NEC 2014 Code Changes

CHANGES FROM 2011 TO 2014 CODE ARE IN RED

ARTICLE 506

Zone 20, 21, and 22 Locations for Combustible Dusts or Ignitible Fibers/Flyings

506.2 Definitions.

Combustible Dust. Dust particles that are 500 microns or smaller (material passing a U.S. No. 35 Standard Sieve as defined in ASTM E 11-09, Standard Specification for Wire Cloth and Sieves for Testing Purposes) and present a fire or explosion hazard when dispersed and ignited in air.

Informational Note: See ASTM E 1226–12a, Standard Test Method for Explosibility of Dust Clouds, or ISO 6184-1, Explosion protection systems — Part 1: Determination of explosion indices of combustible dusts in air, for procedures for determining the explosibility of dusts.

506.3 Other Articles.

All other applicable rules contained in this Code shall apply to electrical equipment and wiring installed in hazardous (classified) locations.

Exception: As modified by Article 504 and this article.

506.6 Material Groups.

For the purposes of testing, approval, and area classification, various air mixtures (not oxygen enriched) are to be grouped as required in 506.6(A), (B), and (C).

(A) Group IIIC. Combustible metal dust.

Informational Note: Group IIIC is equivalent to Class II, Group E as described in 500.6(B)(1).

(B) Group IIIB. Combustible dust other than combustible metal dust.

Informational Note: Group IIIB is equivalent to Class II,Groups F and G as described in 500.6(B)(2) and 500.6(B)(3), respectively.

(C) Group IIIA. Solid particles, including fibers, greater than 500 µm in nominal size, which may be suspended in air and could settle out of the atmosphere under their own weight.

Informational Note No. 1: Group IIIA is equivalent to class III.

Informational Note No. 2: Examples of flyings include rayon, cotton (including cotton linters and cotton waste), sisal, jute, hemp, cocoa fiber, oakum, and baled waste kapok.

506.7 Special Precaution.

Article 506 requires equipment construction and installation that ensures safe performance under conditions of proper use and maintenance.

506.9 Equipment Requirements.

(C) Marking.

(1) Division Equipment. Equipment identified for Class II, Division 1 or Class II, Division 2 shall, in addition to being marked in accordance with 500.8(C), be permitted to be marked with all of the following:

(1) Zone 20, 21, or 22 (as applicable)

(2) Material group in accordance with 506.6

(3) Maximum surface temperature in accordance with 506.9(D), marked as a temperature value in degrees C, preceded by "T" and followed by the symbol "°C"

(2) Zone Equipment.

Equipment meeting one or more of the protection techniques described in 506.8 shall be marked with the following in the order shown:

(1) Zone

(2) Symbol "AEx"

(3) Protection technique(s) in accordance with Table

506.9(C)(2)(3)

(4) Material group in accordance with 506.6

(5) Maximum surface temperature in accordance with 506.9(D), marked as a temperature value in degrees C, preceded by "T" and followed by the symbol "°C"

(6) Ambient temperature marking in accordance with 506.9(D)

Exception: Associated apparatus NOT suitable for installation in a hazardous (classified) location are required to be marked only with 506.9(C)(2)(2), (3), and (5), but BOTH the symbol AEx in 506.9(C)(2)(2) and the symbol for the type of protection in 506.9(C)(2)(3) must be enclosed within the same square brackets; for example, [AEx iaD] or [AEx ia] IIIC.

(D) Temperature Classifications. Equipment shall be marked to show the maximum surface temperature referenced to a 40°C ambient, or at the higher marked ambient temperature if the equipment is rated and marked for an ambient temperature of greater than 40°C. For equipment installed in a Zone 20 or Zone 21 location, the operating temperature are to be based on operation of the equipment when blanketed with the maximum amount of dust (or with dust-simulating fibers/flyings) that can accumulate on the equipment. Electrical equipment designed for use in the ambient temperature range between −20°C and +40°C shall require no additional ambient temperature marking. Electrical equipment that is designed for use in a range of ambient temperatures other than −20°C and +40°C is considered to be special; and the ambient temperature range shall then be marked on the equipment, including either the symbol “Ta” or “Tamb” together with the special range of ambient temperatures.

506.15 Wiring Methods.

Wiring methods shall maintain the integrity of the protection techniques and shall comply with 506.15(A), (B), or (C).

(A) Zone 20. In Zone 20 locations, the following wiring methods shall be permitted.

(1) Threaded rigid metal conduit or threaded steel intermediate metal conduit.

(2) Type MI cable terminated with fittings listed for the location. Type MI cable must be installed and supported in a manner to avoid tensile stress at the termination fittings.

Exception No. 1: MI cable and fittings listed for Class II, Division 1 locations shall be permitted to be used.

Exception No. 2: Equipment identified as intrinsically safe “iaD” or “ia” are permitted to be connected using the wiring methods identified in 504.20.

(6) Where necessary to employ flexible connections, liquid-tight flexible metal conduit with listed fittings, liquid-tight flexible nonmetallic conduit with listed fittings, or flexible cord listed for extra-hard usage and provided with listed fittings used. Where flexible cords are used, they shall also comply with 506.17 and must be terminated with a listed cord connector that maintains the type of protection of the terminal compartment. Where flexible connections are subject to oil or other corrosive conditions, the insulation of the conductors are to be of a type listed for the condition or shall be protected by means of a suitable sheath.

Exception No. 1: Flexible conduit and flexible conduit and cord fittings listed for Class II, Division 1 locations are permitted to be used.

Exception No. 2: For elevator use, an identified elevator cable of Type EO, ETP, or ETT, shown under the “use” column in Table 400.4 for “hazardous (classified) locations,” and terminated with listed connectors that maintain the type of protection of the terminal compartment are permitted.

(7) Optical fiber cable Types OFNP, OFCP, OFNR, OFCR, OFNG, OFCG, OFN, and OFC are permitted to be installed in raceways in accordance with 506.15(A).

Optical fiber cables shall be sealed in accordance with 506.16.

(B) Zone 21. In Zone 21 locations, the wiring methods in (B)(1) and (B)(2) are permitted.

(1) All wiring methods permitted in 506.15(A).

(2) Fittings and boxes that are dust-tight, provided with threaded bosses for connection to conduit, in which taps, joints, or terminal connections are not made, and are not used in locations where metal dust is present, may be used.

Informational Note: For further information on construction, testing, and marking of cables, cable fittings, and cord connectors, see ANSI/UL 2225-2011, Cables and Cable- Fittings for Use in Hazardous (Classified) Locations.

Exception: Equipment identified as intrinsically safe “ibD” or “ib” are permitted to be connected using the wiring methods identified in 504.20.

(C) Zone 22. In Zone 22 locations, the following wiring methods shall be permitted.

(1) All wiring methods permitted in 506.15(B).

(2) Rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dust-tight wireways.

(3) Type MC or MI cable with listed termination fittings.

(4) Type PLTC and Type PLTC-ER cable in accordance with the provisions of Article 725, including installation in cable tray systems. The cable shall be terminated with listed fittings.

(5) Type ITC and Type ITC-ER cable as permitted in 727.4 and terminated with listed fittings.

(6) Type MC, MI, MV, TC, or TC-ER cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between two adjacent cables, shall be the wiring method

employed. Single-conductor Type MV cables shall be shielded or metallic armored. The cable must be terminated with listed fittings.

(7) Intrinsic safety type of protection "ic" are permitted using any of the wiring methods permitted for unclassified locations. Intrinsic safety type of protection "ic" systems must be installed in accordance with the control drawing(s). Simple apparatus, not shown on the control drawing, shall be permitted in a circuit of intrinsic safety type of protection "ic", provided that the simple apparatus does not interconnect the intrinsic safety type of protection "ic" circuit to any other circuit.

Informational Note: The term Simple Apparatus is defined in 504.2.

Separation of circuits of intrinsic safety type of protection "ic" must be in accordance with one of the following:

a. Be in separate cables

b. Be in multi-conductor cables where the conductors of each circuit are within a grounded metal shield

c. Be in multi-conductor cables where the conductors have insulation with a minimum thickness of 0.25 mm (0.01 in.)

(8) Boxes and fittings shall be dust-tight.

(9) Optical fiber cable Types OFNP, OFCP, OFNR, OFCR, OFNG, OFCG, OFN, and OFC are allowed to be installed in cable trays or any raceway in accordance with 506.15(C). Optical fiber cables are to be sealed in accordance with 506.16.

506.20 Equipment Installation.

(A) Zone 20. In Zone 20 locations, only equipment listed and marked as suitable for the location shall be permitted.

Exception: Equipment listed for use in Class II, Division 1

locations with a suitable temperature class shall be permitted.

(B) Zone 21. In Zone 21 locations, only equipment listed and marked as suitable for the location are permitted.

Exception No. 1: Apparatus listed for use in Class II, Division 1 locations with a suitable temperature class shall be allowed.

Exception No. 2: Pressurized equipment identified for Class II, Division 1 shall be allowed.

(C) Zone 22. In Zone 22 locations, only equipment listed and marked as suitable for the location shall be permitted.

Exception No. 1: Apparatus listed for use in Class II, Division 1 or Class II, Division 2 locations with a suitable temperature class are permitted.

Exception No. 2: Pressurized equipment identified for Class II, Division 1 or Division 2 shall be permitted.

(D) Material Group. Equipment marked Group IIIC shall be permitted for applications requiring IIIA or IIIB equipment. Similarly, equipment marked Group IIIB shall be allowed for applications requiring IIIA equipment.

(E) Manufacturer's Instructions. Electrical equipment installed in hazardous (classified) locations are to be installed in accordance with the instructions (if any) provided by the manufacturer.

(F) Temperature. The temperature marking specified in 506.9(C)(2)(5) shall comply

with (E)(1) or (E)(2):

(1) For combustible dusts, less than the lower of either the layer or cloud ignition temperature of the specific combustible dust. For organic dusts that may dehydrate or carbonize, the temperature marking shall not exceed the lower of either the ignition temperature or 165°C (329°F).

(2) For ignitible fibers/flyings, less than 165°C (329°F) for equipment that is not subject to overloading, or 120°C (248°F) for equipment (such as motors or power transformers) that may be overloaded.

506.25 Grounding and Bonding.

Regardless of the voltage of the electrical system, grounding and bonding shall comply with Article 250 and the requirements in 506.25(A) and (B).

ARTICLE 514 Motor Fuel Dispensing Facilities

514.3 Classification of Locations. [See Figure 514.3.]

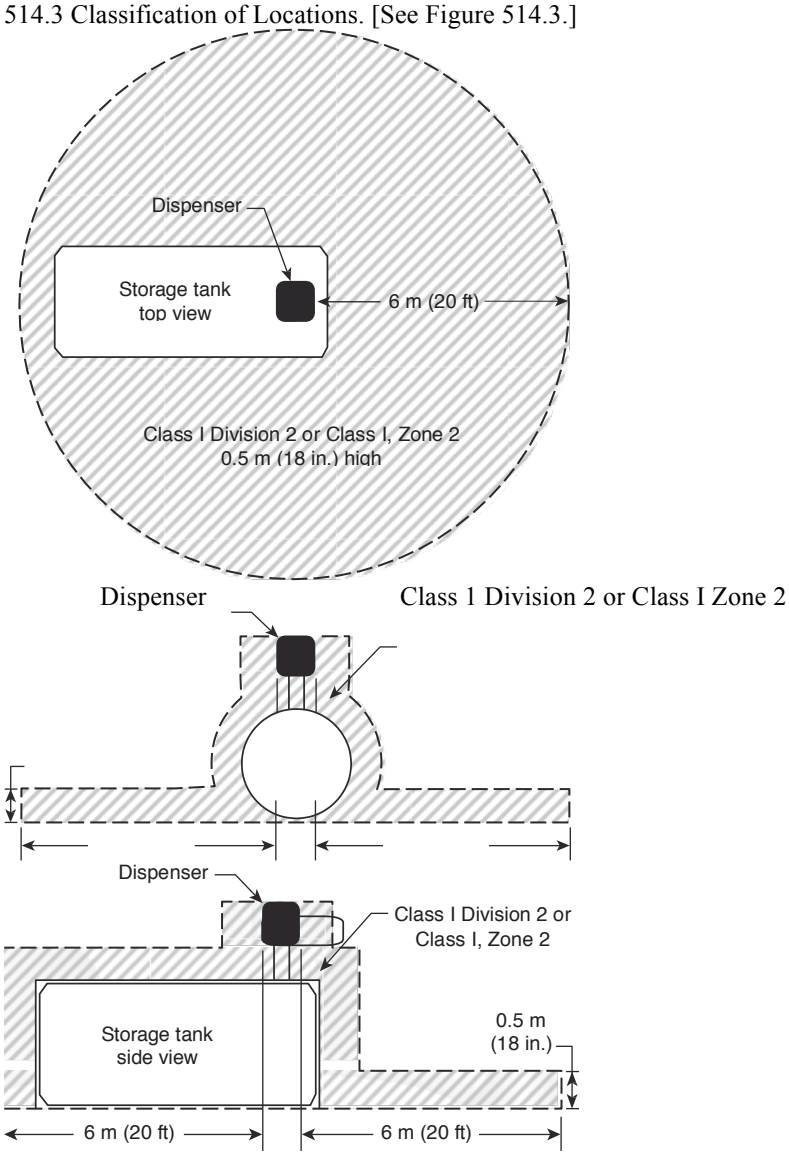

Figure 514.3(B) Classified Areas Adjacent to Dispenser Mounted on Aboveground Storage Tank. [30A: Figure 8.3.2(b)]

(C) Motor Fuel Dispensing Stations in Boatyards and Marinas.

(1) General. Electrical wiring and equipment located at or serving motor fuel dispensing locations installed on the side of the wharf, pier, or dock opposite from the liquid piping system.

Informational Note: For additional information, see NFPA 303-2011, Fire Protection Standard for Marinas and Boatyards, and NFPA 30A-2012, Motor Fuel Dispensing

Facilities and Repair Garages.

(2) Classification of Class I, Division 1 and 2 Areas. The following criteria must be used for the purposes of applying Table 514.3(B)(1) and Table 514.3(B)(2) to motor fuel dispensing equipment on floating or fixed piers, wharfs, or docks.

(D) Closed Construction. Where the construction of floating docks, piers, or wharfs is closed so that there is no space between the bottom of the dock, pier, or wharf and the water, as in the case of concrete-enclosed expanded foam or similar construction, and the construction includes integral service boxes with supply chases, the following shall apply:

(1) The space above the surface of the floating dock, pier, or wharf shall be a Class I, Division 2 location with distances as specified in Table 514.3(B)(1) for dispenser and outdoor locations.

(2) Spaces below the surface of the floating dock, pier, or wharf that have areas or enclosures, such as tubs, voids, pits, vaults, boxes, depressions, fuel piping chases, or similar spaces, where flammable liquid or vapor can accumulate shall be a Class I, Division 1 location.

Exception No. 1: Dock, pier, or wharf sections that do not support fuel dispensers and abut, but are located 6.0 m (20 ft) or more from, dock sections that support a fuel dispenser(s) are permitted to be Class I, Division 2 locations where documented air space is provided between dock sections to allow flammable liquids or vapors to dissipate without traveling to such dock sections. The documentation shall comply with 500.4(A).

Exception No. 2: Dock, pier, or wharf sections that do not support fuel dispensers and do not directly abut sections that support fuel dispensers shall be permitted to be unclassified where documented air space is provided and where flammable liquids or

vapors cannot travel to such dock sections. The documentation shall comply with 500.4(A).

(E) Open Construction. Where the construction of piers, wharfs, or docks is open, as in the case of decks built on stringers supported by pilings, floats, pontoons, or similar construction, the following shall apply:

(1) The area 450 mm (18 in.) above the surface of the dock, pier, or wharf and extending 6.0 m (20 ft) horizontally in all directions from the outside edge of the dispenser and down to the water level must be a Class 1, Division 2 location.

(2) Enclosures such as tubs, voids, pits, vaults, boxes, depressions, piping chases, or similar spaces where flammable liquids or vapors can accumulate within 6.0 m (20 ft) of the dispenser shall be a Class I, Division 1 location.

ARTICLE 516 Spray Application, Dipping, Coating, and Printing Processes Using Flammable or Combustible Materials

516.2 Definitions. For the purpose of this article, the following definitions shall apply.

Flash-Off Area. An open or enclosed area after a spray application process where vapors are released due to exposure to ambient air or a heated atmosphere. [33:3.3.1.1]

Limited Finishing Workstation. An apparatus that is capable of confining the vapors, mists, residues, dusts, or deposits that are generated by a spray application process and that meets the requirements of Section 14.3 of NFPA 33, Standard for Spray Application Using Flammable or Combustible Materials, but does not meet the requirements of a spray booth or spray room, as herein defined. [33:3.3.15.1]

Resin Application Area. Any area in which polyester resins or gelcoats are spray applied. [33:3.3.1.2]

Spray Area. Any fully enclosed, partly enclosed, or unenclosed area in which

ignitible quantities of flammable or combustible vapors, mists, residues, dusts, or deposits are present due to the operation of spray processes, including

(1) any area in the direct path of a spray application process;

(2) the interior of a spray booth or spray room or limited finishing workstation, as herein defined; (3) the interior of any exhaust plenum, eliminator section, or scrubber section; (4) the interior of any exhaust duct or exhaust stack leading from a spray application process; (5) the interior of any air recirculation filter house or enclosure, including secondary recirculation particulate filters; (6) any solvent concentrator (pollution abatement) unit or solvent recovery (distillation) unit. The following are not considered to be a part of the spray area: (1) fresh air make-up units; (2) air supply ducts and air supply plenums; (3) recirculation air supply ducts downstream of secondary filters;exhaust ducts from solvent concentrator (pollution abatement) units. [33: 3.3.2.3]

Spray Room. A power-ventilated fully enclosed room used exclusively for open spraying of flammable or combustible materials. A spray room is a purposefully enclosed room built for spray/coating/dipping applications provided with dedicated ventilation supply and exhaust. Normally the room is configured to house the item to be painted, providing reasonable access around the item/process. Depending on the size of the item being painted, such rooms may actually be the entire building or the major portion thereof. [33: 3.3.15]

Un-enclosed Spray Area. Any spray area that is not confined by a limited finishing workstation, spray booth, or spray room, as herein defined. [33: 3.3.2.3.2]

516.3 Classification of Locations.

Classification is based on quantities of flammable vapors, combustible mists, residues, dusts, or deposits that are present or might be present in quantities sufficient

to produce ignitible or explosive mixtures with air. (A) Zone Classification of Locations.

(1) For the purposes of this article, the zone system of electrical area classification shall be applied as follows:

a. The inside of open or closed containers or vessels are considered a Class I, Zone 0 location.

b. A Class I, Division 1 location are allowed to be alternatively classified as a Class I, Zone 1 location.

c. A Class I, Division 2 location are allowed to be alternatively classified as a Class I, Zone 2 location.

d. A Class II, Division 1 location are allowed to be alternatively classified as a Zone 21 location.

e. A Class II, Division 2 location are allowed to be alternatively classified as a Zone 22 location. [33: 6.2.2]

(2) For the purposes of electrical area classification, the division system and the zone system shall not be intermixed for any given source of release. [33: 6.2.3]

(3) In instances of areas within the same facility classified separately, Class I, Zone 2 locations shall be permitted to abut, but not overlap, Class I, Division 2 locations. Class I, Zone 0 or Zone 1 locations shall not abut Class I, Division 1 or Division 2 locations. [33: 6.2.4]

(4) Open flames, spark-producing equipment or processes, and equipment whose exposed surfaces exceed the auto-ignition temperature of the material being sprayed shall not be located in a spray area or in any surrounding area that is classified as Division 2, Zone 2, or Zone 22.

Exception: This requirement shall not apply to drying, curing, or fusing apparatus.

[33:6.2.5]

(5) Any utilization equipment or apparatus that is capable of producing sparks or particles of hot metal and that is located above or adjacent to either the spray area or the surrounding Division 2, Zone 2, or Zone 22 areas must be of the totally enclosed type or be constructed to prevent the escape of sparks or particles of hot metal.

[33: 6.2.6]

(B) Class I, Division 1 or Class I, Zone 0 Locations. The following spaces shall be considered Class I, Division 1, or Class I, Zone 0, as applicable:

(1) The interior of any open or closed container or vessel of a flammable liquid

(2) The interior of any dip tank or coating tank

(3) The interior of any ink fountain, ink reservoir, or ink tank

(C) Class I, Division 1; Class I, Zone 1; Class II, Division 1; or Zone 21 Locations. The following spaces must be considered Class I, Division 1, or Class I, Zone 1, Class II, Division 1, or Zone 21 locations, as applicable:

(1) The interior of spray booths and rooms except as specifically provided in 516.3(D)(7).

(2) The interior of exhaust ducts.

(3) Any area in the direct path of spray operations.

(4) For open dipping and coating operations, all spaces within a 1.5-m (5-ft) radial distance from the vapor sources extending from these surfaces to the floor. The vapor source shall be the liquid exposed in the process and the drainboard, and any dipped or coated object from which it is possible to measure vapor concentrations exceeding 25 percent of the lower flammable limit at a distance of 300 mm (1 ft), in any direction, from the object …

(5) Sumps, pits, or below grade channels within 7.5 m

(25 ft) horizontally of a vapor source. If the sump, pit, or channel extends beyond 7.5 m (25 ft) from the vapor source, it must be provided with a vapor stop or it shall be classified as Class I, Division 1 for its entire length.

(6) All space in all directions outside of but within 900 mm (3 ft) of open containers, supply containers, spray gun cleaners, and solvent distillation units containing flammable liquids.

(7) For limited finishing workstations, the area inside the curtains or partitions.

(D) Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations. The following spaces are considered Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22, as applicable.

(1) Unenclosed Spray Processes. For unenclosed spraying, all space outside of but within 6 m (20 ft) horizontally and 3 m (10 ft) vertically of the Class I, Division 1 or Class I, Zone 1 location as defined in 516.3(A) and not separated from it by partitions. See Figure 516.3(D)(1). [33:6.5.1]

(2) Closed-Top, Open-Face, and Open-Front Spray Booths and Spray Rooms. If spray application operations are conducted within a closed-top, open-face, or open-front booth or room…, any electrical wiring or utilization equipment located outside of the booth or room but within 915 mm (3 ft) of any opening must be suitable for Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable. The Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations shown in Figure 516.3(D)(2) shall extend from the edges of the open face or open front of the booth or room.

(3) Open-Top Spray Booths.

For spraying operations conducted within an open top spray booth, the space 915 mm (3 ft) vertically above the booth and within 915 mm (3 ft) of other booth openings

shall be considered Class I, Division

2; Class I, Zone 2; Class II, Division 2; or Zone 22. [33:6.5.3]

(4) Enclosed Spray Booths and Spray Rooms. For spraying operations confined to an enclosed spray booth or room, electrical area classification shall be as follows: [33:6.5.4]

(1) The area within 915 mm (3 ft) of any opening must be classified as Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable, as shown in Figure 516.3(D)(4)(1).

(2) Where exhaust air is re-circulated, both of the following shall apply:

a. The interior of any recirculation path from the secondary particulate filters up to and including the air supply plenum must be classified as Class I, Division

2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable.

b. The interior of fresh air supply ducts shall be unclassified.

(3) Where exhaust air is not re-circulated, the interior of fresh air supply ducts and fresh air supply plenums shall be unclassified.

(5) Limited Finishing Workstations. For limited finishing workstations, the area inside the 915-mm (3-ft) space horizontally and vertically beyond the volume enclosed by the outside surface of the curtains or partitions shall be classified as Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22, as shown in Figure 516.3(D)(5).

(6) Areas Adjacent to Open Dipping and Coating Processes. Electrical wiring and electrical utilization equipment located adjacent to open processes must meet the requirements of 516(D)(6)(1) through (4)…[34: 6.4]

(1) Electrical wiring and electrical utilization equipment located in any sump, pit, or below grade channel that is within 7620 mm (25 ft) horizontally of a vapor source,

as defined by this standard, must be suitable for Class I, Division 1 or Class I, Zone 1 locations. If the sump, pit, or channel extends beyond 7620 mm (25 ft) of the vapor source, it shall be provided with a vapor stop, or it is classified as Class I, Division 1 or Class I, Zone 1 for its entire length. [34: 6.4.1]

(2) Electrical wiring and electrical utilization equipment located within 1525 mm (5 ft) of a vapor source must be suitable for Class I, Division 1 or Class I, Zone 1 locations. The space inside a dip tank, ink fountain, ink reservoir, or ink tank shall be classified as Class I, Division 1 or Class I, Zone 0, whichever is applicable. [34: 6.4.2]

(3) Electrical wiring and electrical utilization equipment located within 915 mm (3 ft) of the Class I, Division 1 or Class I, Zone 1 location described in 516.3(D)(6)(2) must be suitable for Class I, Division 2 or Class I, Zone 2 locations, whichever is applicable. [34: 6.4.3]

(4) The space 915 mm (3 ft) above the floor and extending 6100 mm (20 ft) horizontally in all directions from the Class I, Division 1 or Class I, Zone 1 location described in 6.4.3 shall be classified as Class I, Division 2 or Class I, Zone 2, and electrical wiring and electrical utilization equipment located within this space shall be suitable for Class I, Division 2 or Class I, Zone 2 locations, whichever is applicable. [34: 6.4.4]

Exception: This space shall be permitted to be unclassified for purposes of electrical installations if the surface area of the vapor source does not exceed 0.5 m2 (5 ft2), the contents of the dip tank, ink fountain, ink reservoir, or ink tank do not exceed 19 L (5 gal), and the vapor concentration during operating and shutdown periods does not exceed 25 percent of the lower flammable limit.

(7) Enclosed Coating and Dipping Operations. Areas adjacent to enclosed dipping

and coating processes are to be classified in accordance with 516.3(D)(7) and Figure 516.3(D)(7). The space adjacent to an enclosed dipping or coating process or apparatus shall be considered unclassified. [34: 6.5.3]

Exception: The space within 915 mm (3 ft) in all directions from any opening in the enclosures shall be classified as Class I, Division 2 or Class I, Zone 2, as applicable. [34:6.5.2]

The interior of any enclosed dipping or coating process or apparatus must be a Class I, Division 1 or Class I, Zone 1 location, and electrical wiring and electrical utilization equipment located within this space shall be suitable for Class I, Division 1 or Class I, Zone 1 locations, whichever is applicable. The area inside the dip tank shall be classified as Class I, Division 1 or Class I, Zone 0, whichever is applicable. [34: 6.5.1]

(8) Open Containers. All space in all directions within 600 mm (2 ft) of the Division 1 or Zone 1 area surrounding open containers, supply containers, spray gun cleaners, and solvent distillation units containing flammable liquids, as well as the area extending 1.5 m (5 ft) beyond the Division 1 or Zone 1 area up to a height of 460 mm (18 in.) above the floor or grade level.

516.4 Wiring and Equipment in Class I Locations.

(B) Wiring and Equipment — Vapors and Residues.

Unless specifically listed for locations containing deposits of dangerous quantities of flammable or combustible vapors, mists, residues, dusts, or deposits (as applicable), there must not be electrical equipment in any spray area as herein defined whereon deposits of combustible residue may readily accumulate. All electrical wiring must comply with 516.4(A).

(C) Illumination.

(1) Luminaires, like that shown in Figure 516.4(C)(1), that are attached to the walls or

ceiling of a spray area but that are outside any classified area and are separated from the spray area by glass panels shall be suitable for use in unclassified locations. Such fixtures must be serviced from outside the spray area. [33:6.6.1]

(2) Luminaires, like that shown in Figure 516.4(C)(1), that are attached to the walls or ceiling of a spray area; that are separated from the spray area by glass panels and that are located within a Class I, Division 2; a Class I, Zone 2; a Class II, Division 2; or a Zone 22 location shall be suitable for such location. Such fixtures shall be serviced from outside the spray area. [33:6.6.2]

(3) Luminaires, like that shown in Figure 516.4(C)(3), that are an integral part of the walls or ceiling of a spray area shall be permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures shall be listed for use in Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable, and also shall be listed for accumulations of deposits of combustible residues. Such fixtures are permitted to be serviced from inside the spray area. [33:6.6.3]

(4) Glass panels used to separate luminaires from the spray area or that are an integral part of the luminaire shall meet the following requirements.

a. Panels for light fixtures or for observation shall be of heat-treated glass, laminated glass, wired glass, or hammered-wired glass and are to be sealed to confine vapors, mists, residues, dusts, and deposits to the spray area. [33:5.5.1]

Exception: Listed spray booth assemblies that have vision panels constructed of other materials shall be permitted.

b. Panels for light fixtures shall be separated from the fixture to prevent the surface temperature of the panel from exceeding 93°C (200°F). [33:5.5.2]

c. The panel frame and method of attachment shall be designed to not fail under fire

exposure before the vision panel fails. [33: 5.5.3]

(F) Static Electric Discharges.

(1) All persons and all electrically conductive objects, including any metal parts of the process equipment or apparatus, containers of material, exhaust ducts, and piping systems that convey flammable or combustible liquids, shall be electrically grounded. [34:6.8.1]

(2) Provision must be made to dissipate static electric charges from all nonconductive substrates in printing processes.