UL 1286

STANDARD FOR SAFETY

Office Furnishing Systems

UL Standard for Safety for Office Furnishing Systems, UL 1286

Sixth Edition, Dated June 29, 2022

Summary of Topics

This revision of ANSI/UL 1286 dated March 21, 2024 includes the following changes in requirements:

> ***– Addition of Requirements for Tamper-Resistant Receptacles to Harmonize with NEC Article 406.12; 13.4.1.10***
>
> ***– Correction to Language in 31.1***

Text that has been changed in any manner or impacted by ULSE's electronic publishing system is marked with a vertical line in the margin.

The new and revised requirements are substantially in accordance with Proposal(s) on this subject dated January 5, 2024.

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UL 1286

Standard for Office Furnishing Systems

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June 29, 2022

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The most recent designation of ANSI/UL 1286 as an American National Standard (ANSI) occurred on March 21, 2024. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

Comments or proposals for revisions on any part of the Standard may be submitted to ULSE at any time. Proposals should be submitted via a Proposal Request in ULSE's Collaborative Standards Development System (CSDS) at https://csds.ul.com.

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CONTENTS

INTRODUCTION

CONSTRUCTION

ELECTRICAL CONSTRUCTION

STRUCTURAL CONSTRUCTION

ELECTRICAL PERFORMANCE

STRUCTURAL PERFORMANCE

MARKINGS

MANUFACTURING AND PRODUCTION LINE TESTS

ANNEX A (informative) – MODULAR PRE-WIRED OFFICE FURNISHING FLOOR RACEWAY SYSTEMS

INTRODUCTION

CONSTRUCTION

PERFORMANCE

MARKING AND INSTALLATION INSTRUCTIONS

ANNEX B (normative) – OFFICE FURNISHING SYSTEMS MOUNTED TO BUILDING STRUCTURES

INTRODUCTION

CONSTRUCTION

PERFORMANCE

MARKINGS AND INSTALLATION INSTRUCTIONS

INTRODUCTION

1 Scope

1.1 These requirements cover office furnishing panels, study carrels, work stations, and pedestal-style systems that form an office furnishing system in accordance with the National Electrical Code, ANSI/NFPA 70. These are able to be provided with an electrical distribution system, including switches, convenience outlets, and channels for routing communication cables within system components separate from electrical raceways. Office furnishing systems include filing cabinets, desks, work surfaces, shelves, storage units, and similar items that have a particular electrical or mechanical function unique to an office furnishing system.

1.2 These requirements also cover lighting units intended to be mechanically attached to particular components within an individual device or office furnishing system.

1.3 These requirements also cover modular pre-wired office furnishing wiring systems.

1.4 These requirements do not cover panels that are intended to penetrate the ceiling, or that are used to support the building structure.

1.5 These requirements also cover office furnishing systems intended for mounting to building structures for stability or support.

1.6 Individual commercial office furnishings are covered by UL 2999. These products may include, but are not limited to:

a) Desks;

b) Tables;

c) Conference room tables;

d) Bookcases;

e) Storage cabinets; and

f) Motorized carts and stands for audio/video equipment; and

g) Benching Systems.

The above products may be provided with modesty and privacy screens.

2 Glossary

2.1 For the purposes of this Standard the following definitions apply.

2.2 ACCESSIBLE PART – A part located so that it is capable of being contacted by a person, either directly or as determined using the probe illustrated in Figure 9.1.

2.3 ACCESSORY – An electrical component that is intended to be attached in the field or to be shipped separately; for example, a raceway, a top- or base-feed, a fixture, or similar component.

2.4 BRANCH CIRCUIT – The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

2.5 BRANCH CIRCUIT, MULTIWIRE – A branch circuit that consists of two or more ungrounded conductors that have a voltage between them, and a grounded conductor that has equal voltage between it and each ungrounded conductor of the circuit and that is connected to the neutral or grounded conductor of the system.

2.6 CHANNEL, CORD/CABLE – A passage intended for the routing and holding of communication wiring, low-voltage wiring, and wiring having functional insulation plus a layer of supplementary insulation. A channel is not required to provide mechanical protection, and is not evaluated as a raceway.

2.7 CLASS 2 CIRCUIT – A circuit having power and voltage limitations as defined in ANSI/NFPA 70, Article 725. To determine whether a circuit is within Class 2 limits, measurements shall be made in accordance with UL 5085-1 and UL 5085-3, or UL 1310.

2.8 CONNECTOR, UNIT-TO-UNIT MECHANICAL – An assembly that is used to connect two or more adjacent units for the purpose of providing mechanical support between the units.

2.9 CORD CONNECTOR (convenience outlet) – A female contact device that is wired or molded on flexible cord and intended to be installed as part of an office furnishing wiring system to supply current to utilization equipment.

2.10 CONVENIENCE OUTLET – A female connector of one of the configurations covered in the Standard for Wiring Devices – Dimensional Requirements, ANSI/NEMA WD6 that is provided for the connection of a small appliance, a work light, or similar product.

2.11 CORE – That portion of an office furnishing structural unit from one outside surface to its opposite outside surface, excluding decorative trim, electrical hardware, and mechanical supporting feet or glides.

2.12 ELECTRICAL CONNECTING ASSEMBLY TYPES:

BASE FEED – An electrical raceway assembly that contains supply conductors used to provide electrical power from a branch-circuit electrical supply located in the floor, column or wall of the building structure to the base of the office furnishing starter unit.

PASS-THROUGH UNIT – An electrical raceway assembly without any means for connection of utilization equipment, used to pass electrical power through a unit.

TOP FEED – An electrical raceway assembly that contains the electrical supply conductors used to provide electrical power from a branch-circuit electrical supply located in the ceiling or wall of the building structure to the office furnishing starter unit.

UNIT-TO-UNIT – An electrical raceway assembly that is used to electrically interconnect two adjacent mechanically connected units.

SYSTEMS JUMPER – An electrical raceway connection assembly that is used for the interconnection of office furnishing electrical systems and manufactured wiring systems.

SYSTEM-TO-SYSTEM ADAPTER – An electrical raceway connection assembly that is used for the interconnection of one type or configuration of office furnishing electrical system to a different type or configuration of office furnishing electrical system.

2.13 ENCLOSURE – A part of the equipment that:

a) Renders inaccessible all or any parts of the equipment that may otherwise present a risk of electric shock;

b) Retards propagation of flame initiated by electrical disturbances occurring within; and

c) Provides the internal components with protection from outside physical abuses.

2.13A ENCLOSURE, ELECTRICAL – That part of the product that:

a) Renders inaccessible all or any parts of the equipment that may otherwise present a risk of electric shock; and/or

b) Retards propagation of flame initiated by electrical disturbances occurring within.

2.14 FABRIC PARTITIONS – A partition consisting of fabric without a rigid backing that is attached to a framing system.

2.15 FIELD-WIRING TERMINAL – A terminal to which a conductor is intended to be connected in the field.

2.16 FUNCTIONAL LOAD[a] – The level of loading or force typical of hard use.

2.17 FURNISHING SYSTEM – An arrangement of interconnected or individual units, work stations, study carrels, and similar types of products. A furnishing system is defined as being of one of the following three types:

Type I – A system that provides all required parts and employs prewired modular electrical systems and accessories requiring only quick connect and disconnect means for electrical connections, other than the permanent connection to the branch-circuit supply. A Type I system is not prohibited from being shipped with accessories:

a) Installed in the panel; or

b) Installed in the field when the accessories are marked for use in the system.

Type II – A system that provides raceways for the routing and termination of wiring in the field. Wiring assemblies, when provided, are not always complete. This type of system requires inspection of the wiring by the local authorities.

Type III – A system that is not intended to be wired and has no provision for the routing and termination of wiring.

2.18 INSULATION, BASIC – Insulation applied to live parts to provide basic protection against electric shock.

2.19 INSULATION, SUPPLEMENTARY – A separate layer of insulation that is provided in addition to the basic insulation to reduce the risk of electric shock in the event of breakdown of the basic insulation.

2.20 LOSS OF SERVICEABILITY[a] – The failure of any component to carry its intended load or to perform its normal function or adjustments.

[a] With the permission of BIFMA, this definition is reproduced from ANSI/BIFMA X 5.6. BIFMA shall not be responsible for the manner in which the information is presented, used, nor for any interpretations thereof.

2.21 OFFICE FURNISHING SYSTEM – System formed from office furnishing panels, study carrels, workstations, and pedestal-style systems, and the like. See 1.1, 1.2 and 1.5.

2.22 OFFICE FURNISHING UNIT – A combination of panels that create one office area. An office furnishing system is made up of one or more office furnishing units.

2.23 PANEL[a] – A flat or curved surface that controls and/or defines space; provides privacy and a means for hanging components.

2.23A PANEL, LOW LEVEL – A panel with a height above the floor that is less than 28 inches and may support and protect electrical raceways and electrical distribution systems. The system may also provide mechanical support for work surfaces, storage units screens and similar components. A low level panel is not intended for seating.

2.24 PANEL MOUNTED COMPONENT[a] – A product intended to be supported wholly by a panel system.

2.25 PANEL RUN[a] – Two or more panels connected in a straight line.

2.26 PANEL-SUPPORTED[a] – 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.

2.27 PANEL SYSTEMS PRODUCTS[a] – The panels, screens, and various panel-mounted components used in conjunction with panel systems.

2.28 PROOF LOAD[a] – The level of loading or force in excess of hard use.

2.29 RACEWAY – An enclosed channel designed expressly for holding wires, cables, or busbars. It provides mechanical, fire, and electrical protection to the internal system wiring.

2.30 RACEWAY TYPES:

FURNISHING RACEWAY– A raceway that is physically supported by an office furnishing unit after installation or is integral to the office furnishing unit.

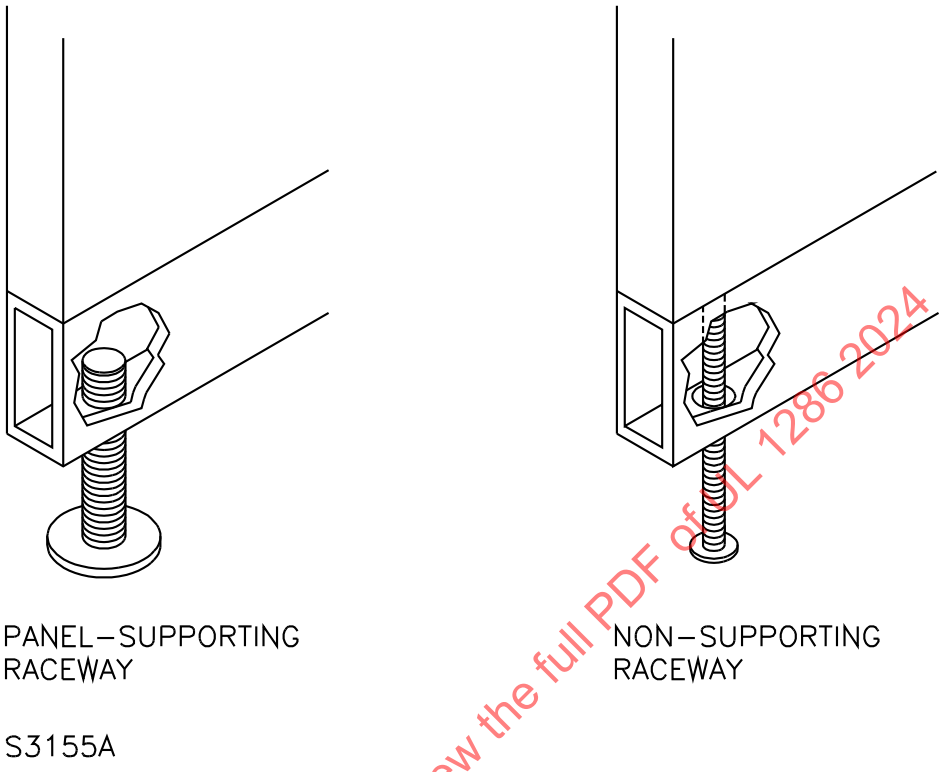
FURNISHING (PANEL) SUPPORTING RACEWAY – A raceway that the office furnishing unit rests directly upon or to which supporting feet or glides are mechanically connected. See Figure 2.1.

PASS-THROUGH FURNISHING RACEWAY – A raceway that is physically connected between other raceways that does not have convenience outlets or any other means for connection of utilization equipment and is used to pass electrical power through a unit.

2.31 RACEWAY, FURNISHING-SUPPORTING – A raceway that the furnishing rests directly upon, or to which supporting feet or glides are mechanically connected. See Figure 2.1.

Figure 2.1

Furnishing-Supporting Raceway



2.32 RECEPTACLE, CONVENIENCE (convenience outlet) – A female contact device intended to be installed as part of an office furnishing wiring system to supply current to utilization equipment.

2.33 SCREEN[a] – Non-load-carrying space divider that is less than ceiling height.

2.33A SCREEN, LOW LEVEL – A screen with a height above the floor less than 28 inches.

2.34 STARTER UNIT – The unit that is connected to the external supply source and that sometimes has provision for electrical connection of additional portions of an office furnishing system. The physical location of the starter unit within the system is not specified, however, a series of electrically interconnected units forming a wall has a single starter unit.

2.35 STARTER UNIT TYPES:

FIXED STARTER UNIT – A unit that is intended for permanent attachment to the building structure. A unit is permanently attached when the unit is secured and supported by mechanical fastening to the building structure. A bracket or similar arrangement that has no positive fastening means, such as a bolt or screw, to secure the unit is not permanent attachment, nor is an arrangement that serves only to stabilize the unit.

FREESTANDING STARTER UNIT – A unit that is not intended for permanent attachment to the building structure and is not provided with means for such attachment.

2.36 SURFACE CLASSIFICATIONS[a]:

ADJUSTABLE KEYBOARD SURFACE – An adjustable surface that is intended for placement of the keyboard, and/or other computer input devices.

DISPLAY SHELF – A shelf with a sloping surface and retaining flange or edge.

PRIMARY SURFACE – A surface that has the apparent potential for the highest loading within a workstation or a surface on which a person may sit. In cases where more than one horizontal surface exists, there may be more than one primary surface.

SECONDARY SURFACE – A surface that is used for storage (i.e., a shelf) or occupied exclusively by the equipment placed on the surface.

TRANSACTION SURFACE – A surface that is less than 16 in (406 mm) deep and is not enclosed. It is primarily used as a temporary work surface and not as a shelf.

WRITING SHELF – A moveable, typically stowable surface that is not intended to carry loads greater than 25 lb (11 kg), whose primary function is to support ancillary office tasks, such as writing and short-term reference material handling.

2.37 TEST LOAD[a] – A particular load/force placed in or on a component specified by a test procedure and not included in the dead weight of the component.

2.38 TIP OVER[a] – The condition where the unrestricted unit will not return to its normal upright position.

2.39 UNIT – A panel, table, storage cabinet, file cabinet or the like, the primary purpose of which is to form an office furnishing system or a portion of a system.

2.40 UNIT INSERT – A separable portion of a panel (excluding decorative trim, electrical components, and structural elements of the unit) that is intended to be removed or replaced in the field, with or without the use of tools.

2.41 USER SERVICING – Any form of servicing that is intended to be performed by personnel other than qualified service personnel. Some examples of user servicing are:

a) The attachment of accessories by means of attachment plugs, convenience outlets, or by means of other separable connections.

b) The replacement of:

1) Fuses and lamps that are accessible without the use of tools, and

2) Lamps such as those employed for ambient lighting and that require frequent replacement, whether or not the operation requires the use of tools.

c) The disconnection or connection of a unit, excluding a permanently connected starter unit, constructed so that the user is not exposed to basic insulated or uninsulated live parts.

d) The laying in of communication-type cables or telephone cord in a cord-management trough or a designated communication channel.

2.42 USER ADJUSTABLE SURFACES[a] – A surface that is intended to be adjusted by the user while under normal use.

2.43 VIDEO MOUNTING SYSTEM TYPES:

ADJUSTABLE MOUNT – A mounting system designed with components that may be adjusted once, infrequently or requires a tool be used for adjustment and is intended to support the video display in a fixed position after assembly and installation.

ARTICULATING MOUNT – A mounting system intended to allow active movement, adjustment, and repositioning, after installation.

MONITOR ARM – A device identified to support a computer video display that is in turn supported by or secured to a desk or table.

2.44 WORKING EDGE[a] – The side of the surface at which the primary user sits. (Note: Some surfaces may have more than one working edge; for example, conference tables.)

2.45 WORK SURFACE[a] – A horizontal surface used to perform tasks and/or for storage space.

3 Components

3.1 A component of a product covered by this Standard shall:

a) Comply with the requirements for that component as specified in this Standard;

b) Be used in accordance with its rating(s) established for the intended conditions of use; and

c) Be used within its established use limitations or conditions of acceptability.

3.2 A component of a product covered by this Standard is not required to comply with a specific component requirement that:

a) Involves a feature or characteristic not required in the application of the component in the product;

b) Is superseded by a requirement in this Standard; or

c) Is separately investigated when forming part of another component, provided the component is used within its established ratings and limitations.

3.3 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

3.4 A component that is also intended to perform other functions such as overcurrent protection, ground-fault circuit-interruption, surge suppression, any other similar functions, or any combination thereof, shall comply additionally with the requirements of the applicable standard(s) that cover devices that provide those functions.

3.5 Electromagnetic-interference filters, relocatable power taps, and transient voltage surge suppressors that are used in office furnishing systems to operate on 50 to 60 Hz power circuits shall comply, in addition to the applicable requirements in this Standard, with the applicable requirements in UL 1283, UL 1363, and UL 1449, respectively.

3.6 Metallic raceways shall comply with UL 5 and non-metallic raceways shall comply with UL 5A, except as specified in Table 3.1.

Table 3.1
Application of Specific Testing Requirements of UL 5A

UL 5A Section[a]	Test name[a]	Application
5.5	Temperature	Shall be performed as specified in Section 21, Temperature Test of this standard.
5.6	Deflection under heat and load	Not performed.
5.8	Resistance to thermal degradation	Materials shall have appropriate thermal properties based on temperatures measured.
5.11	Cold Impact	Test shall be performed at 25 °C.[b]
5.12	Low temperature handling	Not performed.
5.14	Flame test in cable trays – FT4 (optional)	Not performed.

[a] If a test is not listed, it shall be performed as specified in UL 5A, if applicable.

[b] For furnishing-supporting raceways, the test in 22.2, Impact test – furnishing-supporting enclosures of this Standard shall also be performed.

3.7 Equipment that is intended to energize or de-energize electrical loads by responding to sensors and controlling the loads through the use of pre-programmed data logic or similar means shall comply with UL 916.

3.8 Metallic and non-metallic enclosures shall comply with UL 50.

3.9 Insulating materials that are in direct or indirect contact of live parts shall comply with UL 746C.

3.10 Metal raceways shall comply with Tables 12.1 – 12.4, in UL 5 and non-metallic raceways shall comply with the Crushing Resistance, Resistance to Impact and Mold Stress Tests in UL 746C and have a Relative Thermal Index (mechanical with impact) equal to or greater than the temperatures measured during the Temperature Test.

4 Units of Measurement

4.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

5 Referenced Publications

5.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

5.2 The following publications are referenced in this Standard:

ANSI Z97.1, *Safety Glazing Material Used in Buildings – Safety Performance Specifications and Methods of Test*

ASTM A90/A90M, *Standard Test Methods for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc Alloy Coatings*

ASTM A653/A653M, *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

ASTM C39/C39M, *Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens*

ASTM C90, *Standard Specification for Loadbearing Concrete Masonry Units*

ASTM C216, *Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)*

ASTM D3359, *Standard Test Method for Rating Adhesion by Tape Test*

ASTM D3363, *Standard Test Method for Film Hardness by Pencil Test*

ASTM D4145, *Standard Test Method for Coating Flexibility of Prepainted Sheet*

ASTM E230/E230M, *Standard Specification and Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples*

ANSI/NFPA 70, *National Electrical Code*

ANSI/BIFMA X5.5, *Desk and Table Products*

ANSI/BIFMA X5.6, *Standard for Office Furnishings – Panel Systems*

ANSI/BIFMA X5.9, *Storage Units*

EN 12600, *Glass in Building – Pendulum Test – Impact Test Method and Classification for Flat Glass*

NFPA 701, *Standard Test Methods of Fire Tests for Flame Propagation of Textiles and Films*

UL 1, *Flexible Metal Conduits*

UL 4, *Armored Cable*

UL 5, *Surface Metal Raceways and Fittings*

UL 5A, *Nonmetallic Surface Raceways and Fittings*

UL 50, *Enclosures for Electrical Equipment, Non-Environmental Considerations*

UL 94, *Tests for Flammability of Plastic Materials for Parts in Devices and Appliances*

UL 153, *Portable Electric Luminaires*

UL 183, *Manufactured Wiring Systems*

UL 360, *Liquid-Tight Flexible Steel Conduit*

UL 410, *Slip Resistance of Floor Surface Materials*

UL 498, *Attachment Plugs and Receptacles*

UL 514A, *Metallic Outlet Boxes*

UL 514B, *Conduit, Tubing, and Cable Fittings*

UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*

UL 514D, Cover Plates for Flush-Mounted Wiring Devices

UL 723, *Test for Surface Burning Characteristics of Building Materials*

UL 746C, *Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 817, *Cord Sets and Power-Supply Cords*

UL 916, *Energy Management Equipment*

UL 962, *Household and Commercial Furnishings*

UL 969, *Marking and Labeling Systems*

UL 969A, *Marking and Labeling Systems – Flag Labels, Flag Tags, Wrap-Around Labels and Related Products*

UL 1283, *Electromagnetic-Interference Filters*

UL 1310, *Class 2 Power Units*

UL 1363, *Relocatable Power Taps*

UL 1439, *Tests for Sharpness of Edges on Equipment*

UL 1441, *Coated Electrical Sleeving*

UL 1449, *Surge Protective Devices*

UL 1598, *Luminaires*

UL 1660, *Liquid-Tight Flexible Nonmetallic Conduit*

UL 2999, *Individual Commercial Office Furnishings*

UL 5085-1, *Low Voltage Transformers – Part 1: General Requirements*

UL 5085-3, *Low Voltage Transformers – Part 3: Class 2 and Class 3 Transformers*

CONSTRUCTION

6 General

6.1 An office furnishing system shall be formed and assembled so that it has the strength, stability, and rigidity to resist the abuses to which it is subjected without resulting in a risk of fire, electric shock, or injury to persons. See the Structural Performance requirements of Sections 30 – 36.

6.2 A frame, a guard, a handle, or similar part, or an exposed portion of an enclosure, such as an edge, projection, or corner, shall be smooth and rounded, and not be so sharp as to result in a risk of injury to

persons during intended use and maintenance of the product. Compliance shall be determined in accordance with the requirements in UL 1439.

6.3 A top- or base-electrical feed for a panel assembly shall not be used to provide support to the panel system.

6.4 A modular pre-wired office furnishing floor raceway system shall comply with Annex A.

7 Accessibility of Electrical Component Parts

7.1 Live parts of an office furnishing system shall be enclosed to reduce the risk of fire, electric shock, and injury to persons. See 18.5.2.

Exception No. 1: A part in a Class 2 circuit is not required to be enclosed. See 2.7.

Exception No. 2: A unit-to-unit electrical connecting assembly complying with the requirements in 13.1.4 – 13.1.7 and a contact opening of a receptacle that complies with the requirement in 9.1 are not required to be further enclosed.

7.2 A raceway enclosing uninsulated live parts shall be complete and shall require the use of a tool or tools to gain access to those parts. See 18.5.2.

7.3 A raceway enclosing basic insulated live parts shall be complete and reliably secured in place. See 18.5.2.

7.4 A snap-fit cover, a cover secured by 1/4-turn screws, or a similar cover, that is secured to a rigidly-supported raceway member is able to be used as the enclosure of basic insulated wiring when:

a) The cover complies with the applicable snap-fit cover tests specified in Strength of Enclosure Tests, Section 22; or

b) Where metallic, the cover is reliably connected to the ground return path by means other than simple friction between surfaces.

7.5 With reference to 7.4, the system shall comply with one of the following:

a) The installation of communication or low-voltage cable or wiring does not require access to the enclosed basic insulated parts, or

b) Basic insulated wiring that is accessible when installing communication or low-voltage wiring is reliably held in place so that it is not unintentionally displaced or requires handling during the installation of the communication or low-voltage wiring.

8 Accessories

8.1 The requirements in this Section apply to accessories other than raceways, top- or base-feeds, and other components explicitly covered by other sections of this Standard.

8.2 A system having provision for the use of electrical accessories to be attached in the field shall be constructed so that the use of such accessories does not introduce a risk of fire, electric shock, or injury to persons.

8.3 A system shall comply with the requirements in this Standard with or without the accessory installed.

8.4 Installation of an electrical accessory by the user shall be restricted to an arrangement by which the electrical connections are accomplished by means of mating connectors, attachment plugs and receptacles, or attachment plugs and cord connectors.

8.5 Installation of an accessory intended to be made by service personnel shall be by means of mating connectors, attachment plugs and receptacles, plug-in connectors, insulated wire connectors, or by connection to existing wiring terminals.

8.6 With reference to 8.5, any installation that requires the cutting of wiring or the soldering of connections by the installer is not in compliance with the requirement unless the office furnishing system is Type II (see 2.17). An installation that requires cutting, drilling, or welding is not in compliance with the requirement in electrical enclosures and in other areas where such operations have the potential to damage existing electrical or mechanical components and wiring within the enclosures.

8.7 Strain-relief means shall be provided for the wiring in an accessory where stress is otherwise transmitted to terminal connections that are not visible during or after installation.

8.8 The mounting location of an accessory shall be indicated on the furnishing, unless:

a) The mounting location is obvious due to the function of the accessory and arrangement of the basic products, and

b) Instructions are provided covering the installation and location for the accessory.

8.9 An accessory shall be subjected to the Trial Installation Test, Section 37 to determine that the installation is applicable, that the instructions are detailed and accurate, and that the use of the accessory does not introduce a risk of fire, electric shock, or injury to persons.

ELECTRICAL CONSTRUCTION

9 Contacts

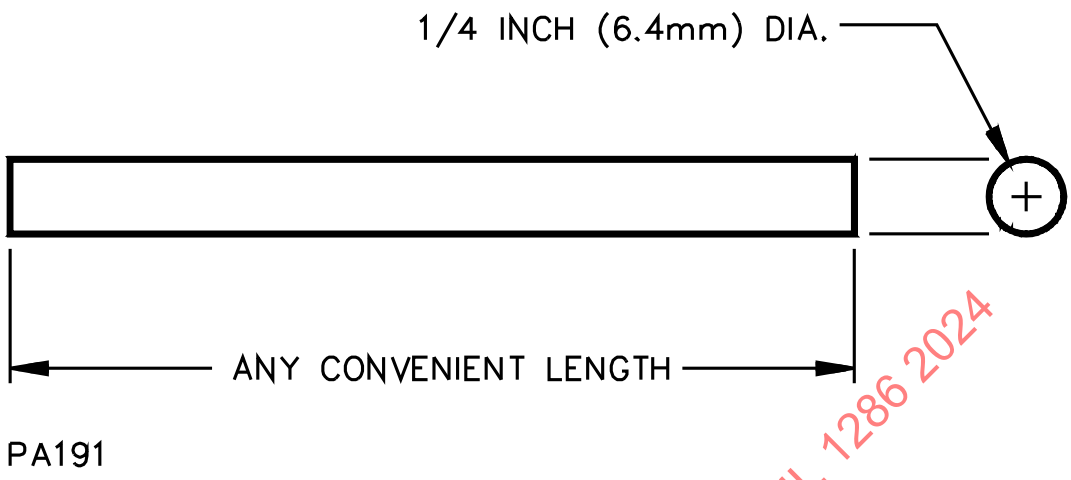
9.1 A contact opening in a connector employed for quick assembly to connect power between two panels, between a panel and a top- or base-feed, or similar assembly, shall be such that the probe illustrated in Figure 9.1 does not contact an uninsulated live part when:

a) The probe is applied to the contact opening, without the mating plug inserted, or

b) The mating plug is partially inserted into the connector.

Figure 9.1

Accessibility probe



10 Power-Supply Connections

10.1 General

10.1.1 A starter unit shall have provision for connection of a wiring system in accordance with ANSI/NFPA 70.

10.1.2 A starter unit shall be connected to a supply source so that no ungrounded supply (unidentified) conductor exceeds a potential of 120 V with respect to the grounded supply conductor or the grounding conductor.

10.1.3 A top- or base-feed, supply cable, fitting, cable connector, and mating electrical raceway shall be constructed so that stresses on the top- or base-feed or supply cable that occur during the installation and intended use of the product do not result in a risk of fire or electric shock. See 13.1.13, 13.2.1, and 25.1 – 25.2.

10.2 Permanently connected systems

10.2.1 A fixed starter unit shall be provided with means for permanent attachment to the branch-circuit supply.

10.2.2 A Type I fixed starter unit not equipped with a top- or base-feed or supply cable shall be provided with field-wiring terminals or leads for the connection of conductors having an ampere rating:

a) That results in compliance of the panel system with the requirements in this Standard, and

b) That is in accordance with ANSI/NFPA 70.

10.2.3 A Type II fixed starter unit is not required to be provided with a splice compartment or a junction box to make connections.

10.2.4 A terminal or splice compartment shall be complete and shall enclose all field-wiring terminals and splices to be made in the field.

10.2.5 A terminal or splice compartment shall be of a size that provides free space for all enclosed conductors. Fill requirements and the corresponding volume required are to be determined in accordance with ANSI/NFPA 70, Article 370. The volume provided by the terminal or splice compartment is to be determined by using water as specified for the Volume Verification Test in UL 514A.

10.2.6 A terminal or splice compartment in which power-supply connections are to be made in the field shall be located so that the connections are accessible for inspection after installation of the office furnishing system.

10.2.7 The compartment specified in 10.2.4 shall be located so that, when making conduit connections, internal wiring and electrical components are not exposed to mechanical abuse or strain.

10.2.8 A terminal compartment intended for connection of a supply raceway shall be prevented from turning with respect to the supporting surface.

10.2.9 A terminal intended solely for connection of an equipment-grounding conductor shall secure a conductor of the size required in accordance with ANSI/NFPA 70.

10.2.10 A wiring terminal shall be prevented from turning.

10.2.11 A field wiring wire-binding screw intended for connection of an equipment-grounding conductor shall be located so that it will not require removal during normal servicing of the product and shall have one of the following constructions:

a) A green terminal screw with a hexagonal head that is not easily removed,

b) A green hexagonal terminal nut that is not easily removed,

c) A green pressure wire connector, or

d) When the terminal of the grounding conductor is not visible, the conductor entrance hole shall be marked with one of the following:

1) The color green,

2) The word “Green” or “Ground,”

3) The letters “G” or “GR,” or

4) A ground symbol.

10.2.12 A wire-binding screw at a wiring terminal shall not be smaller than No. 10 (4.8 mm diameter). Where a pretapped hole is not provided, a thread-forming screw shall be used.

Exception: The use of a No. 8 (4.2 mm diameter) screw at a terminal intended only for connection of a 14 AWG (2.1 mm^2) or smaller conductor complies with the requirement.

10.2.13 A terminal plate tapped for a wire-binding screw shall be of metal not less than 0.05 in (1.27 mm) thick. There shall be two or more full threads in the metal. Extruding the metal to provide the threads complies with this requirement.

Exception: The use of a terminal plate not less than 0.03 in (0.76 mm) thick complies with the requirement where the tapped threads comply with Tightening Torque Test, Section 23.

10.2.14 A wire-binding screw shall be provided with an upturned lug or cupped washer that retains a supply conductor of the size intended to be connected.

10.2.15 A terminal (for example, a plate and screw) intended for the connection of a grounded supply conductor shall be formed of, or plated with, metal that is substantially white in color and shall be readily distinguishable from other terminals or shall be clearly identified in some other manner, such as on an attached wiring diagram.

10.2.16 A lead intended for the connection of a grounded supply conductor shall be finished to show a white or gray color, and shall be readily distinguishable from other leads.

10.2.17 The surface of an insulated lead intended solely for connection of an equipment-grounding conductor shall be substantially green with or without one or more yellow stripes, and no other lead visible to the installer shall be so identified.

10.2.18 The free length of a lead located inside an outlet box or field-wiring compartment and intended for field connection to a branch circuit shall not be less than 6 in (150 mm). A free length of lead intended for connection to the branch circuit supply shall not be supplied on furnishing components other than a dedicated starter unit or as part of a furnishing raceway, or similar component.

10.2.19 Where flexible metal conduit, liquidtight flexible metal conduit, or liquidtight flexible nonmetallic conduit is employed in a top- or base-feed for permanent connection:

a) A bushing or fitting shall be used so that enclosed wiring does not contact sharp edges or burrs, and

b) The method of strain relief shall comply with Strain-Relief Tests, Section 25.

10.3 Cord-connected systems

10.3.1 A freestanding starter unit connected to a single-phase branch circuit by a flexible cord provided with a grounding-type attachment plug shall be constructed so that:

a) The method of electrical interconnection of the office furnishing system is such that the length of electrically interconnected furnishings is not capable of exceeding 30 ft (9.1 m), or

b) The system shall be provided with instructions as specified in 39.3.

10.3.2 A flexible cord used in accordance with 10.3.1 shall be rated for use at a voltage not less than the rated voltage of the product. The ampacity of the cord and plug shall:

a) Not be less than that required for the application in accordance with ANSI/NFPA 70, and

b) Not be less than 20 A.

10.3.3 A flexible cord shall be of a Type rated for extra-hard usage (Type S or the equivalent). The cord shall not be more than 2 ft (0.6 m) long, as measured along the cord from the back surface of the attachment plug to the back surface of the cord fitting at the office furnishing.

10.3.4 The attachment plug specified in 10.3.1 shall be rated 125 V, 20 A minimum, and shall be of one of the configurations covered in the Standard for Wiring Devices – Dimensional Requirements, ANSI/NEMA WD6-1988.

10.3.5 *Deleted*

11 Internal Wiring

11.1 The wiring and connection between parts within a single office furnishing shall be enclosed. See Accessibility of Electrical Component Parts, Section 7.

11.2 A hole through which insulated wires pass in a sheet-metal wall within the overall enclosure of an office furnishing shall be provided with:

a) A bushing so that wires do not contact sharp edges or burrs, or

b) A smooth, rounded surface.

11.3 A metal clamp or guide used for routing internal wiring shall be provided with smooth, rounded edges. Auxiliary nonconducting mechanical protection shall be provided where a clamp exerts pressure on a basic insulated conductor.

11.4 Wiring shall be routed away from projections, sharp edges, screw threads, burrs, fins, moving parts, drawers, and similar parts to prevent abrasion or other damage to the wire insulation.

11.5 The wiring shall consist of wires of a type or types rated for the application with respect to:

a) Intended conditions of use, such as flexibility, mechanical abuse, temperature, ampacity, and voltage, and

b) Where subject to flexing, the wires comply with the Electrical Connecting Assembly Tests, Section 24.

11.6 Wiring connected between furnishings that have the flexibility of forming various angles with respect to each other shall be stranded-conductor type.

Exception: Solid conductors are not prohibited between furnishings where:

a) The furnishings form angles which are permanent after installation,

b) The system is Type II (see 2.17), and

c) The raceway does not prohibit inspection and replacement of the wiring when configurations are changed.

11.7 Color-coded basic insulation shall be used for internal wiring. Each circuit shall be indicated by a particular color. The grounded supply conductor shall be colored white, gray, white or gray with a color stripe, or by three continuous white stripes on other than green insulation along its entire length. An insulated grounding conductor shall be green or substantially green with one or more yellow stripes. Color coding of a supply conductor or conductors that are visible during installation shall be consistent for units of the same furnishing system.

Exception: Wiring is not required to be color-coded where it is not accessible during intended use and maintenance of the system.

11.8 Grounded conductors installed in the same raceway or enclosure shall be uniquely identified. Identification that distinguishes each grounded conductor shall be one of the following:

a) By an outer covering of white or gray with a readily distinguishable colored stripe other than green running along the insulation, or

b) Other and different means of identification that will distinguish each grounded conductor.

Exception: Grounded conductors are not required to be color-coded where they are not accessible during intended use and maintenance of the system.

11.9 Flexible cord or festoon cable shall not be employed as a system raceway as defined in 2.29 – 2.31 or as internal wiring within a raceway. Also see 13.1.12.

Exception: This requirement does not apply to a unit-to-unit electrical connecting assembly or to an electrical connecting assembly for an accessory (such as a lighting unit) where the accessory is not used to supply power to other components of the system. See 13.1.3.

11.10 Conductors from electric light and power circuits shall be separated from conductors of Class 2 circuits by enclosing the light and power conductors in a separate wiring raceway, providing a partition between conductors of the different systems where both systems are in the same raceway, or providing reliable physical separation of at least 2 in (50.8 mm) between conductors of the different systems. A partition, used for separation, shall be grounded metal or material that complies with the requirements for internal barriers in UL 746C.

11.11 A splice or connection shall be mechanically secure and provide electrical continuity. A soldered connection shall be mechanically secured before being soldered. A splice shall not be made in an area other than a specified wiring compartment area. For example, a splice shall not be located inside conduit.

11.12 A splice shall be provided with insulation equivalent to that of the wires involved.

11.13 When determining compliance for splice insulation consisting of fabric, thermoplastic, or other types of tubing, factors such as the dielectric properties and use temperature of the splice insulation shall be investigated. Thermoplastic tape wrapped over a sharp edge shall not be used as an insulating means.

11.14 Stranded internal wiring that is connected to a wire-binding screw shall be provided with a means to prevent loose strands of the wire from contacting other uninsulated live parts not always of the same polarity or dead metal parts. Means for compliance include use of a pressure-type spade terminal connector with turned-in or turned-up ends, by a closed loop connector, or other equivalent means.

12 Grounding

12.1 A path for electrical current shall be provided between all parts of a metal raceway containing electrical parts or wiring. See Grounding-Impedance Test, Section 19.

12.2 Flexible metal conduit shall not be relied upon for the grounding path through an individual office furnishing or between office furnishing units.

12.3 The grounding means through an individual office furnishing and between office furnishing units shall have an ampacity at least equivalent to that of the supply conductors.

12.4 A furnishing system that employs quick-connect means for electrically connecting the branch-circuit supply to the panel and from furnishing-to-furnishing shall be constructed so that the grounding connection is made prior to or at the same time that all other supply connections are made.

12.5 A dead metal part that has the potential to become energized shall be bonded to the grounding return path by means of a conductor with a wire gauge not smaller than the wire gage of the supply wires of the furnishing.

Exception: A conductor smaller than the supply wires and not smaller than 18 AWG (0.82 mm^2) complies where the length is less than 6 in (150 mm).

12.6 Sheet metal screws shall not be used to connect grounding conductors to terminals, dead metal enclosures or to bond dead metal enclosures to conductors or other dead metal parts.

13 Electrical Connecting Assemblies

13.1 Unit-to-unit, pass-through-unit, and top- and base-feed electrical connecting assemblies

13.1.1 A unit-to-unit electrical connecting assembly shall be relaxed or slightly compressed under normal use unless it has the requisite properties for long-term use under tension. Normal use includes any angle that is capable of being made between two mechanically connected units unless prevented by the connection of the system or prohibited by the instruction manual.

13.1.2 A unit-to-unit or pass-through-unit electrical connecting assembly shall be constructed to withstand the flexing that occurs in normal use. See Electrical Connecting Assemblies Tests, Section 24.

13.1.3 Flexible cord used in a unit-to-unit electrical connecting assembly shall be:

a) Of a Type rated for extra-hard usage (Type S or the equivalent), and

b) Provided with a mating connector at each end. Also see 13.1.6.

13.1.4 Nonrigid polymeric material acting as supplementary insulation and providing mechanical support for a unit-to-unit or pass-through-unit electrical connecting assembly consisting of insulated live parts (other than low voltage) shall not be less than 0.030 in (0.76 mm) thick. The insulated live parts shall be molded into the nonrigid material to prevent bunching of the insulated conductors.

Exception No. 1: Supplementary insulation, consisting of a nonrigid polymeric material less than 0.030 in (0.76 mm) thick or of the non-molded type, that complies with the Dielectric Voltage-Withstand Test, Section 20, meets the intent of this requirement.

Exception No. 2: When sleeving is provided as supplementary insulation, the assembly shall comply with the requirements for nonrigid polymeric materials specified in 13.1.6 and be rated VW-1 in accordance with UL 1441.

13.1.5 When insulated live parts are provided with supplementary insulation in accordance with 13.1.4 a maximum slot, gap, or opening of 0.090 in (2.29 mm), as measured in the relaxed state, is allowed for flexibility of the assembly.

13.1.6 A unit-to-unit electrical connecting assembly employing flexible cord as specified in 13.1.3 or nonrigid polymeric material as specified in 13.1.4:

a) Shall not be longer than 24 in (600 mm), and

b) Shall be recessed such that a 2-in (51-mm) diameter sphere is prevented from contacting the connecting assembly.

Exception: A connecting assembly provided with mechanical protection rated for the application is not required to be recessed.

13.1.7 A nonrigid polymeric material employed as supplementary insulation as specified in 13.1.4 shall be Class V-2 or better in accordance with UL 94.

13.1.8 Flexible conduit employed as part of a connecting device shall not be made to exceed its minimum bend radius under normal use. See 13.1.1. The number of conductors within the conduit shall be

limited to 40 % fill. To calculate the fill, the maximum insulated conductor diameter and the minimum inside diameter of the conduit are to be used.

Exception: Conduit is in compliance with more than 40 % fill when the combination of the conduit and enclosed conductors is investigated and found to comply with Temperature Test, Section 21, and Electrical Connecting Assemblies Tests, Section 24.

13.1.9 A connecting assembly employing 1/2-in trade size or larger flexible metal conduit or liquidtight flexible metal conduit that does not employ a separate grounding conductor and is intended to pass through a furnishing and electrically connect two furnishings that are not mechanically contiguous shall not be more than 12 ft (3.6 m) long.

13.1.10 An electrical connecting assembly employing 1/2-in trade size or larger flexible metal conduit or liquidtight flexible metal conduit that connects to a component part of the office furnishing where the office furnishing user would be likely to reposition that portion of the furnishing as part of normal use, shall be provided with a stranded grounding conductor.

Exception: Bonding jumpers used to connect fittings, connectors, and similar parts, and that are not subject to flexing are not required to be stranded.

13.1.11 A connecting assembly shall not employ liquidtight flexible nonmetallic conduit, 3/8-in trade size flexible metal conduit, or 3/8-in trade size liquidtight flexible metal conduit in lengths more than of 6 ft (1.8 m) long.

13.1.12 A pass-through-unit electrical connecting assembly shall not consist of thermoplastic- or rubber-insulated flexible cord or cable.

13.1.13 A connecting assembly of a type other than those specified in 13.1.3 – 13.1.12 shall be rated for the application with respect to:

a) Resistance to impact,

b) Flexibility,

c) Accessibility to the user,

d) Direct support requirements for live parts,

e) Indirect support requirements for live parts,

f) Stress to wire terminations, and

g) Flammability.

13.1.14 A plug or receptacle used to connect electrical power from unit-to-unit or to connect a top- or base- feed to a starter unit shall not have a general- or specific-purpose configuration specified in UL 498.

13.1.15 Top- and base-feeds constructed of flexible metal conduit or liquidtight flexible metal conduit less than 1/2-in trade size shall not exceed 6 ft (1.8 m) in length.

13.1.16 A unit-to-unit, pass-through unit, and top- and base-feed assemblies incorporating 1/2-in trade size and larger flexible metal conduit, liquidtight flexible metal conduit, or armored cable complying with UL 1, UL 360, or UL 4; employing a separate ground conductor, shall not be restricted in length.

13.1.17 A unit-to-unit, pass-through unit, and top- and base-feed assemblies employing connectors which facilitate the connection of the grounding conductor to the flexible metal conduit, liquidtight flexible metal conduit, or armored cable shall comply with Grounding-Impedance Test, Section 19.

Exception: A flexible metal conduit, liquidtight flexible metal conduit, or armored cable, not exceeding 6 ft (1.8 m) in length and having fittings complying with UL 514B is not required to be tested for grounding impedance.

13.2 System jumpers

13.2.1 A systems jumper for interconnection of office furnishings and manufactured wiring systems shall:

a) Comply with the requirements for an accessory in this Standard,

b) Be marked in accordance with paragraphs 38.7 and 38.16,

c) Be provided with a wiring diagram facilitating the traceability of the circuits, and

d) Be provided with installation instructions indicating the installation requirements outlined in 39.7.

13.2.2 The office furnishings electrical system to which the systems jumper specified in 13.2.1 is connected shall be installed in a wired partition unless the electrical system complies with the requirements for use outside of a wired partition.

13.2.3 A manufactured wiring system that is intended to terminate within the wired partition, of the office furnishing component, including a systems jumper, shall be rated as an accessory for use with the specific office furnishings partition.

13.2.4 System jumpers that employ mating connectors for connection to the office furnishing electrical system shall comply with 13.3, Mating connectors.

13.2.5 The mating connector end of a system jumper that is intended for connection to a manufactured wiring system shall comply with the requirements for mating connectors in UL 183.

13.2.6 System jumpers shall comply with one of the following constructions:

a) Flexible metal conduit, liquid-tight flexible metal conduit, or liquid-tight flexible nonmetallic conduit shall comply with UL 1, UL 360, or UL 1660, or

b) Flexible metal conduit is not required to comply with all specified construction dimensions under the following conditions:

1) Trade sizes of 9/16-inch and 5/8-inch oval shaped and flexible metal conduit shall comply with the 1/2-inch trade size performance requirements in UL 1, and trade size of 3/8-inch reduced wall flexible conduit shall be provided with internal and external diameters as specified in Table 13.1. All other construction and performance requirements shall be in accordance with UL 1,

2) All mating connector assemblies shall be factory installed,

3) All fittings and connector assemblies for use with a conduit as specified in 13.2.6(b)(1) shall be factory installed or provided attached to the conduit, and

4) The flexible metal conduit specified in 13.2.6(b)(1) shall be subjected to follow up evaluation on performance testing in accordance with UL 1 on the indicated trade sizes.

Table 13.1
Conduit Dimensions

Trade size of conduit	External diameters, in		Internal diameters, in	
	Minimum	Maximum	Minimum	Maximum
3/8	0.560	0.690	0.375	0.520

13.3 Mating connectors

13.3.1 Mating connectors shall:

a) Be reliably keyed by a physical or mechanical means to maintain correct polarity consistent with the wiring diagram on the power-feed of connected parts and proper interconnection of parts.

b) Be rated 20 A minimum.

c) Comply with the direct-support requirements in UL 746C. Connectors totally enclosed in a metal raceway shall be Class HB or better and connectors not so enclosed shall be Class V-2 or better in accordance with UL 94.

Exception: Connectors that comply with the requirements in UL 498, complies with the intent of this requirement.

d) Have the grounding-terminal conductors connect before or at the same time mating supply conductors connect when two or more connectors are being mated as intended. During disconnection of mating connectors, the supply conductors shall disconnect before or at the same time the grounding conductor disconnects.

e) Not subject mating parts to tension during normal use of the product.

f) Be latched or otherwise secured together to provide electrical continuity between mating parts. Connectors that are not provided with a mechanical latch shall be subjected to the minimum separation force portion of the Mating Connector Separation Tests, Section 27.

13.4 Convenience outlets

13.4.1 Receptacles

13.4.1.1 A receptacle utilizing flexible cord shall also comply with UL 817.

13.4.1.2 Polymeric materials that are in direct contact with uninsulated live parts shall comply with the material requirements in UL 498.

13.4.1.3 Flexible cord shall be of the “ST or SJT” type.

13.4.1.4 Receptacles rated 15 A may utilize 14 AWG (2.1 mm^2) conductors.

13.4.1.5 A receptacle provided for the connection of a small appliance, a work light, or similar product shall comply with UL 498.

13.4.1.6 A receptacle as specified in 13.4.1.5 shall be of a grounding-type configuration rated 125 or 250 V, 15 or 20 A.

13.4.1.7 A convenience receptacle shall be visible to the user. Also see 38.11.

Exception: The receptacle is not required to be visible where:

a) The receptacle is visible by opening a hinged door or similar cover, and

b) The supply cord of an appliance connected to the receptacle is not subjected to abrasion because of the location of the receptacle.

13.4.1.8 Convenience receptacles shall comply with the Spill Test. See Section 28, Spill Test.

Exception No. 1: This requirement does not apply to a receptacle that is oriented in a position so its face is in a vertical 90° plane ±5°.

Exception No. 2: This requirement does not apply to a receptacle that is covered or otherwise protected from spillage when not in use.

Exception No. 3: This requirement does not apply to a receptacle that is located at least 3 inches (76 mm) above the work surface when the work surface is adjusted to its highest position.

13.4.1.9 Receptacle faces shall be flush with, or project from, faceplates or raceway covers of insulating material and shall project a minimum of 0.015 in (0.38 mm) from metal faceplates.

13.4.1.10 All non-locking type convenience receptacles (ANSI/NEMA 5-15R or 5-20R) used in areas identified in Article 406.12 of the National Electrical Code, NFPA 70, shall be Tamper-Resistant type.

Exception No. 1: This requirement does not apply when receptacles are located more than 5-1/2 feet (1.7 m) above the floor.

Exception No. 2: This requirement does not apply when receptacles are part of a luminaire or appliance.

13.4.2 Hospital grade convenience receptacles

13.4.2.1 Hospital grade receptacles shall comply with all of the general requirements for receptacles in UL 498, and also comply with the performance requirements contained in Supplement SD, Hospital Grade Devices, of UL 498. The installation instructions shall comply with 39.8.

13.4.3 Cord connector outlets

13.4.3.1 Flexible cord assemblies provided with a female cord connector that is provided for the connection of a small appliance, a work light, or similar product shall comply with UL 817, and the following additional requirements:

a) The cord shall be of the ST or SJT type;

b) The cord assembly shall not exceed 2 ft (610 mm) in length from the supply connection to the face of the female cord connector body;

c) Polymeric materials in direct contact with uninsulated live parts shall comply with the material requirements of UL 498;

d) The interface between the cord and the supply connection shall comply with Strain-Relief Tests, Section 25; and

e) Cord connectors with a 15-A configuration shall be supplied by minimum 14 AWG copper conductors. Cord connectors with a 20-A configuration shall be supplied by minimum 12 AWG copper conductors.

13.4.3.2 A cord connector convenience outlet shall be constructed so that when in its at rest position its face is in a vertical plane.

Exception: A cord connector, when in its at rest position, results in its face not in a vertical plane shall comply with the Spill Test, Section 28.

14 Strain Relief

14.1 A strain-relief means shall be provided so that mechanical stress placed on a flexible cord or flexible conduit (such as a pull or twist) is not transmitted to terminals, splices, or internal wiring. Where a clamp is employed with a cord, auxiliary insulation is required where the clamp is capable of damaging the cord insulation.

14.2 To determine compliance with 14.1, a strain-relief means is to be subjected to the applicable tests specified in Strain-Relief Tests, Section 25.

14.3 Means shall be provided so that a flexible cord or conduit is not able to be pushed into the product through the cord-entry hole where such displacement:

a) Subjects the cord to mechanical damage,

b) Exposes the cord to a temperature higher than its rated value, or

c) Reduces spacings below the minimum values.

15 Bushings

15.1 At a point where a flexible cord passes through an opening in a wall, barrier, or enclosure, a bushing or equivalent means shall be employed to provide a smooth, rounded surface against which the cord bears. The means employed shall be substantial and secured in place.

16 Spacings

16.1 At other than field-wiring terminals, spacings integral to a component through air and over the surface of insulation between uninsulated live parts of opposite polarity, and between uninsulated live parts and dead metal parts shall not be less than 1/16 in (1.6 mm). Spacings through air and over the surface of insulation between uninsulated live parts and Class 2 or communication circuits shall not be less than 3/32 in (2.5 mm).

Exception: This requirements does not apply to the internal spacings of components having individual requirements; for example, the internal spacings of a switch.

16.2 Spacings at field-wiring terminals shall not be less than 1/4 in (6.4 mm), through air and over surface, between:

a) Uninsulated live parts of opposite polarity, and

b) Uninsulated live parts and dead metal parts.

17 Office Furnishing Lighting Units

17.1 A lighting attachment shall comply with UL 153 and UL 1598, as applicable, and shall be rated for the intended use.

17.2 A lighting attachment shall not be provided with a convenience outlet.

17.3 An attachment cord shall be of a Type rated for at least hard usage (Type SJ or the equivalent), have conductors that are not smaller than 18 AWG (0.82 mm^2), and not be more than 9 ft (2.74 m) long as measured from the back surface of the attachment plug to the point of cord entry on the fixture.

17.4 An attachment cord shall be routed away from sharp edges, burrs, fins, moving parts, and similar parts, that are capable of abrading or otherwise damaging the cord. The cord shall not be damaged by movement or relocation of the fixture or panel.

STRUCTURAL CONSTRUCTION

18 Mechanical Assembly

18.1 General

18.1.1 An office furnishing system shall be constructed so that when adjacent units are connected, disconnected, or moved to form varying angles with each other as during intended operation, a risk of fire, electric shock, or injury to persons is not introduced.

18.1.2 Furnishings provided with raceways that are able to be electrically interconnected shall additionally be provided with means for mechanical attachment to each other. Also see 39.4.

18.1.3 A switch, receptacle, cord connector, or other component that is intended to be handled by the user shall be prevented from turning, loosening, or otherwise becoming disengaged from its mounting panel.

18.1.4 The means by which the turning or loosening specified in 18.1.3 is prevented shall include more than friction between surfaces. For example, a properly applied lock washer is a means to prevent turning of a device having a single-hole mounting means.

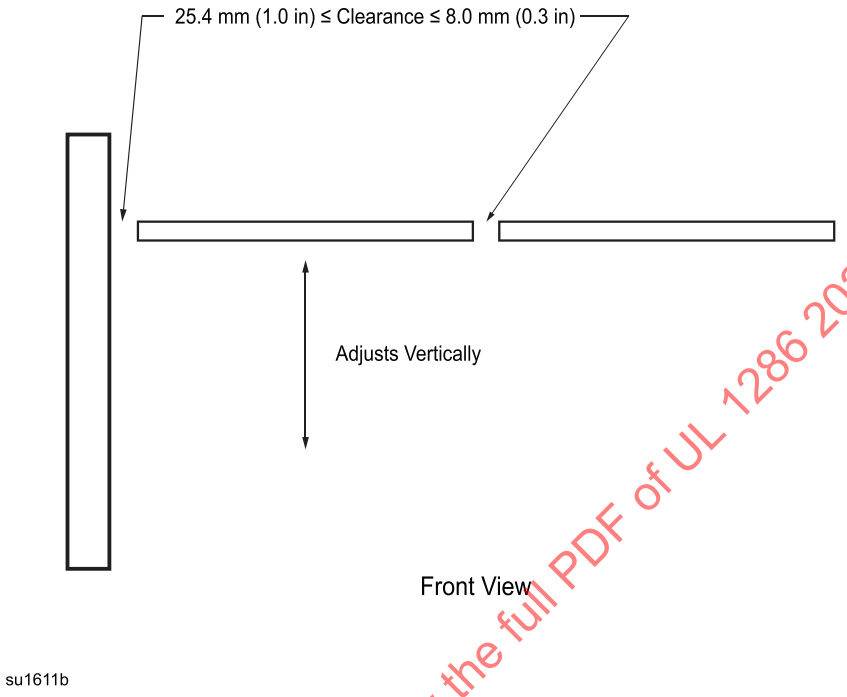
18.1.5 A top- or base-feed for a furnishing assembly shall not be employed for the purpose of providing support for a single starter unit or adjacent units.

18.1.6 The clearance between a vertically user-adjustable surface and any adjacent surface shall not be less than 25 mm (1 in.). A clearance less than 8 mm (0.3 in.) is acceptable where the clearance is maintained throughout the travel of the adjusting surface. Articulating keyboard support surfaces are exempt from this requirement.[a]

[a] With the permission of BIFMA, this requirement is reproduced from ANSI/BIFMA X 5.6. BIFMA shall not be responsible for the manner in which the information is presented, used, nor for any interpretations thereof.

Figure 18.1

Vertically Adjustable Surface Clearance



18.2 Panels

18.2.1 Office furnishing panel systems shall comply with the applicable structural performance requirements in Sections 30 – 36.

18.2.2 Panels shall comply with the flammability requirements of 18.9.1.

18.2A Low Level Panels And Screens

18.2A.1 In addition to the applicable requirements in this standard, a low-level panel or screen shall comply with 18.2A.2 and 18.2A.3.

18.2A.2 A low level panel or screen that may be used for seating shall comply with:

a) The requirements in 8.2 and 8.3;

b) The applicable test requirements in Sections 19 – 37 of this Standard; and

c) The applicable test requirements in Table 18.1.

Table 18.1
Storage Units
ANSI/BIFMA X5.9 – 2019

Section	Test Name
4.2	Concentrated Functional Load
4.3	Distributed Functional Load
4.4	Concentrated Proof Load
4.5	Distributed Proof Load
4.6	Extendible Element Static Load
5	Leg/Glide Assembly Strength
6	Racking Resistance
7.1	Top Load Ease Cycle
7.2	Drop Test – Dynamic – for Units with Seat Surfaces
7.3	Durability Test for Units with Seating Surfaces – Cyclic Impact
9.2	Horizontal Force Stability Test for Storage Units without Extendible Elements
9.3	Stability Test for Type I Units with at least one Extendible Element
9.4	Stability Test for Type I Storage Units with Multiple Extendible Elements
9.5	Stability Test for Type II Storage Units with Extendible Elements
9.6	Vertical Force Stability Test for Storage Units
9.7	Stability Test for Pedestals/Storage Units with Seat Surfaces

18.2A.3 Low level panels that are not a straight run and are in configurations that could support a load such as in a straight run or in an “L”, “T”, “Y”, or “X” formation, either by using other panels or by the connection of accessories, such as a work surface, shall be evaluated for loading conditions such as being sat on. Low level screens that are considered able to be used for seats are those that are not a straight run and are in configurations that could support a load such as in an “L”, “T”, “Y”, or “X” formation by using other screens.

18.2A.4 Low level panels and screens shall be provided with instructions in 39.11.

18.3 Fabric Partitions

18.3.1 Fabric partition and frame assemblies not intended to support component accessories are required to comply with the Force Stability Test specified in Table 31.1.

18.3.2 Fabric partition and frame assemblies intended to support component accessories shall comply with the applicable structural performance requirements in Sections 30 – 36.

18.3.3 Fabric partitions shall comply with the flammability requirements of 18.9.4.

18.4 Cord/cable channels

18.4.1 A cord/cable channel (for example, a snap-on wire router) employed or supplied for the purpose of routing flexible cord of accessories or portable appliances used with the system shall:

a) Be securely fastened to and supported by a single unit or work surface of the system, or the equivalent,

b) Be smooth and free of burrs, sharp edges, or other projections that damage the insulation on the cord,

c) Be provided for cord routing only from a work surface or similar area to a convenience outlet either on the work surface or the unit to which the surface is mounted, or on an immediately adjacent office furnishing unit,

d) Not provide for the routing of cord across the full width of an office furnishing unit. See 38.12, 38.13, and 39.6, and

Exception: A cord/cable channel attached to a work surface is able to extend across more than the full width of a panel where the cord/cable channel does not extend for the full width of the work surface.

e) Have provision, without the use of tools, for the cord to be disconnected from the source of supply and examined for the entire length of the cord.

18.5 Raceway

18.5.1 A system raceway shall be supported through individual office furnishing units, underneath, and/or between mechanically contiguous units. Raceways connecting office furnishing workstations in the field are considered part of the electrical installation and not as system raceways.

18.5.2 Parts that make up a raceway shall butt tightly together or overlap.

Exception No. 1: Where clearance is required for the placement of a component, such as the face of a receptacle or a similar component, the clearance shall not be greater than 0.030 in (0.76 mm) between the component and the adjacent enclosure edge.

Exception No. 2: A clearance in the form of a slot, gap, or opening between a component and the adjacent enclosure edge not greater than 0.090 in (2.29 mm) wide complies with the requirement where the raceway is provided with a secondary cover that reduces the risk of entrance of debris.

18.5.3 A system raceway shall be of sufficient size to provide free space for all enclosed conductors. Fill requirements and the corresponding volume required are to be determined in accordance with NFPA 70, Article 370. The volume provided by the raceway is to be determined by using water as specified for the Volume Verification Test in UL 514A.

Exception: A raceway having a fill exceeding, or a volume less than, that specified in the NEC meets the intent of the requirement when the raceway, with the intended fill and volume, complies with Temperature Test, Section 21.

18.5.4 A knockout provided in a raceway for a 1/2-inch or larger trade-size conduit shall comply with the knockout requirements in Connections for Wiring Systems in UL 514A.

18.6 Mechanical connectors

18.6.1 A mechanical connector shall be constructed to withstand the strain to which it is subjected during normal use. See Mechanical Connector Tests, Section 35.

18.7 Glass panels

18.7.1 Glass shall not be less than 1/8 in (3.0 mm) thick and the glass shall be a non-shattering type and shall:

a) Comply with the requirements in ANSI Z97.1, Class A; or EN 12600, 1(B)1 or 1(C)1; or

b) Comply with 34.1.1.

18.7.2 All furnishings with glass shall comply with the Glass Panels Tests – Retention, 34.2.

18.8 Protection against corrosion

18.8.1 A raceway or fitting relied upon as a ground return path shall be protected against corrosion by enameling, galvanizing, plating, or other equivalent means on all inside and outside surfaces unless the metal is inherently resistant to dry-location indoor atmospheric corrosion. Cut edges are not required to be protected.

18.8.2 An iron or steel part other than a raceway or fitting shall be provided with corrosion protection, such as enameling, galvanizing, plating, or other equivalent means, when the malfunction of the unprotected part introduces a risk of fire, electric shock, or injury to persons.

18.8.3 To determine compliance with 18.8.1 and 18.8.2, ferrous metal parts shall comply with Resistance to Corrosion Test, Section 36.

18.9 Flammability of materials

18.9.1 A component of an office furnishing system or individual unit, and that has an individual or a mechanically contiguous (within 12 inches (30.5 cm) surface area of 10 ft^2 (0.93 m^2) or more, shall be tested in accordance with UL 723. The component shall:

a) Have a flame-spread index of 200 or less, and

b) Be marked in accordance with 38.6 when the smoke developed index exceeds 450.

Exception: Lighting fixture luminaires are not required to be included in the test.

18.9.2 A base raceway cover that is used as an electrical enclosure or support for live parts, formed of combustible material and that is mechanically contiguous (within 12 inches (30.5 cm) across and runs at least the full width of one unit shall have a flammability rating of HB in accordance with UL 94.

18.9.3 A combustible material used to form a small decorative part or mechanical connector that is used as an electrical enclosure or support for live parts shall have a flammability rating of HB or better in accordance with UL 94. This requirement also applies to fabric and adhesive systems employed as a decorative covering on interpanel poles and posts.

Exception: A fabric and adhesive system employed as a decorative covering on interpanel poles and posts is not required to have a flammability rating of HB or better where the fabric and adhesive system is a part of a component complying with 18.9.1.

18.9.4 A fabric partition shall comply with NFPA 701.

18.10 Monitor arms

18.10.1 A monitor arm shall comply with UL 962 and shall be subjected to the tests in Video Display Mounting System Tests, Section 33.

18.11 Video displays

18.11.1 Video display mounting

18.11.1.1 A system that provides for the mounting of a video display to the office furnishing shall additionally comply with 18.11, Video Displays, and the requirements as specified in Section 31, Functional and Proof Load Tests, and Section 33, Video Display Mounting System Tests, for the type of office furnishing that the video display is mounted to.

18.11.1.2 The tests in Section 31, Functional and Proof Load Tests, shall be conducted with the video display mounting system loaded in accordance with Table 33.1, except for the proof load test which shall be conducted in accordance with 33.2, Proof load securement test.

18.11.1.3 A nonmetallic connector used to secure the video display to the office furnishing or the attachment of mounting system to the office furnishing shall be subjected to the conditioning tests specified in Mold Stress-Relief Distortion, in UL 746C before any mechanical tests are performed.

18.11.1.4 Adjustable and articulating video mounts shall be tested in all positions of adjustment. When testing a video mount in more than one position is considered necessary, a new representative video mount may be used for each test position.

18.11.1.5 Gravity and adhesives alone shall not be relied upon to secure video displays and mounts to the office furnishing. A mechanical fastening means is required.

18.11.2 Mounting system ventilation

18.11.2.1 If the video mounting system is provided with an enclosure including doors, covers or panels that may be closed restricting ventilation to the audio/video equipment or similar products, while energized and performing their intended function, ventilation shall be provided as a minimum of 0.31 square inches (2 square cm) of ventilation opening per input watt of the enclosed equipment. Approximately one half of the area is to be located near the base of the bottom edge of the mounting system and the remaining open area is to be located near the top of the mounting system.

18.11.2.2 Any internal dividers, such as shelving, shall allow the flow of convection air through the mounting system.

18.11.2.3 Ventilation openings may not originate or exit into confined spaces of an office panel, office furniture, building structure, walls, floors, ceilings and the like.

18.11.2.4 A reduction in the area of ventilation openings may be provided when powered ventilation is integral to the mounting system and either of the following is provided:

a) A trouble signal indicator visible to the user when the air flow drops below 75 % of the design air flow; or

b) Power to any receptacle provided for the enclosed equipment deenergizes when air flow drops below 75 % of the design air flow.

18.11.2.5 A mounting system that recesses into an enclosure when not in use shall be provided with an interlock to deenergize the power to the audio/video equipment when in the recessed position. Designs intended to be operated within an enclosure and complying with 18.11.2.1 – 18.11.2.4 are not required to have an interlock.

ELECTRICAL PERFORMANCE

19 Grounding-Impedance Test

19.1 The impedance of two electrically interconnected raceways, or top- and base-feeds, between the point of connection of the equipment-grounding means and other metal parts that have the potential to become energized, shall be measured in accordance with 19.2 – 19.6. The impedance shall not be more than 0.1 Ω.

19.2 For raceways, an alternating current of at least 25 A from a source of supply of not more than 6 V is to be passed from the point of connection of the equipment-grounding means to a metal part in the grounding circuit, and the resulting drop in potential is to be measured between the two points. The resistance in ohms is to be determined by dividing the drop in potential in volts by the current in amperes passing between the two points.

19.3 For raceways, other than as specified in 19.5, the two widest furnishings or separable furnishing raceways are to be electrically and mechanically connected as intended. For a flexible raceway system, the test is to be conducted with the flexible conduit in a relaxed straight-line position. For liquid-tight flexible metal conduit, the outer-most jacket is to be removed at the identified point in order to expose the metal. The current source specified in 19.2 is to be connected to any point on the ground-return path of one furnishing raceway and connected to any point on the adjacent raceway. This procedure is to be repeated a minimum of three times; each time the point or points of supply connection is to be changed. The ground path is to cool between each test.

19.4 For top- and base-feeds, other than as specified in 19.5, the two widest furnishings or separable furnishing raceways are to be electrically and mechanically connected as intended. The current source specified in 19.2 is to be connected to any point on the ground-return path of one furnishing raceway and connected to any point on the adjacent raceway. This procedure is to be repeated a minimum of three times; each time the point or points of supply connection is to be changed. The ground path is to cool between tests.

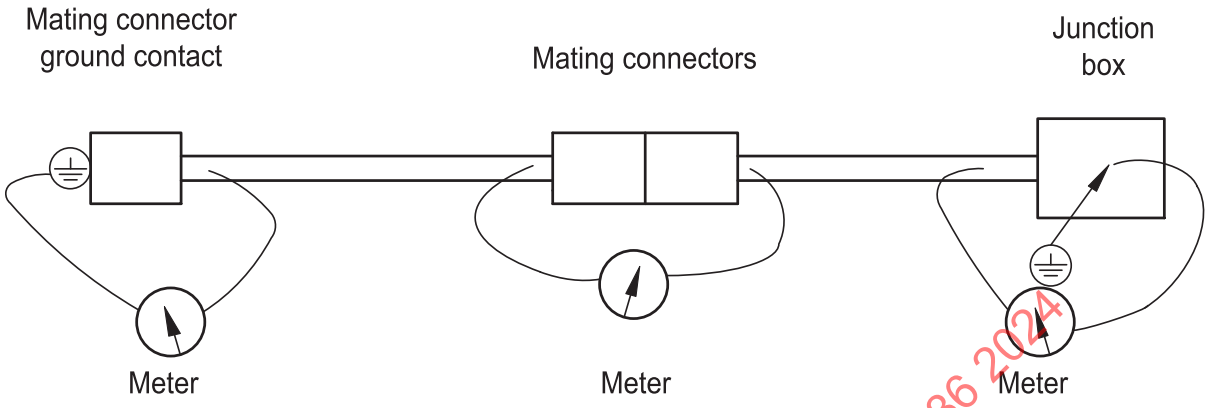
19.5 Flexible metal conduit that complies with UL 1; liquid-tight flexible metal conduit that complies with UL 360; and armored cable that complies with UL 4, shall comply with the test specified in 19.6.

19.6 For electrical connecting assemblies, unit-to-unit, pass-through-unit, and top- and base-feed assemblies using flexible metal conduit, liquid-tight flexible metal conduit, or armored cable that employs a separate grounding conductor, the resistance across the area where the junction box and conduit or cable are joined, across the area where the connector and conduit or cable are joined and across the connectors that are mated shall be measured in accordance with 19.7.

19.7 An alternating current of not less than 25 A from a source of supply of not more than 6 V is to be applied for the test. One lead of the testing device is to be connected on the conduit or cable 1/16 in (1.6 mm) from where the conduit or cable enters the connector or junction box. The other lead of the testing device is to be connected to the ground terminal of the connector or the ground point of the junction box. See Figure 19.1. For liquid-tight flexible metal conduit, the outermost jacket is to be removed at the point of connection to the box or connector in order to expose the metal before the leads are connected for testing. The resistance in ohms is then to be determined by dividing the drop in potential in volts by the current in amperes passing between the two points.

Figure 19.1

Grounding-Impedance test



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19.8 With respect to 19.2, 19.3, and 19.4, a pass-through-unit raceway, top- and base-feed, or electrical connecting assembly is a single furnishing raceway.

20 Dielectric Voltage-Withstand Test

20.1 The insulation and spacings of an electrical accessory shall withstand for 1 min, without breakdown, the test potential specified in 20.3.

20.2 Breakdown is indicated by the tripping of an overload protector in the test equipment or an abrupt decrease or retarded advance of the voltmeter reading.

20.3 A 60-Hz essentially sinusoidal potential is to be applied between live parts conductively connected to the supply circuit and dead metal parts. The applied potential is to be 1240 V, or 1000 V plus two times the supply voltage, whichever is higher. The supply source is to have capacity such that the potential specified is maintained, except in case of breakdown. The voltage is to be increased gradually from zero until the prescribed test potential is reached or until breakdown occurs. The potential shall be applied between:

a) The supply wiring and dead metal parts; and

b) Any two conductors. This test is to be continued until each conductor has been tested with respect to every other conductor.

21 Temperature Test

21.1 Accessories

21.1.1 An accessory intended to provide through-power shall be tested as specified in 21.1.2 – 21.1.5. The accessory shall not attain a temperature at any point that constitutes a risk of fire or that damages any materials employed in the furnishing system or the accessory. The maximum observed temperature rise plus 30 °C shall be within the rated temperature range of a material on which the temperature is observed.

21.1.2 The temperature test is to be conducted at an ambient temperature of 25 – 30 °C (77 – 86 °F). All temperatures are to be determined by use of thermocouples.

21.1.3 Not less than three interconnected furnishings are to be tested. The supply and load, see 21.1.4, are to be connected to the through-power circuit by the top- or base-feed and unit-to-unit electrical connecting assemblies. The circuit is then to be loaded so that rated current flows through each grounded and ungrounded supply conductor. The current flowing through the through-power circuit is not to be less than 20 A. A grounded supply conductor intended for connection to a multiwire branch circuit is to carry 100 % of rated current. The current flowing through the grounded supply conductor is to be not less than 20 A.

21.1.4 A low-voltage current source or a voltage source not exceeding 120 V to ground is to be used to attain the current flow specified in 21.1.3. When a low-voltage current source is employed, the circuit is to be loaded by short-circuiting the appropriate conductors of the unterminated end of a unit-to-unit electrical connecting assembly that has been connected to the raceway of the last unit in the series. When a voltage source not to exceed 120 V to ground is used, a resistive or tungsten filament lamp load is to be used to load the circuit.

21.1.5 The temperature test is to be performed for 72 h. During the test, the supply source is to be disconnected from the circuit two times and the system is to return to ambient temperature. The disconnection is to last not less than 4 h and not more than 7 h. Temperature readings are to be taken after at least 6 h have elapsed after each start-up and during the final hour of the test. See Table 21.1.

Table 21.1
Temperature Test – Typical Time Schedule

Hour	Action taken
0	Power supply on
16	Temperature measurement
17	Power supply off
24	Power supply on
40	Temperature measurement
41	Power supply off
48	Power supply on
71	Temperature measurement
72	Power supply off

21.2 Lighting attachments

21.2.1 During the temperature test, the temperature of the external surfaces of a lighting attachment shall not exceed 90 °C (194 °F).

Exception: A surface temperature exceeding 90 °C meets the intent of the requirement where:

a) The surface is more than 78 in (1980 mm) from the floor in all mounting or installation configuration, or

b) The marking specified in 38.15 is:

1) Provided on or adjacent to the surface, and

2) Visible after installation of the accessory.

22 Strength of Enclosure Test

22.1 Snap-fit cover for enclosures

22.1.1 A snap-fit cover employed as part of an enclosure shall be subjected to the tests specified in 22.1.2 or 22.1.3. The cover shall not crack or dislodge from the means of support on the raceway. Any distortion of the cover resulting from the tests shall not prevent the normal removal and replacement of the cover.

22.1.2 The enclosure is to be clamped in place and oriented so that the covered face of the enclosure is parallel to the horizontal and directed down. A 25-lb (11.3-kg) weight is to be attached to any point on the edge or outside surface of the cover and gradually released until it hangs freely. The weight is then to hang for 1 min.

22.1.3 For a snap-fit cover formed of polymeric material, the test specified in 22.1.2 is to be repeated on three additional samples of the cover that have been conditioned as specified in Mold Stress-Relief Distortion, in UL 746C.

22.2 Impact test – furnishing-supporting enclosures

22.2.1 A furnishing-supporting raceway shall be tested as specified in 22.2.2 – 22.2.4. The raceway shall not be deformed to a degree that results in a risk of fire, electric shock, or injury to persons. Where deformation of the raceway is to the extent that electrical components are not able to be connected as intended, the raceway complies only where the deformation does not result in a risk of fire, electric shock, or injury to persons that is the result of damage to components, or reduction of electrical spacings below minimum specified levels.

22.2.2 Each of six samples of the raceway is to be tested; three as specified in 22.2.3, and the other three as specified in 22.2.4. Each sample is to be attached, as intended, to the heaviest furnishing with which it is to be used. Adjustable glides or feet are to be adjusted outward 1/2 in (12.7 mm).

22.2.3 The assembly is to be raised so that the bottom of the raceway is parallel to, and 6 in (152 mm) above, the plane of a tile-covered cement floor. The raceway is to be clamped in a manner that enables the assembly to pivot freely about the lower corner of one end. The raceway is to be impacted by releasing the free end (the end opposite to the clamped end) enabling it to fall and strike the floor.

22.2.4 With the assembly resting on a tile-covered cement floor, the raceway is to be clamped in a manner that enables the assembly to pivot freely about the lower corner of one end. The raceway is to be impacted by raising the free end so that the lower edge of the free end is 6 in (152 mm) above the floor and then releasing it.

23 Tightening Torque Test

23.1 With reference to the Exception to 10.2.13, the tapped threads in a terminal plate less than 0.30 in (7.6 mm) thick shall not strip as a result of the tightening torque specified in Table 23.1. A screw, either supplied or specified by the manufacturer, is to be tightened to the terminal at a torque, and with a wire in place, as specified in Table 23.1.

Table 23.1
Tightening Torque

Size of terminal screw, No.	Wire sizes to be tested, AWG[a]	Tightening torque	
		lbf-in	Newton-meters (N·m) or kilogram-meters (kg·m)
8	14 (S) and 16-22 (ST)	16	1.8 or 0.18
10	10-14 (S) and 16-22 (ST)	20	2.3 or 0.23
[a] ST – stranded wire; S – solid wire.			

24 Electrical Connecting Assemblies Test

24.1 A flexible unit-to-unit electrical connecting assembly shall be tested as specified in 24.2 and 24.3. As a result of the tests, the assembly shall not show any of the following conditions:

a) Substantial abrasion of the internal wiring,

b) A reduction in spacings between live parts of opposite polarity below the minimum specified in Spacings, Section 16,

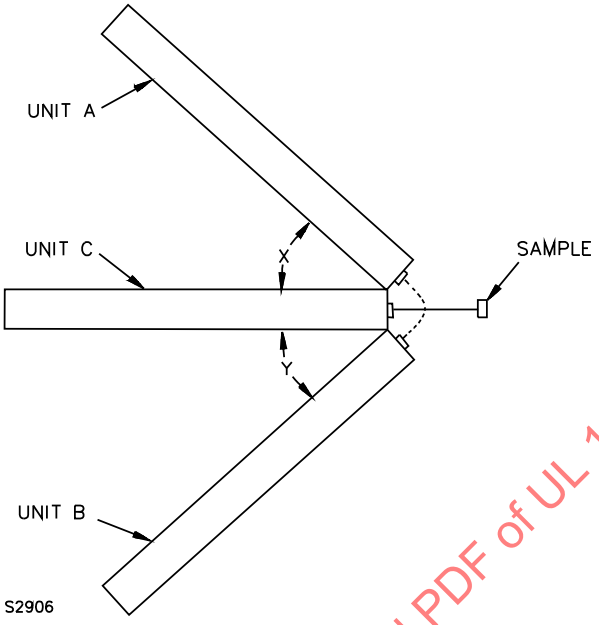
c) Loosening of the cable or interconnecting assembly in the connector fitting, or

d) Displacement of more than 1/8 in (3.2 mm) between the cable or interconnecting assembly and the connector fitting.

24.2 Each of three samples of the assembly are to be tested. Three units are to be arranged as illustrated in Figure 24.1. One end of the sample is to be connected to Unit C. The other end of the sample is then to be subjected to 50 cycles of flexing, each cycle consisting of the sample first being connected to Unit A and then being connected to Unit B. During the test, the sample is to be flexed and twisted as required to make connections in normal installation of the product.

Figure 24.1

Unit-to-unit connecting assembly flexing



NOTE – Units A and B are to be on either side of Unit C, in positions equivalent to the units being mechanically connected and such that angles X and Y are the smallest specified by the manufacturer or the smallest angle consistent with the mechanics of the units and the sample under test. The sample is then to be tested as specified in 24.2.

24.3 The test specified in 24.2 is to be supplemented to take into account additional features of the assembly or furnishing system. For example, units in a system that are movable with respect to each other without disassembly of the system are to be tested to determine the ability of the units to withstand the additional stress or load resulting from movement.

25 Strain-Relief Tests

25.1 General

25.1.1 Where used in this Section, the term "cable" is replaceable by "cord," "flexible metal conduit," or similar terms.

25.1.2 Three as-received specimens and three specimens that have been conditioned in accordance with Mold Stress-Relief Distortion, in UL 746C shall comply with 25.2.1 – 25.3.3.

Exception: The three conditioned specimens are not required when they do not consist in whole or in part of molded components.

25.2 Top- and base-feed connections

25.2.1 A fitting intended to secure the top- or base-feed or supply cable to an electrical connector or furnishing supporting raceway shall be subjected to the tests specified in 25.2.2 – 25.2.5. The fitting shall not separate from the feed or cable. The supporting metal or polymeric material used at a point where the branch-circuit supply is to be connected shall not show any of the following conditions:

a) Crack,

b) Distort to an extent that interferes with the intended operations of the product, or

c) Enable stress to be placed on wire terminations.

Exception: The tests are not required when the supporting raceway and fitting have been investigated as a unit and the combination of the raceway and fitting are rated for use in the application.

25.2.2 Six samples of each raceway-to-fitting interface of the completed cable assembly are to be tested. See the Exception to 25.1.2.

25.2.3 A decorative panel and similar components or other mechanical device that is not reliably secured in place is not required to be in place for the tests.

25.2.4 Each of the samples is to be secured to the support (electrical connector or furnishing raceway) as intended in the completed cable assembly. The support device is to be clamped in position and oriented so that the opening of the support device is downward and parallel to the horizontal. Top- and base-feed devices employing a connector to mate with a raceway component within the panel, and not having a separate clamp, are to be tested by inserting the connector in the mating component and then clamping the component in position. Wire connections within the electrical connector or raceway are to be disconnected for constructions where the connection otherwise supports the applied force. A 50-lb (22.6-kg) weight is to be attached to the cable at a distance of 6 in (152 mm) from the face of the opening of the support device, and is to be gradually applied to the cable in a direction perpendicular to the face of the cable fitting. The weight is to be applied for 1 min.

25.2.5 The same three samples of the support device are to be clamped in position and oriented so that the face of the opening of the support device is perpendicular to the horizontal. A 30-lb (13.6-kg) weight is to be attached to the cable at a distance of 6 in (152 mm) from the face of the fitting and gradually applied and held for 1 min. The weight is also to be applied with the supporting device rotated 90, 180, and 270°.

25.3 Unit-to-unit and pass-through-unit electrical connections

25.3.1 The strain-relief means between a connector and the supporting flexible cable or raceway is to be tested as specified in 25.3.3. The strain-relief means shall not be displaced, damaged, or damage the cable or raceway.

25.3.2 Six samples of the connector and associated cable or raceway assembly is to be tested. See the Exception to 25.1.2.

25.3.3 Wire terminations within the assembly are to be disconnected for constructions where the connection otherwise supports the applied force. A 35-lbf (156-N) force is to be applied in the direction tending to pull the connector from the raceway. The force is to be gradually applied and maintained for 1 min.

26 Conductor Secureness Test

26.1 The connection of a 10 – 16 AWG (5.3 – 1.3 mm^2) conductor to a crimp-type wire connector shall not break when subjected for 1 min to a pull of 30 lbf (133 N) applied between the crimp-type wire connector and the conductor. The connection of a 18 AWG (0.82 mm^2) conductor shall not break when subjected for 1 min to a pull of 20 lbf (89 N) applied between the crimp-type wire connector and the conductor.

26.2 Where the construction of the office furnishing is such that the enclosure also provides a retaining force on a conductor, the test is to be performed on an assembly consisting of the crimp-type wire connector, conductor, and enclosure.

26.3 The test is to be performed with the angle between the crimp-type wire connector and the conductor at the same angle as in the office furnishing. The pull force is to be applied gradually.

27 Mating Connector Separation Tests

27.1 Mating connectors shall be tested as specified in 27.2 and 27.3 using a pull of 7-1/2 lbf (33 N) per contact or 30 lbf (133 N) total, whichever is less, and with any latching mechanism or similar device rendered inoperative. The connectors shall separate. For connectors consisting of two or more sections assembled to form flexible joints, the pull is to be applied such that no flexible joint is stressed.

Exception: Mating connectors constructed of material that does not rely upon compression of polymeric parts or rigid sections of raceway not requiring strain-relief means are in compliance when they have a maximum separation force greater than 30 lbf. For such constructions, the separation force is to be equal to the maximum required force (as determined from six mated pairs) plus 5 lbf (22 N) applied to the mated connectors 4 in (101.6 mm) from the mating point. The test is to be in accordance with 27.2 and 27.3. The maximum separation-force test shall not:

a) Stress internal connections, or

b) Damage the contacts or connector bodies or result in a risk of fire or electric shock.

27.2 Each of three pairs of the mating connectors is to be subjected to ten conditioning cycles of insertion and withdrawal, after which the connectors are to be fully reinserted. The specified pull is then to be applied for 1 min in a direction normal to the plane of the face of the connecting devices and tending to separate the connectors.

27.3 Following the test specified in 27.2, each of the three pairs of connectors is to be connected to a source of supply and made to carry 125 % of rated current for 7 h. The connectors are then to undergo 50 additional cycles of insertion and withdrawal and application of the specified pull is to be repeated.

27.4 Mating connectors not provided with a mechanical latching mechanism or equivalent means to prevent unintended disconnection and displacement shall be tested for the minimum separation force as specified in 27.2 and 27.3 using a pull of 3 lbf (14 N). The connectors shall not separate.

28 Spill Test

28.1 Procedure

28.1.1 With reference to 13.4.1.8 and the Exception to 13.4.3.2, following the testing specified in 28.1.2 – 28.1.5, the convenience outlet assembly shall comply with Spill test dielectric voltage-withstand test, 28.2.

28.1.2 A line voltage convenience receptacle and/or low voltage outlet, such as a USB port, is to be mounted as intended in the office furnishing. Suppressor elements, across-the-line or solid state connected components are to be disconnected, removed or bypassed prior to the test. All covers are to be opened. A cover that does not require a tool to remove is to be removed. Covers that tend to close themselves are to be allowed to fall to their natural resting position. When more than one convenience outlet is enclosed by a single self-closing cover, one standard 2-wire power-supply cord with a parallel blade attachment plug, NEMA 1-15P plug configuration, is to be mated with an outlet in order to hold the outlet cover open. The cord shall exit the receptacle or cord connector assembly as allowed by the cover. The receptacle or cord connector assembly shall be un-energized and shall remain undisturbed throughout the test sequence.

28.1.3 A cord connector shall be manually manipulated to any position allowed by the construction of the furnishing and released so that it returns to its at rest position for the Spill Test.

28.1.4 An acrylic cylinder 3 ±1/16 in (76.2 ±1.6 mm) inside diameter by 4 ±1/16 in (101.6 ±1.6 mm) overall height with 1/8 in ±1/16 in (3.2 ±1.6 mm) thick base and cylinder wall is to be filled with 8 ±0.25 fl. oz (237 ±7.4 ml) of saline solution, consisting of 8 ±0.1 g of table salt per 1 ±0.1 L of distilled water at ambient room temperature.

28.1.5 The test cup, as specified in 28.1.4, is to be placed on a 45 – 47° incline plane from the horizontal surface. The incline plane is to be large enough to support the entire base of the cup. The leading edge of the test cup base is to be positioned on the test surface 4 to 4.25 inches (10.2 to 10.8 cm) in from the edge of the unit. See Figure 28.1 and Figure 28.2. The test cup is to be placed so that the rim of the cup, when tipped over, is aligned with the receptacle or cord connector face. See Figure 28.3. If a plug is inserted, the cup is to be aligned with a receptacle or cord connector without the inserted plug. The cup is then to be manually tilted toward the receptacle or cord connector under test and allowed to fall by gravity toward the receptacle or cord connector.

Figure 28.1

Side View of Spill Test Fixture to Test sample (drawing not to scale)

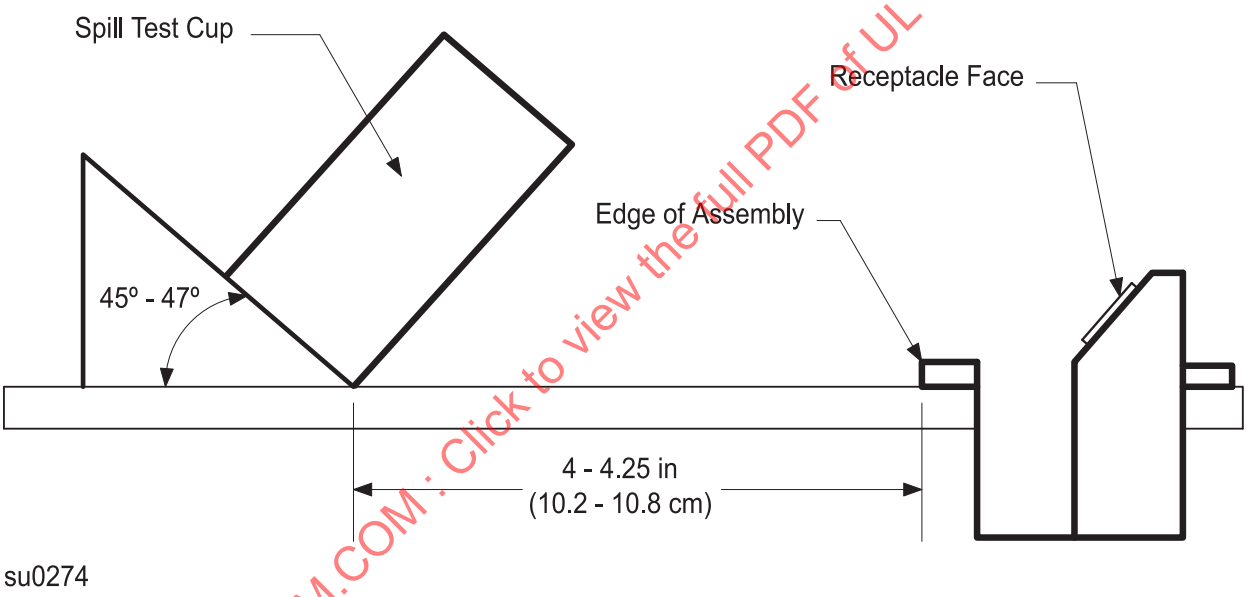


Figure 28.2

Side View of Spill Test Fixture to Test Sample (drawing not to scale)

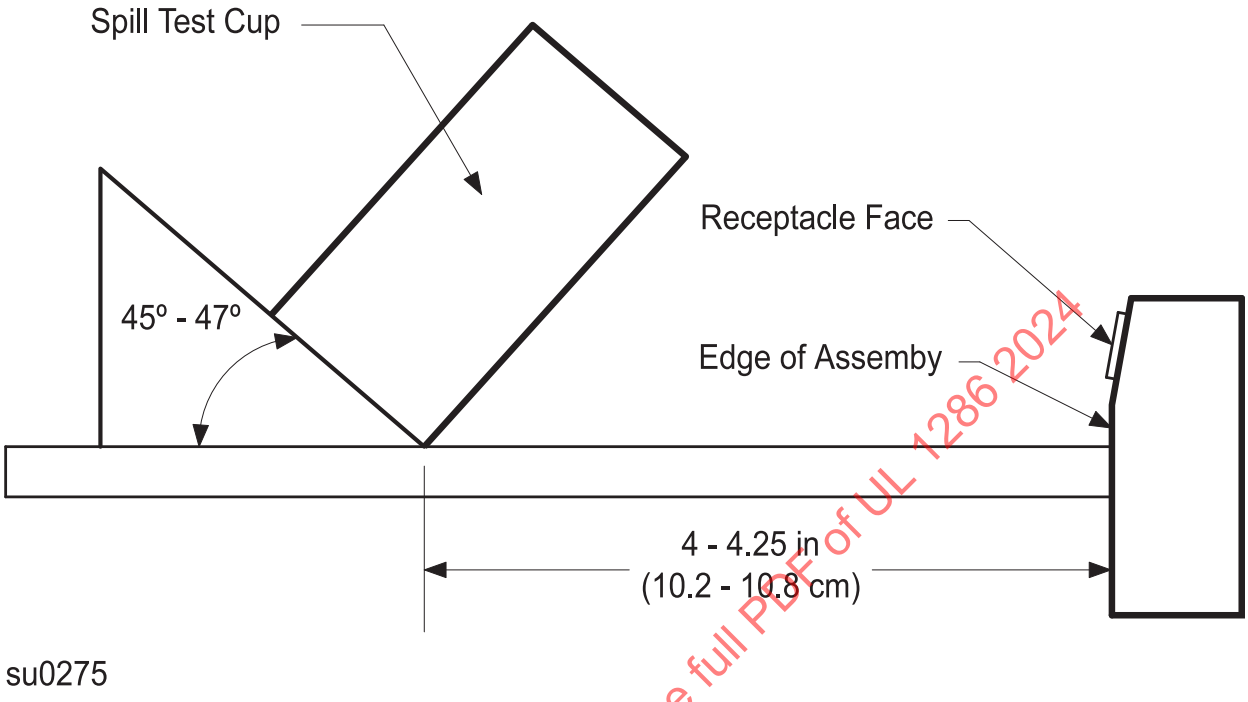
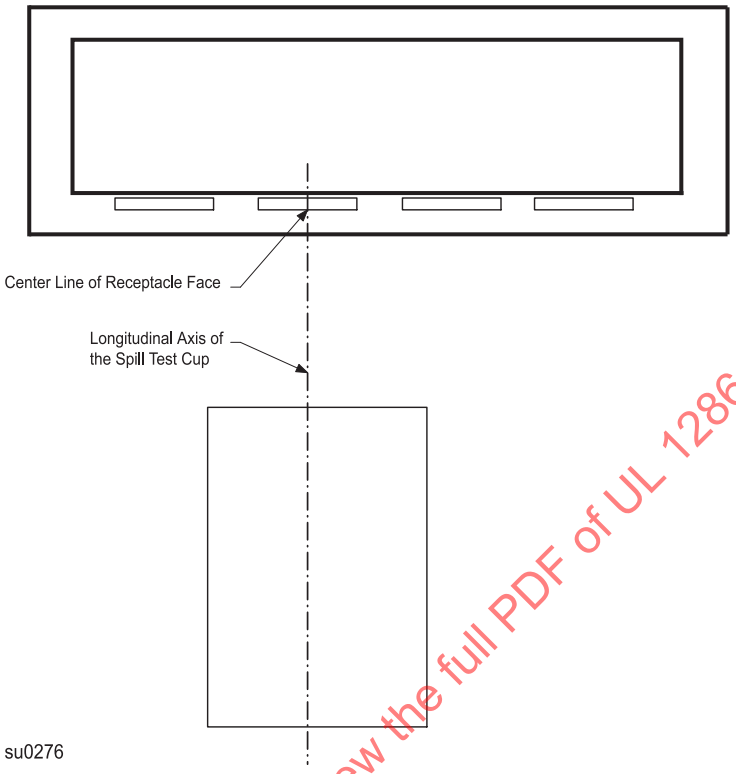


Figure 28.3

Top View of Spill Test Cup to Receptacle Face



28.2 Spill test dielectric voltage-withstand test

28.2.1 A receptacle or cord connector assembly shall be undisturbed following the spill test and shall withstand an applied potential of 1240 V, or 1000 V plus two times the supply voltage, whichever is higher.

28.2.2 For receptacle or cord connector assemblies provided with metallic enclosures, the potential shall be applied one minute after the spill test cup is released. The potential shall be applied between any live part conductively connected to the supply circuit and any dead metal part and the enclosure.

28.2.3 For receptacle or cord connector assemblies provided with non-metallic enclosures, one minute after the test cup is released, without un-mounting the sample, metal foil is to be wrapped around all of the accessible enclosure areas containing live parts. Metal foil is not to be placed over receptacle or cord connector faces. The metal foil shall closely conform to the shape of the enclosure. Immediately after application of the metal foil, the potential shall be applied between any live part conductively connected to the supply circuit and any dead metal part or metal foil applied to the enclosure.

29 Knockout Test

29.1 A knockout shall remain in place, and the clearance between the knockout and the opening shall not be more than 0.030 in (0.75 mm) as a result of the test specified in 29.2.

29.2 A force of 10 lb (44.5 N) is to be applied to the knockout for 1 min by means of a minimum 1-1/2-in (38.1-mm) long by 1/4-in (6.4-mm) diameter mandrel with a flat end. The force is to be applied in a direction perpendicular to the plane of the knockout and at the point with the greatest potential to cause movement. The clearance between the knockout and the opening is to be measured 1 h after the force is removed.

29.3 A knockout shall be capable of being removed by means of a screwdriver, used as a chisel, without leaving any sharp edges or causing any damage to the box, raceway, or the surrounding surface of the wiring compartment. The side edge of a screwdriver is to be run along the edge of the knockout opening once, to remove any fragile tabs remaining along the edge.

STRUCTURAL PERFORMANCE

30 General

30.1 A permanently wired furnishing consisting of a single unit intended to stand alone shall be provided with a means to secure the unit to the building structure.

30.2 A cord and plug connected office furnishing is not required to be provided with a means to secure the office furnishing to the building structure.

30.3 Office furnishings shall be tested as specified in 30.4 and 30.5. The assembly shall not tip over or incur damage that results in a risk of fire, electric shock, or injury to persons. Additional tests are required to cover individual features, such as the number of units in a straight run, and doors, drawers, files, and similar features, that when opened, create additional weights or moments.

30.4 For use in the tests specified in this Section, instruction manuals and other literature provided by the manufacturer are to be reviewed to determine implicit or explicit configurations that are the least stable. The results of tests on the least stable configuration is determined to be representative of result of the same tests as other configurations.

30.5 Each configuration of an assembly to be tested is to be assembled on a smooth hardwood surface in accordance with the manufacturer's instruction manual. The glides, feet, casters, and similar parts are to be blocked or otherwise prevented from moving along the surface. The means used to prevent movement are not to restrict tipping of the assembly.

30.6 A component shall be subjected to the applicable tests specified in this Section. The component is to be supported by an office furnishing system as specified in the instruction manual. As a result of the tests, the component shall not show either of the following conditions:

a) Collapse or deform to a degree that results in a risk of injury to persons, or

b) Present a risk of fire, electric shock, or injury to persons by causing the supporting wall to collapse or deform to such a degree that components are damaged or electrical spacings are reduced below minimum required levels.

30.7 With reference to 30.6:

a) A risk of injury to persons exists when the component is completely displaced from its support system or when the component or support system is damaged to the extent that there are sharp edges or corners exposed, which do not comply with UL 1439.

b) Electrical components within the component and supporting unit shall comply with the requirements for Accessibility of Electrical Component Parts, Section 7, and Dielectric Voltage-Withstand Test, Section 20.

30.8 Additional tests are to be performed when it is determined that a single configuration is not representative of the particular components, combinations of components, configurations of systems, alternate supporting means, and similar cases that involve unusual loading conditions.

31 Functional and Proof Load Tests

31.1 A furnishing assembly connected to an office panel shall be tested in accordance with ANSI/BIFMA X 5.6, as listed in Table 31.1.

31.2 For functional load tests, the system shall not tip over or become disengaged as a result of the applicable tests of Table 31.1. Components shall not separate from the system, and there shall be no loss of serviceability or damage incurred that results in a risk of fire, electric shock, or injury to persons.

31.3 For proof load tests, there shall be no sudden and major change in the structural integrity of the product as a result of the tests of Table 31.1. Loss of serviceability is acceptable and there shall be no damage incurred that results in a risk of fire, electric shock, or injury to persons.

Table 31.1
Required Tests of ANSI/BIFMA X 5.6-2016

Section reference	Section title
5.1	Force Stability Test
5.2	Impact Stability Test
5.3	Force Stability Test for Freestanding Screens
6.2	Panel System Strength Test – Static Functional Load
6.3	Panel System Strength Test – Static Proof Load
8.1	Primary Surface Concentrated Functional Load Test
8.2	Horizontal Surface Distributed Functional Load Tests
8.3	Primary Surface Concentrated Proof Load Tests
8.4	Horizontal Surface Distributed Proof Load Tests
8.5	Transaction Surfaces Torsional Load Test
8.6	Functional Load Test For Panel Mounted Storage Units – Static
8.7	Proof Load Test for Panel Mounted Storage Units – Static
10.1	Top Load Ease Cycle Test (for Primary Surfaces)
10.2	Cycle Test for Extendible Elements
10.3	Cycle Test for Low Height Drawers
10.4	Extendible Element Retention Impact and Durability (Out Stop) Tests
10.5	Extendible Element Rebound Test
12.1	Upward Force Static Disengagement Test for Panel Mounted Components
12.2	Upward Force Impact Disengagement Test for Panel Mounted Components
13	Pull Force Test

32 Panel Systems with Cross-Members Over Walkways

32.1 A panel system that incorporates cross-members (beams) intended to be located over a walkway is to be assembled as specified by the manufacturer and tested as specified in 32.2 – 32.4.

Exception No. 1: A cross-member that is at a height greater than 9 ft (2.7 m) above the ground shall be tested in accordance with 32.5.

Exception No. 2: A cross-member that is unable to be physically grasped and held on to, shall be tested in accordance with 32.5.

32.2 The loads specified in 32.3 – 32.5 are to be applied to a cross-member and distributed over a length of 2 ft (610 mm) where the cross-member is the least supported, and then re-applied in the same manner where the cross-member connects to the supporting means.

32.3 A load of 450 lb (204.1 kg) is to be applied for 15 min in accordance with 32.2. When the manufacturer's instructions or markings specify the maximum weight the cross-member is intended to support, two times that specified weight is to be added to the 450-lb load.

32.4 A load of 225 lb (102.1 kg) is to be applied in accordance with 32.2 and dropped from a height of 3 in (76.2 mm).

32.5 With reference to Exception Nos. 1 and 2 to 32.1, a load of three times the weight of the cross-member is to be applied for 15 min in accordance with 32.2. When the manufacturer's instructions or markings specify the maximum weight the cross-member is intended to support, two times that specified weight is to be added to the three times the weight of the cross-member for the total load.

33 Video Display Mounting System Tests

33.1 Cycling test for articulating video mounts

33.1.1 An articulating video mounting system shall be constructed so there is no collapse, permanent damage, loosening of pivots or fasteners resulting in a risk of fire, electric shock, or injury to persons during or after the cycling test. The video mount shall be installed according to the instructions provided with the video mount to the office furnishing. The office furnishing shall be unloaded or loaded in accordance with the functional load requirements of Section 31, Functional and Proof Load Tests, which ever condition is determined to be more severe. All threaded fasteners that may be affected by the mount movement shall be torqued to specifications. All movement tension adjustments shall be adjusted as recommended by the instructions provided.

Exception: A monitor arm shall comply with the cycle test specified in ANSI/BIFMA X 5.5. Monitor arms with electrical features shall also comply with 33.1.2 – 33.1.5.

33.1.2 To determine compliance with 33.1.1 regarding the risk of fire and electric shock, the spacings of an articulating video mounting system and its accessories shall comply with Section 16, Spacings, after cycling, and the electrical system shall comply with the Dielectric Voltage-Withstand Test, Section 20, after cycling.

Exception: Electrical systems supplied by a Class 2 or LPS power source and posing no risk of injury from failure to operate are not required to comply with the dielectric voltage-withstand test after cycling.

33.1.3 A manually articulating mount shall be subjected to 2,500 cycles of operation. A motor operated articulating mounting system shall be subjected to 6,000 cycles of operation. Threaded fasteners and tension adjustments shall not be adjusted during the cycling test.

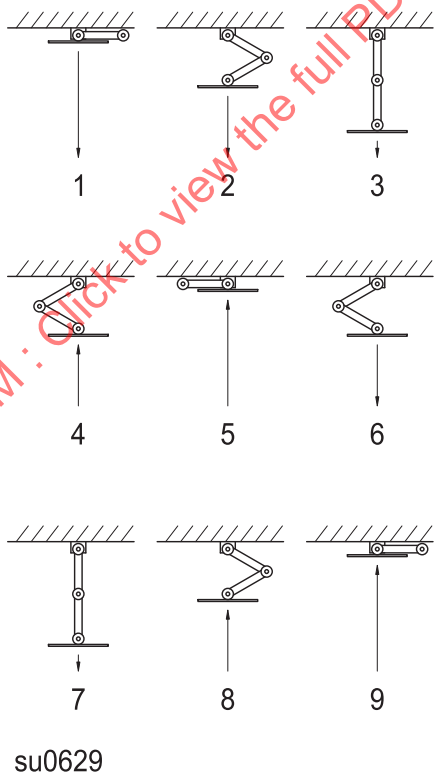
33.1.4 An articulating mounting system shall be loaded as specified in Table 33.1.

Table 33.1
Video Display Weight

Intended Mounting System Type	Functional Load Requirement
Flat Panel Displays such as a Plasma Display, Liquid Crystal Display (LCD), Light Emitting Diode Display (LED) and Organic Light Emitting Diode Display (OLED)	The maximum manufacturer's specified video display weight. The center of gravity of the weight shall be centered on the mount unless the installation instructions specify a different configuration and shall not extend more than 3 inches from the mounting surface.

33.1.5 When cycling a mounting system each axis is to be cycled either individually or in combination. Each axis shall be cycled 2,500 times for a manually adjustable mount or 6,000 cycles for a motorized adjustable mount. A cycle is considered to be one extreme position to the opposite extreme position and back to the original position without rest. See Figure 33.1 as an example of cycling a two axis double pivot design. In applying cycling test requirements, specific pivots and joints of an axis whose failure would not create a risk of fire, electric shock, or injury to persons shall be considered as complying with the requirement without test.

Figure 33.1
One Cycle of a Two Axis Double Pivot Design



33.2 Proof load securement test

33.2.1 A video mounting system and its accessories shall be constructed so there is no collapse, permanent damage, loosening of pivots or fasteners resulting in a risk of fire, electric shock, or injury to persons during or after the proof load test.

33.2.2 The cycling test shall be conducted prior to conducting the Proof Load Securement Test.

33.2.3 Each shelf, work surface, drawer, or storage area shall be loaded with the proof load specified in Section 31, Functional and Proof Load Tests, for the type of office furnishing under investigation and concurrently loaded for a period of 60 minutes with the following load:

a) Four times (4X) the load specified in Table 33.1 when the individual supporting surface is rated 100 pounds (45.36 kG) or less, or

b) Two times plus 200 pounds (2x + 200 lbs) (2x + 90.72 kG) the load specified in Table 33.1 when the video display supporting surface type is greater than 100 pounds. A specified load greater than 100 pounds shall be not less than 105 pounds (47.6 kG).

Exception: With regards to (a) and (b), a monitor arm shall comply with proof load test specified in ANSI/BIFMA X 5.5, when attached to the desk or table in accordance with the installation instructions.

33.3 Monitor arm tests

33.3.1 Monitor arms shall comply with the tests specified in Table 33.2.

Table 33.2
Monitor Arm Tests
ANSI/BIFMA X5.5 – 2014

Section Reference	Section Title
23A	Cycle Test Rotational Movement at Base
23B	Cycle Test Rotational Movement at Linkage/Knuckle
23C	Cycle Test Vertical (Up/Down)
23D	Cycle Horizontal

34 Glass Panel Tests

34.1 Impact

34.1.1 With reference to 18.7.1(b), a glass panel shall be subjected to the Impact Test specified in UL 746C. The panel shall not crack or break to the extent that a piece of panel is released or drops from its normal position.

34.2 Retention

34.2.1 As a result of the test specified in 34.2.2, a glass panel shall not become dislodged or displaced from its mounting means.

34.2.2 The panel is to be mounted in the intended manner. A sand-filled ball having a 30.0 ±0.5 in (760 ±13 mm) circumference and a weight of 20 lb (9.1 kg) is to fall as a pendulum through the distance that produces an impact of 35 ft-lbf (47.5 J) on any point on the panel.

35 Mechanical Connector Tests

35.1 Conditioning

35.1.1 A nonmetallic unit-to-unit mechanical connector shall be conditioned as specified in 35.1.2 or 35.1.3. As a result of the conditioning, the connector shall not crack, shrink, melt, swell, warp, or otherwise be damaged to an extent that interferes with the intended use.

35.1.2 A connector fabricated of polymeric material is to be conditioned as specified in Mold Stress-Relief Distortion, in UL 746C.

35.1.3 A connector of rubber-like material, such as neoprene, is to be conditioned in an air-oven for 70 h at 100 ±2 °C (212 ±3.6 °F).

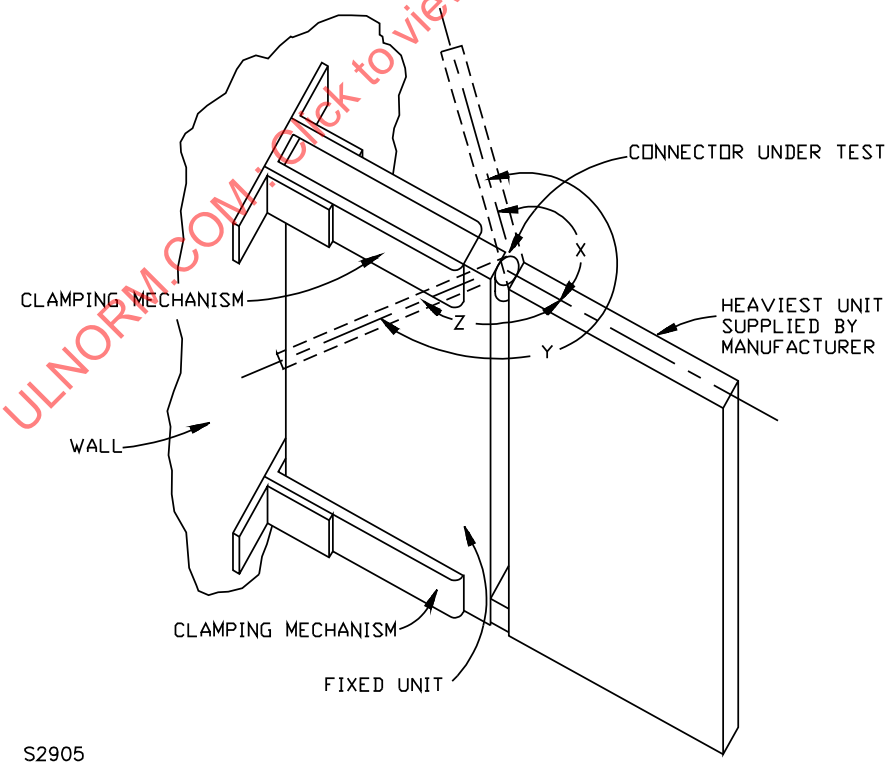
35.2 Flexing

35.2.1 A flexible unit-to-unit mechanical connector that enables the connected units to be moved without disassembly of the product shall be tested as specified in 35.2.2 and 35.2.3. As a result of the test, the connector shall not be damaged to an extent that presents a risk of injury to persons or that interferes with the intended use of the product. The connector shall continue to support the heaviest panel at the end of the test.

35.2.2 Each of three samples of the connector is to be subjected to 50 cycles of flexing. The connector is to be secured to two units, at least one of which is the heaviest unit provided by the manufacturer. One unit is to be clamped in its normal upright position. The heaviest unit is to be pivoted along the axis of the hinge while standing on a smooth, hard surface with any glides or feet in place. Starting with the units making an angle of 180°, the heaviest unit is to be moved through an angle X equal to 135° unless the travel is mechanically limited to a lesser angle. The heaviest unit is then to be moved through an angle Y equal to 270° in the opposite direction, unless the travel is mechanically limited to a lesser angle, and then returned through an angle Z to the starting position. This is one complete cycle. See Figure 35.1.

Figure 35.1

Mechanical Connector Flex Test



35.2.3 Following the test specified in 35.2.2, a connector formed of molded rubber or polymeric material is to be subjected to the corresponding conditioning specified in 35.1.2 or 35.1.3. The connector is then to be subjected to 50 additional cycles of flexing using the procedure specified in 35.2.2.

36 Resistance to Corrosion Test

36.1 A ferrous metal part shall be subjected to the test specified in 36.3.There shall not be visible corrosion at the conclusion of the test, and a joint relied upon as a ground-return path shall comply with 36.2.

Exception No. 1: This test is not required at locations where protection is impractical, such as on a sliding surface of a hinge, a shaft, and similar locations.

Exception No. 2: A ferrous metal part is not required to be subjected to the test where the surface is enameled, galvanized, or plated.

36.2 A grounding impedance test is to be performed as specified in Grounding-Impedance Test, Section 19, prior to the test specified in 36.3. In order to determine whether or not corrosion has appeared in a joint that is relied upon as a ground-return path, a grounding-impedance test is to be repeated after the test specified in 36.3. The resistance shall not increase more than 3 %.

36.3 The enclosure or representative parts of the enclosure are to be subjected to a salt spray (fog) for 24 h in accordance with ASTM B117. At the end of the test, the specimens are to be removed from the chamber, washed in clean running water not warmer than 100 °F (38 °C) to remove salt deposits from the surface, and dried immediately. Corrosion products are to be removed by light brushing where required in order to observe corrosion of the underlying surface.

37 Trial Installation Test

37.1 A furnishing shipped disassembled or an accessory (see 8.9) shall be assembled or installed following the provided instructions to determine that the installation instructions are applicable, that the instructions are detailed and accurate, and that the use of the accessory does not introduce a risk of fire, electric shock, or injury to persons.

MARKINGS

38 Details

38.1 All required markings shall be permanent die-stamped, ink-stamped, or paint-stenciled lettering. Adhesive-backed label systems shall comply with the requirements for indoor-use labels in UL 969, or UL 969A, where the required location allows a marking on the cord. Minimum letter height shall be 3/32 in (2.4 mm) as measured by characters, such as b, 1, and H. A contrasting background shall be provided for legibility.

Exception: The markings required by 38.3, 38.4, and 38.7 are not required to have a contrasting background where the text of the molded or die-stamped marking is raised or recessed to a height or depth that allows the text to be clearly and distinctly legible.

38.1A When a flag-type label is used, the tag shall be either of the following forms:

a) A flag-type label having a hole to permit securement to the power-supply cord by a plastic strap or equivalent means. The strap shall not be removable without cutting.

b) A flag-type with an adhesive back. The tag is to be wrapped tightly once around and is to adhere to the supply cord. The ends of the tag are to adhere to each other and project as a flag. The required markings are to be positioned on the projecting flag portion of the tag.

38.2 The individual letters of the signal word of a cautionary marking – "WARNING," "CAUTION," and similar words – shall be larger than the letters of the statement that follows, and shall not be less than 7/64 in (2.8 mm) high.

38.3 An office furnishing unit shall be marked with the manufacturer's name, trade name, or trademark; the date or other dating period of manufacture not exceeding any three consecutive months; a distinctive catalog number or the equivalent; and the system Type. See 2.17.

Exception: Using a traceable code for the manufacturer's identification when the product is identified by the brand or trademark owned by a private labeler complies with the intent of this requirement.

38.4 An accessory, component, or unit insert for an office furnishing unit shall be marked with the manufacturer's name, trade name, or trademark; the date or other dating period of manufacture not exceeding any three consecutive months; and a distinctive catalog number or the equivalent.

Exception: The date of manufacture is in compliance when abbreviated or in a nationally recognized conventional code or in a code affirmed by the manufacturer, only when the code:

a) Does not repeat in less than 20 year, and

b) Does not require reference to the production records of the manufacturer to determine when the product was manufactured.

38.5 The marking specified in 38.3 and 38.4 is not required to be visible after installation without the use of a tool where, as part of the normal installation and use, it is secured and enclosed by a cover requiring only a common tool to remove or open.

Exception: A component, the physical size of which is such that all the required markings are not able to be physically placed on the component and maintain the minimum letter heights specified in 38.1 and 38.2, shall be marked with the name, trade name, or trademark and the date or other dating period of manufacture. All other required markings shall be provided on the smallest shipping container.

38.6 A component having a smoke-developed index of more than 450, as determined in accordance with 18.9.1, shall be marked "SMOKE DEVELOPED INDEX OVER 450." The marking shall be located so that it is visible after installation of the component without the use of tools.

Exception: For a panel employing a unit insert, the insert shall be marked to indicate the smoke-developed index. The panel employing the unit insert shall be marked to indicate that the smoke-developed index marking is located on the back of the unit insert.

38.7 Each office furnishing component (work surface, cabinet, or electrical accessory) that is shipped separately from the major office furnishing unit to which it is to be connected shall be marked as specified in 38.3 and shall be identified with respect to its intended use and interrelationship with the furnishing; for example – "For Use with Office Furnishing System Series _____" in which the appropriate series, or catalog number is designated. When separable components are factory-assembled and shipped together, only the complete assembly and not the component is required to be marked.

Exception: A component, the physical size of which is such that all the required markings are not able to be physically placed on the component and maintain the minimum letter heights specified in 38.1 and

38.2, shall be marked with the name, trade name, or trademark and the date or other dating period of manufacture. All other required markings shall be provided on the smallest shipping container.

38.8 Each top- and base-feed assembly shall be marked with a diagram or the equivalent, indicating the methods of connection to the branch circuit and the electrical rating. The diagram or equivalent marking shall be located so that it is visible after installation of the assembly.

Exception: Marking a top- and base-feed assembly intended to be used in a cord-connected system as specified in 10.3.1 – 10.3.4 with only the electrical rating complies with this requirement.

38.9 Each top- or base- feed supplying power to a furnishing system shall be marked with the word "WARNING" and the following or the equivalent: "Risk of Fire or Electric Shock. It is possible for this office furnishing system to be connected to more than one source of supply. Disconnect all sources prior to any servicing. A single circuit shall not to be powered by more than one source."

38.10 A nondirectional furnishing system that is not provided with a top- or base-feed shall have each raceway marked with the warning marking specified in 38.9.

38.11 Each convenience outlet shall be marked by a letter, number, color, or a similar designation to indicate the circuit in the system to which the receptacle is connected. The identification shall be consistent throughout the system, and with any markings on the diagram for branch-circuit connections. The marking shall be visible without disassembly of the product.

38.12 An office furnishing unit that has cord/cable channels, located internally or externally to the unit, and that are intended to be used for routing flexible cord of accessories or portable appliances shall:

a) For cord/cable channels located internally, be marked to indicate that cords are not to be routed through to another complete unit or worksurface, or

b) For cord/cable channels located externally, be marked to indicate that cords are not to be routed across one complete unit of work surface to another.

38.13 Each cord/cable channel shall be marked, where visible when a cord is being inserted, to indicate that the cord/cable channel is not to be used for routing extension cords.

38.14 Each electrical accessory that is a load on a circuit (such as a lighting attachment, a motor, or similar accessories) shall be marked with its electrical rating in volts and amperes or watts in a location that is visible after installation without the use of tools.

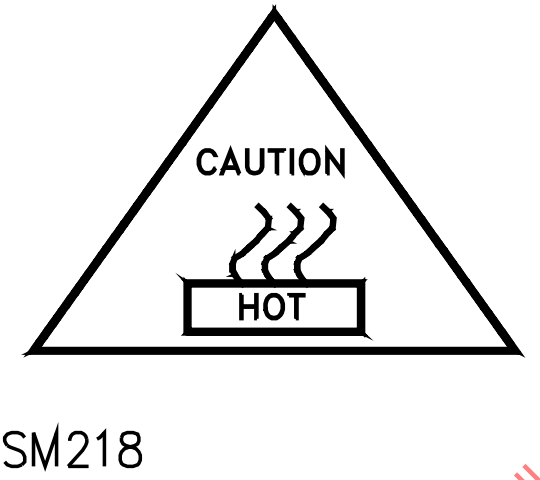
38.15 Where the temperature of the external surface of a lighting attachment exceeds the values specified in 21.2.1, the attachment shall be legibly and permanently marked on, or adjacent to, the hot surface with:

a) The word "CAUTION" and the word "Hot" or the equivalent, or

b) The symbol shown in Figure 38.1. The word "HOT" shall be within the triangle and the word shall be "CAUTION" within or adjacent to the triangle.

Figure 38.1

Marking Symbol for Hot Surfaces



38.16 A systems jumper shall be marked to identify the manufactured wiring system with which the jumper is intended to be used.

38.17 When installation, operating, and maintenance instructions are provided in accordance with 39.1 (c), (d) or (e), each major component of an office furnishing system (panel, desk, work surface, cabinet, book case, electrical wiring assembly, or a similar component) shall be marked with the following or equivalent: "Operating, maintenance, and installation instructions are available at http://www.___ .com/___/." The blanks are to be filled in with the URL address where the actual instructions can be viewed, downloaded, and printed.

38.18 The supporting surface for the video display or monitor arm shall be permanently marked with the maximum weight of the video display it is intended to support. The marking is not required to be visible after installation of the video display.

38.19 *Deleted*

38.20 Office furnishings shall be marked with the applicable type designations as specified in 2.17.

39 Installation and Operating Instructions

39.1 Operating, maintenance, and installation instructions shall be provided. The instructions shall be included or made available with the office furnishing system in accordance with one of the following methods:

a) Printed operating, maintenance and installation instructions shall be provided with each major component of an office furnishing system (panel, desk, work surface, cabinet, book case, electrical wiring assembly, or a similar component).

b) Bulk shipments provided with less than one set of printed operating, maintenance and installation instructions for each major component in the shipment meet the intent of the requirement when one or more of the following conditions apply:

1) Bulk shipments from a manufacturing facility to an off-site distribution center are not required to have the instructions provided with the shipment when the appropriate instructions are added to each major component of an office furnishing system (panel, desk,

work surface, cabinet, book case, electrical wiring assembly, or a similar component) at the distribution center before final redistribution to the consumer.

2) Bulk shipments from a manufacturing facility to a customer at a single destination where the redistribution and installation of the product including distribution of instructions is under the control of the customer shall include one set of instructions as a minimum. In addition, a statement shall be provided in those instructions indicating that the appropriate instructions (original or copies) are to be made available to the users of the equipment.

c) When each major component of an office furnishing system (panel, desk, work surface, cabinet, book case, electrical wiring assembly, or a similar component) is marked in accordance with 38.17, a single set of printed operating, maintenance, and installation instructions shall be packaged with one of those major components.

d) Bulk shipments provided with a single set of printed operating, maintenance, and installation instructions for the office furnishing system and where each major component is marked in accordance with 38.17 meet the intent of the requirement when one or more of the following conditions apply:

1) Bulk shipments from a manufacturing facility to an off-site distribution center are not required to have each major component provided with an instruction set when the appropriate instructions are added to one of the major components of an office furnishing system (panel, desk, work surface, cabinet, book case, electrical wiring assembly, or a similar component) at the distribution center before final redistribution to the consumer.

2) Bulk shipments from a manufacturing facility to a customer at a single destination where the redistribution and installation of the product including distribution of instructions is under the control of the customer shall include one set of instructions as a minimum. In addition, a statement shall be provided in those instructions indicating that the appropriate instructions can be viewed, downloaded, and printed at http://www.___.com/___/. The blanks are to be filled in with the URL address where the actual instructions can be viewed, downloaded, and printed.

e) Operating, maintenance, and installation instructions shall be made available electronically through a web address specified on the product, packaging and/or included information sheet, which shall include a statement indicating that the appropriate instructions can be viewed, downloaded, and printed at http://www.___.com/___/. Each manufacturer shall supply the appropriate URL address where the actual instructions can be viewed, downloaded, and printed.

39.2 The instructions specified in 39.1 shall include, and not be limited to, the directions and information required to cover the mechanical and electrical limitations of the system and the intended installation, maintenance, operation, and use of the product.

39.3 Instructions provided in accordance with 10.3.1(b) for a cord-connected system shall specify, in a prominent location, that:

a) The furnishings shall be mechanically contiguous, and

b) The combined length of the furnishings with electrically interconnected raceways shall not exceed 30 ft (9.1 m).

39.4 The instructions for a system provided with raceways that are able to be electrically interconnected shall specify that the electrically interconnected furnishings shall also be mechanically interconnected.

39.5 For a system consisting of glass panels that are not shipped with the system, and such panels are intended to be mounted in the field, the system shall be provided with instructions that specify the size and

thickness of the panels and the type of glass to be used. The instructions shall be such that a glass panel complying with the manufacturer's specification also complies with 18.7.1.

39.6 The installation instructions for a system that employs cord/cable channels shall include the information specified in 38.13.

39.7 With reference to 13.2.1(e), the installation instructions for a systems jumper for the interconnection of office furnishing and manufactured wiring systems shall:

a) Specify that the interconnected electrical systems shall terminate with an office furnishings electrical system,

b) Specify that the interconnected electrical systems shall not have an interconnection such that an office furnishings system is first and then followed by a manufacturing wiring system, and

c) Specify that the interconnected electrical systems shall not alternate between office furnishing and manufacturing wiring systems.

39.8 Hospital grade receptacles provided with proprietary modular contacts for connection to the office furnishing electrical supply shall be provided with installation instructions that include the word “WARNING” and the following or the equivalent: “Do Not Use this Office Furnishing in General Patient Care Areas or Critical Patient Care Areas. They have not been evaluated for use where Article 517 of the National Electrical Code, ANSI/NFPA 70 requires hospital grade components.”

39.9 The maximum weight of the video display it is intended to support shall be identified in the assembly instructions.

39.10 Only those sub-assemblies, critical components and accessories that have been evaluated as part of the complete furnishing shall be specified in the instructions.

Exception: Accessories that have not been evaluated may be in the instructions when they are clearly identified as not being evaluated.

39.11 Instructions for a low level panel or screen shall include a statement that the panel/screen shall only be used against a wall, under other furnishings, or in locations to minimize the risk of tripping or other injury to persons.

Exception: These instructions are not required for a low level panel/screen when it is connected to non-low level panels /screens.

MANUFACTURING AND PRODUCTION LINE TESTS

40 Grounding Continuity Test

40.1 Each cord-connected starter unit shall be tested, as a routine production-line test, to determine that grounding continuity exists between the grounding pin of the attachment plug and the raceway. For a raceway that is complete, the raceway is not required to be attached to the supporting unit.

40.2 A continuity indicating device – such as an ohmmeter, battery-and-buzzer combination, or similar device – is to be used to determine compliance with 40.1.

41 Dielectric Voltage-Withstand Test

41.1 Each office furnishing system electrical assembly shall withstand without electrical breakdown, as a routine production-line test, the application of a 40 – 70 Hz potential of 1000 V for 60 s or 1200 V for 1 s, between:

a) The supply wiring and dead metal parts that have the potential to become energized,

b) Supply wiring of opposite polarity where separate grounded supply conductors are employed, and

c) The ungrounded supply conductors of opposite polarity where the same grounded supply conductor is employed for both circuits.

41.2 The test is to be performed when the system assembly is complete (fully assembled). It is not intended that the product be unwired, modified, or disassembled for the test.

Exception No. 1: A fully enclosed raceway that is separable from the furnishing wall is not required to be secured to the wall.

Exception No. 2: Load connected, across the line components or components which employ transient voltage surge suppressors are not required to have the suppression element connected for this test.

41.3 The test equipment is to include a transformer having sinusoidal output, a means of indicating the test potential, an audible or visual indicator of electrical breakdown, and a manually reset device to restore the equipment after electrical breakdown or an automatic feature to reject any products that do not comply with 41.1.

41.4 Where the output of the test-equipment transformer is less than 500 VA, the equipment is to include a voltmeter in the output circuit to directly indicate the test potential.

41.5 Where the output of the test-equipment transformer is 500 VA or more, the test potential is to be indicated by a voltmeter in the primary circuit or in a tertiary-winding circuit, a selector switch marked to indicate the test potential, or in the case of equipment having a single test-potential output, a marking in a readily visible location to indicate the test potential. Where marking is used without an indicating voltmeter, the equipment shall include a positive means, such as an indicator lamp, to indicate that the manually reset switch has been reset following a dielectric breakdown.

41.6 Test equipment other than that specified in 41.3 – 41.5 is able to be used when the test results using the alternative equipment is equivalent to the test results using the equipment specified in 41.3 – 41.5.

ANNEX A (informative) – MODULAR PRE-WIRED OFFICE FURNISHING FLOOR RACEWAY SYSTEMS

INTRODUCTION

A1 Scope

A1.1 The requirements of this annex cover modular, branch circuit, pre-wired, office furnishing raceway wiring systems for use on floors and attachment to office furnishings. The wiring systems are for use in indoor dry locations using off-site manufactured subassemblies intended for field-installation, for branch circuits and communication circuits located in accessible areas for connection to office furnishings.

A1.2 The requirements of this annex address the routing, interconnection and protection of factory installed branch circuit power conductors with modular power connectors and field installed communication conductors for connection to office furnishings.

A1.3 The pre-wired office furnishing floor raceway wiring system accessories shall comply with requirements in the body of this Standard, except as modified by the requirements of this Annex.

A2 Glossary

A2.1 CONNECTING ASSEMBLY, UNIT-TO-UNIT ELECTRICAL – A component that is used to electrically connect unit raceways of two or more adjacent, mechanically connected units.

A2.2 CONNECTOR, UNIT-TO-UNIT MECHANICAL – An assembly that is used to connect two or more adjacent units for the purpose of providing mechanical support between the units.

A2.3 PEDESTAL FLOOR BOX – A floor box and cover that, when installed as intended, provides a means for mounting of receptacle outlets above the floor's finished surface.

CONSTRUCTION

A3 Accessible Routes

A3.1 Reduction of trip hazard

A3.1.1 A pre-wired office furnishing raceway wiring system shall comply with the following construction requirements to reduce the likelihood of creating a trip hazard.

A3.1.2 When installed in accordance with the installation instructions, no part of the raceway system intended to reside in an accessible route shall extend above the finished floor surface more than 1/4 in (6 mm) unless a transitional ramp is provided that complies with one of the following:

a) If the projection is between 1/4 in (6 mm) and 1/2 in (13 mm) above the finished floor there shall be a beveled slope no greater than 1:2 on each side of the projection, or

b) If the projection is greater than 1/2 in (13 mm) above the finished floor there shall be a beveled slope no greater than 1:20 on each side of the projection.

A3.1.3 The finished floor is the top surface of tile, carpet, hardwood flooring or the like. The installation instructions are to be used as guide in determining the height of the raceway above the finished floor surface after the installation is complete.

A3.2 Slip resistance of floor surface materials

A3.2.1 A pre-wired office furnishing raceway wiring system intended for use in accessible routes (walkways) shall have a textured walking surface, ribs or other slip reducing construction.

Exception: A modular system that is intended to be covered by carpet or carpet squares is not required to be slip resistant.

A3.2.2 When necessary to determine if a surface is slip resistant, the raceway component exposed in the accessible route shall comply with UL 410, for floor covering materials (FCM).

A4 Mounting

A4.1 Provision shall be made for attaching the system to the floor or office furnishing. Such means shall provide for securing the system at intervals of not more than 4 ft (1.22 m). If the total system is less than 4 ft, the system shall be secured at least near the beginning and end of the system. If the base is designed to be secured to the floor or office furnishing surface by screws or bolts extending from the inside, the arrangement shall not result in damage to the conductors. This can be accomplished through the use of round-head or pan-head screws or bolts and washers that serve to protect the head of the screw or bolt, or other appropriate means.

A4.2 Mounting hardware such as screws or bolts shall be packaged with the raceway or the installation instructions packaged with the raceway shall specify the appropriate hardware to mount the raceway.

A4.3 An adhesive strip, if provided on the system, may serve only as a positioning aid during the installation process. The system shall also have provisions for mechanical fastening as required in A4.1 and A4.2.

A4.4 Raceway or fitting covers shall be constructed such that the use of a tool (such as the prying action of a screwdriver) or two simultaneous deliberate actions are necessary for their removal for gaining access to internal areas of the raceway after installation.

A4.5 Provision shall be made for securing the cover to the base of a two-piece raceway at intervals of not more than 4 ft (1.22 m). If the total system is less than 4 feet, the raceway cover shall be secured at least near the beginning and end of the raceway. A cover that is held in place by continuous grooves, flanges, or the like shall securely fix the cover in place in accordance with A4.4.

A4.6 Unless the modular system is provided with a specific design for transitioning across a building expansion joint, the manufacturers installation instructions shall include a warning statement in accordance with A30.9 not to install the system across building expansion joints.

A5 Wiring Devices

A5.1 A wiring device or device assembly shall be secured to the raceway by a positive means such as two screws or rivets. A snap-fit or other non-positive means of securement may be used if the securement complies with the test specified in Section A26, Receptacle Secureness Test.

A5.2 A wiring device or device assembly may be mounted by the center screw if it is identified for the purpose.

A6 Electrical Continuity

A6.1 Electrical continuity shall be provided between all dead metal parts of a raceway system while the parts are installed in the intended manner. See Electrical Resistance Test, Section A18.

A6.2 All dead metal parts of a raceway system that are likely to become energized shall be bonded to ground. Mounting hardware that is not exposed or accessible after installation is not required to comply with this requirement.

A7 Grounding and Bonding

A7.1 A grounding and bonding screw provided in a metal raceway or fitting shall:

a) Be No. 10 – 32 or larger,

b) Have a green-colored head that is slotted or hexagonal, or both, and

c) Be plated steel, stainless steel, copper, or copper alloy.

A7.2 A grounding screw shall engage the metal with at least two full threads and shall be used in conjunction with upturned lugs, a cupped washer, or an equivalent method capable of retaining a 10 AWG (5.3 mm^2) conductor under the head of the screw. A sheet metal screw shall not be used for the connection of a grounding conductor.

A7.3 With respect to the requirement in A7.1 a grounding conductor provided in lieu of a grounding screw shall be sized in accordance with the maximum size of supply conductor incorporated within the pre-wired office furnishing raceway wiring system assembly and shall be solid or stranded copper not smaller than 12 AWG (3.3 mm^2), and shall be a minimum of 6 in (152 mm) long.

A7.4 One end of a grounding conductor shall be secured to the metal raceway or fitting by a screw complying with A7.1 or by a permanent means, such as welding, or by means of a copper, copper alloy, or stainless-steel rivet. If insulated, the color of the surface of the insulation shall be green, with or without one or more yellow stripes.

A8 Accessibility of Parts

A8.1 Live parts of a pre-wired office furnishing raceway wiring system shall be enclosed to reduce the risk of fire, electric shock, and injury to persons. Refer to 18.5.2.

Exception No. 1: A part in a Class 2 circuit is not required to be enclosed. Refer to 2.7.

Exception No. 2: A unit-to-unit electrical connecting assembly complying with the requirements in 13.1.4 – 13.1.7 and a contact opening of a receptacle that complies with the requirement in 9.1 are not required to be further enclosed.

A8.2 A raceway enclosing uninsulated live parts shall be complete and shall require the use of a tool or tools to gain access to those parts. Refer to A4.4 and A4.5 for access requirements.

A8.3 Where clearance is required for the placement of a component, such as the face of a receptacle or a similar component, the clearance shall not be greater than 0.030 in (0.76 mm) between the component and the adjacent enclosure edge.

A8.4 A clearance in the form of a slot, gap, or opening between a component and the adjacent enclosure edge not greater than 0.090 in (2.29 mm) wide complies with the requirement when the raceway is provided with a secondary cover that reduces the risk of debris entering.

A8.5 A raceway enclosing basic (functionally) insulated live parts shall be complete and reliably secured in place. Refer to A4.4 and A4.5.

A8.6 The system shall comply with one of the following: