

SEMI E70-0698

GUIDE FOR TOOL ACCOMMODATION PROCESS

NOTE: This entire document was revised in 1998.

1 Purpose

1.1 This document will provide an overview of the various elements of Tool Accommodation, a methodology by which semiconductor processing equipment is installed in a cost-effective and timely manner. This addition to the SEMI Tool Accommodation Standards set describes the process by which the referenced SEMI documents can be effectively used to achieve tool installation cost and schedule goals.

2 Scope

2.1 This overview document will provide process development, facilities, manufacturing, and sales engineers (as well as purchasing agents and managers) with a basic understanding of the various elements in a Tool Accommodation methodology. This process emphasizes quality, completeness, timeliness, and cost-effectiveness as key elements of successfully installing semiconductor processing equipment into wafer fabrication facilities. By describing a generic process flow, this document identifies a road map for using published standards that comprehend all the procedures involved in tool accommodation from procurement through acceptance. As a common ground for communication and comparison, terms and definitions are also included.

3 Referenced Documents

NOTE: All documents cited will be the latest published versions.

3.1 SEMI Documents

SEMI E6 — Facilities Interface Specifications Guideline and Format

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

SEMI E49.1 — Guide for Tool Final Assembly, Packaging and Delivery

SEMI E49.2 — Guide for High Purity Deionized Water and Chemical Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E49.3 — Guide for Ultrahigh Purity Deionized Water and Chemical Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E49.4 — Guide for High Purity Solvent Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E49.5 — Guide for Ultrahigh Purity Solvent Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E49.6 — Guide for Subsystem Assembly and Testing Procedures - Stainless Steel Systems

SEMI E49.7 — Guide for Subsystem Assembly and Testing Procedures - Polymer Systems

SEMI E49.8 — Guide for High Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E49.9 — Guide for Ultrahigh Purity Gas Distribution Systems in Semiconductor Manufacturing Equipment

SEMI E51 — Guide for Typical Facilities Services and Termination Matrix

3.2 Other Document¹

Federal Standard 209E — Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones

4 Summary of Referenced Documents

4.1 *SEMI E6* — Facilities Interface Specifications Guideline and Format

4.1.1 Purpose of SEMI E6 is to communicate from supplier to user the facilities requirements of semiconductor equipment.

4.1.2 Benefits of SEMI E6 include assurance of effective communication of process tool installation requirements.

4.1.3 *Roles and Responsibilities for SEMI E6* — Tool supplier submits information requested in SEMI E6, facilities interface specification. Equipment engineer, facilities engineer, and installation manager use tool requirements information provided by supplier to prepare facility and efficiently install the tool.

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Table 1 SEMI Tool Accommodation Standards

Guideline for	Facility Services	Process Tool	Process Tool Subsystems (internal distribution system for)			
			General	Water & Chemical	Solvent	Gas
Facility Services Matrix defines utilities available for tool	SEMI E51					
Facilities Interface Specification defines tool requirements of facilities		SEMI E6				
Subsystem terms and references			SEMI E49			
High purity (HP) subsystem requirements				SEMI E49.2	SEMI E49.4	SEMI E49.8
Ultrahigh purity (UHP) subsystem requirements				SEMI E49.3	SEMI E49.5	SEMI E49.9
Subsystem assembly and testing				SEMI E49.7	SEMI E49.6	SEMI E49.6
Tool packaging and delivery		SEMI E49.1				

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

4.2.1 Purpose of SEMI E49 is to specify requirements for process distribution systems located inside of, and provided with, semiconductor processing tools. (SEMI E49 acts as a reference document for the series of SEMI E49 standards, SEMI E49.1 through SEMI E49.9. See Table 1, SEMI Tool Accommodation Standards for an explanation of the ten documents included in the SEMI E49 series.)

4.2.2 Benefits of the SEMI E49 series include assurance of compatibility in purity and performance between the tool and facility distribution systems.

4.2.3 *Roles and Responsibilities for SEMI E49 Series* — Facilities engineer and installation manager submit appropriate SEMI E49 requirements, either HP or UHP. Tool supplier uses information provided to ensure distribution system compatibility.

4.3 SEMI E51 — Guide for Typical Facilities Services and Termination Matrix

4.3.1 Purpose of SEMI E51 is to communicate from customer to supplier factory facilities available at the utility point of connection (UPOC) for a semiconductor tool.

4.3.2 Benefits of SEMI E51 include assurance of cost-effective and timely tool installation with minimum retrofit to customer site.

4.3.3 *Roles and Responsibilities for SEMI E51* — Facilities engineer and installation manager submit utility specifications requested in SEMI E51 matrixes, either typical or site-specific. Tool supplier uses

information provided about facility to assist in configuration of the process tool.

5 Terminology

5.1 *acceleration cost* — Additional costs incurred to complete the project sooner than the original scheduled baseline plan.

5.2 *as-built drawings* — Documentation describing the actual configuration and dimensions at the end of construction.

5.3 *base build* — Installation of base building, services, and equipment to establish functional environmental controls and utilities to support production equipment installation.

5.4 *bidding* — Obtaining sealed quotes for a defined scope of work.

5.5 *burdened/unburdened* — Identification of costs included or excluded from contractual labor rates.

5.6 *capital equipment* — Equipment that is depreciated according to tax guidelines for durable goods. Generally has a value greater than \$1,000.00 and a useful life greater than 5 years.

5.7 *change order* — A document defining a formal change in drawings, specifications, and/or scope of work.

5.8 *cleanroom* — Confined area in which the humidity, temperature, particulate matter, and contamination are precisely controlled within specified parameters. Cleanroom classes are defined in Federal Standard 209, Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones.

5.9 *conditioned power* — Electrical power that is manipulated to maintain specified tolerances.

5.10 *construction* — The set of activities that transforms plans and specifications into functional systems capable of performing to specification.

5.11 *construction consumable* — Any material used up during construction.

5.12 *construction management* — The set of activities that define, direct, monitor, and report construction activities such as workmanship, adherence to design, cost, and schedule conformance.

5.13 *contingency* — A reserve of funds, time, and/or material that is allocated to maintain schedule and budget. A reserve for scope changes, unforeseen site conditions, change in material prices, or unanticipated events.

5.14 *contract award* — Notification to the successful bidder and subsequent signing of contract documents.

5.15 *contractor* — A licensed company hired to accomplish a contractually specified scope of work.

5.16 *cost of ownership (COO)* — The total lifetime cost associated with acquisition, installation, and operation of fabrication equipment [SEMI E35].

5.17 *cycle time, gross installation* — Total time to install and commission process equipment, typically starting from dock date to release for vendor startup.

5.18 *cycle time, net installation* — Actual time devoted to construction activities related to tool hookup from dock date to ready for inspection.

5.19 *damage* — Destruction or unintentional alteration resulting in a liability.

5.20 *dedicated truck* — Exclusive drayage of a shipment.

5.21 *design build* — A contract method whereby the contractor assumes responsibility for design generation and construction to accomplish a specified performance criteria.

5.22 *design start* — A milestone event that designates the initial conversion of equipment specifications and design concepts into engineering plans and specifications.

5.23 *detailing* — Generation of dimensioned shop fabrication plans based on process and instrumentation drawings (P&ID), field surveys, and configuration verifications.

5.24 *direct/indirect cost* — Direct costs are the cost of anything physically associated with the installation, removal, or modification of equipment. Indirect costs cannot be associated with a specific piece of equipment. Profit, overhead, and administrative costs are typically considered indirect.

5.25 *distribution system* — The collection of subsystems and components used in a semiconductor manufacturing facility to control and deliver process chemicals from source to point of use for wafer manufacturing processes.

5.26 *dock date* — The date when the fab equipment, including all ancillary components, is on-site at the loading dock.

5.27 *emergency power* — Electrical power supplied by alternate sources or backup systems, like generators that come on line when the main utility power supply fails.

5.28 *equipment engineering* — A group that focuses primarily upon the electrical, electronic, and mechanical characteristics of production equipment. Depending upon the site and the fab area, Equipment Engineering may be a distinct organization, or the equipment engineering responsibilities may be handled by other groups, such as Process Engineering or Manufacturing Engineering. Equipment Engineering is typically responsible for selection and physical configuration of production equipment.

5.29 *facilities interface specification* — Documentation provided by a tool supplier that contains the tool requirements for utilities and installation as defined in SEMI E6. So-called equipment data sheets are one section of this document that also includes requirements for safety, facilities services, shipping and receiving, install, startup, acceptance, and training.

5.30 *fast track* — A scheduling method that eliminates float and maximizes parallel activities, thereby reducing overall project duration. Selective use of overtime is typically used to reduce the duration of critical path activities.

5.31 *field change order* — A document defining a formal change in drawings, specifications, and/or scope of work generated after contract award by on-site personnel to incorporate conditions identified during construction.

5.32 *field fabrication* — Assembly and/or modification of components on the job site to accommodate site-specific conditions.

5.33 *float* — Unallocated time created when tasks are completed ahead of schedule or a task's duration is less than the allotted amount.

5.34 *free on board (FOB)* — Goods placed on a truck or other means of transportation at a point specified by the seller without charge to the buyer, but with all further transportation at the buyer's expense.