

(B) Ampacity of Type MV and Type MC Cables (2001 Volts or Over) in Cable Trays. The ampacity of cables, rated 2001 volts, nominal, or over, installed according to 392.22(C) shall not exceed the requirements of this section.

Informational Note: See 110.40 for conductor temperature limitations due to termination provisions.

(1) Multiconductor Cables (2001 Volts or Over). The ampacity of multiconductor cables shall be as given in Table 315.60(C)(9) and Table 315.60(C)(10), subject to the following:

- (1) Where cable trays are continuously covered for more than 1.8 m (6 ft) with solid unventilated covers, not more than 95 percent of the ampacities of Table 315.60(C)(9) and Table 315.60(C)(10) shall be permitted for multiconductor cables.
- (2) Where multiconductor cables are installed in a single layer in uncovered cable trays, with maintained spacing of not less than one cable diameter between cables, the ampacity shall not exceed the allowable ampacities of Table 315.60(C)(5) and Table 315.60(C)(6).

(2) Single-Conductor Cables (2001 Volts or Over). The ampacity of single-conductor cables, or single conductors cabled together (triplexed, quadruplexed, and so forth), shall comply with the following:

- (1) The ampacities for 1/0 AWG and larger single-conductor cables in uncovered cable trays shall not exceed 75 percent of the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4). Where the cable trays are covered for more than 1.8 m (6 ft) with solid unventilated covers, the ampacities for 1/0 AWG and larger single-conductor cables shall not exceed 70 percent of the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4).
- (2) Where single-conductor cables are installed in a single layer in uncovered cable trays, with a maintained space of not less than one cable diameter between individual conductors, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities in Table 315.60(C)(3) and Table 315.60(C)(4).
- (3) Where single conductors are installed in a triangular or square configuration in uncovered cable trays, with a maintained free air space of not less than 2.15 times the diameter ($2.15 \times \text{O.D.}$) of the largest conductor contained within the configuration and adjacent conductor configurations or cables, the ampacity of 1/0 AWG and larger cables shall not exceed the ampacities in Table 315.60(C)(1) and Table 315.60(C)(2).

Part III. Construction Specifications

392.100 Construction.

(A) Strength and Rigidity. Cable trays shall have suitable strength and rigidity to provide adequate support for all contained wiring.

(B) Smooth Edges. Cable trays shall not have sharp edges, burrs, or projections that could damage the insulation or jackets of the wiring.

(C) Corrosion Protection. Cable tray systems shall be corrosion resistant. If made of ferrous material, the system shall be protected from corrosion as required by 300.6.

(D) Side Rails. Cable trays shall have side rails or equivalent structural members.

(E) Fittings. Cable trays shall include fittings or other suitable means for changes in direction and elevation of runs.

(F) Nonmetallic Cable Tray. Nonmetallic cable trays shall be made of flame-retardant material.

ARTICLE

393

Low-Voltage Suspended Ceiling Power Distribution Systems

Part I. General

393.1 Scope. This article covers the installation of low-voltage suspended ceiling power distribution systems.

Low-voltage suspended ceiling power distribution systems are suspended ceiling assemblies that include a distribution bus within the supporting structure for the ceiling tiles. The bus distributes Class 2 power, which can be used for lighting and other applications. Exhibit 393.1 illustrates a typical system. Exhibit 393.2 illustrates the connection to the distribution grid bus rail.

393.6 Listing Requirements. Suspended ceiling power distribution systems and associated fittings shall be listed as in 393.6(A) or (B).

(A) Listed System. Low-voltage suspended ceiling distribution systems operating at 30 volts ac or less or 60 volts dc or less shall be listed as a complete system, with the utilization equipment, power supply, and fittings as part of the same identified system.

(B) Assembly of Listed Parts. A low-voltage suspended ceiling power distribution system assembled from the following parts, listed according to the appropriate function, shall be permitted:

- (1) Listed low-voltage utilization equipment
- (2) Listed Class 2 power supply
- (3) Listed or identified fittings, including connectors and grid rails with bare conductors
- (4) Listed low-voltage cables in accordance with 722.179, conductors in raceways, or other fixed wiring methods for the secondary circuit

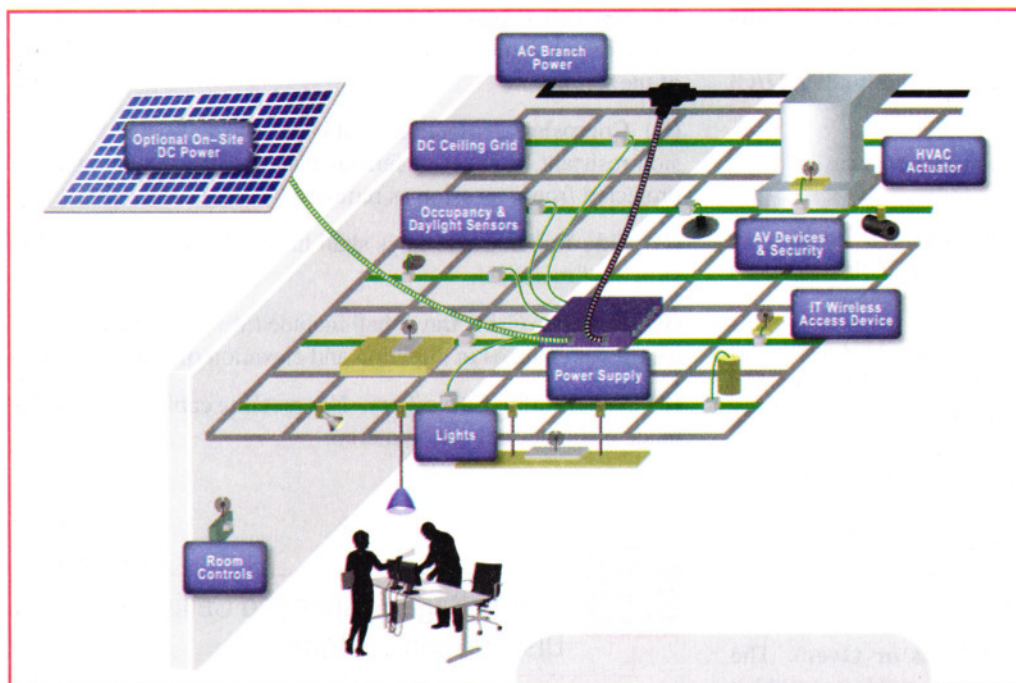


EXHIBIT 393.1 An illustration of a suspended ceiling distribution system. (Courtesy of EMerge Alliance)

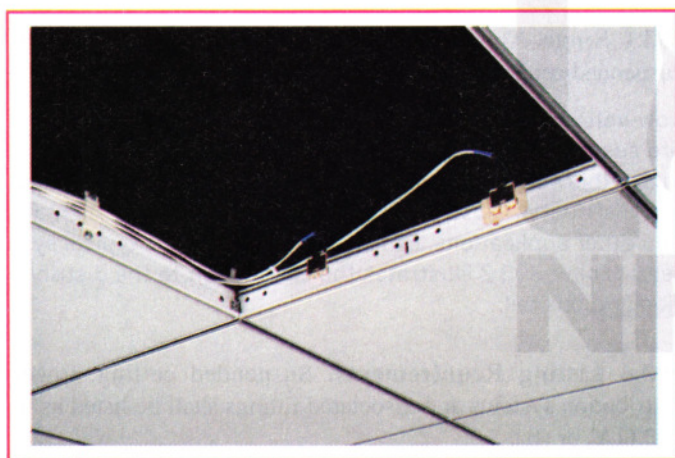


EXHIBIT 393.2 Connectors used in a suspended ceiling distribution system. (Courtesy of Armstrong® Ceiling Solutions)

Part II. Installation

393.10 Uses Permitted. Low-voltage suspended ceiling power distribution systems shall be permanently connected and shall be permitted as follows:

- (1) For listed utilization equipment capable of operation at a maximum of 30 volts ac (42.4 volts peak) or 60 volts dc (24.8 volts peak for dc interrupted at a rate of 10 Hz to 200 Hz) and limited to Class 2 power levels in Chapter 9, Table 11(A) and Table 11(B) for lighting, control, and signaling circuits.
- (2) In indoor dry locations.
- (3) For residential, commercial, and industrial installations.

- (4) In other spaces used for environmental air in accordance with 300.22(C), electrical equipment having a metal enclosure, or with a nonmetallic enclosure and fittings, shall be listed for use within an air-handling space and shall have adequate fire-resistant and low-smoke-producing characteristics and associated wiring material suitable for the ambient temperature.

Informational Note: See ANSI/UL 2043-2018, *Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces*, for one method of defining adequate fire-resistant and low-smoke-producing characteristics for electrical equipment with a nonmetallic enclosure.

393.12 Uses Not Permitted. Suspended ceiling power distribution systems shall not be installed in the following:

- (1) In damp or wet locations
- (2) Where subject to corrosive fumes or vapors, such as storage battery rooms
- (3) Where subject to physical damage
- (4) In concealed locations
- (5) In hazardous (classified) locations
- (6) As part of a fire-rated floor-ceiling or roof-ceiling assembly, unless specifically listed as part of the assembly
- (7) For lighting in general or critical patient care areas

393.14 Installation.

(A) General Requirements. Support wiring shall be installed in a neat and workmanlike manner. Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the

cable is not damaged by normal building use. Such cables shall be supported by straps, staples, hangers, cable ties listed and identified for securement and support, or similar fittings designed and installed so as not to damage the cable.

Informational Note: Suspended ceiling low-voltage power grid distribution systems should be installed by qualified persons in accordance with the manufacturer's installation instructions.

(B) Insulated Conductors. Exposed insulated secondary circuit conductors shall be listed, of the type, and installed as described as follows:

- (1) Class 2 cable supplied by a listed Class 2 power source and installed in accordance with **Part I of Article 722 and Parts I and II of Article 725**
- (2) Wiring methods described in Chapter 3

393.21 Disconnecting Means.

(A) Location. A disconnecting means for the Class 2 supply to the power grid system shall be located so as to be accessible and within sight of the Class 2 power source for servicing or maintenance of the grid system.

(B) Multiwire Branch Circuits. Where connected to a multiwire branch circuit, the disconnecting means shall simultaneously disconnect all the supply conductors, including the grounded conductors.

393.30 Securing and Supporting.

(A) Attached to Building Structure. A suspended ceiling low-voltage power distribution system shall be secured to the mounting surface of the building structure by hanging wires, screws, or bolts in accordance with the installation and operation instructions. Mounting hardware, such as screws or bolts, shall be either packaged with the suspended ceiling low-voltage lighting power distribution system, or the installation instructions shall specify the types of mounting fasteners to be used.

(B) Attachment of Power Grid Rails. The individual power grid rails shall be mechanically secured to the overall ceiling grid assembly.

393.40 Connectors and Enclosures.

(A) Connectors. Connections to busbar grid rails, cables, and conductors shall be made with listed insulating devices, and these connections shall be accessible after installation. A soldered connection shall be made mechanically secure before being soldered. Other means of securing leads, such as push-on terminals and spade-type connectors, shall provide a secure mechanical connection. The following connectors shall be permitted to be used as connection or interconnection devices:

- (1) Load connectors shall be used for power from the busbar to listed utilization equipment.
- (2) A pendant connector shall be permitted to suspend low-voltage luminaires or utilization equipment below the grid

rail and to supply power from the busbar to the utilization equipment.

- (3) A power feed connector shall be permitted to connect the power supply directly to a power distribution cable and to the busbar.
- (4) Rail-to-rail connectors shall be permitted to interconnect busbars from one ceiling grid rail to another grid rail.

Informational Note: See UL 310, *Standard for Electrical Quick-Connect Terminals*, for quick-connect terminals. See UL 486A-486B, *Standard for Wire Connectors*, for mechanical splicing devices.

(B) Enclosures. Where made in a wall, connections shall be installed in an enclosure in accordance with Parts I, II, and III of Article 314.

393.45 Overcurrent and Reverse Polarity (Backfeed) Protection.

(A) Overcurrent Protection. The listed Class 2 power supply or transformer primary shall be protected at not greater than 20 amperes.

(B) Interconnection of Power Sources. Listed Class 2 sources shall not have the output connections paralleled or otherwise interconnected unless listed for such interconnection.

(C) Reverse Polarity (Backfeed) Protection of Direct-Current Systems. A suspended ceiling low-voltage power distribution system shall be permitted to have reverse polarity (backfeed) protection of dc circuits by one of the following means:

- (1) If the power supply is provided as part of the system, the power supply is provided with reverse polarity (backfeed) protection; or
- (2) If the power supply is not provided as part of the system, reverse polarity or backfeed protection can be provided as part of the grid rail busbar or as a part of the power feed connector.

393.56 Splices. A busbar splice shall be provided with insulation and mechanical protection equivalent to that of the grid rail busbars involved.

393.57 Connections. Connections in busbar grid rails, cables, and conductors shall be made with listed insulating devices and be accessible after installation. Where made in a wall, connections shall be installed in an enclosure in accordance with Parts I, II, and III of Article 314, as applicable.

393.60 Equipment Grounding Conductor. The supply side of the Class 2 power source shall be connected to an equipment grounding conductor in accordance with the applicable requirements in Part IV of Article 250.

393.61 Grounding of Load Side of Class 2 Power Source. Class 2 load side circuits for suspended ceiling low-voltage power grid distribution systems shall be permitted to be grounded.