PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. De-Ionized (DI) Water Systems
   2. Distilled Water Systems
   3. Reverse Osmosis (RO) Water Systems

B. The intent of these standards is to provide input to the design team on the University's preference of manufacturers, design, equipment options and quality assurance to maintain the longevity of its assets.

1.2 Related Sections:

A. Section 22 05 00 – Common Work for Plumbing Systems

B. Section 22 05 01 – Common Requirements for Plumbing Systems

C. Section 22 11 00 – Domestic Water Piping Systems

1.3 DESIGN REQUIREMENTS

A. Use this standard to specify DI water piping systems, distilled water piping systems and RO water piping systems for laboratories, process areas (pilot plants) and clean rooms.

B. Design process water systems so that impurities cannot be trapped in the piping systems and that biological growth is inhibited. Dead legs in process water systems are not permitted.

C. Risers shall have isolation valves between each floor and at each floor branch. All takeoffs from mains shall have isolation valves.

D. All branch takeoffs from piping mains are required to have shut off valves at the takeoffs so that repairs can be performed on the branch piping without shutting down the system.

E. Provide shut off valves at each equipment connection
F. Route all process water piping in inside walls only. Consult the University Energy and Engineering Department if it is necessary to route process water piping in an exterior wall.

G. When designing laboratory process water systems, all branch take offs into each individual laboratory suite shall have an isolation valve. Each connection to a laboratory bench or equipment must have an isolation valve. Maximum isolation within the laboratory is critical so that experiments can continue within the laboratory when repairs or tie-ins are required.

H. For projects in laboratory settings, consult with researchers and technicians to determine their requirements are included in the design.

I. Specify flushing procedures for piping. Flushing must be performed after all piping components are permanently installed and at each point of use within each laboratory.

J. Consult the University Energy and Engineering group when connecting new materials to existing materials at each location. Confirm all new materials are compatible with the existing materials.

1.4 SUBMITTALS

A. Product Data:
   1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
   2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
   3. Piping Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

B. Manufacturer’s Installation Instructions: Submit installation instructions for material and equipment.

C. Sanitation Procedures: Submit manufacturer’s approved procedure.

1.5 CLOSEOUT SUBMITTALS

Not Applicable

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

B. Do not store process water pipe and fittings in direct sunlight.
1.7 FIELD MEASUREMENTS
   A. Verify field measurements prior to fabrication.

1.8 WARRANTY
   A. Furnish two year parts and labor manufacturer warranty for process water piping system.

1.9 EXTRA MATERIALS
   A. Furnish five (5) extra kits for manufacturing of pipe joints.
   B. If a kit for manufacturing pipe joints has a shelf life, provide five (5) fresh kits at the end of the warranty period.

PART 2 PRODUCTS

2.1 PROCESS WATER SYSTEMS
   A. The University of Delaware will entertain either natural polypropylene (PP) or natural polyvinidene fluoride (PVDF) process water piping systems.
   A. All process water piping systems shall be a minimum equivalent to schedule 80 wall thickness.
   B. All process water piping systems shall be made from electro-fusion type joint systems. Solvent weld process water piping is not allowed on the University of Delaware Newark Campus.
   C. All elements of the process water piping systems (pipe, fittings and valves) shall be of the same material and manufacturer. Do not mix different materials or manufacturers to make the process water piping system.
   D. Acceptable Manufacturers:
      1. George Fisher Inc., PPRO-SEAL
      2. Orion Fittings, Rinoite or Socket Fusion
      3. Ipex Inc., Enpure
      4. Nibco, Chempure
   E. Couplings, Adapters and Transition Fittings: Assemblies with electro-fused or flanged parts; compatible with piping and fluids flowing through the system; and made by same piping manufacturer for joining piping systems.
F. BALL VALVES (Use for pipe size 2” and smaller)
   1. Pressure Rating: 150psig
   2. Body Material: Natural PP or Natural PVDF to match piping system
   3. Body Design: Union type
   4. End Connections: Detachable, butt or socket weld
   5. Seats: PTFE
   6. Stems: Stainless Steel or Match Body Type
   7. Stem Seals: FKM- rubber O-rings
   8. Handle: Tee shaped

G. BUTTERFLY VALVES (Use for pipe size 2-1/2” and larger)
   1. Pressure Rating: 150psig
   2. Body Material: Natural PP or Natural PVDF to match piping system
   3. Body Design: Lug type only
   4. Seats: FKM rubber
   5. Stems: Stainless Steel
   6. Stem Seals: FKM- rubber O-rings
   7. Handle: Lever type with locking device

H. CHECK VALVES
   1. Pressure Rating: 150psig
   2. Body Material: Natural PP or Natural PVDF to match piping system
   3. Body Design: Bolted-bonnet type
   4. End Connections: Flanged
   5. Shaft: Match Body Type
   6. Disc and Arm: Match Body Type
   7. Gasket and Seals: FKM- rubber O-rings

I. DIAPHRAM VALVES (Use for throttling only)
   1. Pressure Rating: 150psig
   2. Body Material: Natural PP or Natural PVDF to match piping system
   3. Body Design: Bolted-bonnet type
   4. End Connections (2” and smaller): Detachable, socket
   5. End Connections (2-1/2” and larger): Flanged
   6. Diaphragm: FKM rubber
   7. Seals: FKM- rubber O-rings
   8. Handle: Wheel shaped

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.
D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION - PIPE

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.
C. Group piping whenever practical at common elevations.
D. Slope piping and arrange systems to drain at low points.
E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
G. Provide access doors where valves and fittings are not accessible.
H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
I. Sleeve pipes passing through partitions, walls and floors.
J. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
K. Install unions downstream of valves and at equipment or apparatus connections.
L. Install valves with stems upright or horizontal, not inverted.
M. Support piping as per pipe manufacturers recommendations so that there is no sag in the pipe line and no fluids will be trapped in the pipe.
N. Joints shall be constructed as per manufacturer’s instructions. If joining dissimilar materials, adapter shall be compatible with both piping systems materials.
O. Route process water systems so that impurities cannot be trapped in the piping systems and that biological growth is inhibited. Avoid creating dead legs in process water systems.

3.3 FIELD QUALITY CONTROL

A. All personnel installing the process water piping system shall be factory trained in the performance of each step of the installation of the system. Contractor will provide certification of factory training for all employees used to install the process water piping system.

B. The mechanical contractor shall supply factory inspection of all process water pipe systems. The manufacturer must certify the process water pipe system installation conforms to its quality requirements. The manufacturer must submit written certification with the close out documents.

C. Test process water piping system in accordance with City of Newark Water Department requirements.

END OF SECTION