

SEMI F31-0698

GUIDE FOR BULK CHEMICAL DISTRIBUTION SYSTEMS

1 Purpose

1.1 This guide defines components of Bulk Chemical Distribution Systems and sets forth Basic Design Elements and optional design features common to BCD Systems.

2 Scope

2.1 This guide applies to BCD Systems used in semiconductor manufacturing facilities for supplying liquid chemicals to wafer cleaning and other manufacturing processes.

NOTICE: This standard does not purport to address safety issues, if any, associated with its use. It is the responsibility of the users of this standard to establish appropriate safety and health practices and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 This guide is not intended to be applicable to every possible use and type of chemical dispensing system but only to those systems that originate with sources of single lots of liquid materials of 55 gallons or more, and which operate in a way that splits a single liquid stream into multiple streams. This guide excludes slurry systems, small liquid chemical dispensing systems, chemical waste systems, and many other types of systems that dispense fluids.

3.2 This guide excludes construction protocols for BCD Systems, such as clean manufacturing practices, integrity of fabrication, and prequalification of materials.

3.3 This guide does not intend to cover all the important safety considerations which relate to Bulk Chemical Distribution Systems.

3.4 References to “containers” in this document are not limited to “Bulk Containers” as defined in the Code of Federal Regulations (CFR) Section 49 or Department of Transportation (DOT) Regulations.

4 Referenced Standards and Documents

4.1 SEMI Standards

SEMI E49 — Guide for Standard Performance, Practices, and Sub-Assembly for High Purity Piping Systems and Final Assembly for Semiconductor Manufacturing Equipment

SEMI S2 — Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment

4.2 DOT¹

Department of Transportation

4.3 Federal Regulations²

49 CFR — Title 49 of the Code of Federal Regulations

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

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 CDM — Chemical Dispensing Module

5.1.2 CDU — Chemical Dispensing Unit

5.1.3 DIW — Deionized Water

1 Department of Transportation, 400 Seventh Street, SW, Washington, D.C. 20590

2 United States Government Printing Office, Washington, D.C. 20402

5.1.4 MDU — Modular Dispensing Unit

5.2 Definitions

5.2.1 *blending* — combination of two or more chemicals to create a mixture which contains a desired ratio of constituents.

5.2.2 *chemical dispense system* — the module used for filtering and for dispensing chemical into the distribution piping network which may be referred to by a number of manufacturer's specific designations: CDM, CDU, and MDU.

5.2.3 *chemical reprocessing unit* — a subsystem which purifies or recycles a chemical.

5.2.4 *chemical transfer* — the technique used to move chemical between different points in the distribution system.

5.2.4.1 *pressurization* — the use of high purity nitrogen or other appropriate gas to displace liquid through the distribution system.

5.2.4.2 *pumping* — a mechanical or pneumatically operated technique used to create hydraulic force in the system.

5.2.4.3 *hybrid system* — a combination of pressurization and pumping techniques used to transfer chemical.

5.2.5 *day tank* — a vessel that stores that amount of chemical which may be consumed within one or more days. This holding vessel usually stores prefiltered chemical until it is transferred to the manufacturing process.

5.2.6 *decontamination* — cleaning up of a BCD System, or any subsystems thereof, by introducing chemical solutions into the piping systems. This procedure occurs during qualification and prior to commissioning the system.

5.2.7 *dilution* — combination of a concentrated chemical and DIW to create a lower concentration of the aqueous chemical.

5.2.8 *on-site gas-to-chemical generation* — the contacting of a liquid and gas phase to create a stable liquid solution. The chemical is generated on-site in a form suitable for distribution through a dispense system.

5.2.9 *pickling* — conditioning of the system by filling it with the actual chemical or another chemical for which the system is designed. This chemical will stay in the system for a specified period of time. The purpose of this conditioning is to leach out impurities prior to actually using any chemical in the manufacturing process.

5.2.10 *polishing* — the process of flowing chemical through a filter one or more times to reduce the particulate levels of the chemical.

5.2.11 *primary containment* — tubing, piping, or components whose wetted surface is directly in contact with the chemical. These components are generally made from fluoropolymer materials such as Perfluoroalkoxy (PFA).

5.2.12 *secondary containment* — tubing or piping which contains the primary piping or tubing. The purpose of this configuration is to control leaks and to protect against spills. Secondary containment of solvent systems generally uses stainless steel material, and acid or base systems generally use Schedule 40 Polyvinylchloride (PVC) material boxes such as VMB. This may also be used as secondary containment.

5.2.13 *stabilized filtration* — a design feature that provides for the continuous flow of chemical through filters to minimize shocking and pulsating of the filters.

5.2.14 *surge suppression* — use of a device or in-line chamber that minimizes flow pulsations caused by a pump. This may also be referred to as pulsation dampener.

5.2.15 *valve manifold box (VMB)* — a chemical-resistant enclosure which houses manual and/or pneumatically actuated valves, tees, and fittings.

5.2.16 *vessel* — a vessel fabricated from or containing an inner lining of chemically inert and resistant materials which is specifically designed to maintain the purity level of the chemical for a long period of time. All containers are fabricated from or at least contain an inner lining of chemically inert and resistant materials and are specifically designed to maintain the purity level of the chemical for long periods of time. The larger containers are generally designed in conformance to Department of Transportation Regulations (DOT) and may be transported by ground. These containers have fittings which are compatible to this purpose so that they may be hooked up to the BCD Systems directly. Such containers include: