

SEMI F22-1102

GUIDE FOR GAS DISTRIBUTION SYSTEMS

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1 Purpose

1.1 This reference document is intended to outline for the user the common systems configurations, components, and subcomponents of high purity gas distribution systems in a semiconductor fabrication facility. Related specifications are also noted.

2 Scope

2.1 Outlined in this document are both bulk and specialty gas distribution systems.

2.2 Components and subcomponents are identified from the point-of-supply to the point-of-connection to the process tool.

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 The gas distribution system configurations noted in this reference document are provided solely as a guide to indicate common industry practice. They are not presented as, or intended to be, a representation of best engineering practice.

3.2 The reference documents noted are provided for general guidance only and are not intended to portray a code compliance protocol. The users should always consult local authorities to determine specific applicable codes and regulations. Agencies, regulatory or otherwise, noted herein are representative only of the U.S.

3.3 Specifications, SEMI Standards or other, are noted to assist the user as a reference only.

4 Referenced Standards

4.1 None.

5 Terminology

5.1 Abbreviations and Acronyms

5.1.1 AOV — Air-operated valves

5.1.2 ASO — Automatic shutoff valve

5.1.3 POC — Point of connection

5.1.4 POU — Point of use

5.1.5 VMB — Valve manifold box

5.2 Definitions

5.2.1 *air-operated valves (AOV)* — are those which require pneumatic energy to initiate or terminate flow or to change flow path (e.g., normally closed, partially open, double acting).

5.2.2 *automatic shutoff valve (ASO)* — a mechanically, electrically, or pneumatically activated valve which has the sole purpose of terminating flow if a predetermined condition is exceeded. For cryogenic supply systems, ASO's are used in conjunction with a low temperature sensing device.

5.2.3 *check valve* — a mechanical gas system component which prevents reverse flow.

5.2.4 *effluent treatment system* — a device which, through mechanical, chemical, cryogenic, absorbent, or other means, abates hazardous gas effluent to “environmentally safe levels” through dilution, neutralization, entrapment, or distillation.

5.2.5 *excess flow device* — a mechanical or electrical component which senses and signals an AOV or itself to terminate flow in the event predetermined flow is exceeded.

5.2.6 *face seal fitting* — a high purity fitting which incorporates two machined faces and a metallic gasket within a male/female nut configuration to attain a high leak integrity seal.

5.2.7 *filter* — a porous device, generally constructed of polymer, metal, or ceramics and housed in a metal chamber, which traps particles, preventing them from being transported downstream.

5.2.8 *flow restrictor* — a component, generally an orifice, which prohibits gas flow beyond a predetermined flow.

5.2.9 *gas box* — a gas distribution subsystem which generally contains the final shut-off valve(s) prior to the POC. It may also contain filter(s) and a regulator.

5.2.10 *hazardous gas detectors* — analytical instruments which placed in strategic locations in and around gas distribution systems and components are used to detect potentially unnoticeable releases at extremely low levels.

5.2.11 *low temperature sensing device* — a component which protects the system downstream of the vaporizer from cryogenic temperatures by initiating an alarm or triggering a valve shut-down.

5.2.12 *nitrogen generation plant* — a system which, generally through cryogenic distillation, separates and purifies nitrogen from ambient air. Other air separation techniques may be used but are not considered in this document.

5.2.13 *point of connection (POC)* — is often used interchangeably with POU, indicating the final connection between the system and the process tool.

5.2.14 *point of use (POU)* — is often used interchangeably with POC, indicating the final connection between the system and the process tool.

5.2.15 *pressure relief valve* — a device which, at a given design pressure set point, releases gas pressure to prevent system over-pressurization.

5.2.16 *pressure transducer* — a component which mechanically or electrically senses the pressure within a gas system and transmits a signal to a readout or a control device.

5.2.17 *process gas panel* — a subsystem, generally contained within a gas cabinet, that delivers process gas from the cylinder to the specialty gas distribution system.

5.2.18 *purifier* — generally a catalytic, resinous, or diatomaceous material within a pressure vessel which removes particulate and/or trace gas impurities from a gas stream.

5.2.19 *regulator* — generally a mechanical device which alters the pressure within a gas system.

5.2.20 *segregation* — a practice in design and operation to prevent non-compatible gases from co-mingling.

5.2.21 *tube trailer* — a bulk gas supply system which manifolds high pressure, DOT-specified, vessels (cylindrical tubes) on a portable trailer.

5.2.22 *vacuum generator* — a component in a process gas panel which, via a suction created by an inert gas venturi, allows for evacuation of the gas system to levels of 16.7 kPa (25" mercury) or less.

5.2.23 *valve manifold box (VMB)* — a gas distribution subsystem designed to allow the distribution of a single process cylinder gas to multiple process tools. Its manifold design uses a series of valves (manual or AOV), regulators, filters, and vacuum generator(s), and may be controlled manually or automatically.

5.2.24 *vaporizer* — a component which, through heat transfer, is designed to convert a cryogenic liquid to a gas.

6 Bulk Gas Distribution Systems

6.1 Cryogenic Liquid Supply (see Figure 1)

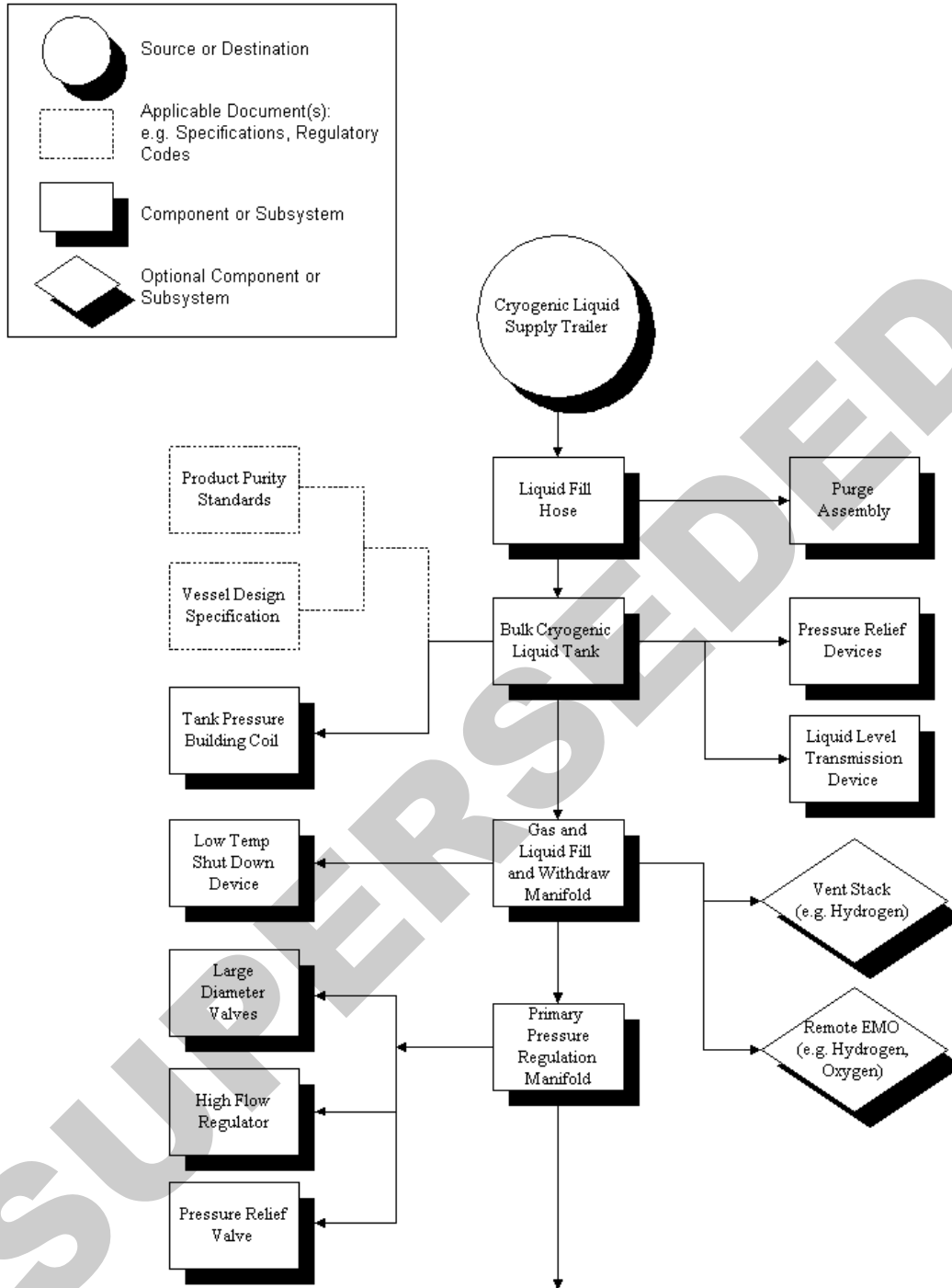


Figure 1
Bulk Gas (Cryogenic) Supply System Flow Chart

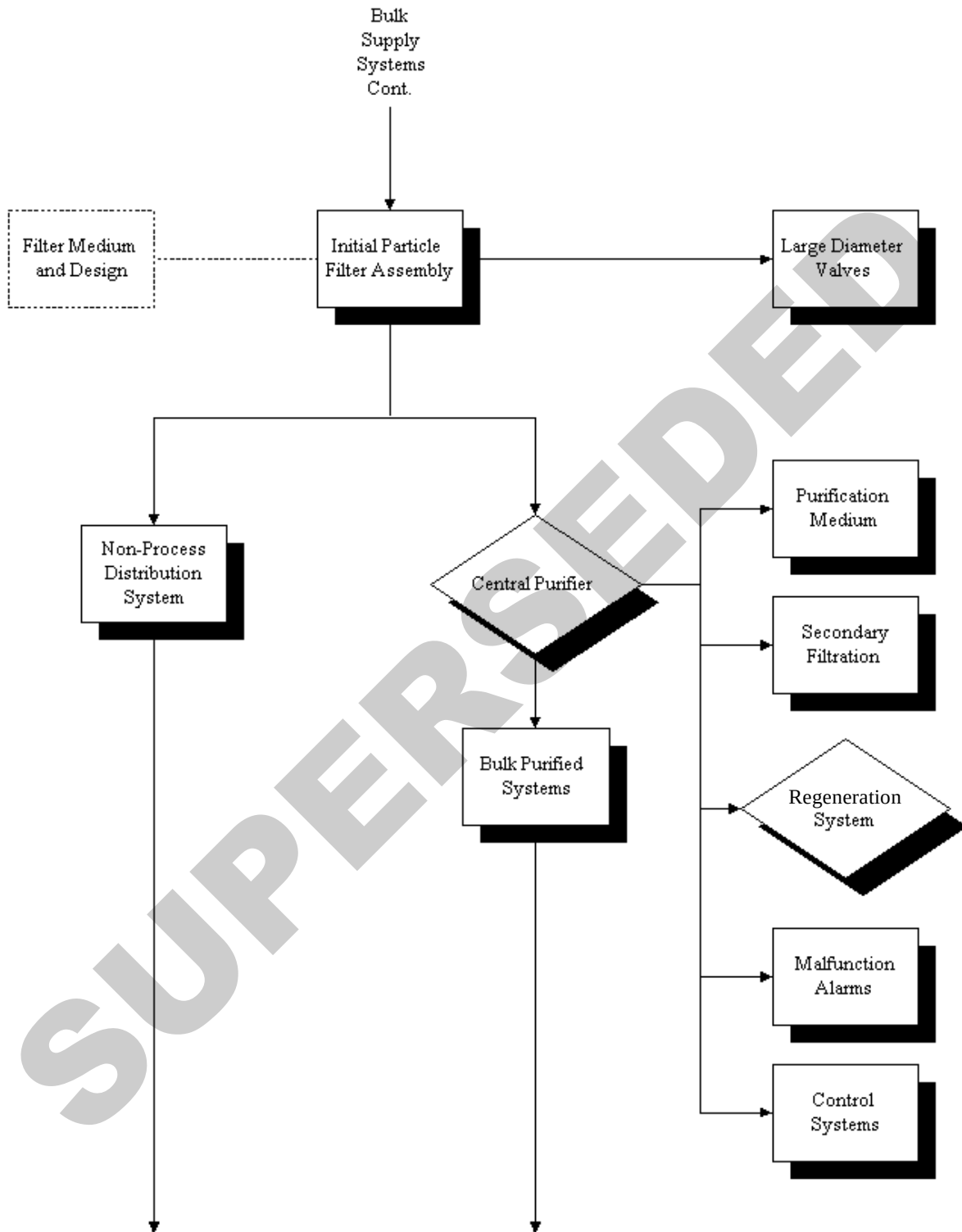


Figure 1
Bulk Gas (Cryogenic) Supply System Flow Chart (cont.)

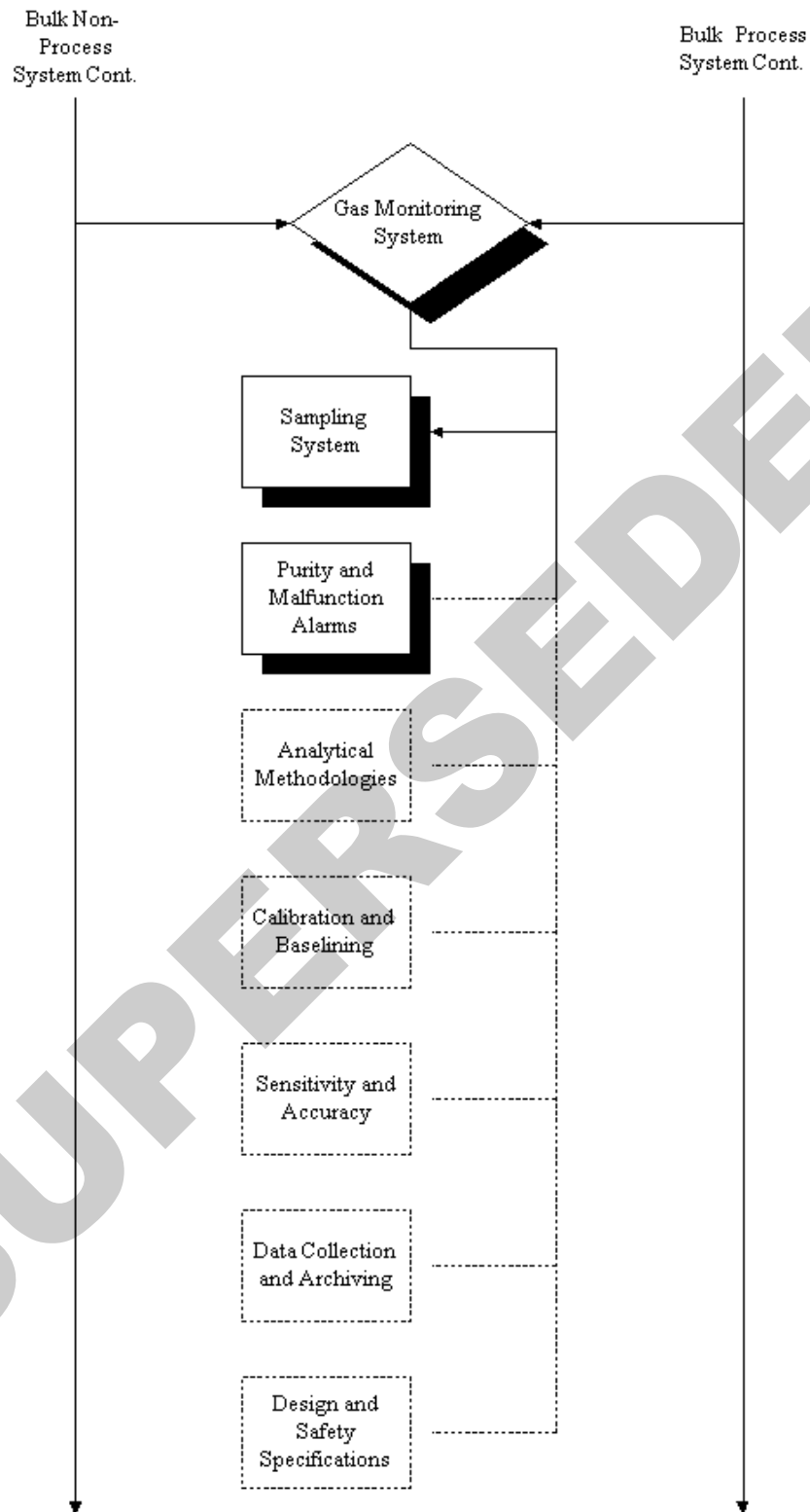


Figure 1
Bulk Gas (Cryogenic) Supply System Flow Chart (cont.)

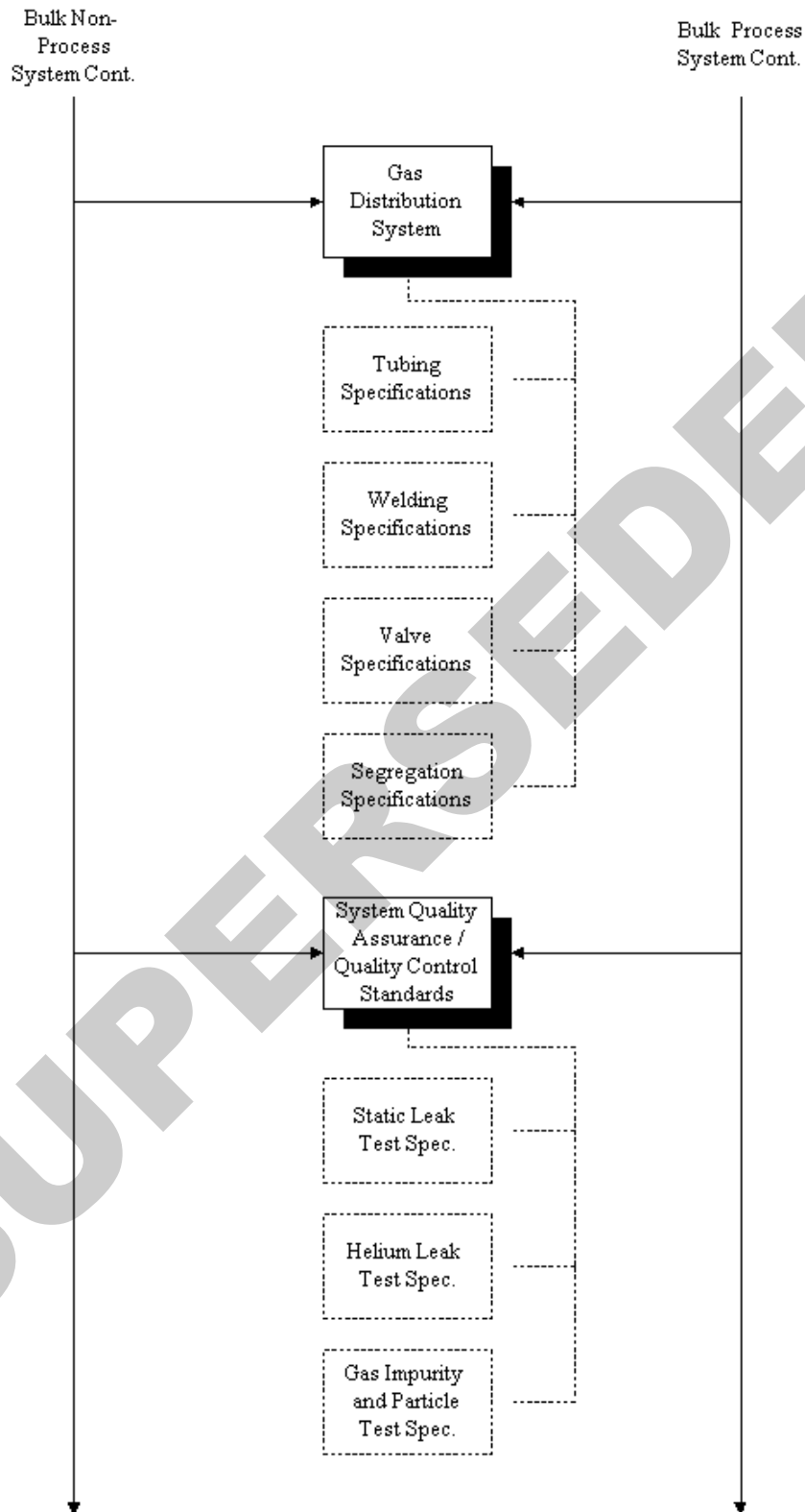


Figure 1
Bulk Gas (Cryogenic) Supply System Flow Chart (cont.)