

GUIDELINES FOR FABRICATION & INSTALLATION OF STAINLESS STEEL HIGH PURITY DISTRIBUTION SYSTEMS

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Prepared by
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GUIDELINES FOR FABRICATION & INSTALLATION OF STAINLESS STEEL HIGH PURITY DISTRIBUTION SYSTEMS

1. SCOPE

- 1.1 This Technical Bulletin addresses materials; fabrication, installation and final documentation required for stainless steel high purity distribution systems, for either liquid or gaseous products.

2. APPLICATION

- 2.1 Stainless steel high purity distribution systems are typically specified for critical clean applications in the Semiconductor, Pharmaceutical, Bio-Pharmaceutical, Chemical, Fiber Optics, Food, and Dairy Industries.
- 2.2 This information provides a contractor the ability to review customers' specifications from materials acquisition through system installation. This Technical Bulletin is not intended to take precedence over customer specifications or procedures.

3. REFERENCES

- 3.1 ASME, Section IX Welding & Brazing Qualifications.
- 3.2 ASME and AWS Sections as applicable.
- A. ASME B 31.1 Power Piping.
 - B. ASME B 31.3 Process Piping.
 - C. AWS Z 49.1 Safety in Welding & Cutting
 - D. ASME BPE, Bioprocessing Equipment
- 3.3 ASTM, Sections as applicable.
- A. ASTM A632
 - B. ASTM A269
 - C. ASTM A270
 - D. ASTM A450
- 3.4 Current Good Manufacturing Practice (CGMP) Regulations of the Food and Drug Administration chapter 1 of CFR 21, part 210 & 211.

4. MATERIALS

- 4.1 The most common alloy of choice is 316L stainless steel. To satisfy specific applications, the customer may specify stainless steel materials of other ASTM types such as 304, 304L, 316, 317, 317L or nickel alloys such as Hastelloy or Inconel. Additional specific controls on material chemistry (i.e. limits on sulfur content or other elements) may be required for best success in specific applications.
- 4.2 Tube and tube fittings are the typical product form specified in lieu of pipe except for large diameter systems. Tube and fittings are manufactured to more exact dimensional tolerances, meeting the

requirements of high purity automated welding processes and weld acceptance criteria. Tubing sizes smaller than 2" OD should be specified to be seamless material. Tubing 2" OD and larger is typically specified as rolled-and-welded with a continuous long seam. The longitudinal seam is manufactured to present a smooth, uniform interior surface. All fittings should be of the long tangent tube type, with a square butt weld end preparation to facilitate automatic welding. The interior surface should have the same quality finish as the tube or component item to which it is to be welded.

- 4.3 Valves: All valves should be of the type, model, and size specified in the design. Valves should have an interior surface finish equal or better than the adjacent tube or component. The valve body should be of forged or wrought material in lieu of castings. Valves shall have either square butt end preparation for welding or sanitary tri-clamp type end connections when they must be removable.
- 4.4 Components: All other components such as regulators, filters, pressure transducers, etc., that are integrated into the systems should have the same quality surface finish as the tube and fittings. Components shall have sanitary tri-clamp type end connections or extended square butt ends for welding.
- 4.5 Surface Finish: The interior surface of high-purity tubing is normally polished (commonly 180 grit or better) to minimize surface roughness and cleaned to minimize systems contamination upon installation. The interior surface may require mechanical polishing and/or electro-polishing to meet specific Ra micro inch finish requirements. Exterior polish for aesthetic or housekeeping reasons is optional to the customer. Surface finishes as specified by the customer, are available as follows:

- 4.5.1 Mill Finishes: An unpolished mill finish is typically 60 to 100 Ra.
- 4.5.2 Mechanical Polish Finishes:
- A. 180 grit polish = an average 25 Ra or maximum 30 Ra
 - B. 240 grit polish = an average 16 Ra or maximum 20 Ra.
 - C. 320 grit polish = an average 10 Ra or maximum 12 Ra
- 4.5.3 Chem-Polished:
- A. Less than 20 Ra
 - B. Less than 10 Ra