

**SEFA 10 - 2013**

Adaptable Laboratory Furniture Systems  
Recommended Practices

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*Special thanks to  
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## Foreword

### SEFA Profile

The Scientific Equipment and Furniture Association (SEFA) is an international trade association comprised of manufacturers of laboratory furniture, casework, fume hoods and other related products, along with members of the design and installation professions. The Association was founded to promote this rapidly expanding industry and improve the quality, safety and timely completion of laboratory facilities in accordance with customer requirements.

### SEFA Recommended Practices

SEFA and its committees are active in the development and promotion of Recommended Practices having domestic and international applications. Recommended Practices are developed by the association taking into account the work of other standard writing organizations. Liaison is also maintained with government agencies in the development of their specifications.

SEFA's Recommended Practices are developed in and for the public interest. These practices are designed to promote a better understanding between designers, architects, manufacturers, purchasers, and end-users and to assist the purchaser in selecting and specifying the proper product to meet the user's particular needs. SEFA's Recommended Practices are periodically updated. The Recommended Practices are numbered to include an annual suffix which reflects the year that they were updated. SEFA encourages architects to specify these Recommended Practices as follows: "SEFA 10-2013".

### SEFA Glossary of Terms

SEFA has developed a Glossary of Terms (SEFA 4-2010) for the purpose of promoting a greater understanding between designers, architects, manufacturers, purchasers and end users. The terms defined by SEFA are frequently used in contracts and other documents, which attempt to define the products to be furnished or the work involved. The Association has approved this Glossary in an effort to provide uniformity among those who use these terms. Where a specific Recommended Practice contains definitions which differ from those in the Glossary of Terms, then the definitions in the specific Recommended Practice should be used.

SEFA encourages all interested parties to submit additional terms or to suggest any changes to those terms already defined by the Association. The definitions should be used to help resolve any disputes that may arise or to incorporate the applicable terms in any contract or related documents.

### SEFA Disclaimer

SEFA uses its best effort to promulgate Recommended Practices for the benefit of the public in light of available information and accepted industry practices. SEFA does not guarantee or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with SEFA Recommended Practices or that any tests conducted under its Recommended Practices will be non-hazardous or free from risk.

## 1.0 Scope

SEFA 10 is intended to provide designers, architects, purchasers, end users, and manufacturers workable tools for evaluating various types of adaptable laboratory furniture systems. This Recommended Practice provides descriptions of various adaptable laboratory furniture systems and evaluates important features of each system. Adaptability, strength, and functionality are rated for each adaptable system described, along with how each system integrates with laboratory services and utilities.

This document is inclusive of glossary/definitions, illustrations, descriptions, classifications and testing protocols. There is no material bias in this document.

## 2.0 Purpose

The purpose of this document is to describe the distinguishing characteristics of adaptable laboratory furniture systems. Each class designation identifies the key attributes for purposes of evaluating the suitability for the intended use. These classes apply to products specifically designed and manufactured for installation and use in a laboratory. All materials shall be laboratory grade and of appropriate quality and type for the purpose intended. Construction shall conform to the best practices of the scientific/laboratory furniture industry. Product finish shall be resistant to chemical spills and splashes common to a typical laboratory operation. Structural strength shall be adequate to support heavy laboratory apparatus, storage containers and heavy instruments. Products should interface with the appropriate lab services (plumbing, electrical, communication).

This document provides a common language to describe the various classes of furniture along with an overview of the generic attributes as a way to evaluate and specify a product class that is appropriate for the intended use and specific needs of an application.

## 3.0 Definitions

### 3.1 Adaptable Laboratory Furniture Systems Defined

Adaptable Laboratory Furniture systems are defined as modular furniture assemblies consisting of individual components including support structures, cabinets and storage units, worksurfaces, shelving, and accessories. This Recommended Practice includes classifications for different types of these systems based on a rating scale beginning with the least adaptable laboratory furniture system to the most adaptable system.

### 3.2 Characteristics of Adaptable Laboratory Furniture Systems

Adaptable Laboratory Furniture Systems are designed from modular components to create laboratory furniture assemblies that accommodate reconfiguration and/or relocation. These systems consist of pre-engineered components that are reusable. Adaptable Laboratory Furniture systems typically allow for some degree of component adjustability that may include shelving, cabinetry, worksurfaces, and utilities. Some systems require attachment to the building structure, and some are freestanding or mobile.

### 3.3 Vibration

Floor mounted and adaptable laboratory furniture systems have differing attributes regarding vibration isolation based on several factors. These include the vibration stability of the building structure, how the furniture is attached to the structure, how the system transfers vibration from one component to another, and how independent units are able to isolate vibration. The laboratory designer needs to take all factors into account to properly address the vibration isolation needs of the equipment being used in the laboratory. Manufacturers of different systems can recommend approaches to vibration isolation based on the individual requirements of the lab.

### 3.4 Mobile Cabinet

A mobile cabinet is generally defined as a free standing base cabinet storage device mounted on casters or glides. This style of casework is designed to be easily relocated by the lab user. Several factors need to be considered when specifying mobile casework. These include the load capacity,

the stability of the units in both the unloaded and loaded condition, and how the units integrate with the laboratory furniture system. Common options designed to improve stability include lockable casters, counter weighting, anti-tip devices, and the use of interlocking drawer restriction hardware on multiple drawer units. Maximum 3/4 extension drawer slide is recommended for the top drawer. The laboratory designer needs to take all factors into account to properly design the mobile units for the specific application. Manufacturers of mobile cabinets can recommend approaches based on the individual requirements of the lab.

### 3.5 Glossary of terms

**Access Panel:** Removable panel for access to utility chase.

**Adaptable Casework:** Modular base and wall cabinets, display fixtures and storage shelves. The generic term for both “boxes” and special desks, benching systems instrumentation and equipment support tables and transporters.

**Adaptable Laboratory Furniture:** A generic term for modular base and wall cabinets, display fixtures, storage shelves, benching systems, instrumentation and equipment support tables and transporters, and other structural components that create bench assemblies that allow for reconfiguration and/or adjustability.

**Adaptable Systems:** A group of interacting structural supports, casework and utility services that are independent elements forming or regarded as forming a collective entity.

**Adjustable:** The ability to adjust casework components such as cabinets, shelving, worksurfaces, table frames, legs or accessories in the vertical and/or horizontal direction.

**C-Frame:** A supporting floor-based leg assembly designed in a c-shape to support a surface. Upper and lower horizontal tubes are designed to support suspended base and wall cabinets. Optional slotted vertical supports are designed to support shelving.

**Cabinets (Base):** A base cabinet is a storage device consisting of two ends, a back, and a face.

The face may be open, to access the storage area, or may be outfitted with one or more drawers and/or door(s). The base cabinet may or may not have a top. A base cabinet is always mounted and/or set on the floor and supports a surface.

**Cabinets (Mobile):** A base cabinet storage device consisting of four casters with different configurations of door and drawers. A mobile cabinet can consist of an interlocking drawer device, gang locking mechanism, anti-tip devices and counter weight for safety applications.

**Cabinets (Suspended):** A base cabinet storage device consisting of different configurations of doors and drawers. The base cabinet is suspended from a table frame or rail system by means of a mechanical device. The base cabinet is designed to be repositioned or removed.

**Cabinets (Tall):** A tall cabinet is a storage device that consists of two ends, a back and a face. The face may be open to access the storage area or may be outfitted with one or more drawers and/or door(s). A tall cabinet is always mounted on the floor and is nominally 84”.

**Cabinets (Wall):** A wall cabinet is a storage device consisting of two ends, a back, and a face. The face may be open to access the storage area or may be outfitted with one or more drawers and/or door(s). A wall case is typically mounted to a wall or attached to a support structure.

**Cantilevered:** A bracket or frame supporting a surface tied to a support structure.

**Carts:** See instrument carts

**Core:** The structural element of a Class 4 core based casework system. The core typically supports casework elements such as table frames, worksurfaces, suspended cabinetry, shelving and accessories. It is typically fixed in place and is designed to house plumbing, electrical, and data piping and wiring. Also see “Module”.

**Chase (Plumbing Area):** Space located behind the back of the base cabinet used to house plumbing, electrical lines, or data lines.

**Corner Post:** Two-way or three-way structural

connectors designed to accommodate 90 degree intersections of cores, frames, or panels.

**Deflection:** The movement of a structure or structural part as a result of stress or weight loads.

**Docking Station:** A support structure designed for centralized distribution of utilities. Designed to be used in conjunction with table, carts and transporters.

**Drain Line:** The pipe or tubing used to connect the sink tail piece or trap to the building waste line.

**Equipment Rack:** A movable or mobile racking system that accommodates laboratory equipment or instrumentation. Shelving enables vertical stacking of equipment.

**Face Inserts:** A removable panel or insert which can be removed for access to a utility chase or service area.

**Filler Panel:** A panel used to close an open space between a unit and a wall or between two units.

**Floor Mounted:** Traditional casework construction where the cabinet is supported and attached to the floors and walls of the building.

**Freestanding:** Requiring no support or fastening to other structures.

**Interchangeable:** Casework system components that can be utilized in like sized system elements.

**Instrument Cart:** A mobile structure designed to support and transport instrumentation and laboratory equipment. Components can be independent and reconfigurable.

**Island Core:** A vertical support utility chase designed to support cantilevered worksurfaces, storage units and service outlets and fittings. Island units are free-standing and not tied to the building structure other than the floor.

**Manifold:** A fitting or pipe with many outlets or connections relatively close together.

**Mobile Casework:** see Cabinets (Mobile)

**Module:** see Core —The structural element of a Class 4 core based casework system. The core typically supports casework elements such as table frames, worksurfaces, suspended cabinetry, shelving and accessories. It is typically fixed in place and is designed to house plumbing, electrical, and data piping and wiring.

**Modular:** Casework and casework system designs that use a standard set of dimensions for the key elements of the system.

**Movable Casework:** see Cabinets (Mobile)

**Overhead Service Carrier (Horizontal and Vertical):** Overhead service carriers are designed to deliver ceiling fed utilities in pre-determined, repeatable, patterns incorporating valves, connections, outlets, and other distribution systems.

**P-Frame:** A system consisting of an enclosed utility chase supported by p-shaped support legs. The p-shaped support legs are either fixed in height or height adjustable through a telescoping inner leg member. The modular utility chase houses service lines and provides support for table frames and storage components.

**Panel Assembly:** Panel assemblies provide support structures where no plumbed services are required. Structural support extends both above and below the work surface height.

**Panel-supported:** Individually connected panels and work surface, filing, storage, and shelving components and accessories that receive their primary support from the panels and that, when combined, form complete workstations.

**Peninsula Core:** A vertical support utility chase designed to support cantilevered worksurfaces, storage units and service outlets and fittings. Peninsula units are free-standing and can be tied to the building structure. Peninsula units run perpendicular to the perimeter casework and utility chase of the lab module.

**Pipe Support:** A rack of framework located in the service tunnel to support the service lines.

**Power Pole:** Power poles are used between corner posts, panel connections, tables and the ceiling to conceal and route electrical, data and communication wiring.

**Quick Connect:** Devices used in place of the serrated tip where quick connect requirements are needed for water, air, and non-corrosive gases. Typically associated with utility docking stations and overhead service carriers.

**Reagent Cap/Ledge:** A surface that is provided down the middle of center tables, island or peninsulas to provide a means to support mechanical and electrical services and service fittings as needed.

**Relocatable:** A casework system or component that can be moved without modification.

**Seismic Kit:** A brace kit designed to be tied to a structural support and the building structure to meet seismic requirements occurring in earthquake zones.

**Service:** The supplying of utilities or commodities such as water, air, gas, vacuum, and steam as required in hospital or laboratory functions. This can also refer to power or data.

**Service Bridge:** An elevated horizontal utility bridge that provides access to service fixtures and an obstruction free work area. Service bridge houses electrical, data, media, lighting and chase for localized exhaust.

**Service Delivery Modules:** Any number of utility delivery modules that house electrical, plumbing, communication service fitting i.e. overhead service carriers, service pedestal, docking stations, etc.

**Service Line:** Pipe or tubing used to convey the service, gas or liquid, from the building service line to the service fitting on the laboratory furniture or equipment.

**Service Pedestal:** Service pedestals include electrical outlet boxes, service fittings, and other utility outlets that are mounted to a surface or reagent ledge.

**Service Tunnel or Service Chase:** Area in back of or between the backs of base cabinets and under

the working surface provided to allow room for several lines.

**Service Turret:** An enclosure that projects above the table top to provide room for the service line to be brought up through the table top or be connected to the service fittings that are mounted on the outside surface of the enclosure.

**Service Umbilical:** A fully enclosed chase containing service lines extending from the ceiling area above the laboratory bench into the service tunnel of the same laboratory bench.

**Shelving:** A flat surface fastened horizontally to a cabinet interior or a wall used to hold objects.

**Shelving (Cantilevered):** A flat surface fastened to a vertical support that is slotted to accept brackets that enable the shelf to be repositioned vertically.

**Strength:** Known also as “modulus of rupture” or “flexural strength” and is the ultimate or breaking strength. Generally measured by supporting a strip of material across two supports and applying a load between these supports. By computation the strength values can be used to determine the load-carrying ability of the product and may be used to compare strengths of different products.

**Support Structures:** Vertical and horizontal structural supports that support storage components, utility delivery systems and work surfaces.

**Suspended:** Typically referring to casework and laboratory furniture accessories suspended from a frame and/or rail system.

**Tables:** An article of furniture having a flat, horizontal surface supported by one or more support members (legs), and a frame (apron).

**Tables (Movable):** An article of furniture having a flat, horizontal surface supported by one or more support members (legs), and a frame (apron). Leg members are equipped with a leveling and/or support device that does not require the table to be permanently fixed to the building structure.

**Tables (Mobile):** An article of furniture having a flat, horizontal surface supported by one or more



support members (legs), and a frame (apron). Leg members are equipped with a caster device that enables the support structure to be freely transported throughout the building structure.

**Table Frame:** Support structure supporting a worksurface. A table frame can be a free-standing unit or cantilevered from a vertical support. Table frames may also support casework and accessory components.

**Transporters:** Any number of cart or table delivery modules that transport and store laboratory equipment and instrumentation, i.e. instrument carts, mobile tables, and mobile cabinets, etc.

**Utilities:** Plumbing, electrical, and/or data devices and their associated piping, wiring, conduit, etc.

### 3.6 Codes and Standards (Related to)

**SEFA 3** – Recommended Practices for Work Tops

**SEFA 4** – Glossary of Terms

**SEFA 8** – Recommended Practices for Casework

**UL 61010A-1** – Electrical Equipment  
for Laboratory Use

**UL 962** – Household and Commercial Furnishings

## 4.0 Classifying Adaptable Furniture Systems

The adaptable systems described in this Recommended Practice have been classified based on a rating scale beginning with the least adaptable laboratory furniture system to the most adaptable system. An adaptability chart (see Appendix A) was created to define the common tasks associated with laboratory furniture adaptability, and assigns each system a numerical scoring range based on how that particular task can be accommodated by the particular adaptable system. The total point range for a particular system determines its position in the classification, from lowest (least adaptable) to highest.

### 4.1 Description of Classes

#### **Class 1 – FIXED FLOOR MOUNTED AND WALL SUPPORTED**

Floor mounted casework utilizes traditional base cabinet construction which is supported and

attached to the floors and walls of the building. The cabinetry can be either built-in or modular. Worksurfaces are mounted to the top of the base cabinets in continuous lengths.

#### **Class 2 – WALL RAIL SUPPORTED**

Wall rail casework systems use a wall mounted fixed horizontal and/or vertical support rail from which the cabinetry is hung. The rail can be positioned to support under counter base units, above counter wall cases, shelving, or other ancillary items. The worksurface is typically mounted to the under counter base units, although independently supported worksurfaces can be utilized. Some systems allow for hanging the casework and worksurface at varying heights.

#### **Class 3 – SELF SUPPORTING FRAME**

Self Supporting Frame casework systems utilize a floor supported cantilevered support frame (C-Frame). Some systems are fully cantilevered; some utilize a front leg for added strength and stability. The frame can be worksurface height or also include above counter framing. Base cabinets, upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Typically, the frame utilizes a support leg structure connected by horizontally run support members. The frame can be constructed to provide a chase for horizontally run services beneath the worksurface and behind the base cabinets. Typically, the worksurfaces are supported independently of the cabinets, allowing for cabinet relocation horizontally within the structure. Some systems are designed with height adjustable support legs. Self supporting frame systems can also be used in conjunction with mobile or floor mounted casework.

#### **Class 4 – CORE BASED**

Core based casework systems utilize a floor mounted support module (core) from which table frames, upper cabinets, shelving, service utility distribution, and ancillary items are suspended. The core module is typically anchored to the floor and/or adjacent walls or structural members, to provide a self-supporting structure for all system components. Core modules can be worksurface height or also include an above counter structure. The core modules provide a chase for horizontally and vertically run services. The core modules can

be provided with enclosure panels or be open. Base cabinets can be floor mounted or mobile in front of the support module, or suspended from table frames supported by the core module. Typically, individual core modules are provided in varying lengths and are combined to create full length assemblies. Table frames with work surfaces and shelving are suspended from the core modules. Typically the Core module incorporates adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items.

#### **Class 5 – PANEL BASED**

Panel based systems are similar to Core based systems except they utilize a narrow support module, typically 6" or less. This narrow panel design limits the available space for service utility distribution. These panel assemblies are sometimes used as wall partitions, and can include features such as glass inserts, doors, and other features associated with internal wall partitions. These systems can require attachment to overhead structures in addition to floor and/or wall anchoring.

#### **Class 6 – TABLE BASED**

Table based systems use independent floor mounted self-supporting tables as the key component. They are used in conjunction with separate wall mounted or structural upper storage systems. The tables can be adjustable in height, and can be designed to support suspended base cabinets, and/or floor mounted or mobile base units. For this class, these tables do not have above worksurface structures integrated into the table. Utilities, sinks, and other fixed elements are typically separate from the tables, allowing the tables to be easily relocated.

#### **Class 7 – FREE STANDING WORKSTATION**

Free Standing Workstations are table based systems utilizing floor mounted tables as the key component. The workstation can be worksurface height or incorporate above counter structure. The workstations can incorporate either adjustable height or fixed height worksurfaces. Base cabinets can be mobile, floor mounted, or suspended. Upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Free Standing Workstations with above counter structures can be preplumbed and prewired, and used in conjunction with ceiling mounted

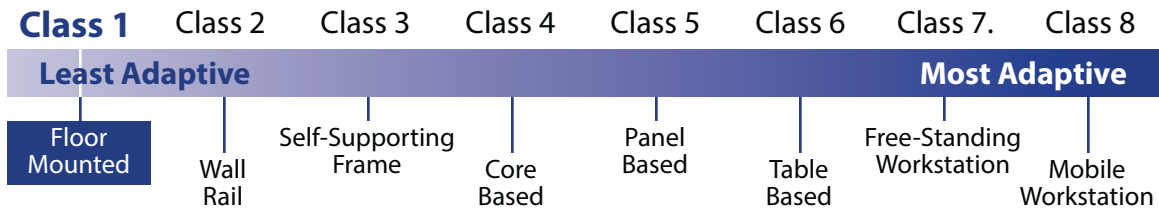
service utility distribution systems. Typically, Free Standing Workstations incorporate adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items. Free Standing Workstations are not anchored to the building, allowing for simple relocation.

#### **Class 8 – MOBILE WORKSTATION**

Mobile Workstations are similar to Free Standing Workstations, but are typically mounted on casters to accommodate simple relocation. The workstation can be worksurface height or incorporate above counter structure. The workstation can incorporate either adjustable height or fixed height worksurfaces. Base cabinets can be mobile, floor mounted, or suspended. Upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Mobile Workstations with above counter structures can be preplumbed and prewired, and used in conjunction with ceiling mounted service utility distribution systems. Typically, Mobile Workstations incorporate adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items.

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## 5.1 CLASS 1 – FIXED – FLOOR MOUNTED & WALL SUPPORTED CASEWORK



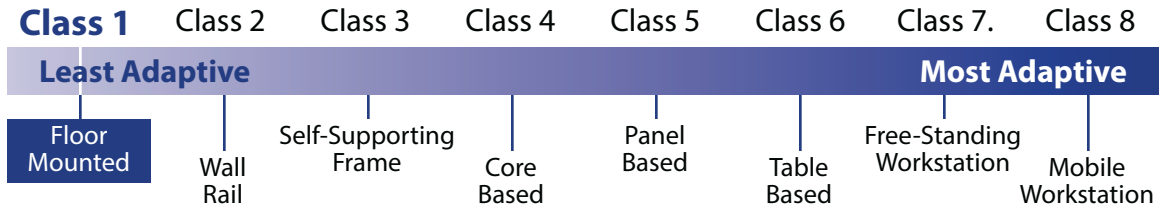
### Class 1 – FIXED CASEWORK

Fixed or floor mounted casework utilizes traditional base cabinet construction supported and attached to the floors and walls of the building. The cabinetry can be either modular or custom built. Worksurfaces are mounted to the top of the base cabinets in continuous lengths.

### Adaptability Features:

- Cabinets and worksurfaces are not adjustable or easily reconfigurable. If the cabinetry is modular, casework can be uninstalled then reinstalled in a new configuration or location. New components may be required for relocation.
- Wall cases or shelving and can be fixed or adjustable depending on design.
- Utilities are typically mounted directly to the worksurfaces or casework. Horizontal pipe chase areas are created by offsetting the cabinets from the wall and running utilities within the space.

## 5.1 CLASS 1 – FIXED – FLOOR MOUNTED & WALL SUPPORTED CASEWORK



### Functionality Features:

- Fixed casework can be designed to provide a high degree of cleanability. Cabinets can be caulked or sealed to the wall, base molding can be sealed to the floor, and other cracks and crevices can be sealed or minimized. Continuous worksurfaces and sealable joints are excellent for wet lab applications.
- Fixed casework provides the highest storage volume rating, with little unusable space.
- Strength, stability and vibration control rate high when fixed casework is properly anchored to the building structure.
- In lieu of a test bench, see SEFA 8 for laboratory grade performance criteria

### Class 1 – ADAPTABILITY RATING CHART \*

Action	Class 1
Relocate a Cabinet	1 – 2
Relocate a Bench	1 – 2
Adjust a Worksurface	0 – 0
Add a Shelf	2 – 4
Adjust a Shelf	2 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>7 – 13</b>

### Class 1 – FUNCTIONALITY RATING CHART \*\*

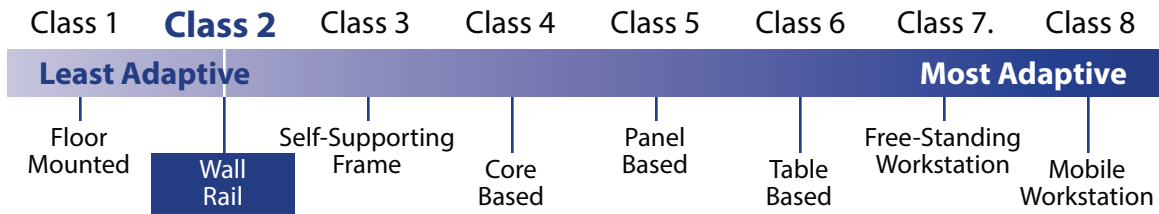
Action	Class 1
Cleanability	3 – 4
Storage Volume	4 – 4
Strength – Overall	4 – 4
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>12 – 17</b>

\* See Appendix A

\*\* See Appendix B

## 5.2

## CLASS 2 – WALL RAIL SUPPORTED



### Class 2 – WALL RAIL SUPPORTED

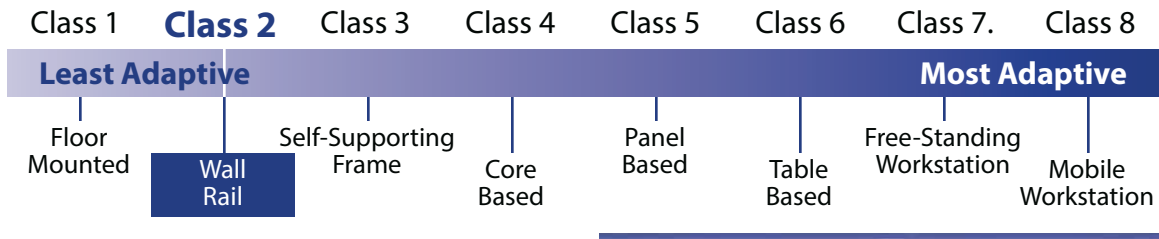
Wall rail casework systems use a wall mounted fixed horizontal and/or vertical support rail from which the cabinetry is hung. The rail can be positioned to support under counter base units, above counter wall cases, shelving, or other ancillary items. The worksurface is typically mounted to the under counter base units, although independently supported worksurfaces can be utilized. Some systems allow for hanging the casework and worksurface at varying heights.

### Adaptability Features:

- Wall rail supported systems typically allow for some degree of base cabinet relocation along the length of the rail system. The structural requirements of the worksurface may limit this feature, as the worksurface commonly uses the base cabinets for support.
- Bench relocation is possible by dismantling the rail system from the wall and reassembling in another area. New components are not necessarily required.
- Worksurface height adjustments can be accomplished within a limited range with some designs.
- Wall cases or shelving can be fixed or adjustable depending on design.
- Utilities are typically mounted directly to the worksurfaces or casework. Wall rail supported systems may require horizontal utility runs to be placed within the wall.

## 5.2

## CLASS 2 – WALL RAIL SUPPORTED



### Functionality Features:

- Wall rail supported systems, like many adaptable systems that utilize suspended casework, create areas behind and between cabinet and structural elements that can be difficult to access and clean. Worksurfaces can be sealed in continuous lengths, but this can limit casework adjustability.
- Storage volume is good, but restricted to base cabinet size restrictions common to all suspended casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system and the anchorage to the wall.

### Class 2 – ADAPTABILITY RATING CHART \*

Action	Class 2
Relocate a Cabinet	3 – 3
Relocate a Bench	1 – 3
Adjust a Worksurface	3 – 4
Add a Shelf	2 – 4
Adjust a Shelf	3 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>13 – 19</b>

### Class 2 – FUNCTIONALITY RATING CHART \*\*

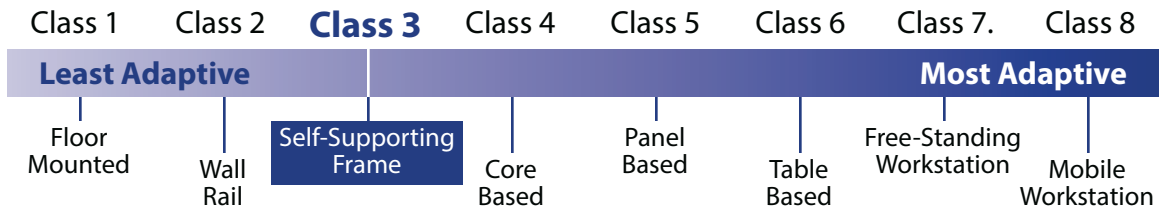
Action	Class 2
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 3
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>5 – 14</b>

\* See Appendix A

\*\* See Appendix B

### 5.3

### CLASS 3 – SELF-SUPPORTING FRAME



#### Class 3 – SELF-SUPPORTING FRAME

Self Supporting Frame casework systems utilize a floor supported cantilevered support frame (C-Frame). Some systems are fully cantilevered; some utilize a front leg for added strength and stability. The frame can be worksurface height or also include above counter framing. Base cabinets, upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Typically, the frame utilizes a support leg structure connected by horizontally run support members. The frame can be constructed to provide a chase for horizontally run services beneath the worksurface and behind the base cabinets. Typically, the worksurfaces are supported independently of the cabinets, allowing for cabinet relocation horizontally within the structure. Some systems are designed with height adjustable support legs. Self supporting frame systems can also be used in conjunction with mobile or floor mounted casework.

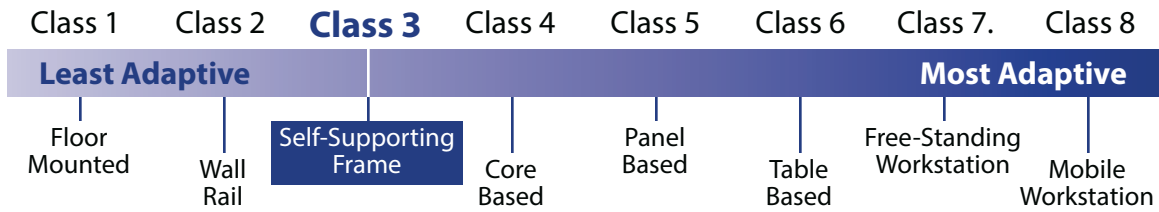
#### Adaptability Features:

- Self supporting frame systems typically allow for fairly simple cabinet relocation along the horizontal frame.
- Bench relocation is only possible by dismantling or disconnecting the frame system from the wall and/or floor and reassembling in another area. New components are not necessarily required.
- Worksurface height adjustment is not possible with most self supporting frame designs. The systems that offer worksurface height adjustment typically use a telescoping frame design for the vertical members. Height adjustment requires removal of the suspended casework and worksurfaces, adjusting the vertical members, then reattaching the suspended units and worksurfaces.
- Wall cases or shelving can be wall mounted, or mounted to above worksurface framework that is part of the self supporting frame structure. Shelf adjustability depends on the system design.
- Utilities are typically mounted directly to the worksurface, with horizontal utility lines attached to the system framework.



### 5.3

### CLASS 3 – SELF-SUPPORTING FRAME



#### Functionality Features:

- Self-supporting frame systems, like many adaptable systems that utilize suspended casework, create areas behind and between cabinet and structural elements that can be difficult to access and clean. Worksurfaces can be sealed in continuous lengths, but this can limit casework adjustability.
- Storage volume is good, but restricted to base cabinet size restrictions common to all suspended casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system and anchorage to the wall.

#### Class 3 – ADAPTABILITY RATING CHART \*

Action	Class 3
Relocate a Cabinet	2 – 4
Relocate a Bench	2 – 3
Adjust a Worksurface	2 – 3
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>15 – 19</b>

#### Class 3 – FUNCTIONALITY RATING CHART \*\*

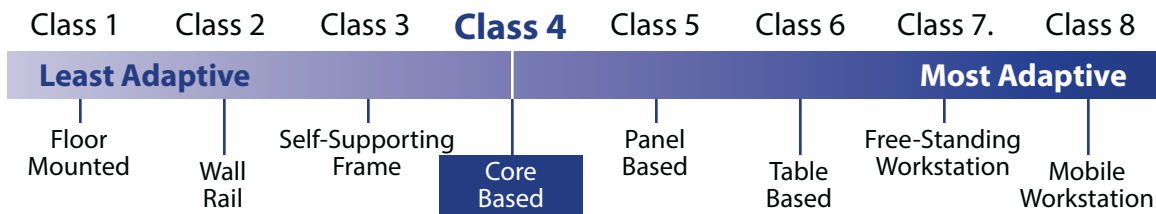
Action	Class 3
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 4
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>5 – 15</b>

\* See Appendix A

\*\* See Appendix B

## 5.4

### CLASS 4 – CORE BASED



#### Class 4 – CORE BASED

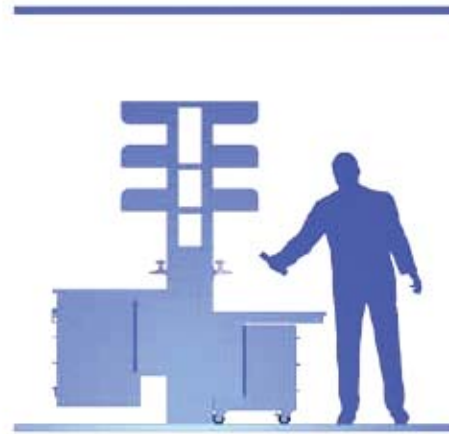
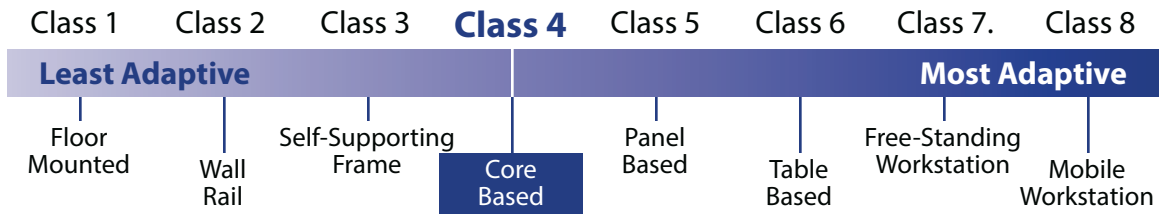
Core based casework systems utilize a floor mounted support module (core) from which table frames, upper cabinets, shelving, service utility distribution, and ancillary items are suspended. The core module is typically anchored to the floor and/or adjacent walls or structural members, to provide a self-supporting structure for all system components. Core modules can be worksurface height or also include an above counter structure. The core modules provide a chase for horizontally and vertically run services. The core modules can be provided with enclosure panels or be open. Base cabinets can be floor mounted or mobile in front of the support module, or suspended from table frames supported by the core module. Typically, individual core modules are provided in varying lengths and are combined to create full length assemblies. Table frames with work surfaces, and shelving are suspended from the core modules. Typically the Core module incorporates adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items.

#### Adaptability Features:

- Core based casework systems typically provide for simple cabinet relocation when suspended or mobile cabinetry is used.
- Bench relocation is only possible by dismantling and disconnecting the core system from the wall and/or floor and reassembling in another area. New components are not necessarily required.
- Worksurface height adjustment is accomplished on most of these systems by individual support frames hung from the cores with a height adjustable slot design. Suspended cabinets are first removed, and then the worksurface and its frame are lifted (often with a mechanical lift device) and placed in a new position on the core.
- Wall cases or shelving can be wall mounted, or mounted to above worksurface framework that is part of the core structure. Shelf adjustability depends on the system, but is typically a simple slot design.
- Utilities are typically mounted directly to the cores, with horizontal utility lines attached within the core system framework.

## 5.4

## CLASS 4 – CORE BASED



### Functionality Features:

- Core based systems, like many adaptable systems that utilize suspended casework, create areas behind and between cabinets and structural elements that can be difficult to access and clean. Worksurfaces are typically not sealed in continuous lengths, as this interferes with worksurface height adjustment. Soft caulk is sometimes used for joints when a liquid seal is important.
- Storage volume is good, but restricted to base cabinet size restrictions common to all suspended casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system, and the anchorage to the wall and/or floor.

### Class 4 – ADAPTABILITY RATING CHART \*

Action	Class 4
Relocate a Cabinet	2 – 4
Relocate a Bench	2 – 3
Adjust a Worksurface	2 – 4
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>15 – 20</b>

### Class 4 – FUNCTIONALITY RATING CHART \*\*

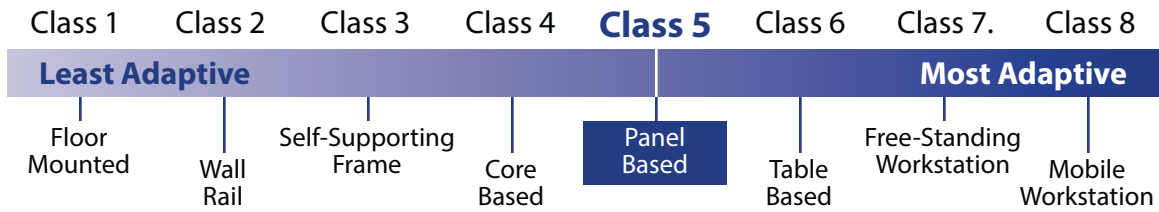
Action	Class 4
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	3 – 4
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>6 – 15</b>

\* See Appendix A

\*\* See Appendix B

## 5.5

## CLASS 5 – PANEL BASED



### Class 5 – PANEL BASED

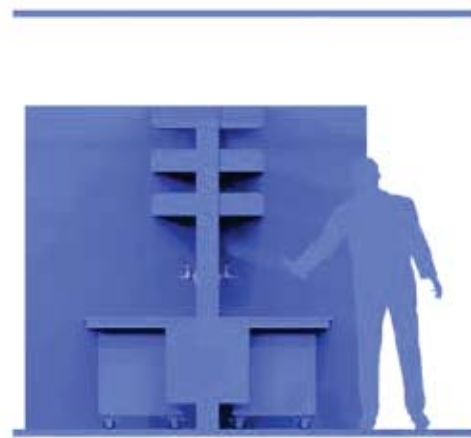
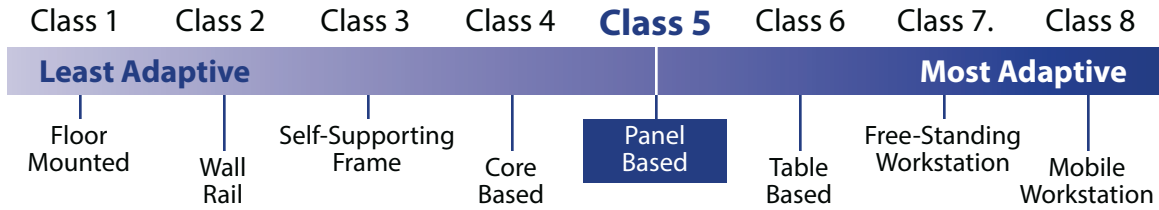
Panel based systems are similar to Core based systems (see Class 4) except they utilize a narrow support module, typically 6" or less. This narrow panel design limits the available space for service utility distribution. These panel assemblies are sometimes used as wall partitions, and can include features such as glass inserts, doors, and other features associated with internal wall partitions. These systems can require attachment to overhead structures in addition to floor and/or wall anchoring.

### Adaptability Features:

- Panel based casework systems typically provide for simple cabinet relocation when suspended or mobile cabinetry is used.
- Bench relocation is only possible by dismantling and disconnecting the panel system from the wall, floor and/or ceiling, then reassembling in another area. New components are not necessarily required.
- Worksurface height adjustment is accomplished on most of these systems by individual support frames hung from the panel with a height adjustable slot design. Suspended cabinets are first removed, and then the worksurface and its frame are lifted (often with a mechanical lift device) and placed in a new position on the panel.
- Wall cases or shelving can be wall mounted, or mounted to above worksurface framework that is part of the panel structure. Shelf adjustability depends on the system, but is typically a simple slot design.
- Utilities are typically mounted directly to the panels, with horizontal utility lines attached within the panel system framework.

5.5

CLASS 5 – PANEL BASED



**Functionality Features:**

- Panel based systems, like many adaptable systems that utilize suspended casework, create areas behind and between cabinets and structural elements that can be difficult to access and clean. Worksurfaces are typically not sealed in continuous lengths, as this interferes with worksurface height adjustment. Soft caulk is sometimes used for joints when a liquid seal is important.
- Storage volume is good, but restricted to base cabinet size restrictions common to all suspended or mobile casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system, and the anchorage to the wall and/or floor.

**Class 5 – ADAPTABILITY RATING CHART \***

Action	Class 5
Relocate a Cabinet	2 – 4
Relocate a Bench	2 – 3
Adjust a Worksurface	3 – 4
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>16 – 20</b>

**Class 5 – FUNCTIONALITY RATING CHART \*\***

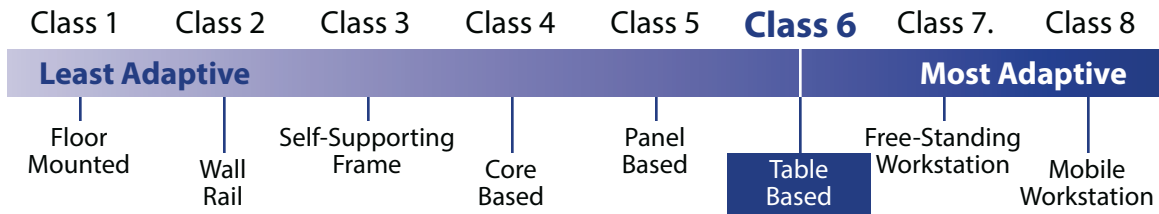
Action	Class 5
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 4
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>5 – 15</b>

\* See Appendix A

\*\* See Appendix B

## 5.6

## CLASS 6 – TABLE BASED



### Class 6 – TABLE BASED

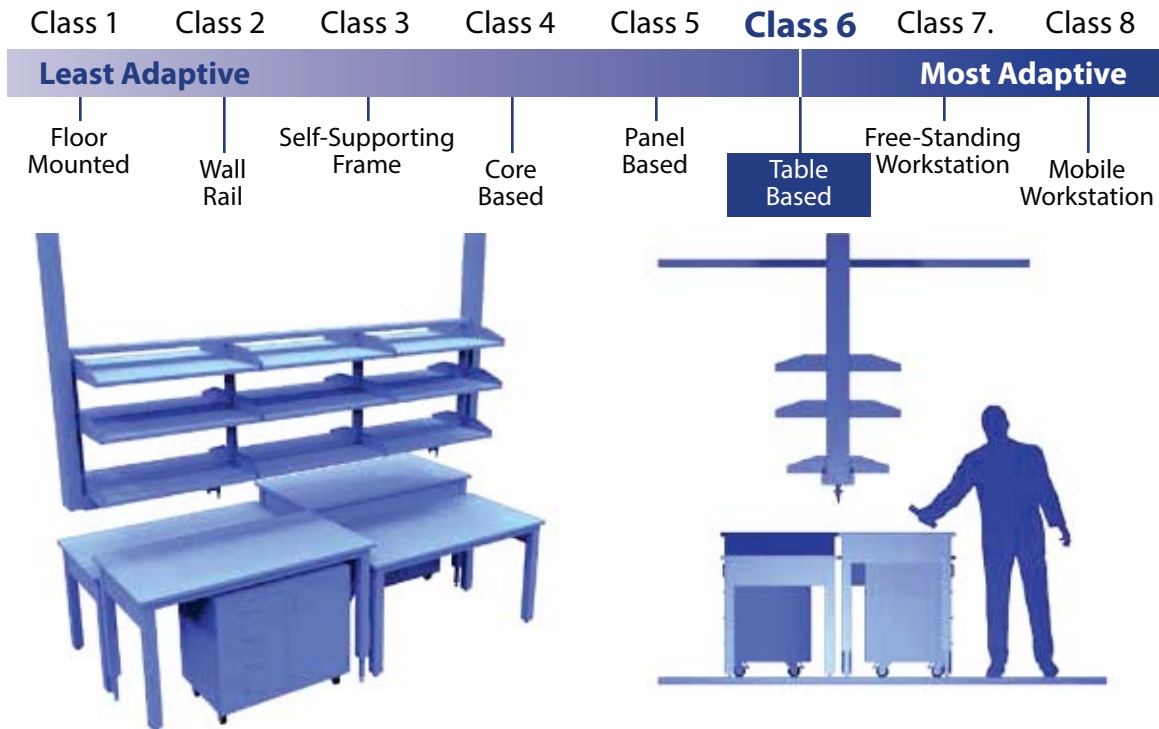
Table based systems use independent floor mounted self-supporting tables as the key component. They are used in conjunction with separate wall mounted or structural upper storage systems. The tables can be either adjustable or fixed height. The base cabinets can be mobile, floor mounted, or suspended from the tables. For this class, these tables do not have above worksurface structures integrated into the table. Utilities, sinks, and other fixed elements are typically separate from the tables, allowing the tables to be easily relocated.

### Adaptability Features:

- Table based systems typically use mobile or suspended base cabinetry allowing for simple relocation of base units. It is more common for these systems to use mobile casework units that are on casters or freestanding.
- Bench relocation is a matter of moving the table to a new location. Suspended cabinets may need to be removed prior to moving.
- Worksurface height adjustment is typically accomplished on these systems by adjusting the table legs. This adjustment can be a telescoping leg design that requires a hardware mechanism for adjustment. Also crank, or power adjustment is available on some systems. Suspended casework units may need to be removed before adjustment.
- Wall cases or shelving can be wall mounted, or mounted to an independent structure. In this classification the table does not include above worksurface support structures.
- Utilities are typically mounted to specialty units such as sink units, utility drops or utility pods that are at locations convenient to the tables.

## 5.6

## CLASS 6 – TABLE BASED



### Functionality Features:

- Many adaptable systems that utilize suspended casework, create areas behind and between cabinets and structural elements that can be difficult to access and clean. Table based systems are designed to allow easy relocation of the entire table, allowing greater access to these areas. Worksurfaces are typically not sealed in continuous lengths; they are matched to the individual table.
- Storage volume is restricted to base cabinet size restrictions common to all suspended or mobile casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system, and the anchorage to the wall and/or floor.

### Class 6 – ADAPTABILITY RATING CHART \*

Action	Class 6
Relocate a Cabinet	2 – 4
Relocate a Bench	4 – 4
Adjust a Worksurface	3 – 4
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	1 – 1
<b>Adaptability Range</b>	<b>18 – 21</b>

### Class 6 – FUNCTIONALITY RATING CHART \*\*

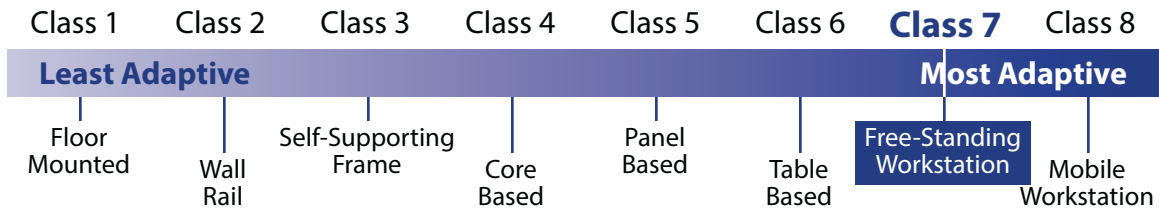
Action	Class 6
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 3
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>5 – 14</b>

\* See Appendix A

\*\* See Appendix B

## 5.7

## CLASS 7 – FREE-STANDING WORKSTATION



### Class 7 – FREE-STANDING WORKSTATION

Free-standing workstations are table based systems utilizing floor mounted tables as the key component. The workstation can be worksurface height or incorporate above counter structure. The workstations can incorporate either adjustable height or fixed height worksurfaces. Base cabinets can be mobile, floor mounted, or suspended. Upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Free-standing workstations with above counter structures can be pre-plumbed and prewired, and used in conjunction with ceiling mounted service utility distribution systems. Typically, free-standing workstations incorporate adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items. Free-standing workstations are not anchored to the building, allowing for simple relocation.

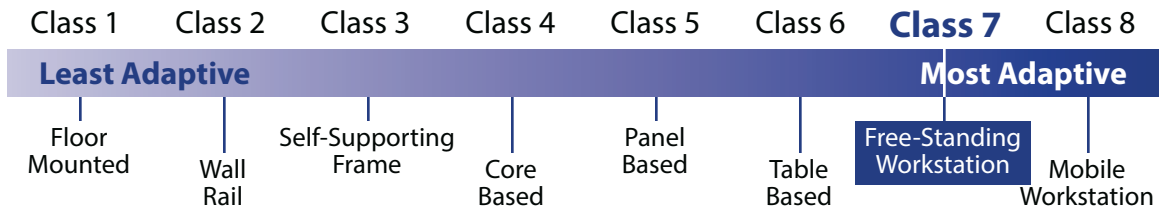
### Adaptability Features:

- Free-standing workstation systems typically use mobile or suspended base cabinetry allowing for simple relocation of base units. It is more common for these systems to use mobile casework units that are on casters or freestanding.
- Bench relocation is a matter of moving the table to a new location. Suspended cabinets may need to be removed prior to moving.
- Worksurface height adjustment is typically accomplished on these systems by adjusting the table legs. This adjustment can be a telescoping leg design that requires a hardware mechanism for adjustment. Also crank, or power adjustment is available on some systems. Suspended casework units may need to be removed before adjustment.
- Wall cases or shelving can be wall mounted, or mounted to a framework structure integrated into the workstation. Typically, a simple slot design allows for shelf adjustment.
- Free-standing workstations can incorporate pre-plumbed and prewired utilities. Often these are provided with cords and hoses to connect to quick connect fittings located in a ceiling panel or overhead service carrier.



5.7

**CLASS 7 – FREE-STANDING WORKSTATION**



**Functionality Features:**

- Many adaptable systems that utilize suspended casework, create areas behind and between cabinets and structural elements that can be difficult to access and clean. Free-standing workstation systems are designed to allow easy relocation of the entire bench, allowing greater access to these areas. Worksurfaces are typically not sealed in continuous lengths; they are matched to the individual table.
- Storage volume is restricted to base cabinet size restrictions common to all suspended or mobile casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system. These systems are typically not anchored to the building structure.

**Class 7 – ADAPTABILITY RATING CHART \***

Action	Class 7
Relocate a Cabinet	2 – 4
Relocate a Bench	3 – 4
Adjust a Worksurface	3 – 3
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	3 – 4
<b>Adaptability Range</b>	<b>19 – 23</b>

**Class 7 – FUNCTIONALITY RATING CHART \*\***

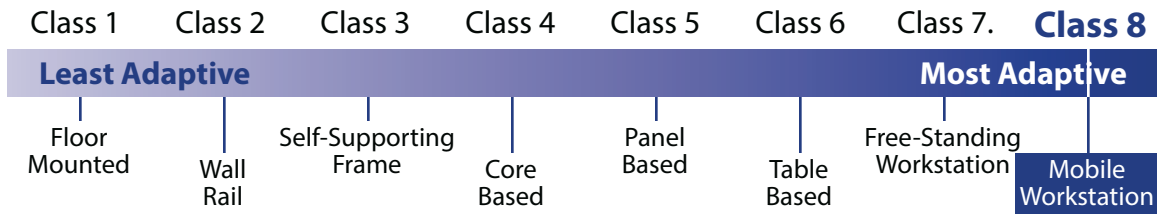
Action	Class 7
Cleanability	2 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 3
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>6 – 14</b>

\* See Appendix A

\*\* See Appendix B

## 5.8

## CLASS 8 – MOBILE WORKSTATION



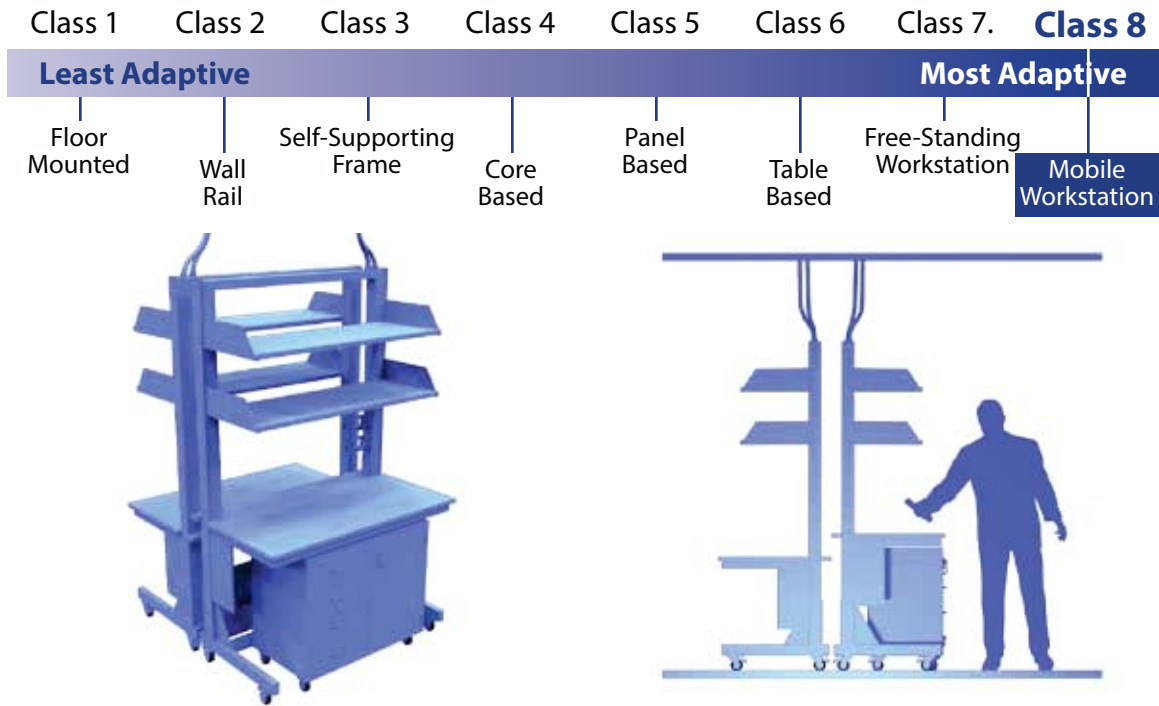
### Class 8 – MOBILE WORKSTATION

Mobile Workstations are similar to Free Standing Workstations (see Class 7), but are typically mounted on casters to accommodate simple relocation. The workstation can be worksurface height or incorporate above counter structure. The workstation can incorporate either adjustable height or fixed height worksurfaces. Base cabinets can be mobile, floor mounted, or suspended. Upper cabinets, worksurfaces, shelving, service utility distribution, and ancillary items can be suspended from the frame structure. Mobile Workstations with above counter structures can be pre-plumbed and prewired, and used in conjunction with ceiling mounted service utility distribution systems. Typically, Mobile Workstations incorporate adjustment slots for vertical height adjustability of worksurfaces, shelving and ancillary items.

### Adaptability Features:

- Mobile workstation systems typically use mobile or suspended base cabinetry allowing for simple relocation of base units. It is more common for these systems to use mobile casework units that are on casters or freestanding.
- Bench relocation is a matter of moving the table to a new location. Suspended cabinets may need to be removed prior to moving.
- Worksurface height adjustment is typically accomplished on these systems by adjusting the table legs. This adjustment can be a telescoping leg design that requires a hardware mechanism for adjustment. Also crank, or power adjustment is available on some systems. Suspended casework units may need to be removed before adjustment.
- Wall cases or shelving can be wall mounted, or mounted to a framework structure integrated into the workstation. Typically, a simple slot design allows for shelf adjustment.
- Mobile workstations can incorporate pre-plumbed and prewired utilities. Often these are provided with cords and hoses to connect to quick connect fittings located in a ceiling panel or overhead service carrier.

## 5.8 CLASS 8 – MOBILE WORKSTATION



### Functionality Features:

- Many adaptable systems that utilize suspended casework, create areas behind and between cabinets and structural elements that can be difficult to access and clean. Mobile workstation systems are designed to allow easy relocation of the entire bench, allowing greater access to these areas. Worksurfaces are typically not sealed in continuous lengths; they are matched to the individual table.
- Storage volume is restricted to base cabinet size restrictions common to all suspended or mobile casework systems.
- Strength, stability and vibration isolation are related to the design and components of the individual system. These systems are typically not anchored to the building structure.

### Class 8 – ADAPTABILITY RATING CHART \*

Action	Class 8
Relocate a Cabinet	3 – 4
Relocate a Bench	4 – 4
Adjust a Worksurface	3 – 4
Add a Shelf	4 – 4
Adjust a Shelf	4 – 4
Relocate a Utility	3 – 4
<b>Adaptability Range</b>	<b>21 – 24</b>

### Class 8 – FUNCTIONALITY RATING CHART \*\*

Action	Class 8
Cleanability	1 – 3
Storage Volume	1 – 3
Strength – Overall	2 – 4
Strength – Worksurface	1 – 4
Stability – Tipping	0 – 1
<b>Functionality Range</b>	<b>5 – 15</b>

\* See Appendix A

\*\* See Appendix B

## 6.0 Test Criteria

### 6.1 Purpose

Many of the components used in adaptable casework shall be tested in conformance to the appropriate section within SEFA – 8. Shelves, drawers, doors, tables, coatings and component hardware are all specified for laboratory grade performance within that standard. Performance criteria specific to Adaptable Furniture relate to strength and stability. The purpose of this standard is to identify the minimal acceptable physical strength of adaptable furniture. This is not intended to replicate or in any way distract from proper engineering analysis for seismic conditions. Refer to the International Building Code, IBC - 2000 for the proper performance testing under seismic conditions.

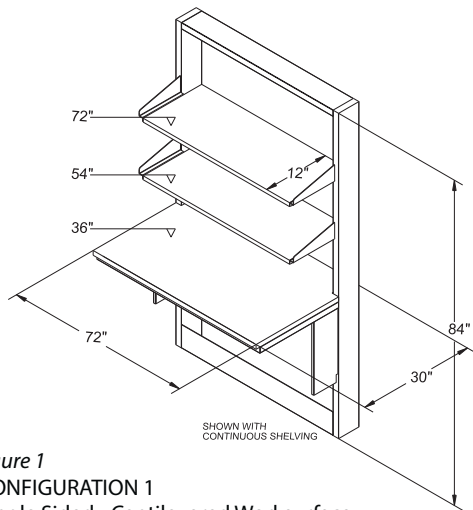


figure 1  
CONFIGURATION 1  
Single Sided - Cantilevered Worksurface

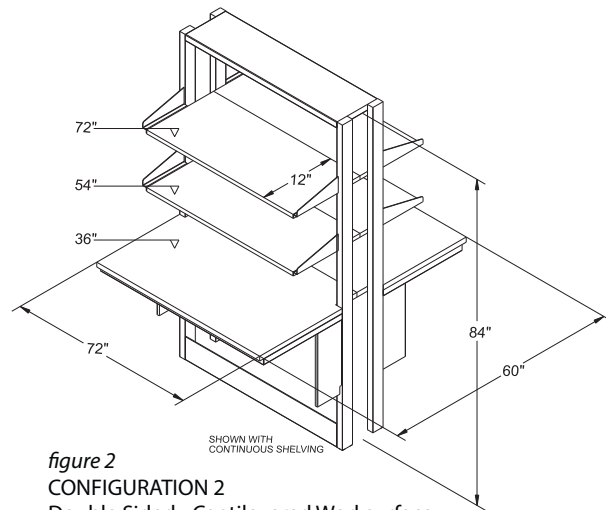


figure 2  
CONFIGURATION 2  
Double Sided - Cantilevered Worksurface

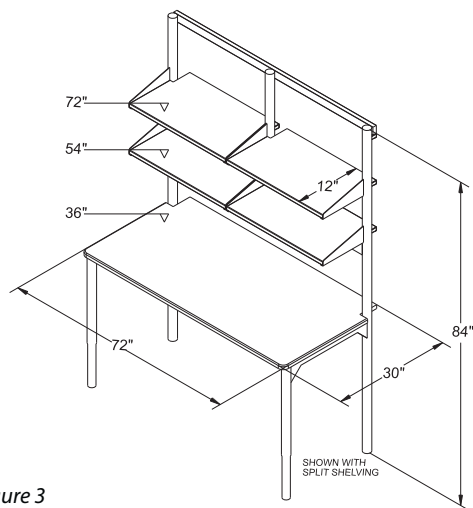


figure 3  
CONFIGURATION 3  
Single Sided - Simply Supported Worksurface

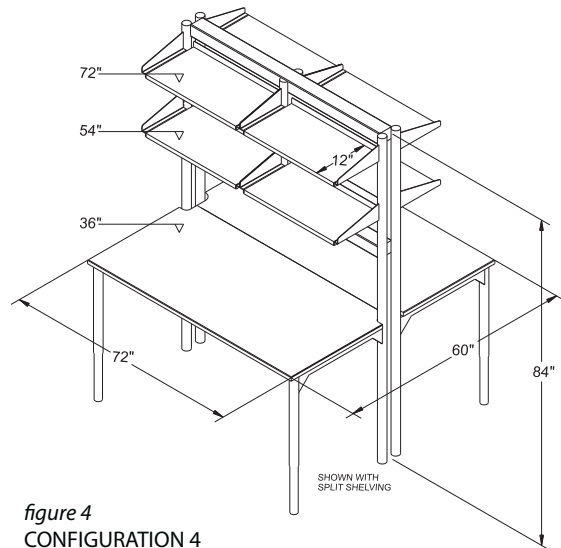


figure 4  
CONFIGURATION 4  
Double Sided - Simply Supported Worksurface

### 6.2 Description of Test Unit

Four configurations have been identified to represent the majority of laboratory grade adaptable furniture. Although designs vary from manufacturer to manufacturer, the basic configuration can be represented by one of four configurations. For test purposes, all systems shall have a work surface and two rows of shelving mounted in the location and to the size shown on the figures below.

1. single sided, cantilevered worksurface
2. double sided, cantilevered worksurface
3. single sided, simply supported worksurface
4. double sided, simply supported worksurface

The manufacturer shall provide a test unit to the design and construction details (including weldments and material choices) that properly represents their individual product family. The product shall have a continuous or a split shelf consistent with their product family. If both continuous shelving and split shelving is offered, the split shelf shall be chosen for testing (Testing agency shall provide a photograph of the assembly and record if shelves tested were continuous or split on the test certificate).

The unit shall be installed and anchored (if appropriate) as specified by the manufacturer. All anchor details will also be recorded and reported on test certificates.

**Great care must be exercised when conducting these tests. SEFA assumes no liability for damage or injury as a result of conducting these tests. Before proceeding assure that you are in compliance with national, state, and regional safety regulations. These tests shall be conducted only by properly trained personnel. All safety precautions shall be taken to insure the safety of testing personnel. These tests require very heavy loads and may result in catastrophic failure that could result in damage or injury to unprepared or untrained personnel.**

### 6.3 Live Load

#### 6.3.1 Each Shelf

Shelf live load shall be equal to 40 lbs per square foot not to exceed 200 pounds. (example: A 6 square foot shelf calculates to 240 pounds so a load of 200 pounds shall be applied on a continuous shelf; or 120 pounds on each split shelf) All shelving load shall be applied by using ten pound sand or shot bags as specified in SEFA-8. Shelf material shall be specified by the manufacturer, installed per manufacturer's specification and reported by the testing agency on the test certificate.

#### 6.3.2 Worksurface

There are four categories of laboratory grade worksurface loads to adaptable furniture. The manufacturer shall specify which category is to be tested and the testing agency shall report the category on the test certificate. All worksurface loads shall be uniformly distributed over the entire worksurface by using fifty pound solid steel bars

as specified in SEFA-8. Worksurface material shall be specified by the manufacturer, installed per manufacturer's specification and reported by the testing agency on the test certificate.

- Category 1 = 200 pounds
- Category 2 = 600 pounds
- Category 3 = 1000 pounds
- Category 4 = 1200 pounds

### 6.4 Strength Test Configuration 1 (Single Sided, Cantilevered)

Refer to Figure 5

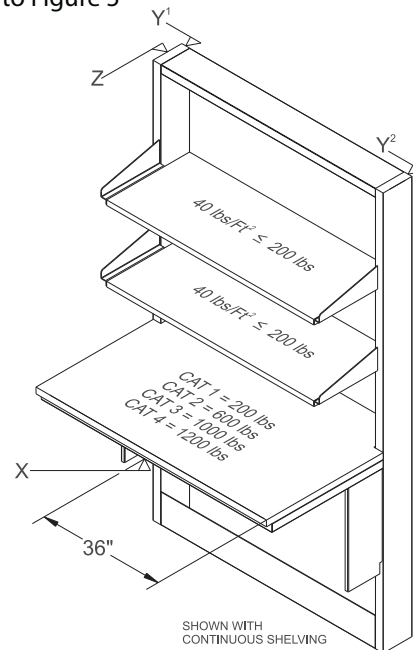


figure 5  
CONFIGURATION 1  
Single Sided - Cantilevered

#### 6.4.1 Test Procedure

Measure the worksurface to find the center point (approximately at 36") and mark it for reference. Establish a zero vertical deflection point. From this point will be determined X coordinate movement.

Establish a zero deflection point at the upper most height and on each end of the assembly. From this point will be determined Y and Z coordinate movement.

Load the shelves with ten-pound sand or shot bags until each shelf is loaded with 40 lbs per sq ft not to exceed 200 pounds.

Record deflection at X, Y<sup>1</sup>, Y<sup>2</sup> and Z.

### 6.4.2 Acceptance Criteria

Allowable maximum deflection  
 $X = 0.125$  inches  
 $Y \text{ avg } (Y^1 + Y^2)/2 = 0.125$  inches  
 $Z = 0.125$  inches

### 6.4.3 Test Procedure Continued

With shelves fully loaded add the worksurface live load using fifty pound steel bars to the specified load category for worksurfaces.

Record deflection at X, Y<sup>1</sup>, Y<sup>2</sup> and Z.

### 6.4.4 Acceptance Criteria

Allowable maximum deflection  
 $X = 0.250$  inches  
 $Y \text{ avg } (Y^1 + Y^2)/2 = 0.125$  inches  
 $Z = 0.125$  inches

## 6.5 Stability Test Configuration 1 (Single Sided, Cantilevered) - Anchored Units

Refer to Fig 6

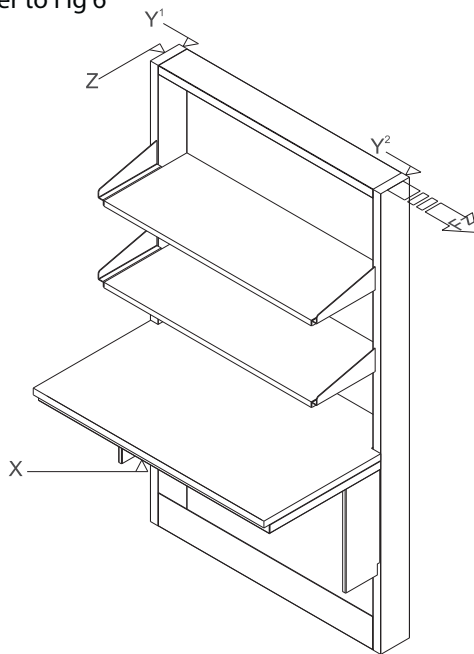


figure 6  
 CONFIGURATION 1  
 Single Sided - Cantilevered - Anchored Units

### 6.5.1 Test Procedure Anchored Units

At the upper most point of the assembly apply a force at Fz equal to two percent of the systems fully loaded maximum.

Record deflection at X and Z.

### 6.5.2 Acceptance Criteria

Allowable maximum deflection  
 $X = 0.060$  inches  
 $Z = 0.500$  inches

## 6.6 Resistance to Overturning Configuration 1 (Single Sided, Cantilevered) - Free Standing Units

### 6.6.1 Test Procedure Free Standing Units

Block the unit at front or rear bottom edge to prevent lateral movement. Tilt the unit 10 degrees from horizontal in the direction most likely to overturn.

### 6.6.2 Acceptance Criteria

A pass is when the unit does not initiate overturn when tilted 10 degrees from horizontal in the direction most likely to cause overturn and when no parts become disengaged from unit.

## 6.7 Strength Test Configuration 2 (Double Sided, Cantilevered)

Refer to Fig 7

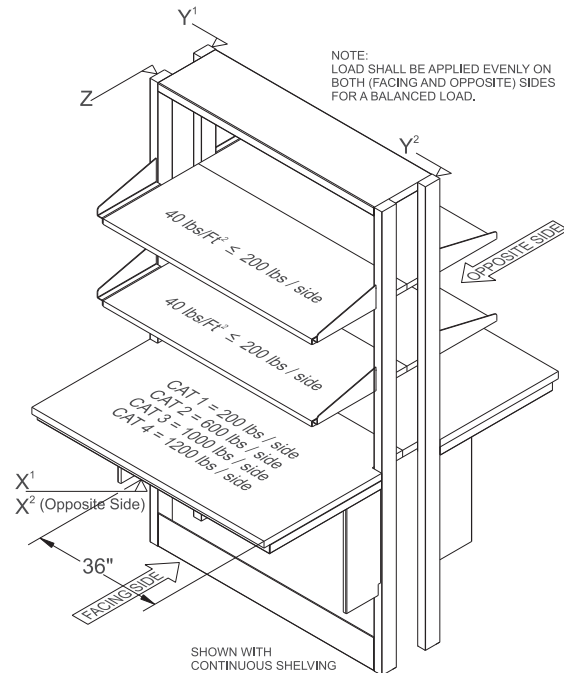


figure 7  
 CONFIGURATION 2  
 Double Sided - Cantilevered

### 6.7.1 Test Procedure

Measure the worksurface to find the center point (approximately at 36") and mark it for reference.

Establish a zero vertical deflection point. From this point will be determined X coordinate movement. Establish an X coordinate on the opposite side equal to the location on facing side.

Establish a zero deflection point at the upper most height and on each end of the assembly. From this point will be determined Y and Z coordinate movement.

Load the shelves with ten-pound sand or shot bags until each shelf is loaded with 40 lbs per sq ft not to exceed 200 pounds. Load shall be applied evenly on both (facing side and opposite) sides for a balanced load

Record deflection at X<sup>1</sup>, X<sup>2</sup>, Y<sup>1</sup>, Y<sup>2</sup> and Z.

### 6.7.2 Acceptance Criteria

Allowable maximum deflection

$$X^1, X^2 = 0.125 \text{ inches}$$

$$Y_{avg} (Y^1 + Y^2)/2 = 0.125 \text{ inches}$$

$$Z = 0.125 \text{ inches}$$

### 6.7.3 Test Procedure Continued

With shelves fully loaded add the worksurface live load using fifty pound steel bars to the specified load category for worksurfaces. Load shall be applied evenly on both (facing side and opposite) sides for a balanced load.

Record deflection at X<sup>1</sup>, X<sup>2</sup>, Y<sup>1</sup>, Y<sup>2</sup> and Z.

### 6.7.4 Acceptance Criteria

Allowable maximum deflection

$$X^1, X^2 = 0.250 \text{ inches}$$

$$Y_{avg} (Y^1 + Y^2)/2 = 0.125 \text{ inches}$$

$$Z = 0.125 \text{ inches}$$

## 6.8 Stability Test Configuration 2 (Double Sided, Cantilevered) – Anchored Units

Refer to Fig 8

### 6.8.1 Test Procedure Anchored Units

At the upper most point of the assembly apply a force at Fz equal to two percent of the systems fully loaded maximum.

Record deflection at X<sup>1</sup>, X<sup>2</sup>, and Z.

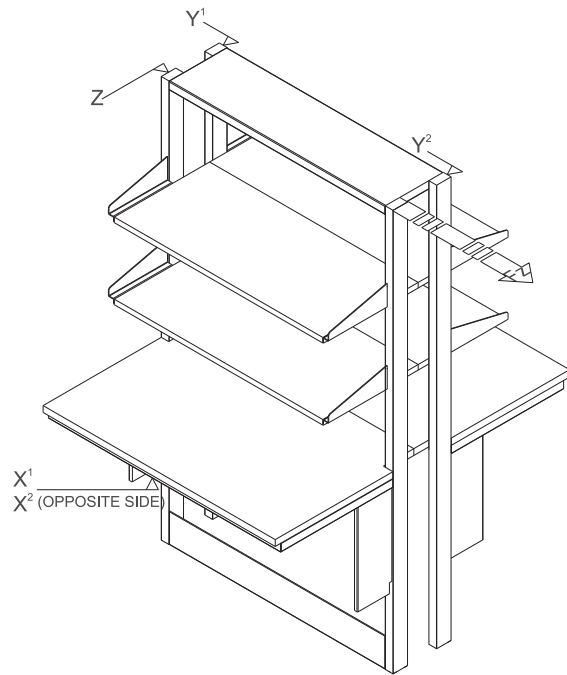


figure 8  
CONFIGURATION 2  
Double Sided - Cantilevered - Anchored Units

### 6.8.2 Acceptance Criteria

Allowable maximum deflection

$$X^1, X^2 = 0.063 \text{ inches}$$

$$Z = 0.500 \text{ inches}$$

## 6.9 Resistance to Overturning Configuration 2 (Double Sided, Cantilevered) Free Standing Units

### 6.9.1 Test Procedure Free Standing Units

Block the unit at front or rear bottom edge to prevent lateral movement. Tilt the unit 10 degrees from horizontal in the direction most likely to overturn.

### 6.9.2 Acceptance Criteria

A pass is when the unit does not initiate overturn when tilted 10 degrees from horizontal in the direction most likely to cause overturn and when no parts become disengaged from unit.

### 6.10 Strength Test Configuration 3 (Single Sided, Supported)

Refer to Figure 9.

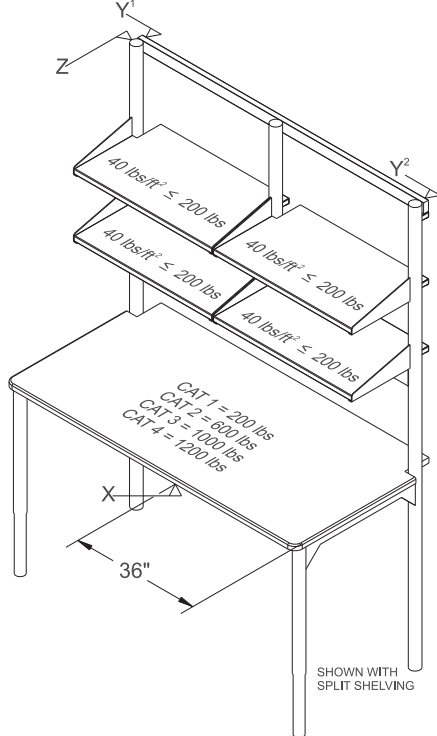


figure9  
CONFIGURATION 3  
Single Sided - Supported

#### 6.10.1 Test Procedure

Measure the work surface to find the center point (approximately at 36") and mark it for reference. Establish a zero vertical deflection point. From this point will be determined X coordinate movement.

Establish a zero deflection point at the upper most height and on each end of the assembly. From this point will be determined Y and Z coordinate movement.

Load the shelves with ten-pound sand or shot bags until each shelf is loaded with 40 lbs per sq ft not to exceed 200 pounds.

Record deflection at X, Y<sup>1</sup>, Y<sup>2</sup> and Z.

#### 6.10.2 Acceptance Criteria

Allowable maximum deflection  
 $X = 0.125$  inches  
 $Y_{avg} (Y^1 + Y^2)/2 = 0.125$  inches  
 $Z = 0.125$  inches

#### 6.10.3 Test Procedure Continued

With shelves fully loaded add the work surface live load using fifty pound steel bars to the specified load category for work surfaces.

Record deflection at X, Y<sup>1</sup>, Y<sup>2</sup> and Z.

#### 6.10.4 Acceptance Criteria

Allowable maximum deflection  
 $X = 0.250$  inches  
 $Y_{avg} (Y^1 + Y^2)/2 = 0.125$  inches  
 $Z = 0.125$  inches

### 6.11 Stability Test Configuration 3 (Single Sided, Supported) - Anchored Units

Refer to Fig 10

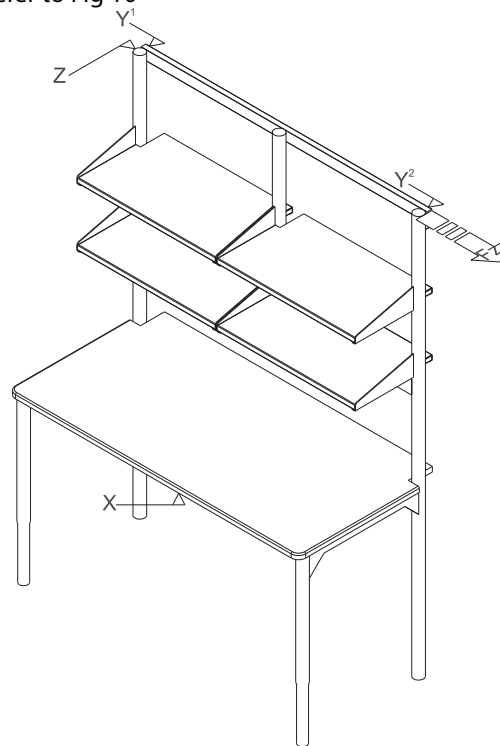


figure 10  
CONFIGURATION 3  
Single Sided - Supported - Anchored Units

#### 6.11.1 Test Procedure Anchored Units

At the upper most point of the assembly apply a force at Fz equal to two percent of the systems fully loaded maximum.

Record deflection at X and Z.



### 6.11.2 Acceptance Criteria

Allowable maximum deflection

$$X = 0.063 \text{ inches}$$

$$Z = 0.500 \text{ inches}$$

### 6.12 Resistance to Overturning Configuration 3 (Single Sided, Supported) Free Standing Units

#### 6.12.1 Test Procedure Free Standing Units

Block the unit at front or rear bottom edge to prevent lateral movement. Tilt the unit 10 degrees from horizontal in the direction most likely to overturn.

#### 6.12.2 Acceptance Criteria

A pass is when the unit does not initiate overturn when tilted 10 degrees from horizontal in the direction most likely to cause overturn and when no parts become disengaged from unit.

### 6.13 Strength Test Configuration 4 (Double Sided, Supported)

Refer to Fig 11

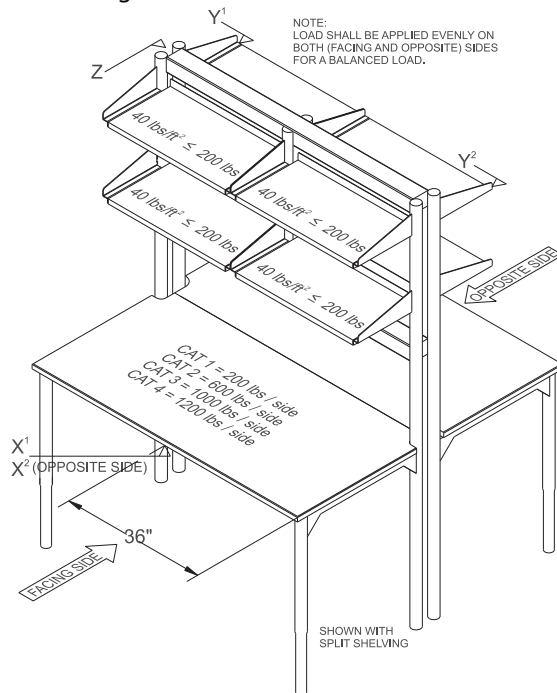


figure 11  
CONFIGURATION 4  
Double Sided - Supported

#### 6.13.1 Test Procedure

Measure the work surface to find the center point (approximately at 36") and mark it for reference.

Establish a zero vertical deflection point. From this point will be determined X coordinate movement. Establish an X coordinate on the opposite side equal to the location on facing side.

Establish a zero deflection point at the upper most height and on each end of the assembly. From this point will be determined Y and Z coordinate movement.

Load the shelves with ten-pound sand or shot bags until each shelf is loaded with 40 lbs per sq ft not to exceed 200 pounds. Load shall be applied evenly on both (facing side and opposite) sides for a balanced load

Record deflection at  $X^1$ ,  $X^2$ ,  $Y^1$ ,  $Y^2$  and Z.

#### 6.13.2 Acceptance Criteria

Allowable maximum deflection

$$X^1, X^2 = 0.125 \text{ inches}$$

$$Y_{avg} (Y^1 + Y^2)/2 = 0.125 \text{ inches}$$

$$Z = 0.125 \text{ inches}$$

With shelves fully loaded add the work surface live load using fifty pound steel bars to the specified load category for work surfaces. Load shall be applied evenly on both (facing side and opposite) sides for a balanced load.

Record deflection at  $X^1$ ,  $X^2$ ,  $Y^1$ ,  $Y^2$  and Z.

Allowable maximum deflection

$$X^1, X^2 = 0.250 \text{ inches}$$

$$Y_{avg} (Y^1 + Y^2)/2 = 0.125 \text{ inches}$$

$$Z = 0.125 \text{ inches}$$

### 6.14 Stability Test Configuration 4 (Double Sided, Supported) – Anchored Units

Refer to Fig 12

#### 6.14.1 Test Procedure

At the upper most point of the assembly apply a force at  $F_z$  equal to two percent of the systems fully loaded maximum.

Record deflection at  $X^1$ ,  $X^2$ , and Z.

#### 6.14.2 Acceptance Criteria

Allowable maximum deflection

$$X^1, X^2 = 0.063 \text{ inches}$$

$$Z = 0.500 \text{ inches}$$

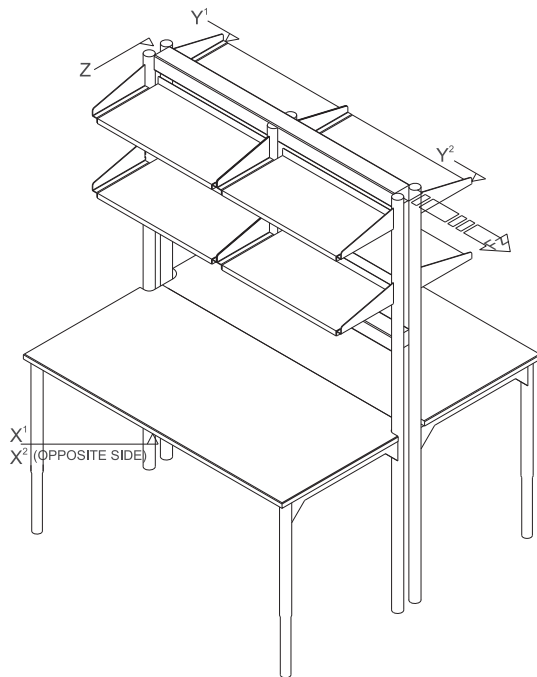


figure 12  
 CONFIGURATION 4  
 Double Sided - Supported Anchored Units

### 6.15 Resistance to Overturning Configuration 4 (Double Sided, Supported) Free Standing Units

#### 6.15.1 Test Procedure Free Standing Units

Block the unit at front or rear bottom edge to prevent lateral movement. Tilt the unit 10 degrees from horizontal in the direction most likely to overturn.

#### 6.15.2 Acceptance Criteria

A pass is when the unit does not initiate overturn when tilted 10 degrees from horizontal in the direction most likely to cause overturn and when no parts become disengaged from unit.

---

<sup>1</sup> Adapted from NSF/ANSI 49-2010

## **7.0 Product Testing**

### **7.1 Forms**

#### **Configuration 1**

Single Sided – Cantilevered

#### **Configuration 2**

Double Sided – Cantilevered

#### **Configuration 3**

Single Sided – Simply Supported

#### **Configuration 4**

Double Sided – Simply Supported

**SEFA 10 - 2013  
Test Report  
Adaptable System**

Class \_\_\_\_\_ per section 5.1-5.8

**Configuration 1  
Single Sided – Cantilevered**

Load Category \_\_\_\_\_ per 6.3.2

Anchor Details:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Shelving:**

Shelf is:  Continuous  Split

Shelf Material \_\_\_\_\_

Shelf size:

ft x  ft =  sq.ft.  
x 40 lb =  each  
Shelf live load

Continuous Shelves x 2 =  lbs  
**Total shelf load**

or  
Split Shelves x 4 =  lbs  
**Total shelf load**

**Work surface:**

Work Surface Load Category:				
CAT 1	CAT 2	CAT 3	CAT 4	Other
200 lb	600 lb	1000 lb	1200 lb	

Table 1

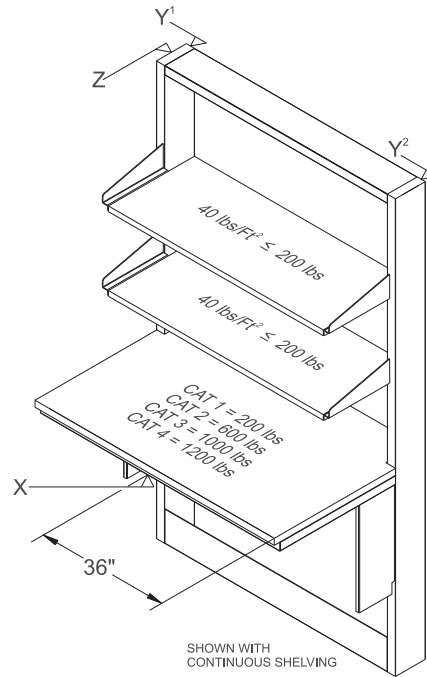
Work surface load

+ Total shelf load

Fully loaded maximum

x 0.02

**Fz Applied Load**



**6.4 Strength Test Configuration 1 (Single Sided, Cantilevered)**

6.4.2

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

6.4.4

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

**6.5 Stability Test Configuration 1 (Single Sided, Cantilevered) Anchored Units**

6.5.2

X  Pass  Fail  
Z  Pass  Fail

**6.6 Resistance to Overturn  
Configuration 1 (Single Sided, Cantilevered)  
Free Standing Units**

6.6.2

Pass  Fail

# SEFA 10 - 2013 Test Report Adaptable System

Class \_\_\_\_\_ per section 5.1-5.8

## Configuration 2 Double Sided – Cantilevered

Load Category \_\_\_\_\_ per 6.3.2

Anchor Details:

---

---

---

---

---

---

---

---

### Shelving:

Shelf is:  Continuous  Split

Shelf Material \_\_\_\_\_

Shelf size:

ft x  ft =  sq.ft.  
x 40 lb =  each  
Shelf live load

Continuous Shelves x 4 =  lbs  
**Total shelf load**

or  
Split Shelves x 8 =  lbs  
**Total shelf load**

### Work surface:

Work Surface Load Category:				
CAT 1	CAT 2	CAT 3	CAT 4	Other
400 lb	1200 lb	2000 lb	2400 lb	

Table 1

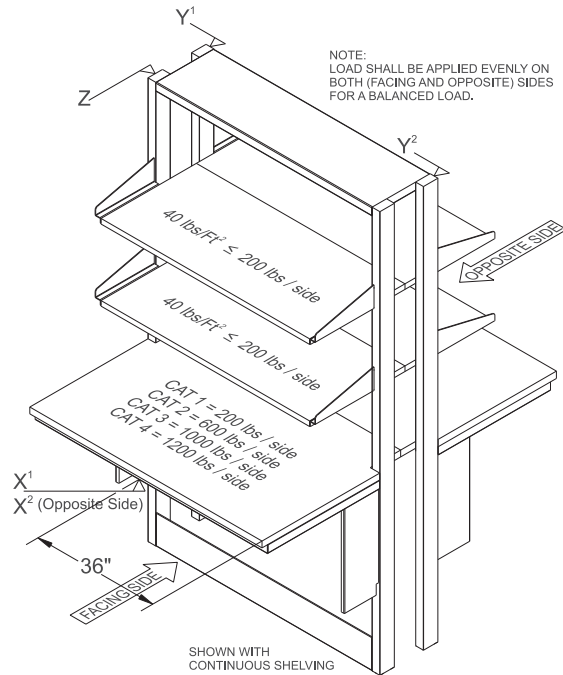
Work surface load

+ Total shelf load

Fully loaded maximum

x 0.02

**Fz Applied Load**



### 6.7 Strength Test Configuration 2 (Double Sided, Cantilevered)

6.7.2

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

6.7.4

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

### 6.8 Stability Test Configuration 2 (Double Sided, Cantilevered) Anchored Units

6.8.2

X  Pass  Fail  
Z  Pass  Fail

### 6.9 Resistance to Overturn Configuration 2 (Double Sided, Cantilevered) Free Standing Units

6.9.2

Pass  Fail

**SEFA 10 - 2013  
Test Report  
Adaptable System**

Class \_\_\_\_\_ per section 5.1-5.8

**Configuration 3  
Single Sided – Simply Supported**

Load Category \_\_\_\_\_ per 6.3.2

Anchor Details:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Shelving:**

Shelf is:  Continuous  Split

Shelf Material \_\_\_\_\_

Shelf size:

ft x  ft =  sq.ft.  
x 40 lb =  each  
Shelf live load

Continuous Shelves x 2 =  lbs  
**Total shelf load**

or  
Split Shelves x 4 =  lbs  
**Total shelf load**

**Work surface:**

Work Surface Load Category:				
CAT 1	CAT 2	CAT 3	CAT 4	Other
200 lb	600 lb	1000 lb	1200 lb	

Table 1

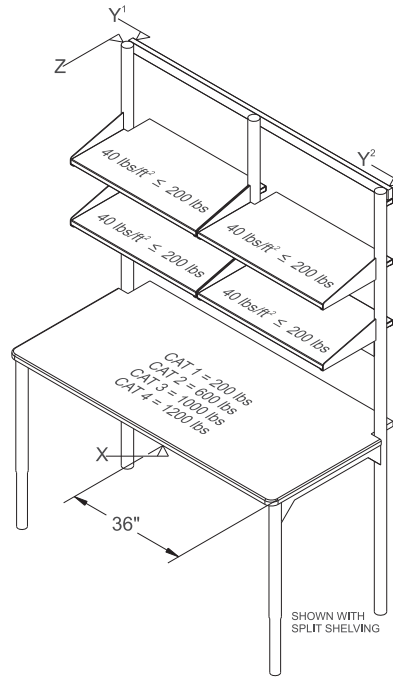
Work surface load

+ Total shelf load

Fully loaded maximum

x 0.02

**Fz Applied Load**



**6.10 Strength Test Configuration 3 (Single Sided, Supported)**

6.10.2

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

6.10.4

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

**6.11 Stability Test Configuration 3 (Single Sided, Supported) Anchored Units**

6.11.2

X  Pass  Fail  
Z  Pass  Fail

**6.12 Resistance to Overturn  
Configuration 3 (Single Sided, Supported) Free Standing Units**

6.12.2

Pass  Fail

# SEFA 10 - 2013 Test Report Adaptable System

Class \_\_\_\_\_ per section 5.1-5.8

## Configuration 4 Double Sided – Simply Supported

Load Category \_\_\_\_\_ per 6.3.2

Anchor Details:

---

---

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---

---

---

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---

### Shelving:

Shelf is:  Continuous  Split

Shelf Material \_\_\_\_\_

Shelf size:

ft x  ft =  sq.ft.  
x 40 lb =  each  
Shelf live load

Continuous Shelves x 4 =  lbs  
**Total shelf load**

or  
Split Shelves x 8 =  lbs  
**Total shelf load**

### Work surface:

Work Surface Load Category:				
CAT 1	CAT 2	CAT 3	CAT 4	Other
400 lb	1200 lb	2000 lb	2400 lb	

Table 1

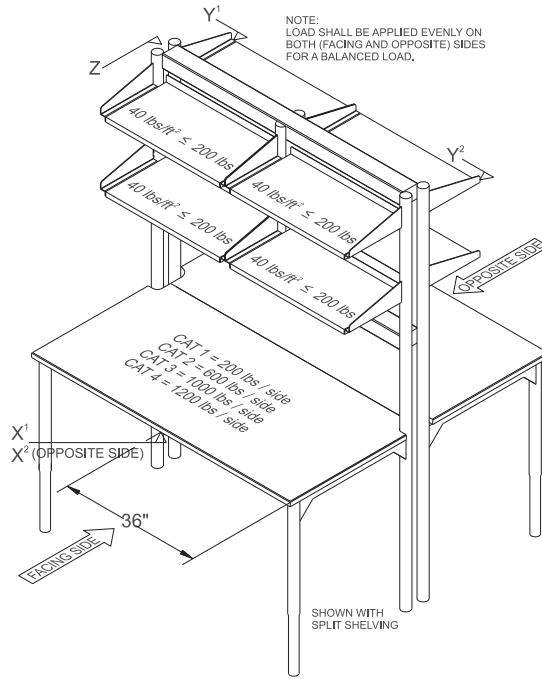
Work surface load

+ Total shelf load

Fully loaded maximum

x 0.02

**Fz Applied Load**



## 6.13 Strength Test Configuration 4 (Double Sided, Supported)

6.13.2

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

6.13.4

X  Pass  Fail  
Yavg  Pass  Fail  
Z  Pass  Fail

## 6.14 Stability Test Configuration 4 (Double Sided, Supported) Anchored Units

6.14.2

X  Pass  Fail  
Z  Pass  Fail

## 6.15 Resistance to Overturn Configuration 1 (Single Sided, Cantilevered) Free Standing Units

6.15.2

Pass  Fail

## APPENDIX A

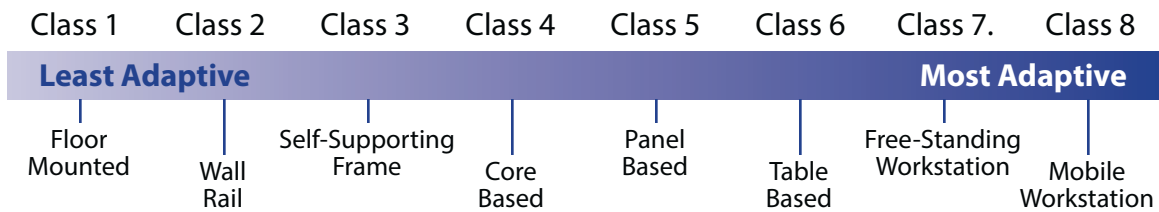
### CLASS ADAPTABILITY RATING CHART

#### How to use these charts:

Each Class is given a numerical range (low to high) for each function. Different configurations of each system can have an impact on a particular function. The Total Point score establishes the Class designation.

#### POINTS DEFINITION

- 0** = Requires new components
- 1** = Requires trade contractors & casework installation personnel
- 2** = Requires casework installation personnel
- 3** = Can be accomplished with facility personnel
- 4** = Can be accomplished by the end user



**ADAPTABILITY RATING CHART**

Action	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Relocate a Cabinet	1-2	3-3	2-4	2-4	2-4	2-4	2-4	3-4
Relocate a Bench	1-2	1-3	2-3	2-3	2-3	4-4	3-4	4-4
Adjust a Worksurface	0-0	3-4	2-3	2-4	3-4	3-4	3-3	3-4
Add a Shelf	2-4	2-4	4-4	4-4	4-4	4-4	4-4	4-4
Adjust a Shelf	2-4	3-4	4-4	4-4	4-4	4-4	4-4	4-4
Relocate a Utility	1-1	1-1	1-1	1-1	1-1	1-1	3-4	3-4
<b>Adaptability Range</b>	<b>7-13</b>	<b>13-19</b>	<b>15-19</b>	<b>15-20</b>	<b>16-20</b>	<b>18-21</b>	<b>19-23</b>	<b>21-24</b>



## APPENDIX B

### CLASS FUNCTIONALITY RATING CHART

#### POINTS DEFINITION

##### CLEANABILITY

- 1** = System creates multiple gaps and hard to reach surfaces
- 2** = Multiple gaps — surfaces reachable
- 3** = Sealed worksurfaces and toespaces — reachable worksurfaces with minor gaps
- 4** = Sealed worksurfaces and toespaces — all surfaces reachable and sealed

##### STORAGE VOLUME

- 1** = Prohibits storage units — allows for shelves only
- 2** = Restricted by suspended unit sizing for fit within system components
- 3** = Restricted by base unit sizing to fit under suspended surfaces
- 4** = Utilizes full volume of bench space available

##### STABILITY – OVERTURN

- 0** = Fail
- 1** = Pass

#### POINTS DEFINITION

##### STRENGTH – OVERALL

##### Single Sided (Worksurface & Shelves)

- 0** = Less than 600 pounds
- 1** = 600 pounds
- 2** = 1000 pounds
- 3** = 1400 pounds
- 4** = Over 1400 pounds

##### STRENGTH – OVERALL

##### Double Sided (Worksurface & Shelves)

- 0** = Less than 1200 pounds
- 1** = 1200 pounds
- 2** = 2000 pounds
- 3** = 2800 pounds
- 4** = Over 2800 pounds

##### STRENGTH – WORKSURFACE

- 1** = 200 pounds
- 2** = 600 pounds
- 3** = 1000 pounds
- 4** = Over 1000 pounds

#### FUNCTIONALITY RATING CHART

Action	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Cleanability	3-4	1-3	1-3	1-3	1-3	1-3	2-3	1-3
Storage Volume	4-4	1-3	1-3	1-3	1-3	1-3	1-3	1-3
Strength – Overall	4-4	2-3	2-4	3-4	2-4	2-3	2-3	2-4
Strength – Work Surface	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4
Stability – Tipping	0-1	0-1	0-1	0-1	0-1	0-1	0-1	0-1
<b>Functionality Range</b>	<b>12-17</b>	<b>5-14</b>	<b>5-15</b>	<b>6-15</b>	<b>5-15</b>	<b>5-14</b>	<b>6-14</b>	<b>5-15</b>

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