



SEMI E51-0298

GUIDE FOR TYPICAL FACILITIES SERVICES AND TERMINATION MATRIX

1 Purpose

1.1 The objectives of this guide are to ensure a timely and cost-effective tool installation with minimum impact on the existing customer facilities, systems, and services and to insure that the quality of facilities supplied (e.g., water, gases, chemicals) is not compromised once internal to the tool.

1.2 This guide provides the equipment supplier with an understanding of the facilities available at the point of connection (POC) at the "typical" customer site. If these typical facility services are considered by tool manufacturers during their tool design, additional cost and lead times associated with customizing each tool installation can be minimized. The result would be reduced costs to build and install semiconductor equipment.

2 Scope

2.1 This document does not include site-specific conditions. When site specifications differ, the Typical Facilities Services and Termination Matrix (Table 1) describes typical semiconductor utility specifications. When site specifications differ, the user should create a Site-Specific Facilities Services and Termination Matrix Example (Table 2) that is submitted with the request for a quote. Each tool should be supplied in a "facility ready" state. This document represents the range of conditions in which equipment should be capable of operating.

3 Impact

3.1 This guide and the termination matrix (Table 1) should be included with other applicable tool purchase specifications. When the supplier receives these documents, a dialogue can be established to resolve any installation issues prior to customer purchase or tool installation. Any additional facility requirements not identified in the site-specific utility matrix should be determined at the time of quote submittal.

4 Referenced Documents

4.1 SEMI Standards

SEMI E6 — Facilities Interface Specifications Guideline and Format

SEMI E7 — Specification for Electrical Interfaces for the U.S. Only

SEMI E30 — Generic Model for Communications and Control of SEMI Equipment (GEM)

SEMI E33 — Specification for Semiconductor Manufacturing Facility Electromagnetic Compatibility

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

4.2 ANSI Standard¹

ANSI B16.5 — Steel Pipe Flanges, Flanged Valves and Fittings, as it refers to 150 lb. flanges

4.3 IEEE Standards²

IEEE Standard 446 — Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications (IEEE Orange Book)

IEEE Standard 1000 — Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (IEEE Emerald Book)

4.4 NFPA Document³

NFPA 70 — National Electrical Code

5 Terminology

5.1 Acronyms and Abbreviations

5.1.1 *amb* — ambient temperature conditions

5.1.2 *atm* — atmospheric conditions, 14.7 psi @ sea level

5.1.3 *CPVC* — chlorinated polyvinyl chloride

5.1.4 *Cu* — copper

¹ American National Standards Institute, 11 W. 42nd Street, 13th Floor, New York, NY 10036

² IEEE, 45 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331

³ National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101



- 5.1.5 *EP* — electropolished
- 5.1.6 *Galv.* — galvanized
- 5.1.7 *in Hg* — inches mercury
- 5.1.8 *in H₂O* — inches water column
- 5.1.9 *kPa* — kiloPascals
- 5.1.10 μ — micron
- 5.1.11 *NFPA* — National Fire Protection Association
- 5.1.12 *NPT* — National Pipe Thread (U.S. Standard)
- 5.1.12.1 *FNPT* — Female National Pipe Thread
- 5.1.12.2 *MNPT* — Male National Pipe Thread
- 5.1.13 *NW Flange* — ISO NW flange
- 5.1.14 *P&ID* — Process (flow) and Instrument Diagram
- 5.1.15 *P. Flange* — ANSI B16.5 pipe flange (for the purpose of this guide)
- 5.1.16 *PFA* — Perfluoralkoy, resin
- 5.1.17 *POC* — point of connection (POC is the point where the facility utility connects to the exterior of the tool.)
- 5.1.18 *POU* — point of use
- 5.1.19 *PP* — Polypropylene
- 5.1.20 *psia* — pounds per square inch, absolute
- 5.1.21 *psig* — pounds per square inch, gauge
- 5.1.22 *PVC* — Polyvinyl Chloride
- 5.1.23 *PVDF* — Polyvinylidene Fluoride
- 5.1.24 *Res.* — resistivity
- 5.1.25 *S.M. Flange* — sheet metal flange
- 5.1.26 *SS* — stainless steel
- 5.1.27 *Stub* — pipe or tube stub

6 Typical Facilities and Termination Matrix

6.1 *Introduction* — This section of the guide identifies typical utilities, materials, and parameters of a typical semiconductor facility. This includes a "Typical Facilities Services and Termination Matrix" (Table 1) identifying these utilities. The guideline outlines typical utilities and is not intended to be limited to these utilities.

The following is an explanation of the typical utility matrix:

6.1.1 *Utilities* — This is a list of process or process-related services typically found in semiconductor facilities. The list is divided into water services, gas services, chemical drain, bulk chemical distribution, exhaust and electrical services. Although 5°C (40°F) to 7°C (44°F) chilled water is not typically found in process areas, special applications may apply.

6.1.2 *Supply Temperature* — Temperature and ranges are measured in °C (°F). Equipment or tool cooling systems should be sized to accommodate these ranges.

6.1.3 *Supply/Return Pressure* — Pressure and ranges are measured in kPa (psig). Where possible, equipment should be designed to operate at lower pressure which reduces energy and safety risks. Regulators should be provided with the tool by the supplier.

6.1.4 *Filtration* — Filtration provides an indicator of particle size expectation at the supplier tool. The fabrication and quality of point of use (POU) filtration should be specified by the customer and supplied with the tool by the supplier.

6.1.5 *Specification* — The specification column is a condensed version of actual customer specifications. The column should be used by customers to specify service quality to the supplier's tool. Specified quality should not be compromised or lessened in any way internally by the supplier's tool. When the tool purchase specification is prepared, expanded, and detailed, quality requirements should be documented.

6.1.6 *POC Material* — Material that the facility typically uses for connections to tools. Additional material quality characteristics should be identified in the purchasing specification. Supplier's interior piping or tubing specification shall meet or exceed the facility POC material quality.

6.1.7 *POC Fitting* — Tool-compatible POC's are critical to ensure that a tool is "facility ready" once it arrives at a customer site. It is recommended that equipment be supplied with matching connections as requested by customer.

6.1.8 *Notes* — Write in special conditions or exceptions.

6.2 *Termination Matrix* — Due to age of construction and/or design, all semiconductor facilities are not the same. To interface with equipment or tool, three suggested POC locations have been determined (see Fig-



ure 1). The POC's are: the top, the bottom, or the back of the tool. POC location should be identified at time of purchase specification. Suppliers should design tools to allow for internal routing to all locations, to avoid customization for every installation.

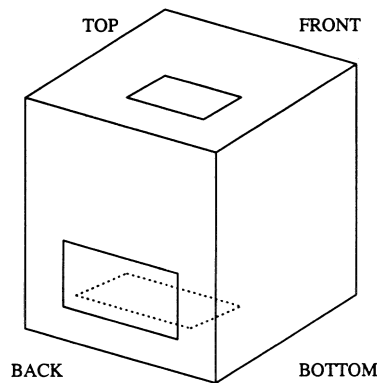


Figure 1
Three Points of Connection
Tool Interface Locations

7 General Considerations

7.1 In addition to typical utilities, other facility-related issues must be addressed prior to tool installation.

7.1.1 *Seismic* — Tool restraints should be provided, with instructions for installation, for customers in earthquake zones.

7.1.2 *Vibration* — Vibration sensitivity of tool should be supplied prior to purchase. See SEMI E6 for analysis methodology.

7.1.3 *Control and Signal Circuits* — Control and signal circuits that are routed external to the machine must comply with Article 725, Class 1, Class 2, and Class 5, Remote Control, Signaling and Power — Control Circuits of the National Electrical Code (NFPA 70).

Class 1 — No power limitation, 600 watts max.

Class 2 — Derived from certified Class 2 power supply.

Class 3 — Derived from certified Class 3 power supply.

8 Process and Instrument Diagrams, and Data Sheet Terms

Please see SEMI E6.

9 High Purity Install, Assembly Protocol

Please see SEMI E49.

10 Vendor POC Labeling

10.1 Each POC shall be labeled as to the service. Service labeling shall match descriptions listed in the Vendor Installation Manual. See SEMI E6 for Vendor Installation Manual format.

10.1.1 Mechanical

Service purpose

Maximum pressure or pressure range

Flow rate (if appropriate)

Example: Process Purge, Nitrogen, 80 psig Max.

10.1.2 Electrical

a. Power:

Service purpose

Voltage & phase

Current (Full load ampere continuous)

b. Example:

Cryo Pump No. 2

208 V, 1 phase

28.2 FLA

c. Control and Signaling:

Purpose

Class of control (see Section 7.3)

d. Example:

Cryo Pump No. 2 Control

Class 2



Table 1. Typical Facilities Services and Termination Matrix Example — United States

<i>Water Service</i>	<i>Supply Temp.</i>	<i>Supply Pressure (Return Pressure where noted)</i>	<i>Filtration (absolute)</i>	<i>Specification</i>	<i>POC Material</i>	<i>POC Fitting</i>	<i>Notes</i>
Non-Potable Water	4°C - amb (40°F - amb)	S = 258 - 552 kPa (40 - 80 psig)	N/A	non-human consumption	Cu/ PVC SCH 40/ PVC SCH 80	NPT	
Ultra Pure Water	20 - 24°C (68 - 76°F)	S = 310 - 379 kPa (45 - 55 psig)	< 0.1 µ	18+ M ohms RES	PVDF/PFA	stub/p. flange ≥ 5 cm (2 in.) stub/union < 5 cm (2 in.)	
Deionized Water	20 - 24°C (68 - 76°F)	S = 310 - 379 kPa (45 - 55 psig)	0.1 - 0.2 µ	17.5 M ohms RES	PVC SCH 80/ PVDF/PFA	stub/p. flange ≥ 5 cm (2 in.) stub/union < 5 cm (2 in.)	
Hot Ultra Pure Water	60 - 90°C (140 - 194°F)	S = 310 - 379 kPa (45 - 55 psig)	< 0.1 µ	site-specific	PVDF	stub/p. flange ≥ 5 cm (2 in.) stub/union < 5 cm (2 in.)	
Fire Protection	amb	NFPA 13	N/A	NFPA 13	N/A	Carbon Steel/ SS	
Process Cooling Water	10 - 16°C (50 - 60°F)	S = 310 - 552 kPa (45 - 80 psig) R = 0 - 207 kPa (0 - 30 psig)	1.0 - 40 µ	50 K ohms RES	PVC SCH 80/ Cu/SS	NPT	

<i>Gas Service</i>	<i>Supply Temp.</i>	<i>Supply Pressure</i>	<i>Filtration (absolute)</i>	<i>Specification</i>	<i>POC Material</i>	<i>POC Fitting</i>	<i>Notes</i>
Nitrogen, Ultra Pure	amb	586 - 655 kPa (85 - 95 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	
Nitrogen, Process	amb	552 - 621 kPa (80 - 90 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	
Nitrogen, Non-Process	amb	552 - 655 kPa (80 - 95 psig)	0.01 - 0.1 µ	-	Cu/SS	face seal	
Compressed Air	amb	655 - 758 kPa (95 - 110 psig)	0.1 - 5.0 µ	-73 to -40°C (-100 to -40°F) dew point	Cu/SS	compression	
Oxygen	amb	552 - 586 kPa (80 - 85 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	
Hydrogen, Bulk	amb	414 - 552 kPa (60 - 80 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	See Note 2
Argon	amb	448 - 586 kPa (65 - 85 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	
Helium	amb	448 - 586 kPa (65 - 85 psig)	0.01 - 0.1 µ	-	316L EP SS	face seal	