



# SEMI E70-0298

## GUIDE FOR TOOL ACCOMMODATION OVERVIEW

### 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 method 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 roadmap 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 E10* — Standard for Definition and Measurement of Equipment Reliability, Availability, and Maintainability (RAM)

*SEMI E15* — Specification for Tool Load Port

*SEMI E35* — Cost of Ownership for Semiconductor Manufacturing Equipment Metrics

*SEMI E44* — Guide for Procurement and Acceptance of Minienvironments

*SEMI E45* — Test Method for the Determination of Inorganic Contamination from Minienvironments

*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

*SEMI F6* — Guide for Secondary Containment of Hazardous Gas Piping Systems

*SEMI S4* — Safety Guideline for the Segregation/Separation of Gas Cylinders Contained in Cabinets

#### 3.2 Other Document<sup>1</sup>

<sup>1</sup> Institute of Environmental Sciences & Technology, 940 East NW Highway, Mount Prospect, IL 60056, 847.255.1561



#### 4 Summary of Referenced Documents

4.1 *SEMI E6* — The purpose of SEMI E6 is to communicate from supplier to user the facilities requirements of semiconductor equipment.

4.1.1 The benefits of SEMI E6 include assurance of effective communication of process tool installation requirements.

4.1.2 The roles and responsibilities for SEMI E6: Tool supplier submits information requested in SEMI E6 equipment data sheets. Equipment engineer, facilities engineer, and installation manager use tool requirements information provided by supplier to prepare facility.

4.2 *SEMI E49* — The 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 E49.9. See Table 1 for an explanation of the ten documents included in the SEMI E49 series.)

**Table 1. SEMI Tool Accommodation Standards**

| Guideline for                         | Facility | Process Tool | Process Tool Subsystems<br>(distribution system for) |                     |         |       |
|---------------------------------------|----------|--------------|------------------------------------------------------|---------------------|---------|-------|
|                                       |          |              | General                                              | Water &<br>Chemical | Solvent | Gas   |
| Facility services available for tools | E51      |              |                                                      |                     |         |       |
| Tool requirements of facility         |          | E6           |                                                      |                     |         |       |
| Subsystem terms and references        |          |              | E49                                                  |                     |         |       |
| HP subsystem requirements             |          |              |                                                      | E49.2               | E49.4   | E49.8 |
| UHP subsystem requirements            |          |              |                                                      | E49.3               | E49.5   | E49.9 |
| Subsystem assembly and testing        |          |              |                                                      | E49.7               | E49.7   | E49.6 |
| Tool packaging and delivery           |          | E49.1        |                                                      |                     |         |       |

4.2.1 The benefits of the SEMI E49 series include assurance of compatibility in purity and performance between the tool and facility distribution systems.

4.2.2 The 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* — The purpose of SEMI E51 is to communicate from customer to supplier factory facilities available at the point of connection (POC) for a semiconductor tool.

4.3.1 The benefits of SEMI E51 include assurance of cost-effective and timely tool installation with minimum retrofit to customer site.

4.3.2 The 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 schedule baseline plan.

5.2 *arrival date* — The date when the fab equipment, including all ancillary components, is on-site at the loading dock and ready to move in. (See *dock date*.)

5.3 *as-built* — Drawings and documentation describing the actual configuration and dimensions at the end of construction.

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

5.5 *bidding* — Obtaining sealed quotes for a defined scope of work. Normally a 2-week process.

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

5.7 *capital equipment* — Equipment that is depreciated according to tax guidelines for durable goods. Generally has a value greater than \$1,000 and a useful life greater than 5 years.

5.8 *change order* — A document defining a formal change in drawings and specifications. Also called an engineering change order.

5.9 *change order, field* — Formal change in drawings and specifications, generated during construction by onsite personnel to incorporate conditions identified during construction.

5.10 *chemical 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.

5.11 *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 209E.

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

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

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

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

5.16 *contingency* — A reserve of funds, time, and/or material that is allocated to maintain schedule and budget. A reserve for unanticipated events.

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

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

5.19 *cycle time, gross installation* — Total time to install and commission process equipment. Typically starting from arrival date to release for vendor start-up.

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

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

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

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

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

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

5.26 *direct/indirect cost* — 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.

5.27 *dock date* — The actual arrival date of material or equipment at the jobsite of material or equipment.