide factory packaged electric motor driven, [reciprocating] [rotary screw] air compressor with manufacturer's standard air filter, oil filter, and drain plug. [Air compressor, aftercooler, and receiver shall be factory packaged as a unit.] Unit shall be capable of supplying [\_\_\_\_\_] standard L/s ([\_\_\_\_\_] SCFM) free air. Maximum allowable discharge temperature is 38 degrees C (100 degrees F). Provide aftercooler as required to meet this temperature limit. The discharge pressure shall be 862 kPa (125 PSI) gauge. [Receiver tank shall be labeled and rated for 862 kPa (125 PSI) [\_\_\_\_\_] gage.],

6.4.1.1 Refrigerated Air Dryer

Dryer operating pressure shall be not less than 862 kPa (125 PSI) [\_\_\_\_\_] gauge. Capacity of dryer shall match or exceed capacity of associated air compressor

6.4.1.2 Air Receiver

Receivers shall be labeled and rated for 862 kPa (125 PSI) [\_\_\_\_\_] gauge.

6.4.1.3 Compressed Air Piping System

Piping shall be [steel] [copper]. [Provide compressed air drops [minimum quantity, 1 per [\_\_\_\_\_] feet, 1 per vehicle service bay, etc.] with quick disconnects throughout the work areas to allow connection of pneumatic tools, air guns, etc.]

- a. Steel piping shall be black seamless schedule 40 carbon steel with threaded fittings and valves.
- b. Copper tubing shall be hard drawn, with wrought copper or bronze fittings and silver brazed joints.
- c. Valves: Bronze gate valves, bronze globe and angle valves, steel gate valves.
- d. Provide pressure regulators, Brass body with integral filter and bowl.

- e. Provide pressure gages, accuracy Grade A, for air, with steel or brass case, and safety glass.
- f. Provide pipe hangers and supports. Provide supports at valves, fittings, branch lines, outlets, changes in direction, equipment, and accessories.
- g. Provide quick disconnect couplings.
- h. Provide compressed air hose reel in each vehicle maintenance bay.

#### 6.4.1.4 Compressed Air System fabrication.

6.4.1.4.1 Brazing Procedures: Record in detail and qualify the "Brazing Procedure Specifications" for every brazing procedure proposed.

6.4.1.4.2 Cleaning: Clean silver-brazed piping to remove residual flux in the system after fabrication.

6.4.1.4.3 Testing: Hydrostatically test compressed air piping after completion of fabrication.

#### 6.4.2 Breathing Air Systems

Provide a Class D Breathing Air System with a 100% backup source.

##### 6.4.2.1 Intake Air Filter and Muffler

Dry-inlet filter and muffler with silencer tubes.

##### 6.4.2.2 Outlet Air Filters

##### 6.4.2.3 Breathing Air Piping Systems

All distribution piping shall be non-ferrous (no plastic systems) with non-lead solder joints, or Teflon tape, or non-toxic pipe joint compounds approved for breathing air.

6.4.2.3.1 Valves: Sized and made for pressures and other design conditions as indicated.

6.4.2.3.2 Pressure Reducing Regulators: Provide with calibrated flow measuring device.

6.4.2.3.3 Hangers and Supports: Provide pipe hangers and supports. Provide supports at valves, fittings, branch lines, outlets, changes in direction, equipment, and accessories.

6.4.2.3.4 Gages: Provide gages with white dials and black lettering, and with sizes, ranges, and case type, as required.

6.4.2.3.5 Quick Disconnect Couplings: Provide quick connect couplings which are not compatible with the general use compressed air system.

##### 6.4.2.4 Brazing Alloy

AWS A5.8, BCuP (Brazing-Copper-Phosphorus) series.

6.4.2.5 Soldering Alloys

Alloy Grade Sb5, Sn94, Sn95, or Sn96.

6.4.2.6 Welding Filler Metal

Compatible with the pipe materials.

6.4.2.7 Threaded Connections

Select jointing compound suitable for the particular application.

6.4.2.8 Piping Identification

Pressure-sensitive adhesive tape and decals.

6.4.2.9 Breathing Air System fabrication.

Pre-installation Cleaning: Provide only pipe and fittings which have been thoroughly washed.

6.4.2.9.1 Brazing and Soldering: Personnel qualification procedures and metal preparation and joining procedures shall be required.

6.4.2.9.2 Welding: Provide welding procedures.

6.4.2.9.3 In-process Cleaning of Piping: During brazing, soldering, or welding operations, continuously clean and purge with oil-free dry nitrogen.

6.4.2.9.4 Testing: Pressure test breathing air piping after completion of fabrication. Testing medium shall be oil-free dry nitrogen.

-- End of Section --