SEMI E72-0600
SPECIFICATION AND GUIDE FOR 300 mm EQUIPMENT FOOTPRINT, HEIGHT, AND WEIGHT

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1 Purpose

1.1 Currently, device manufacturers cannot easily plan or retrofit their fabs, because equipment volumes are not predictable. Similarly, equipment suppliers cannot predict fab designs, because there are too many configurations. In general, fab space is not used efficiently, and there seems to be a trade-off between space efficiency and maintainability. This standard is a guide for equipment design and a specification for maximum limits on equipment volume and weight.

2 Scope

2.1 This standard specifies limits on the footprint, height, and weight of equipment for 300 mm fabs. Separate limits are given for the parts of the equipment in the main fab and in the sub-fab. Separate limits are also given for the equipment after it is installed and for the components of the equipment as it is moved into the fab. The actual footprint may vary by equipment type.

2.2 This standard is intended to set an appropriate level of specification that places minimal limits on supplier innovation while ensuring opportunities for users to be globally (though possibly not locally) efficient with equipment volumes.

2.3 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 limitations prior to use.

3 Referenced Standards

3.1 *SEMI Standards*

SEMI E15 — Specification for Tool Load Port

SEMI E15.1 — Specification for 300 mm Tool Load Port

NOTE 1: As listed or revised, all documents cited shall be the latest publications of adopted standards.

4 Terminology

4.1 *cost footprint* — the area (A) of the smallest horizontal rectangle that contains all of the shadow footprint and half of the easement space around the equipment (for use as the floor space metric in Cost of Ownership calculations). As shown in Figure 1, this is computed as

$$A = [Wt + ½ (Ws – Wt)] \times [Dt + ½ (Ds – Dt)]$$

$$= ¼ (Wt + Ws) \times (Dt + Ds)$$

Where W represents width and D represents depth

4.2 *depth* — the horizontal dimension perpendicular to the load face plane.

4.3 *easement space* — the floor space that must remain clear to the rear and sides of the equipment (but not in front of the load face plane). This includes safety aisles, ergonomic maintenance access space, component removal space, and room for doors to swing out (see Figure 1).

4.4 *load face plane* — the furthest physical vertical boundary plane from the cassette centroid or carrier centroid on the side (or sides) of the tool where loading of the tool is intended (as defined in SEMI E15).

4.5 *shadow footprint* — the area of the floor space directly under every part of the equipment during its operation (see Figure 1). This includes any temporary projections from the equipment during loading or processing (such as carriers that stick out from the equipment or equipment load ports that protrude only when the equipment is being loaded).

4.6 *width* — the horizontal dimension parallel to the load face plane.

5 Requirements and Recommendations

The dimensions cited in the following sections are specified in Table 1.

5.1 *Sub-Fab vs. Main Fab Footprint*

5.1.1 *Requirements* — Both the cost footprint and the shadow footprint of the remote parts of any equipment in the sub-fab must be less than or equal to the cost footprint and the shadow footprint (respectively) of the parts of that equipment in the main fab (the cleanroom including both bays and chases, if any). Furthermore, the remote parts of the equipment in the sub-fab must

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be capable of being installed so that the rectangle defining the cost footprint in the sub-fab is entirely underneath the rectangle defining the cost footprint in the main fab. In some fab designs (such as slab on grade), there is no sub-fab (or basement). In such cases, these requirements apply to the remote parts of the equipment in whichever equipment support area contains the same remote parts of the equipment as a sub-fab. Also, some fabs have multiple sub-fab levels. In such cases, these requirements apply to the remote parts of the equipment in all sub-fab levels.

5.1.2 *Recommendations* — Since the sub-fab is likely to have more columns than the main fab, it is recommended that the remote parts of the equipment in the sub-fab come in modules that can be arranged to accommodate a variety of layouts.

5.2 *Equipment Height*

5.2.1 *Requirements* — The maximum height of any equipment (other than a stocker) must be less than or equal to *H* in the main fab and *Hs* in the sub-fab. Any connections for utilities and required overhead maintenance access must also be included within these limits. These limits also apply during installation, so if a part of the equipment must be rotated up into place, the diagonal measurement must be less than these limits.

5.2.2 *Recommendations* — Thus, equipment suppliers are advised to not plan on ceilings higher than these limits.

5.3 *Floor Loading*

5.3.1 *Requirements* — The maximum mass of any equipment in the main fab divided by its shadow footprint must be less than or equal to *M* (except when support pedestals are used). Furthermore, the maximum weight on any 0.6 m by 0.6 m (2 ft. by 2 ft.) floor tile (in any installation configuration) must be less than or equal to *Mt*. These limits also apply when the equipment is being moved into the fab and installed, unless spreader plates are used.

5.3.2 *Recommendations* — It is recommended that seismic loading also be considered when designing equipment weight distribution.

5.4 *Move-In-Size*

5.4.1 *Requirements* — To clarify the size of the doors and hallways needed in the fab, this paragraph specifies the size of the equipment's components after it has been uncrated, while it is being moved into the fab, and before it is installed. All parts of the equipment destined for the main fab must come in packages that are no taller than *Z* and that are smaller than *X* by *Y* in two orthogonal horizontal dimensions. All parts of the equipment destined for the sub-fab must come in packages that are no taller than *Zs* and that are smaller than *Xs* by *Ys* in two orthogonal horizontal dimensions. Furthermore, none of these packages may weigh more than *Mm* each. This paragraph does not apply to stockers and AMHS transport equipment.

5.4.2 *Recommendations* — Equipment suppliers and device manufacturers might also consider carrier stocker size, move-in timing, and move-in path during stocker and facility design. Equipment that conforms to these limits may still be too large to fit into standard truck trailers or aircraft cargo bays.

5.5 *Maintenance Access*

5.5.1 *Requirements* — To avoid interfering with carrier transport systems, equipment must not require regularly scheduled maintenance from the front. This requirement does not apply to maintenance performed on user interfaces, cart-docking interfaces, load ports, carrier buffers, and load locks.

5.5.2 *Recommendations* — It is recommended that as little regularly scheduled maintenance as possible be required from the side.

5.6 *Width vs. Depth*

5.6.1 *Recommendations* — In general, to minimize the number of bays required in a fab, it is recommended that equipment be designed to minimize width rather than depth.

5.7 *Linked Equipment*

5.7.1 *Recommendations* — To make linked equipment (such as cluster tools or steppers with litho tracks) jointly space efficient, it is recommended that they be designed to minimize the cost footprint of the entire system as a whole.

6 Related Documents

6.1 *SEMI Standards*

SEMI E6 — Facilities Interface Specifications Guideline and Format

SEMI E26.1 — Radial Cluster Tool Footprint 300 mm Standard

SEMI E35 — Cost of Ownership for Semiconductor Manufacturing Equipment Metrics

SEMI E76 — Guide for 300 mm Process Equipment Points of Connection to Facility Services

SEMI S2 — Safety Guidelines for Semiconductor Manufacturing Equipment

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