

Basis of Design

This section applies to the design and installation of reverse osmosis/deionized high purity water systems.

Programming

- Determine the anticipated current and future usage volume in gallons per day and the minimum water purity requirements required by the client during the programming phase of the project. Based on the quantity and quality of water required for the project determine the most appropriate system.
- Provide a flexible design to accommodate future renovation and modification.
- Provide systems that minimize energy and water usage.
- Provide equipment arrangements that minimize downtime in the event of a failure.

Design Criteria

- The minimum water purity for most central equipment RO/DI systems on the Seattle campus is College of American Pathologists (CAP) Type II. These requirements shall be met at each outlet.
- If higher purity water than CAP Type II is required in some individual labs in the building provide Point-of-Use polishing equipment at those locations.
- Typical central equipment will consist of prefilters, multi-media filters, reverse osmosis unit(s), deionizers, carbon filters, ultraviolet lights, storage tank, and distribution loop pumps.
- A water heater may be required upstream of the RO unit because they are most efficient when operated at an inlet water temperatures of 77°F.
- High purity water must be circulated continuously in a closed series loop layout from the central equipment to lab outlets throughout the building. The distribution loop piping must be sized to circulate the water at a velocity in the range of 4 to 6 feet per second under no demand conditions.
- As a design guide the maximum demand for the distribution system will be based on ½ GPM for polishers, 1 GPM for sink outlets, and 5 GPM for glass washers. Actual flow rates for this and other equipment should be used if those flow rates are known. Use appropriate diversity factors based on system size.
- The RO/DI system storage tank will be sized to provide storage for 24 hours of estimated usage. Coordinate the weight of the storage tank with the structural engineer on the consultant team.
- Provide access to sanitize the storage tank.

Design Evaluation

The following information is required to evaluate the design:

- Programming Phase: Provide a narrative description of the RO/DI system to include maximum anticipated usage volume in gallons per day and minimum water purity criteria. Define known future increases in anticipated usage volume if any. Describe the system

major components. Describe the flexibility of the system to accommodate future addition or renovation. Provide an estimate of energy and City water usage. Describe system reliability based on equipment selection to minimize downtime.

- Schematic Design Phase: Provide a block layout of the central equipment. Locate pipe risers, horizontal pipe runs, and the concept of outlet and equipment like glass washer connections.
- Design Development Phase: Provide a preliminary layout of the central equipment. Identify the locations of outlets and equipment such as glass washers. Provide a preliminary layout of the series distribution loop including risers. Provide a preliminary one line system diagram including the central equipment and the distribution loop. Provide a preliminary equipment schedule. Provide an outline of specifications and design calculations.
- Construction Document Phase: Provide a final layout of the central equipment. Provide a final layout of the series distribution loop including riser locations. Provide a final one line system diagram including the central equipment and the distribution loop that includes a control sequence of operation. Provide a final equipment schedule. Provide final specifications and design calculations.

Construction Submittals

- Submittal information shall include catalog cuts of all equipment, valves, fittings, pipe, pipe supporting methods, and the DDC control interface.

Related Sections

- Facilities Services Design Guide – Mechanical - General Requirements
- Facilities Services Design Guide – Mechanical - Plumbing
 - Potable and Nonpotable Water
 - Waste and Drains
 - Acid and Laboratory Wastes
 - Compressed Air, Vacuum, Natural Gas & Nitrogen
 - Plumbing Pressure Testing
- Facilities Services Design Guide – Mechanical - Piping, Valves & Accessories
- Facilities Services Design Guide – Mechanical - Hangers and Supports
- Facilities Services Design Guide – Mechanical - Pumps
- Facilities Services Design Guide – Mechanical - Motors and VFD's
- Facilities Services Design Guide – Mechanical - Metering and Gauges
- Facilities Services Design Guide – Mechanical - Nonstructural Component Seismic Design
- Facilities Services Design Guide – Mechanical - Identification
- Facilities Services Design Guide – Mechanical - Insulation
- Facilities Services Design Guide – Mechanical - Water Treatment and Flushing
- Facilities Services Design Guide – Mechanical - Noise and Vibration Control

- Facilities Services Design Guide – Mechanical - Environmental Control Systems
- Facilities Services Design Guide – Mechanical - Commissioning

Products, Material and Equipment

- For RO/DI piping materials, see Piping, Valves and Accessories section.
- For RO/DI equipment, provide materials suitable for use with high purity water systems.

Installation, Fabrication and Construction

- Provide a means to periodically sanitize the entire system.
- Slope all horizontal piping to be free draining with a minimum slope of 1/8 inch per foot.
- The distribution loop piping will drop to each outlet or piece of equipment to minimize dead end pipe sections to less than six branch line pipe diameters. Each pipe termination will be outfitted with a diaphragm valve.

END OF DESIGN GUIDE SECTION