

5.22.60 – LABORATORY & DEIONIZED WATER SYSTEMS DESIGN AND CONSTRUCTION STANDARD

PART 1: GENERAL

1.01 Purpose:

- A. This standard is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. The responsibility of the engineer is to apply the principles of this section such that the University may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be justified through LCC analysis and submitted to the University for approval.

1.02 Codes and Standards:

- A. **Plumbing Code Compliance:** Comply with applicable portions of International Plumbing Code pertaining to selection and installation of plumbing materials and products.

1.03 Requirements:

- A. The UT-Austin campus has a central system for distribution of de-ionized water (DW). (For historical reasons, it is often referred to as distilled water.) The DW is carried in pressurized polypropylene Schedule 80 lines in the utility tunnels.
- B. The central reverse osmosis/demineralizer system is designed to produce water that meets the following quality specifications:
 - 1. Conductivity < 15 micro ohms/cm
 - 2. pH of 6.0 to 9.0
 - 3. Nonvolatile TOC content < 1.0 ppm
- C. If project requirements demand water quality in excess of that listed above, provide supplemental point-of-use “polishing” systems necessary to provide a continuous supply of water that meets individual water purity requirements.
- D. For buildings requiring DW, provide a 1” PVC 80 line from the tunnel DW main up to a non-pressurized DW tank in the attic. Provide a stainless-steel orifice in the line (1/4” for buildings with large DW demand, 1/8” for buildings with small demand) to limit the amount of makeup to the tank. Provide a valved bypass line around the orifice to allow expedited system refill after being drained.
- E. Provide a stainless-steel solenoid valve to maintain the level in the DW tank. Provide a larger PVC line (often 2 inch) to allow DW flow by gravity or booster pump system from the tank to the building uses. Booster pump systems shall be required to provide adequate pressure to upper floors and building areas with high volume demand equipment.
- F. An ultraviolet sterilizer shall be installed in the piping downstream of the DW

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storage tank.

- G. DW Storage tank shall be provided with tank level sight glass. Sight glass shall be piped external to tank and be provided with isolation service valves at top and bottom of glass. Sight glass shall be equipped with high and low level switches. Switches shall be located within the section of sightglass isolated by service valves. Switches shall provide dry contacts for reporting conditions to BAS/FCMS system.
- H. Provide means of flushing DW system from each end of main system feed on each floor of building with access. New or modified systems shall be designed to incorporate the means to maintain the integrity of water quality to prevent any system contamination. Care shall also be taken to prevent contamination to materials stored or in transit. Any modifications to the system piping or equipment shall require prior notification and pre approval from UT Facilities Services. Design shall provide for future remodeling and incorporate the flexibility to accommodate future changes in research having minimal effect on adjacent labs and research programs and the means to maintain the integrity of water quality during any system modifications to prevent system contamination.
- I. Provide each riser connection serving a building floor or area with section valves for isolation with access. Provide each branch connection to main feed serving a floor or area with section valves for isolation with access. Branch connections from main feeds shall be from top of header.
- J. Provide de-ionized water piping loop to minimize “dead legs”. Dead legs over 12” shall not be allowed.
- K. Provide circulation in all de-ionized water loops at three feet per second minimum, with a target pipe velocity of five feet per second.

PART 2: PRODUCTS

2.01 Standards for Basic Identification:

- A. General: Piping identification Standard at the University is ANSI A13.1 "Scheme for Identification of Piping Systems. All piping shall have flow arrows indicating direction of flow.

2.02 De-Ionized Water Piping, Valves and Fittings:

- A. Pipe valves and fittings for purified water service shall be Schedule 80, Flame Retardant natural virgin, unpigmented Polypropylene with socket thermo seal fusion fittings.
- B. Installation practices, including support spacing and joint fusion, shall be in compliance with manufacturer's printed recommendations.

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- C. Materials from which pipe, fittings and valves are manufactured shall have been tested and approved for conveying potable water by the National Sanitation Foundation (NSF). All pipe, fittings and valves shall bear the NSF hallmark indicating that the material has been tested and approved for conveying deionized water by the national Sanitation Foundation.
- D. To ensure installation uniformity, all system piping components shall be the products of one manufacturer.
- E. All piping shall be thoroughly rinsed and flushed to remove all dirt and debris before installation. After installation the Contractor shall flush the entire piping system with de-ionized water to the satisfaction of the Owner.
- F. All piping exposed within plenums shall have a smoke-developed index of no more than 50 and flame-spread index of no more than 25. All non-conforming piping material located in plenums shall be sleeved. Contractor shall provide a sleeved system through the installation of grooved Schedule 10 galvanized piping and couplings. The sleeve piping shall be no less than 2 inches greater diameter than the polypropylene piping contained within it. Only rolled groove piping may be used. The Victaulic "Fit" fittings and piping system, or any similar set screw type fitting system is specifically prohibited. Vic-Let and Vic-O-Well or similar type fittings are specifically prohibited for use in this application. Where a reduced tee fitting is required, then a reducing tee or regular tee with bell reducer shall be used. If any of the above described prohibited materials or installation methods are used, then the material or installation method shall be corrected at the contractor's expense.
- G. Valves shall be ball valve type and shall be manufactured of the same virgin, unpigmented molding compound as the fittings to assure compatibility.
- H. All ball valves shall have Viton seals, and PTFE seats. Ball valves shall carry a pressure rating of 150 psi at a minimum of 68F, and shall be of True Union design.

2.03 DEIONIZED WATER PUMPS:

- A. Pumps shall be heavy duty plastic or stainless steel duplex, centrifugal type.
- B. Pump heads, sleeve and impeller shall be polypropylene or stainless steel. Seal shall be mechanical type.
- C. Each pump shall be provided with a fused safety switch and a magnetic starter providing overload and under voltage protection. A mechanical alternator shall automatically alternate the operation of the pumps.

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- D. Pumps shall be furnished completed with Vinton, or approved equal, suction and discharge pressure gauge isolator-activators to separate gauge from deionized water.

2.04 LEVEL CONTROLLER

- A. Level controller shall be full plastic body type with no metal parts in contact with deionized water.

2.05 PRESSURE TANKS:

- A. Furnish and install heavy duty plastic pressure tanks with interior rubber sleeve.
- B. Tanks shall be suitable for 75 PSI pressure and 120 degree F. temperature.
- C. Tanks shall be Hydro-cell type tanks.

2.06 FLOW CONTROL VALVES:

- A. Provide a 3/8 inch PP flow control valve in each and every deionized water outlet that limits the flow to 1/2 GPM. Provide a 2 GPM a natural, virgin, unpigmented polypropylene flow control valve in each de-ionized water connection to equipment.
- B. Flow control valves shall maintain a constant flow regardless of inlet pressure changes between 15 and 100 psig. No metal shall be in contact with the liquid.

2.07 PRESSURE REGULATING VALVES

- A. Contractor shall supply and install, where shown on the drawings, socket fusion natural, virgin, unpigmented polypropylene pressure regulating valves.
- B. Valves shall accurately reduce and regulate steady or varying inlet pressures and maintain a constant predetermined outlet pressure.

2.12 PRESSURE GAGES

- A. Pressure GAGES shall be 2-1/2 inch diameter, dual calibrated for 0 to 100 PSI and SI units, having 316 stainless steel bourdon tube. Provide gages with inline dead-leg gage guards where possible.

2.08 PURIFIED WATER STORAGE TANK:

- A. Tank shall be vertical cylindrical type, stainless steel or FRP-jacketed polyethylene, with dished or conical bottom. Tank shall have a tight-fitting removable cover, a steel floor stand, an air filter capable of removing particles as small as 0.5 micron, and rounded interior corners. All tank penetrations shall be

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factory made. Stainless steel tanks shall be No. 4 finish; polyethylene tanks shall be made of FDA approved resin.

2.09 LEVEL SENSORS

- A. Level sensors shall have only stainless steel and Viton in contact with the fluid. Each shall have a snap action switch rated for 125 volts, with an adjustable deadband initially set at 3 inches.
- B. One level sensor shall be wired with the solenoid valve to automatically maintain the liquid level in the tank. The other is to be connected to the BAS system.

PART 3 EXECUTION

3.01 INSTALLATION

- A. At every floor penetration a cast in sleeve or other monolithic curbing at least 2 inches high shall be provided to help contain water spills or leaks.
- B. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

END OF STANDARD