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NAVFAC PTS-D20 (December 2018)  
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Preparing Activity: NAVFAC SUPERSEDING PTS-D20 (February 2018)  
  
PERFORMANCE TECHNICAL SPECIFICATION  
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SECTION D20  
  
PLUMBING  
12/18

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NOTE: This section is intended to be used as a guide and contains requirements that are common to many different types of facilities; however, not all requirements and equipment items will be applicable to all projects. In addition, there may be special requirements for a particular project that are not addressed at all. The RFP preparer may have to incorporate additional information to address these special requirements in this PTS and corresponding Part 3 ESR. If the RFP preparer chooses to delete building elements that are not required for the project, do not change the remaining Uniformat paragraph designations (example - A102001). Uniformat designations are unique to the products they are assigned to. However, the subparagraph numerical extensions (example - 1.2 or a,b,c) of the Uniformat designations may change if subparagraphs are deleted.  
  
This guide specification is formatted utilizing Uniformat II, an industry recognized standard, ASTM E 1557. When the RFP preparer chooses to add a paragraph that does not apply to an existing building element already included in the specification, refer to the Uniformat/WBS located on the NAVFAC Design-Build Website for a listing of Uniformat II designations and definitions.  
  
NOTE: The RFP preparer may view or hide the criteria notes in this PTS section by modifying the WORD preferences for "Hidden text". To view the criteria notes, choose "File" then "Option". Click "Display" then check the "Hidden text" box under "Always show these formatting marks on the screen". In the same section, check the box for "Print hidden text" under "Printing options" to print the criteria notes.  
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**D20 GENERAL**

RFP Part 3 including the Engineering System Requirements (ESR) provide project specific requirements. The RFP Part 4, Performance Technical Sections (PTS) provide generalized technical requirements that apply to multiple facility types and include more requirements than are applicable to any one project. Therefore, only the RFP Part 4 requirements that apply to the project and further define the RFP Part 3 project specific requirements are required.

**D20 1.1 NARRATIVE**

Use this section in conjunction with all parts of the Design Build (D/B) Request for Proposal (RFP) to determine the full requirements of this solicitation.

This section includes the construction of interior plumbing systems [for the hangar and parking apron.] This section covers installations inside the facility and out to the five foot line. See Section G30, *Site Civil/Mechanical Utilities*, for continuation of systems beyond the five foot line.

**D20 1.2 PLUMBING DESIGN GUIDANCE**

Provide the design and installation in accordance with the following references. This Performance Technical Specification (PTS) adds clarification to the fundamental requirements contained in the following Government Standards. The general requirements of this PTS section are located in PTS Section Z10, *General Performance Technical Specification*.

**D20 1.2.1 Government Standards**

Federal Energy Management Program (FEMP)

UNIFIED FACILITIES CRITERIA (UFC)

|  |  |
| --- | --- |
| UFC 1-200-01 | DoD Building Code (A reference in this PTS section to UFC 1-200-01 requires compliance with the Tri-Service Core UFCs that are listed therein, which includes the following significant UFC(s):  UFC 3-401-01, Mechanical Engineering, UFC 3-420-01, Plumbing Systems) |
| UFC 1-200-02 | High Performance and Sustainable Building Requirements |
| FC 1-300-09N | Navy and Marine Corps Design Procedures |
| UFC 3-401-01 | Mechanical Engineering |

UNIFIED FACILITIES GUIDE SPECIFICATIONS (UFGS)

|  |  |
| --- | --- |
| UFGS 01 33 00 | Submittal Procedures |

**D20 1.3 GENERAL REQUIREMENTS**

All work shall comply with the following design standards as a minimum:

UFC 1-200-01, *Design: General Building Requirements*  
UFC 3-800-01N, *Navy and Marine Corps Environmental Engineering for Facility Construction*  
UFC 4-211-01, *Design: Aircraft Maintenance Hangars*  
UFC 3-420-01, *Design: Plumbing*

**D20 1.4 DESIGN SUBMITTALS**

Submit design submittals in accordance with Z10, *General Performance Technical Specifications*, Part 2 Section 01 33 10.05 20, *Design Submittal Procedures*, FC 1-300-09N, *Navy and Marine Corps Design Procedures*, and UFC 3-401-01, *Mechanical Engineering*.

**D20 1.4.1 Plumbing System**

Provide an interior plumbing system as described in the Project Program including accessories and devices as necessary and required for a complete and usable system.

**D20 1.5 CONSTRUCTION SUBMITTALS**

Submit construction submittals in accordance with PTS section Z10, *General Performance Technical Specifications*. In addition to the Z10 requirements, the Designer of Record (DOR) must approve the following construction submittals as a minimum:

Fixtures, equipment, and OMSI information for all equipment and fixtures.

**D20 1.6 QUALITY CONTROL**

Upon completion of the installation test all systems in accordance with the IPC.

**D2010 PLUMBING FIXTURES**

Provide EPA's "WaterSense" labeled fixtures where available.

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NOTE: Coordinate with the ESR to include only the appropriate fixtures for the facility. Verify requirements for additional plumbing fixtures, such as laundry sinks, garbage disposals, grease traps, and other special features. Provide additional paragraphs as necessary for these items.  
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**D201001 WATER CLOSETS**

**D201001 1.1 FLUSH VALVE WATER CLOSETS**

ASME A112.19.2, white vitreous china, siphon jet. Provide ASME A112.19.5 trim. Provide self-closing metering type flush valve, unless automatic flush control is specified in the ESR Section D20. Automatic flush control must conform to UL 1951 and ASSE 1037. Automatic flushing systems to consist of solenoid-activated valves with light beam sensors and include an override pushbutton. Flush valve not to exceed 1.28 GPF (4.8 LPF). Mount handicapped fixtures at a height and provide appurtenances in accordance with ABA Standards.

**D201001 1.2 DUAL FUNCTION FLUSH VALVE WATER CLOSETS**

ASME A112.19.2, white vitreous china, siphon jet. Provide ASME A112.19.5 trim. Provide self-closing metering type dual function flush valve, unless automatic flush control is specified in the ESR Section D20. Automatic flush control must conform with UL 1951 and ASSE 1037. Automatic flushing systems to consist of solenoid-activated valves with light beam sensors and include an override pushbutton. Dual function flush valve must provide a flush of 0.8 to 1.1 GPF (3.0 to 4.2 LPF) or 1.28 GPF (4.8 LPF). Maximum flush volume not to exceed 1.28 GPF (4.8 LPF). Mount handicapped fixtures at a height and provide appurtenances in accordance with ABA Standards.

**D201001 1.3 FLUSH TANK WATER CLOSETS**

ASME A112.19.2, white vitreous china, siphon jet. EPA "WaterSense" labeled. Provide ASME A112.19.5 trim. Water flushing volume of the water closet not to exceed 1.28 GPF (4.8 LPF). Mount handicapped fixtures at a height and provide appurtenances in accordance with ABA Standards.

**D201001 1.4 DUAL FUNCTION FLUSH TANK WATER CLOSETS**

ASME A112.19.2, white vitreous china, siphon jet. Provide ASME A112.19.5 trim. Dual function flush tank water closet providing a dual flush of 0.8 to 1.1 GPF (3.0 to 1.6 LPF) or 1.28 GPF (4.8 LPF). Maximum flush tank volume not to exceed 1.28 GPF (4.8 LPF). Mount handicapped fixtures at a height and provide appurtenances in accordance with ABA Standards.

**D201002 URINALS**

**D201002 1.1 FLUSH VALVE URINALS**

ASME A112.19.2, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, extended side shields. EPA "WaterSense" labeled. Provide large diaphragm (not less than 2.625 inches (66 mm) upper chamber inside diameter at the point where the diaphragm is sealed between the upper and lower chambers) flush valve of chrome plated cast brass conforming to ASTM B 584, including vacuum breaker and angle (control-stop) valve. Maximum flush valve volume not to exceed 0.5 gallons per flush (1.9 lpf). Provide ASME A112.19.5 trim and ASME 112.6.1M concealed chair carriers. Provide self-closing metering type flush valve, unless automatic flush control is specified in the ESR Section D20. Automatic flush control in conformance with UL 1951 and ASSE 1037. Automatic flushing systems to consist of solenoid-activated valves with light beam sensors and include an override pushbutton. Select and install urinals and appurtenances in accordance with the ABA Standards.

**D201002 1.2 WATERLESS URINALS**

ASME A112.19.2, white vitreous china, wall-mounted, wall outlet, non-water using, integral drain line connection, with sealed replaceable cartridge or integral liquid seal trap insert. The urinal and trap assembly must maintain a sufficient barrier of a biodegradable immiscible liquid to provide the trap seal and inhibit the backflow of sewer gases. For urinals that use a replaceable cartridge, provide four additional cartridges for each urinal installed. Provide an additional quart of biodegradable liquid for each urinal installed. Provide ASME A112.6.1M concealed chair carriers. Install and test in accordance with the manufacturers’ recommendations. Drain lines that connect to the urinal outlet must not be made of copper tube or pipe. Select and install urinal and appurtenances in accordance with ABA Standards. Slope the sanitary sewer branch line for waterless urinals a minimum of 1/4-inch per foot. Provide manufacturer's operating manual and on-site training for the proper care and maintenance of the urinal.

**D201003 LAVATORIES**

**D201003 1.1 COUNTERTOP LAVATORIES**

Unless integral bowl is specified elsewhere, lavatories to be white, ASME A112.19.2 vitreous china lavatories with minimum dimensions of 19 inches (483 mm) wide x 18 inches (457 mm) front to rear, and self-rimming type. Provide ASME 112.18.1 copper alloy centerset faucets unless self closing metering or automatic control is specified in ESR section D20. Automatic faucet systems to consist of solenoid-activated valves with light beam sensors and include an override pushbutton. Provide EPA "WaterSense" labeled faucets. Provide with aerator, adjustable P-traps, and perforated grid strainers, unless pop-up drain fittings are specified in ESR section D20.

**D201003 1.2 WALL-MOUNTED LAVATORIES**

ASME A112.19.1, white enameled cast-iron or ASME A112.19.2 white vitreous china with ASME A112.6.1M concealed arm carrier support, with minimum dimensions of 19 inches wide by 18 inches (483 mm wide by 457 mm) front to rear. Provide ASME 112.18.1 copper alloy centerset faucets unless self closing metering or automatic control is specified in ESR section D20. Automatic faucet systems to consist of solenoid-activated valves with light beam sensors and include an override pushbutton. Provide EPA "WaterSense" labeled faucets. Provide with aerator, adjustable P-traps, and perforated grid strainers, unless pop-up drain fittings are specified in ESR section D20.

**D201003 1.3 HANDICAPPED LAVATORIES**

Same as Paragraphs 1.1 or 1.2, except height and appurtenances to be in accordance with ABA Standards.

**D201004 SINKS**

**D201004 1.1 COUNTERTOP SINKS**

ASME A112.19.3 sink, 20 gage stainless steel with integral mounting rim, minimum dimensions of 33 inches (840 mm) wide for two compartment or 21 inches (560 mm) wide for one compartment by 21 inches (560 mm) front to rear, with ledge back and undersides coated with sound dampening material. Provide top-mounted ASME A112.18.1 copper alloy faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers. Provide adjustable P-trap with drain piping to vertical vent stack. If specified in ESR section D20, provide UL 430 waste disposer unit in right compartment.

**D201004 1.2 SERVICE SINKS**

ASME A112.19.1, white enameled cast-iron or ASME A112.19.2 white vitreous china, wall mounted and floor supported by wall outlet cast-iron P-trap, minimum dimensions of 22 inches (560 mm) wide by 20 inches (508 mm) front to rear with 10 inch (254 mm) splashback, and stainless steel rim guard. Provide ASME A112.18.1 copper alloy back-mounted combination faucets with vacuum breaker and 0.75 inch (20 mm) external hose threads.

**D201004 1.3 MOP SINKS**

Pre-cast terrazzo floor-mounted mop sink, 36 inches x 36 inches x 12 inches (914 mm x 914 mm x 305 mm), made of marble chips cast in white Portland cement to a compressive strength of not less than 3000 PSI (20.7 mPa) 7 days after casting. Provide brass body drains with nickel bronze strainers cast integral with terrazzo. Provide stainless steel rim guard for mop sink. Provide chrome-plated exposed hot and cold water faucets ASME A112.18.1 wall-mounted copper alloy faucets swing spout with 3/4 inch (20 mm) hose connection, vacuum breaker, and pail hook. Provide mop hanger on wall above sink suitable for four mops.

**D201004 1.4 LAUNDRY SINKS**

IAPMO Z124.6, plastic, two compartment, minimum dimensions of 40 inches wide by 21 inches (1016 mm wide by 533 mm) front to rear, with floor-supported steel mounting frame secured to wall. Provide ASME A112.18.1 copper alloy centerset faucets, swing spout with aerator, and stainless steel drain outlets with cup strainers, and 1.5 inch (40 mm) adjustable P-trap with drain piping to vertical vent stack.

**D201004 1.5 CLINIC SERVICE SINK**

Provide ASME A112.19.2M white vitreous china, floor mounted, 29-1/2 x 20 x 18 inches, 1-1/2 inch spud top, flush value, stainless steel rim guards and service sink faucet with brace, 6 inch elbow handles, wall to spout outlet and screwdriver stops.

**D201005 SHOWERS/TUBS**

**D201005 1.1 ONE PIECE BATH AND SHOWER MODULES**

IAPMO Z124, made of white fiberglass reinforced plastic (FRP) or acrylic with slip-resistant bathing surfaces, integral grab bar, and three walls integrally molded in one piece. Provide outlet at left or right as necessary to suit module arrangement. Provide pop-up drain fittings and adjustable P-trap. Provide diverter type bathtub and shower supply fittings with body mounted from behind the wall. Provide tub fill over-rim spout with diverter.

**D201005 1.2 SHOWER STALLS**

IAPMO Z124, made of white solid acrylic pressure molded fiberglass reinforced plastic (FRP) shower stalls. Stalls to be scratch-resistant, waterproof and reinforced with integral grab bar, and three walls integrally molded in one piece. Provide diverter type shower supply fittings with body mounted from behind the wall.

**D201005 1.3 SHOWER FLOORS**

Precast terrazzo or Acrylic Shower Floors: Terrazzo must be made of marble chips cast in white Portland cement to produce a compressive strength of not less than 3000 psi (20.7 MPa) 7 days after casting. Provide brass body drains with nickel bronze strainers cast integral with terrazzo.

**D201005 1.4 BATHTUBS**

ASME A112.19.1 white enameled cast-iron or porcelain steel bathtubs, recessed type, minimum dimensions of 60 inches (1524 mm) wide by 30 inches (762 mm) front to rear by 16 inches (406 mm) high with drain outlet for above-the-floor drain installation. Provide diverter type bathtub and shower supply fittings with body mounted from behind the wall. Provide tub overfill rim spout with diverter.

**D201005 1.5 SHOWER SUPPLY FITTINGS**

ASME A112.18.1, ball joint, self-cleaning, adjustable spray pattern shower heads, connected to concealed pipe connected to copper alloy pressure balance single control type mixing valves with front access integral screwdriver stops. Provide EPA "WaterSense" labeled showerhead. Anchor the mixing valves and the pipe to each showerhead in wall to prevent movement.

**D201005 1.6 HANDHELD SHOWER HEAD**

ASSE 1014, adjustable spray hand-held shower head with swivel fitting, 60 inch (1524 mm) minimum flexible chrome plated copper alloy hose and in-line vacuum breaker. Provide push button flow control if specified in ESR section D20. Provide 25 inch (635 mm) grab bar with sliding spray holder that locks at any height.

**D201006 DRINKING FOUNTAINS AND COOLERS**

**D201006 1.1 DRINKING FOUNTAINS**

Wall mounted drinking fountain, constructed of white enameled cast iron with bubbler and push button control. Mount handicapped fixture at a height and provide appurtenances in accordance with ABA Standards.

**D201006 1.2 ELECTRIC WATER COOLERS**

AHRI 1010, wall-mounted, bubbler style, air-cooled condensing unit, 8.0 gph (.5 L per second) minimum capacity, stainless steel splash receptor, double wall heat exchanger, and all stainless steel cabinet. Provide ASME A112.6.1M concealed wall hangers with thru-bolts and back plates. Mount handicapped fixture and provide appurtenances in accordance with ABA Standards.

**D201090 EMERGENCY FIXTURES**

Pressure-compensated tempering valve is required for emergency fixtures, with leaving water temperature setpoint adjustable throughout the range 60 to 95 degrees F (15.5 and 35 degrees C) unless cold water supply meets temperature criteria.

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 or for explosion proof service within NEMA Type 7 or 9 enclosures.

**D201090 1.1 EMERGENCY SHOWER**

ISEA Z358.1, wall-mounted self-cleaning, non-clogging 10 inch (250 mm) diameter stainless steel deluge shower head with elbow, one inch (25 mm) full-flow stay-open ball valve with pull rod and 8 inch (200 mm) diameter ring or triangular handle, one inch (25 mm) interconnecting fittings.

**D201090 1.2 EMERGENCY EYE & FACE WASH**

ISEA Z358.1, wall-mounted self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor. Provide copper alloy control valves.

**D201090 1.3 COMBINATION EMERGENCY SHOWER & EYEWASH**

ISEA 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 10 inch (250 mm) diameter stainless steel deluge shower head with elbow, full flow stay-open ball valve with pull rod and 8 inch (200 mm) diameter ring or triangular handle one inch (25 mm) interconnecting fittings. Provide a self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor. Provide copper alloy control valves.

**D2020 DOMESTIC WATER DISTRIBUTION**

**D202001 PIPES & FITTINGS**

**D202001 1.1 COPPER**

Use copper tubing and fittings for pipe sizes 4 inches (100 mm) or smaller. Use type L tubing above ground with solder fittings. For buried piping, use type K tubing with solder fittings.

**D202001 1.2 CHLORINATED POLYVINYL CHLORIDE (CPVC)**

When specified in ESR section D20, provide CPVC pipe, fittings, and solvent cement meeting requirements of ASTM D 2846/D 2846M for sizes 4 inches (100 mm) and smaller. Provide transition union connections or threaded gate valve between metallic piping and CPVC piping.

**D202002 VALVES & HYDRANTS**

**D202002 1.1 VALVES**

Provide valves at water supplies to fixtures and to provide ease of maintenance.

**D202002 1.2 HOSE BIBBS & HYDRANTS**

Use non-freeze wall hydrants where the winter design temperature is at or below freezing. Hose bibbs are acceptable for use elsewhere.

**D202002 1.2.1 Hose bibbs**

Angle type, copper alloy hose bibbs with vacuum breaker.

**D202002 1.2.2 Wall Hydrants**

Non-freeze, ASSE 1019, cast bronze, with vacuum breaker, locking shield and tee-handle.

**D202003 DOMESTIC WATER EQUIPMENT**

**D202003 1.1 BACKFLOW PREVENTERS**

Provide backflow prevention devices that are approved by the State or local regulatory agencies. If there are no State or local regulatory agency requirements, provide backflow prevention devices that are listed by the Foundation for Cross-Connection Control & Hydraulic Research (FCCHR), or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention devices and assemblies. Provide freeze protection for aboveground exterior applications in areas where the winter design temperature is at or below freezing.

**D202003 1.2 WATER HEATERS**

Provide heaters complete with control system, gauges and ASME rated combination pressure and temperature relief valve. Heaters must meet the performance requirements of ASHRAE 90.1-2013 Table 7.8. Automatic storage type heaters must meet the Energy Star product definition specified in https://www.energystar.gov/products/spec and product to be Energy Star certified. For storage type water heaters, provide ASME code stamped tanks for domestic hot water. Lining must meet NSF 61.

**D202003 1.2.1 Electric Water Heaters**

Electric water heaters with double heating element meeting requirements of UL 174 for water heaters with less than 120 gallons of storage and 200,000 btuh input. Provide water heater meeting requirements of UL 1453 for commercial water heaters with 120 gallons of storage or more and 200,000 btuh input or more. Provide water heaters equipped with glass-lined steel tanks, high efficiency type, insulated with polyurethane foam insulation, replaceable anodes, and adjustable range thermostat to allow hot water settings between 90 and 160 degrees F (32 and 71 degrees C). Water heater warranty must be a minimum of 5 years. In accordance with FEMP requirements, heaters with storage capacity of 55 gallons (209 liters) or less and maximum energy input of 12 kW must have a minimum energy factor (EF) of 0.93 or higher and an annual energy usage of 4,721 kWh or less tested in accordance with U.S. Department of Energy (DOE) test procedure (10 CFR 430, Subpart B, Appendix E). Heaters with storage capacity of greater than 55 gallons (209 liters) and maximum energy input of 12 kW must have a minimum energy factor (EF) of 0.92 and an annual energy usage of 4,773 kWh or less tested in accordance with U.S. Department of Energy (DOE) test procedure (10 CFR 430, Subpart B, Appendix E).

**D202003 1.2.2 Gas-Fired Water Heaters**

High efficiency storage type water heaters meeting requirements of CSA/AM Z21.10.1 for water heaters with less than 120 gallons of storage and input ratings of 75,000 btuh or less. Provide water heater meeting requirements of CSA/AM Z21.10.3 for commercial water heaters with 120 gallons of storage or more and input ratings above 75,000 btuh. Water heaters must meet AGA requirements. Provide water heaters equipped with glass-lined steel tanks, polyurethane foam insulation, replaceable anodes, and adjustable range thermostat to allow hot water settings between 110 and 160 degrees F (43 and 71 degrees C). Water heater warranty must be a minimum of 5 years. Provide vent in accordance with NFPA 54.

**D202003 1.2.3 Oil-Fired Water Heaters**

UL 732 oil-fired water heaters with glass-lined steel tanks, high efficiency type, insulated with polyurethane foam insulation, replaceable anodes, with adjustable range thermostat to allow hot water settings between 110 and 160 degrees F (43 and 71 degrees C). Provide vent in accordance with NFPA 58. Design oil-fired water heater system in accordance with NFPA 31.

**D202003 1.2.4 Electric Instantaneous Water Heaters (Tankless)**

UL 499, heater(s) of the modulating, under the sink, point-of-use type. Output temperature must be adjustable from 40 degrees F to 160 degrees F. Heating elements must be field replaceable. Unit(s) must have a minimum 5-year warranty.

**D202003 1.2.5 Steam Heat Exchangers**

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.

**D202003 1.2.6 Storage Tanks**

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

**D202003 1.3 PUMPS**

**D202003 1.3.1 Inline Pumps**

In-line circulator for service water distribution system. Factory assembled and tested pumps constructed of materials suitable for hot domestic water service.

**D202003 1.3.2 Base Mounted Pumps**

Potable water service, base mounted, end suction pumps with mechanical seals and drip-proof electric motors.

**D202003 1.4 DOMESTIC WATER PRESSURE BOOSTER SYSTEM**

Factory assembled, tested, and certified by a single manufacturer who assumes undivided responsibility for the system to include providing start-up services, two days instruction and furnishing related operations and maintenance manuals. Provide each building with its own system. Each system will consist of a minimum of two pumps mounted on a single, welded structural steel base. Provide bladder type low-flow accumulator storage tank, lead-lag pump alternator selector switches and all related controls and alarms required for safe and proper system operation. Provide constant speed or variable frequency drive pump operation.

**D202003 1.5 EXPANSION TANKS**

Steel expansion tank with potable water rated polypropylene or butyl lined diaphragm at water heater.

**D202003 1.6 WATER METERS**

See PTS G30, Site Civil/Mechanical Utilities, for water meter requirements.

**D202003 1.7 MASTER THERMOSTATIC MIXING VALVES**

ASSE 1017.

**D202004 INSULATION & IDENTIFICATION**

**D202004 1.1 PIPING INSULATION**

Mineral fiber insulation on domestic hot water supply and recirculation piping. Insulate domestic cold water piping with cellular glass insulation.

**D202004 1.2 PIPING & EQUIPMENT IDENTIFICATION**

In addition to the requirements in Section Z10, *General Performance Technical Specification*, provide engraved brass, laminated plastic, or engraved anodized aluminum nameplates for valves. Stop valves in supplies to fixtures will not require nameplates. Identify above ground pipe with the type of service and direction of flow. Letter size, lengths and colors to be in accordance with ANSI A13.1.

**D202005 SPECIALTIES**

**D202005 1.1 WASHING MACHINE CONNECTOR BOX**

Recessed wall box fabricated of [PVC plastic] [galvanized steel with removable flange]. Provide bronze dual washing machine valve with single lever shut-off.

**D202005 1.2 VALVE BOXES**

For each buried valve provide cast-iron, ductile-iron box of a suitable size. Provide cast-iron or ductile-iron cover for the box with the word "WATER" cast on the cover.

**D202005 1.3 WATER HAMMER ARRESTORS**

PDI WH 201, water hammer arrestors in lieu of air chambers.

**D202005 1.4 ICEMAKER CONNECTOR BOX**

Recessed wall box fabricated of PVC plastic. Provide bronze shut-off valve.

**D202090 OTHER DOMESTIC WATER SUPPLY**

**D202090 1.1 SUPPORTS**

Provide piping supports. If a supported floor slab is used, support all piping located below the building from the building support slab.

**D202090 1.2 INSPECTIONS**

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

**D202090 1.3 DISINFECTION**

Upon completion of the installation, disinfect all systems.

**D202090 1.4 PLUMBING SYSTEMS TESTING**

Upon completion of the installation test all systems per the IPC.

**D2030 SANITARY WASTE**

**D203001 WASTE PIPE & FITTINGS**

**D203001 1.1 PIPING AND FITTINGS**

Cast iron hub and spigot pipe and fittings, rubber compression gasket joints or cast-iron hubless pipe and fittings, CISPI 301 with CISPI 310 couplings. Where indicated in ESR Section D20, plastic PVC or ABS piping, fittings, and solvent cement meeting requirements of ASTM D 2665 or ASTM D 2661 may be provided. Equip plastic piping with approved firestopping devices as required by code.

**D203001 1.2 CLEANOUTS**

Provide cleanouts. Utilize material consistent with the piping system materials. Do not locate sanitary cleanouts within occupied spaces, with the exception of toilet and janitor spaces.

**D203002 VENT PIPE & FITTINGS**

Cast-iron hubless pipe and fittings, CISPI 301 with CISPI 310 couplings. Where indicated in ESR Section D20, plastic PVC or ABS piping, fittings, and solvent cement meeting requirements of ASTM D 2665 or ASTM D 2661. Equip PVC piping with approved firestopping devices as required by code. Single drainage/vent stack systems (such as Philadelphia system) and mechanical air admittance valves are not acceptable.

**D203003 FLOOR DRAINS**

Flush strainer or extended rim type. Provide in mechanical rooms, restrooms, fire pump room, laundry room, and plumbing chase areas. Also provide floor drains in specific areas of subsistence buildings and cold-storage buildings as identified in UFC 3-420-01. Provide floor sinks in kitchens. Provide floor sinks where required for interior air handling unit condensate drains. Install condensate and drain piping to avoid interference with equipment access and prevent trip hazards.

**D203004 SANITARY & VENT EQUIPMENT**

**D203004 1.1 PUMPS**

**D203004 1.1.1 Sump Pumps**

Factory assembled and tested submersible type pumps for operation under water.

**D203004 1.1.2 Sewage Pumps**

FS A-A-50555, single or duplex type to meet demand. For duplex types, provide with automatic controls to alternate the operation from one pump to the other.

**D2040 RAIN WATER DRAINAGE**

**D204001 PIPE & FITTINGS**

Cast iron hubless pipe and fittings, CISPI 301 with CISPI 310 couplings. Where indicated in ESR Section D20, plastic PVC or ABS piping, fittings, and solvent cement meeting requirements of ASTM D 2665 or ASTM D 2661 may be used. Equip PVC piping with approved firestopping devices as required by code.

**D204001 1.1 PIPING**

Cast iron hubless pipe and fittings, CISPI 301 with CISPI 310 couplings. Where indicated in ESR Section D20, plastic PVC or ABS piping, fittings, and solvent cement per ASTM D 2665 or ASTM D 2661 may be used. PVC piping shall be equipped with approved firestopping devices as required by code. Size and install piping in accordance with the IPC.

**D204002 ROOF DRAINS**

ASME A112.6.4, with dome and integral flange. Provide a device for making a watertight connection between roofing and flashing.

**D204003 RAIN WATER DRAINAGE EQUIPMENT**

Where required by building design, provide expansion joint(s) of proper size to receive the conductor pipe. The expansion joint must consist of a heavy cast-iron housing, brass or bronze sleeve.

**D204004 INSULATION & IDENTIFICATION**

Provide flexible elastomeric cellular, faced phenolic foam, or cellular glass insulation on all drainage piping that may be subject to condensation. Provide a vapor retarder. Identify aboveground pipe with the type of service and direction of flow. Letter size, lengths and colors to be in accordance with ANSI A13.1.

**D2090 OTHER PLUMBING SYSTEMS**

**D209001 SPECIAL PIPING SYSTEMS**

**D209001 1.1 NATURAL GAS PIPING**

Conform to requirements of the local natural gas utility and ASME B31.8, *Gas Transmission and Distribution Piping Systems*, for exterior piping. Conform to requirements of NFPA 54, *National Fuel Gas Code*, for interior gas piping. Provide meter and pressure regulator in accordance with the requirements of the local utility. Provide earthquake valve where required by code.

**D209002 INTERCEPTORS**

**D209002 1.1 OIL INTERCEPTOR**

Oil interceptor, where required, with a minimum flow capacity to meet system demand.

**D209002 1.2 GREASE INTERCEPTORS**

Provide in accordance with PDI G 101.

**D209003 COMPRESSED AIR SYSTEM (NON-BREATHING)**

**D209003 1.1 AIR COMPRESSOR**

Factory packaged electric motor driven, duplex air compressor including manufacturer’s standard air filter, oil filter, and plug drain. Air compressor, aftercooler, and receiver must be factory packaged as a unit. Receiver tank must meet requirements of ASME PBVC Sec. VIII D1, labeled and rated for 200 PSI (1.38 MPa) gage, equipped with required valves and trimmings, including gage and automatic drain valve and ASME BPVC pressure safety relief valve. Size air compressor and receiver in accordance with the Compressed Air and Gas Institute (CAGI) guidelines. Locate air compressor away from noise sensitive areas.

**D209003 1.2 REFRIGERATED AIR DRYER**

Low-pressure compressed air dryer of the mechanical refrigeration type, equipped with an automatic temperature shutdown switch to prevent freezing, a regenerative air-to-air exchanger (as standard with the manufacturer), and a main compressed air cooling exchanger. Refrigeration system must use non-CFC refrigerant and must cool compressed air to dry the air. Dryer operating pressure not less than 125 PSI (862 kPa) gage. Size the dryer based on system pressure, the entire system air flow, and providing air with a dew point 5 degrees F (-15 degrees C) lower than the most stringent equipment or outlet requirement. The pressure drop of the dryer must not exceed 2 PSI (13.8 kPa) gage.

**D209003 1.3 COMPRESSED AIR PIPING SYSTEM**

Piping in conformance with the requirements of ASME B31.1 for materials, assembly, and testing. Provide steel, black seamless schedule 40 carbon steel piping material meeting requirements ASTM A 53/A 53M with threaded fittings or copper tubing meeting requirements of ASTM B 88, Type K or Type L, hard drawn, Class 1, with wrought copper or bronze fittings. Provide compressed air drops in locations to facilitate work required with quick disconnects throughout the work areas to allow connection of such as pneumatic tools and air guns. Equip each air drop with a filter/moisture separator, pressure gauge, air pressure regulator, and a quick-disconnect.

-- End of Section --

**D209004 BREATHING AIR SYSTEM**

**D209004 1.1 BREATHING AIR SYSTEMS**

Provide breathing air systems for each fuel cell maintenance modules. Provide factory packaged electric motor driven compressors. Compressors shall be oil-free type. Provide an intake structure or opening which avoids shelves, pockets or other surfaces that can attract and accumulate particulates for introduction into the compressors. Design inlet piping for low air velocity to limit the size of particulates that may be carried by the air stream. Raise intake at least 1219 mm (4 feet) above horizontal surfaces to minimize dust intake. Locate compressors in Mechanical Rooms away from noise sensitive areas. Provide vibration isolation for compressors.

Provide a Class D Breathing Air System. The oil-free compressors will supply air for the breathing air system. Each breathing air system will include an air purifier unit that includes a refrigerated air dryer, filters, catalyst, CO monitor and CO alarm, and air receiver. Quality of air shall meet OSHA standards for respiration air and CGA Standards for Grade D air NASI/CGA G-7.1, be suitable for face masks, hoods, helmets, and other breathing apparatus. Provide dry-inlet filter and muffler with silencer tubes. Provide replaceable one micron filter elements. Inlet air filter shall be mounted to the compressor frame and shall be 99.9% efficient at 1 micron and above. Location shall be such that contaminated air is not drawn in. An indicator shall be used to signal filter blockage. Provide outlet filters to meet breathing air requirements. All filters shall be readily accessible for servicing.

**D209004 1.2 PIPING**

All distribution piping shall be ASTM A 269 seamless stainless steel tubing, Type 304, 304L, or 316. Provide matching stainless steel fittings and piping components. All piping components, valves, etc. shall be suitable for use in breathing air systems.

Provide means for filling breathing air sample tanks for testing the breathing air quality. The location of the sample taking shall be on the longest length of breathing air piping from the compressor. This location shall not be inside the aircraft service bay. The sample taking station shall include manifold piping and valves, three (3) sample bottles, bottle storage rack (floor or wall-mounted), and laminated plate with instructions for taking samples.

**D209004 1.3 VALVES**

NFPA 99. Valves of the same type shall be the product of one manufacturer, uniform in pattern and appearance, color coded and labeled for the intended service. Identification plates may be used in lieu of labels.

**D209004 1.4 PRESSURE REDUCING REGULATORS**

Provide with calibrated flow measuring device and CGA V-1 value connections. Minimum occupancy of flow measure device shall be plus or minus 3 percent for the intended use.

**D209004 1.5 GAGES**

ANSI/ASME B40.1 with restrictor shall be manufactured and labeled expressly for the intended service, and marked "DO NOT USE OIL". Provide gages with white dials and black lettering, and with ranges and case type as required. Minimum dial size shall be 63.5 mm (2-1/2 inch) diameter.

**D209004 1.6 QUICK DISCONNECT COUPLINGS**

Provide non-compatible fittings and quick connects (size and type) for breathing air outlets to prevent accidental cross connection with the general use compressed air system. Coordinate selection of quick connects with NADEP personnel to comply with their existing standards.

**D209004 1.7 PIPING IDENTIFICATION**

CID A-A-1689, pressure-sensitive adhesive tape and decals. Colors and labels must conform to ANSI A13.1.

**D209004 1.8 PRE-INSTALLATION CLEANING**

Provide only pipe and fittings that have been thoroughly washed and cleaned in accordance with manufacturer's recommendations for the application. Wash thoroughly, scrubbing as required. Rinse with clean water and blow dry with oil-free dry nitrogen. Do not use carbon tetrachloride, hydrocarbon, or halogenated hydrocarbon solvents.

**D209004 1.9 IN-PROCESS CLEANING OF PIPING**

Continuously purge piping with oil-free dry nitrogen during pipe joining operations. As each section is completed, blow lines clear of dirt and contamination with oil-free dry nitrogen in accordance with NFPA 99. Cap or plug open ends when left unattended.

**D209004 1.10 TESTING**

a. Testing medium shall be oil-free dry nitrogen.

b. Test breathing air system to show compliance with ANSI Z 88.2 and OSHA 29 CFR 1910.134.D- Respiratory Protection, for providing Grade D breathing air as described in the Compressed Gas Association Commodity Specification G-7.1-1966. Test shall include lab test for air samples taken and manufacturer certification that the compressor and associated dryers, air purification, alarms and monitoring system have been installed per the manufacturer recommendations, operating properly, and is safe to use.

-- End of Section --