

SEMI F3-94 (Withdrawn 1103) GUIDE FOR WELDING STAINLESS STEEL TUBING FOR SEMICONDUCTOR MANUFACTURING APPLICATIONS

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NOTICE: This Document was balloted and approved for withdrawal in 2003.

1 Purpose

1.1 The purpose of this Guide is to provide instructions to increase the awareness of the user to the available procedures for welding stainless steel gas distribution systems, and to provide information from which subsequent evaluations and standardization can be derived.

2 Scope

2.1 This Guide covers the general requirements for the welding of stainless steel gas distribution systems.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 SEMI Standards and Safety Guidelines

SEMI F2 — Specification for 316L Stainless Steel Tubing for General Purpose Semiconductor Manufacturing Applications

3.2 ANSI/ASME Standards¹

ANSI/ASME B16.25 — Butt Welding Ends

ANSI/ASME B31.3 — Chemical Plant and Petroleum Refining Piping

Boiler and Pressure Vessel Code — Section IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators

3.3 ASTM Standards²

ASTM A450 — General Requirements for Carbon, Ferritic Alloy, and Austenitic Steel Tubes

3.4 AWS Specification³

AWS D10.9 — Specification and Qualification of Welding Procedures and Welders for Piping and Tubing

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 General Requirements

4.1 All welding performed under this guide should conform to the applicable requirements of the ASME Boiler and Pressure Vessel Code, Section IX, ANSI B16.25, B31.3 Chapter V, and AWS D10.9, to the extent that they are included herein.

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² ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA; Telephone: +1.610.832.9585, Fax: +1.610.832.9555, <http://www.astm.org>

³ American Welding Society, 550 N.W. LeJeune Road, Miami FL 33126, USA; Telephone: +1.800.443.9353; <http://www.aws.org>

5 Materials

5.1 All materials to be welded should be manufactured to ASTM specifications and so certified by the manufacturer. Certification should conform to ASTM A450.

5.2 All seamless austenitic stainless steel tubing should be in conformance with SEMI F2.

6 Testing of Welders

6.1 All welds should be based upon Welding Procedure Specifications and be documented with associated Procedure Qualification Records in accordance with ASME Boiler and Pressure Vessel Code, Section IX, or with AWS D10.9.

6.2 Qualification of the welding procedures to be used, and of the performance of welders and welding operators, should conform to the requirements of the ASME Boiler and Pressure Vessel Code, Section IX, Articles II and III, or AWS D10.9.

7 Welding Procedure

7.1 *Component Preparation*

7.1.1 All weld end preparation should be done in such a manner as to minimize the introduction of contaminants into the system.

7.1.2 All cutting of component or tubing weld ends should be done with a sharp-edged tool. No lubricants of any kind should be allowed.

7.1.3 All component and tubing weld ends that are to be cut should be de-burred without chamfering.

7.1.4 All welding ends requiring preparation for procedures requiring the use of filler material should be prepared in accordance with ANSI/ASME B16.25.

7.1.5 Surfaces for welding should be clean and should be free from oxidation, discoloration, oil, scale, chips, or other material that is detrimental to welding.

7.1.6 All components should be maintained in a clean condition until welded into the system.

7.2 *Welding Requirements*

7.2.1 Welding equipment used to make welds should be operated in accordance with the manufacturer's operating and safety instructions.

7.3 *Welding Procedures*

7.3.1 Prior to the welding of a particular size, wall thickness, alloy, and heat of material, sample welds should be made, dissected, and analyzed.

7.3.2 These welds should be checked for poor penetration, joint contamination, joint soundness, surface oxidation, discoloration, pitting, cracking, defects of fit-up, or defects of workmanship.

7.3.3 Once a sample weld is found to be acceptable, the sample weld should be the on-site work sample against which other welds of the same size, wall thickness, alloy, and heat of material are judged. All essential and supplementary essential variables should be documented in the procedure qualification record.

7.3.4 Any significant deviation(s) from the on-site work sample (§ 7.3.3) will cause the weld(s) to be rejected. Rejected welds should be removed and replaced.

7.3.5 Sample test welds should be made periodically. These tests should be compared to the on-site work sample (§ 7.3.3). Deviation from the on-site work sample should be cause for rejection. The sample test welds should be made at/when:

1. The beginning of each shift.
2. The end of each shift.
3. Any change in welding procedure, materials, tubing size, equipment, or equipment adjustments are made.
4. Any time that a concern or deviation to the weld quality has occurred.