

SPECIAL SPECIFICATION

15233S

WASTE WATER PIPING FOR THE MICROFAB ONLY

PART 1 - GENERAL

1.01 SUMMARY

- A. This Specification includes acid waste drain, fluoride waste drain, **recycle** water drain and their **acid waste and fluoride waste** lifting station. The provided system shall meet all applicable codes indicated herein and those codes required to local building officials.

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Project Specification Sections apply to this section:
1. Section 13085-S - Seismic Protection.
 2. **Section 13943 - Controls**
 3. Section 15050S General Material & Work Requirement-Mechanical
 4. Section 15052-S Operation and Maintenance Manuals
 5. Section 15060-S Hangers and Supports
 6. Section 15075-S Mechanical Identification
 7. Section 15090-S - Polymer Process Piping Systems
 8. Section 15121-S Expansion Compensation
 9. Section 15070-S - Vibration Isolation
 10. Section 15250-S - Insulation Mechanical Systems.
 11. Section 15401 Plumbing
 12. **Section 15484S DI Polish, RO and Recycle Water Performance Specification**
 13. Section 16001-S Electrical Work
 14. Section 16269-S Variable Frequency Controllers
 15. Section 16920-S Motor Control Centers
- C. Where a conflict occurs between this specification and any specification referenced herein, this specification shall take precedence.

- D. Compliance with the most current version of the following codes is required for the design and provision efforts specified herein:
 - 1. ASME Code B31.3: Process Piping (hazardous wastes)
 - 2. ASME Code B31.9: Building Services Piping Code (non-hazardous wastes)
 - 3. Title 40 of the Federal Code of Regulations
 - 4. NFPA 70: National Electric Code
 - 5. ASME Pressure Vessel Code
 - 6. Building and Fire Codes: As determined by local fire or hazardous materials authority
 - 7. Industrial Waste Discharge Ordinances and Codes: As determined by local water authority.
 - 8. International Building Code 2001
- E. UL Certification of Packaged Equipment
 - 1. General: For equipment that is assembled of non-Underwriters Laboratory rated components, the contractor shall obtain third party certification of packaged equipment which indicates that the package equipment as a whole meets UL requirements.

1.03 DEFINITIONS

- A. ASME: The American Society of Mechanical Engineers
- B. NFPA: The National Fire Protection Association
- C. NPS: Nominal Pipe Size
- D. PVC: Polyvinyl Chloride
- E. PVDF: Polyvinylidene Fluoride
- F. CPVC: Chlorinated Polyvinyl Chloride
- G. PP: Polypropylene

1.04 SYSTEM DESCRIPTION

- A. System Description:
 - 1. The acid **waste , fluoride waste and recycle water** piping system shall collect acid waste, fluoride waste and **recycle** water from manufacturing processes and support equipment and convey the waste **to** the corresponding collection tanks. The system shall allow transfer of waste from the collection tanks to acid waste neutralization plant or HF collection tank located in the acid waste neutralization plant and transfer the **recycle** water to the treatment plant located in the building

858. The system shall utilize gravity or pressurized piping systems as appropriate.

2. The following subsystems are to be provided:
 - a. Gravity drain acid waste collection piping systems for acid waste, an acid waste lifting station and double contained pressurized piping for transferring acid waste to the acid waste neutralization plant
 - b. Gravity drain fluoride waste collection piping systems for fluoride waste, a fluoride waste lifting station and double contained pressurized piping for transferring fluoride waste to the existing fluoride waste collection tank in the acid waste neutralization plant
 - c. Gravity drain **recycle water** (DIRC) collection piping systems for **recycle water to the recycling water** lifting station **specified in Section 15484S** and a single contained pressurized piping for transferring **recycle** water to the DI plant in building 858

B. Scope of Work

1. General

- a. The Contractor shall provide, install and commission three complete and fully operational waste/rinse water collection systems to meet the design criteria specified herein. The design shall be based upon the codes, regulations, local jurisdictional requirements and attachments indicated herein.
- b. The system shall be provided with sufficient equipment redundancy to ensure continuous system operation.
- c. The system shall be provided with appropriate piping and equipment connections to promote efficient system maintenance.
- d. Install analyzer instrument and all control valves provided by **DI contractor** for the diversion of DI recycling water to acid waste lifting station or DI recycling lifting station.
- e. Provide stand alone PLC control panel for each lifting system and assisting the tie-in from the facility control system.

1.05 SUBMITTALS

A. Submit under provisions of section **01300, 01311 and 01700.**

B. Product Data.

1. Submit before construction:

- a. Manufacturer's descriptive data, specifications, and/or literature for materials used, including: piping, tubing, fittings, couplings, valves, pumps, pipe supports, and other specialty items.

Include rated capacities and accessories. Also include installation details..

- b. Installation procedures as recommended by the manufacturer and fabricator, including connection and joint details. Include dimensions, weights, loading, required clearances, method of field assembly, components and location and size of each field connection
- c. Proposed cleaning and testing procedures and schedules.
- d. Calculation for the package unit of lifting stations

C. Shop Drawings

- 1. Submit before construction.
 - a. The shop drawing shall include but not be limited to plan view drawings and section drawings, details and details **of the packaged unit of lifting station**

D. Closeout Submittals

- 1. Submit under provisions of Section 01700.
- 2. In addition to submittals required in Section 01700, submit system and drawings in Micro Station format. Drawings to conform to Owners Micro Station release version, and Owner's format for layering and numbering. The Contractor will supply three hard copies of drawings and two CDs of drawing files. The final issue of drawings will have been updated to project record ("as-built") document status including schematic drawing plan and elevation drawings.
- 3. The Contractor will supply three hard copies of documents and two CDs of these document files:
 - a. Specifications in Microsoft Word for Windows, version 6.0
 - b. Operation and maintenance manuals
 - c. Spare parts lists
 - d. Warranty information and documents for equipment
 - e. Maintenance Data for piping, tubing, fittings, couplings, valves, pipe supports, and other specialty items.
- 4. Welding Certificates for welding procedures and operators. (See Quality Assurance section 1.07.)
- 5. Field Test Reports of test specified in Part 3 of this Section. Include the following:
 - a. Test procedures used.
 - b. Test results that comply with requirements.
 - c. Failed test results and corrective action taken to achieve requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store piping, tubing, fittings, couplings, valves, pipe supports, and other specialty items separately by type. The materials shall be stored and handled in a clean, sheltered location.
- B. Any material damaged during shipping or storage must be replaced and may not be repaired.

1.07 QUALITY ASSURANCE

- A. Qualifications. Provide statements of qualification for fabricators. Qualify welding processes and operators according to piping codes listed in 1.02.
- B. Regulatory requirements: design and installation to be in accordance with the state and city local plumbing codes.
- C. Materials: Provide statements of qualification special materials used in installation. Comply with applicable piping codes listed in 1.02.
- D. Labels and/or stamps: Piping, valves, Safety valves, and other specialty items shall bear the appropriate ASME label or stamp of a specified testing agency.
- E. Applicable Specifications & Standards. Comply with Applicable Standards and Codes 15050-S General Mechanical& Work Requirements-Mechanical, and Division 1.
- F. Cleaning procedures required approval by Owner prior to cleaning activities.
- G. In addition to the warranty conditions in Division 1, the Contractor shall repair all leaks on the acid waste system for a period of 6 months following acceptance by the Owner, at no cost to Owner.
- H. Professional Certifications: Design documents generated by the Contractor shall be stamped and signed by an engineer registered in the state where work is located.

1.08 COORDINATION

- A. Coordinate layout and installation of waste piping and system components with other construction.
 - 1. Coordinate piping installation with roof curbs, equipment supports and roof penetrations. Roof specialties are specified in Division 7 Sections.
 - 2. Coordinate pipe sleeve installation for foundation wall penetrations.
 - 3. Coordinate size and location of concrete bases. Cast anchor bolt inserts into bases. Concrete, reinforcement and formwork requirements are specified in Division 3 Sections.
 - 4. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for

fire stopping specified in Division 7 Section “Through-Penetration Fire-stop Systems” for fire and smoke wall and floor assemblies. Coordinate pipe fitting pressure classes with products specified in related Sections.

5.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Piping and Fittings
 - a. George Fischer (PP150 for Pressurized Pipe, PP75 Drain Pipe Fitting)
 - b. Asahi (Duo Pro PP Pipe and Fitting for Pressurized Pipe)
 - c. **Enfield (Flame retardant FRP double containment Pipe)**
 2. Valves
 - a. George Fisher
 - b. Asahi
 - c. Plast-O-Matic
 3. Expansion Joints
 - a. Unisource
 - b. Mercer
 4. Flowmeters
 - a. Fuji
 - b. Panametric
 5. Pressure Sensors
 - a. Rosemount
 6. Pumps
 - a. Vertical pump
 - 1) Vanton
 7. Tubing
 - a. Atlantic
 - b. Dupont
 8. Level Sensors
 - a. George Fischer
 9. **Basket Strainer**
 - a. **Hayward**
 10. **Vent**
 - a. **Harvel**

2.02 MANUFACTURED PRODUCT

A. Available Manufacturers: R. E. Merrill

1. Lifting Stations:

- a. Provide free standing single contained PP lifting station tanks, constructed with stress relieved PP plate and stainless steel supports, with capacity and dimension indicated on the drawing.
- b. Provide PP vertical pumps with capacity indicated on the drawings and mounted on top of the lifting stations
- c. Provide Variable Frequency Drive for the pump control of Acid waste and Rinse Water lifting station
- d. Provide control panel for the lifting stations
- e. Provide nozzles to connect all the process piping indicated on the drawings
- f. Provide drain valve for all lifting station
- g. Provide non potable water bearing flushing for vertical pumps on the acid waste and the fluoride waste lifting station
- h. Provide continuous level controls for lifting station, low and high level alarms
and instrumentation for monitoring tank level.
- i. Provide flexible connection between pump and piping for vibration control
- j. Connect vent pipe to local exhaust
- k. All lifting station tanks must be rated for the working pressure of system.
- l. All lifting station tanks shall have bracket ready for mounting NFPA diamond.

2.03 MATERIALS OF CONSTRUCTION

A. Pipe:

1. PP Gravity Drain, ASTM D-4101, Pressure Rated to 75 psi, butt fusion.
2. PP Pressurized Drain, ASTM D-4101, Pressure Rated to 150 psi, butt fusion.
3. PP Secondary Containment Drain, ASTM D-4101, Pressure Rated to **150** psi, butt fusion, annular spacers.

4. Fire retardant polypropylene: electro-fusion assembly methods, material per ASTM D-4101, maximum average flame spread of zero and maximum extent of burning of 13 mm per ASTM D-635.
- B. Vents: CPVC.
- C. Fittings:
1. PP Gravity Drain, ASTM D-4101, Pressure Rated to 75 psi, butt fusion or mechanical joint (flange and union).
 2. PP Pressurized Drain, ASTM D-4101, Pressure Rated to 150 psi, butt fusion or mechanical joint (flange and union).
 3. PP Secondary Containment Drain, ASTM D-4101, Pressure Rated to 45 psi, butt fusion or mechanical joint (flange and union).
 4. Fire Retardant Polypropylene: match to piping, electro-fusion assembly methods, material per ASTM D-4101, maximum average flame spread of zero and maximum extent of burning of 13 mm per ASTM D-635.
- D. Valves
1. Ball Valves
 - a. PP, body material per ASTM D-4101, full port, pressure rating 150 psi, true-union socket ends according to ASTM D-2657, flange connection according to ANSI B16.5. Seats shall be PTFE with back-ring.
 2. Butterfly Valves
 - a. PP, body material per ASTM D-4101, pressure rating 150 psi, flange connection according to ANSI B16.5. Seals shall be FPM.
 3. Check Valves
 - a. PP, up to 2", ball type, body material per ASTM D-4101, true-union socket ends. Seals shall be FPM
 - b. PP, 3", self-closing type, body material per ASTM D-4101, true-union socket ends. Seals shall be Viton.
 4. Gate Valves
 - a. **PVC, 8", body material per ASTM D-1784, flange connection according to ANSI B16.6. Seals shall be Viton.**
- E. Flanges:
1. PP Special Flange Adaptor with serrated face, body material per ASTM D-4101, butt fusion, 150 psig rated, suitable for butterfly valves with PVDF coated steel flange ring according to ANSI B16.5.
- F. Unions:

1. PP, 2" and smaller, body material per ASTM D-4101, pressure rating 150 psi, viton or viton encapsulated in Teflon O-ring.
 2. Sealant: Per FRP pipe and fitting manufacturer's recommendations.
- G. Piping Flange Fasteners. Hex Head Bolts, UNS S31600, ASTM A193, B8M Class 2, dimensions per ANSI B18.2.1. Heavy hex nuts, UNS S31600, 8M, heavy hex, dimensions per ANSI B18.2.2; supply two washers with each bolt.
- H. Gasket Material: Thickness, material and type suitable for fluid type, pressure and temperature to be handled.
- I. Support structures may include fabricated metal structures or "strut" type modular systems. All support structures shall be of materials that will not corrode in the environment of installation. Epoxy coating, non-corrosive materials (stainless steel, fiberglass) or other methods of corrosion prevention may be used. All metals coatings shall meet the requirements of Division 9.

PART 3 - EXECUTION

3.01 PIPING INSTALLATIONS

- A. General. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping installation requirements. Install piping systems in accordance with manufacturers' instructions and recommendations.
- B. Piping Installation
1. Install all piping in accordance with manufacturer's instructions and recommendations.
 2. Install pipe with proper flow characteristics from point of use to distribution/collection piping, main header, and/or final drain destination.
 - a. Slope. Install all acid waste, fluoride waste and **recycle** water piping (main and sub main) with positive slope to low point in system. Piping inside the building shall maintain a minimum slope of 1/8 inch per foot (gravity flow).
 - b. Pumped systems connecting to a gravity drain line system are to enter in such a way that pressurized discharge will follow the gravity flow.
 - c. Vents. The lifting stations **and the acid waste, fluoride waste and recycle water mains** shall be vented to an exhaust system with a air gap to allow for proper full gravity flow.
 - d. Secondary Containment. Secondary containment systems shall slope to a low point **inside of the subfab** with a drain valve. Leak detections are provided by life safety. Annular spacers inside double contained piping shall be oriented or designed to allow free drainage of liquids to promptly detect leaks.
 3. Branches

- a. Install branch flange connections (for sub-mains) at each main at every sub main location.
 - b. Provide blind flanges for unused connections.
4. Secondary Containment: Secondary containment shall be provided for all overhead (above 6 feet) gravity waste piping **inside of the pipe fit-up room, office area, chemical storage are** and all pressurized acid and fluoride waste piping. Containment piping shall terminate over a sump or other approved location and be provided with a drain valve and leak detection at the lowest point in each branch.
- C. Space Management.
- 1. Install groups of pipes parallel to each other, spaced to permit applying insulation, servicing of valves and removal of pipe clamps.
 - 2. Route piping to conform to piping hierarchy.
 - 3. Protect exposed electrical and mechanical equipment located directly under drain system from leaks by installing drip pans under piping when piping is not double contained.
- D. Anchors, Hangers, & Supports. Install pipe supports as necessary.
- 1. Provide supports as required for positive drainage without sag and interim low points.
 - 2. Plastic pipe shall not directly contact metal support surfaces. The use of high durometer foam, “180 degree half shells” or other approved methods shall be used.
 - 3. Single point loading not permitted on plastic pipe.
 - 4. Anchor piping for proper direction of expansion and contraction.
 - 5. Hanger, support and anchor devices are specified in Division 15060 Section “Hangers and Supports”.
 - 6. Install the following pipe attachments
 - a. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
 - b. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
 - c. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 - d. Spring hangers to support vertical runs.
 - 7. Follow manufacturers’ guidelines for maximum spacing and minimum rod sizes.
 - 8. Support vertical runs at roof, at each floor and at 10-foot (3 m) intervals between floors.

- E. Connections. Provide flanges, unions, couplings or other methods of disassembly at connections to equipment, dissimilar piping (flanges or union only allowed), and as required for routine maintenance and clean out of the system.
 - 1. Use sanitary type fittings for all gravity flow pipe connections.
 - 2. Provide blind flange at end of mains and sub mains for clean out purposes.
 - 3. All point of use connection shall be installed in such way that equipment could be safely hookup to.
- F. Labels. Label all pipes with service designation, including pipe under the raised floor. Label drain line systems properly, as designated by Owners standards and 15075.
- G. Drains. Install drains, consisting of a tee fitting, NPS ¾ inch (DN 20) treaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- H. Transitions: Transitions from one material type to another shall be made by flanges or union only.

3.02 SPECIALTY ITEMS

- A. Flow Meters. Install lengths of straight pipe upstream and downstream from ultrasonic meters according to meet manufacturer's instructions.
- B. Control Valves.
 - 1. Install control valves in accessible locations close as possible to connected equipment.

3.03 PIPE JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for joint construction requirements for threaded, welded and flanged joints.

3.04 TERMINAL EQUIPMENT CONNECTIONS

- A. Size for supply and return piping connections shall be same as for equipment
- B. Install ports for pressure switch with gauge protector at pump outlet connections.

3.05 TESTING.

- A. Visually inspect system. Submit proposed testing procedures, including leak testing for connections to existing systems.
- B. Prepare acid waste piping according to ASME B31.9 or B31.3 (as appropriate) and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.

2. Supply blinds, blind flanges, plumbers plugs, gauges, pressure pumps and any other materials required for testing.
 3. Flush system with clean water.
 4. Clean strainers.
 5. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 6. Install safety valve, set at a pressure no more than one-third higher than test pressure to protect against damage by expanding liquid or other source of overpressure during test.
- C. Perform the tests on acid waste piping.
1. Notify Owner 48 hours in advance of testing. Perform testing and inspection in presence of the Owner.
 2. Test all piping, including primary carrier and secondary containment piping in accordance with the requirements in Section 15050-S. Repair any leaks and retest the system. System can be tested in sections during installation only with prior approval by Owner.
 3. Leak test drainage piping system in entirety or in sections by filling the pipe.
 4. Use ambient temperature water as a testing medium unless there is a risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used with approval of the owner. While filling system, use vents installed at high points of system to release trapped air. Use drains at low points for complete draining of liquid.
 5. Entire system test: Close openings in system, except highest opening. Fill with liquid to point of overflow. Upon completion of the system, test the primary system hydrostatically to a pressure of a minimum of 10 feet above the highest projected point.
 6. Section test. Note: system can be tested in sections only with prior approval by owner. Tightly plug each opening except highest opening of section under test, and then fill with water. Test section with at least 10 feet head of water. In testing successive sections, test sections with at least 10-foot head of water, except uppermost ten feet of system. Keep water in system, or in portion under test, for minimum 2 hours before inspection.
- D. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed Maximum pressure for any vessel, pump, valve or other component in system under test.

- E. Evaluate the test. Visually inspect entire system for leaks. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints and connections for leakage.
- F. Upon completion of the system, test the secondary system pneumatically for a minimum duration of 7 hours. All external joints shall be soaped and visually inspected for leaks. Provide a pressure regulator with gauges to limit pressurization of the system over 10 psig. Provide temporary restraint at all elbows and tees while plastic pipe is under compressed gas pressurization.
- G. Repair any leaks and retest the system. Eliminate leaks by tightening, repairing or replacing components and repeat hydrostatic test until there are no leaks.
- H. Prepare written report of testing. Submit testing and installation report to Owner and Owner's Representative within 6 days of system completion.

3.06 CLEANING

- A. Remove and clean or replace strainer screens.
- B. Upon completion of the system, the primary system shall be flushed clean using non-potable water supplied by the Owner. Purge or blow dry with Nitrogen. Owner will furnish nitrogen.
- C. Upon completion of the system, purge the secondary containment with Nitrogen for a minimum of 15 minutes, or longer if required to purge the system of all visible moisture.

END OF SECTION