

42.11.2.4 Marking.

42.11.2.4.1 Label Requirements. Each over-the-road general-purpose vehicle powered by LP-Gas shall be identified with a weather-resistant diamond-shaped label located on an exterior vertical or near vertical surface on the lower right rear of the vehicle (on the trunk lid of a vehicle so equipped but not on the bumper of any vehicle) inboard from any other markings. [58:11.12.1]

42.11.2.4.2 Label Size.

42.11.2.4.2.1 The label shall be a minimum of 4¼ in. (120 mm) long by ¾ in. (83 mm) high. [58:11.12.2.1]

42.11.2.4.2.2* The marking shall consist of a border and the word PROPANE [1 in. (25 mm) minimum height centered in the diamond] in silver or white reflective luminous material on a black background. [58:11.12.2.2]

42.11.2.5 Industrial (and Forklift) Trucks Powered by LP-Gas.

42.11.2.5.1 Scope. Paragraph 42.11.2.5 applies to LP-Gas installation on industrial trucks (including forklift trucks), both to propel them and to provide the energy for their materials-handling attachments. [58:11.13.1]

42.11.2.5.2 Operations. The operation of industrial trucks (including forklift trucks) powered by LP-Gas engine fuel systems shall comply with 42.11.2.5.2.1 through 42.11.2.5.2.4. [58:11.13.4]

42.11.2.5.2.1 Industrial trucks shall be refueled outdoors. [58:11.13.4.1]

42.11.2.5.2.2 Where cylinders are exchanged indoors, the fuel piping system shall be equipped to minimize the release of fuel when cylinders are exchanged, in accordance with either of the following:

- (1) Using an approved quick-closing coupling in the fuel line
- (2) Closing the shutoff valve at the fuel cylinder and allowing the engine to run until the fuel in the line is exhausted [58:11.13.4.2]

42.11.2.5.2.3 Where LP-Gas-fueled industrial trucks are used in buildings or structures, the following shall apply:

- (1) The number of fuel cylinders on such a truck shall not exceed two.
- (2) The use of industrial trucks in buildings frequented by the public, including those times when such buildings are occupied by the public, shall require the approval of the AHJ.
- (3) The total water capacity of the fuel cylinders on an individual truck shall not exceed 105 lb (48 kg) [nominal 45 lb (20 kg) propane capacity].
- (4) Trucks shall not be parked and left unattended in areas occupied by or frequented by the public without the approval of the AHJ. If left unattended with approval, the cylinder shutoff valve shall be closed.
- (5) In no case shall trucks be parked and left unattended in areas of excessive heat or near sources of ignition. [58:11.13.4.3]

42.11.2.5.2.4 All cylinders used in industrial truck service (including forklift truck cylinders) shall have the cylinder pressure relief valve replaced in accordance with 5.7.2.13 of NFPA 58. [58:11.13.4.4]

42.11.2.6 General Provisions for Vehicles Having Engines Mounted on Them (Including Floor Maintenance Machines).

42.11.2.6.1 Scope.

42.11.2.6.1.1 Paragraph 42.11.2.6 applies to the installation of equipment on vehicles that supply LP-Gas as a fuel for engines installed on these vehicles. [58:11.14.1.1]

42.11.2.6.1.2 Vehicles include floor maintenance and any other portable mobile unit, whether the engine is used to propel the vehicle or is mounted on it for other purposes. [58:11.14.1.2]

42.11.2.6.2 General Requirements.

42.11.2.6.2.1 Industrial trucks (including forklift trucks) and other engines on vehicles operating in buildings other than those used exclusively to house engines shall have an approved automatic shutoff valve installed in the fuel system. [58:11.14.2.1]

42.11.2.6.2.2 The source of air for combustion shall be isolated from the driver and passenger compartment, ventilating system, or air-conditioning system on the vehicle. [58:11.14.2.2]

42.11.2.6.2.3 Non-self-propelled floor maintenance machinery (floor polishers, scrubbers, buffers) and other similar portable equipment shall be listed. [58:11.14.2.3]

42.11.2.6.2.3.1 A label shall be affixed to the machinery or equipment, with the label facing the operator, with the text denoting that the cylinder or portion of the machinery or equipment containing the cylinder shall be stored in accordance with Chapter 8 of NFPA 58. [58:11.14.2.3(A)]

42.11.2.6.2.3.2 The use of floor maintenance machines in buildings frequented by the public, including the times when such buildings are occupied by the public, shall require the approval of the AHJ. [58:11.14.2.3(B)]

42.11.2.7 Garaging of Vehicles. Where vehicles with LP-Gas engine fuel systems mounted on them, and general-purpose vehicles propelled by LP-Gas engines, are stored or serviced inside garages, the following conditions shall apply:

- (1) The fuel system shall be leak-free.
- (2) The container shall not be filled beyond the limits specified in Chapter 7 of NFPA 58.
- (3) The container shutoff valve shall be closed when the vehicle or the engine is being repaired, except when the engine is required to operate. Containers equipped with an automatic shutoff valve as specified in 11.4.1.8 of NFPA 58 satisfy this requirement.
- (4) The vehicle shall not be parked near sources of heat, open flames, or similar sources of ignition or near inadequately ventilated pits. [58:11.16]

42.11.3* Liquefied Natural Gas (LNG). Fuel dispensing facilities for marine, highway, rail, off-road, and industrial vehicles using LNG and LNG storage in ASME containers of 70,000 gal (265 m³) or less shall comply with NFPA 52.

42.11.3.1 Permits. Permits, where required, shall comply with Section 1.12.

Chapter 43 Spraying, Dipping, and Coating Using Flammable or Combustible Materials

43.1 Application.

43.1.1* Operations involving the spray application of flammable and combustible materials shall comply with NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*, and Section 43.1.

43.1.1.1* Section 43.1 shall apply to the spray application of flammable liquids, combustible liquids, or combustible powders either continuously or intermittently, by any of the following methods:

- (1) Compressed air atomization
- (2) Airless or hydraulic atomization
- (3) Electrostatic application methods
- (4) Fluidized bed application methods
- (5) Electrostatic fluidized bed application methods
- (6) Other acceptable application means

[33:1.1]

43.1.1.2 Section 43.1 shall also apply to spray application of water-borne, water-based, and water-reducible materials that contain flammable or combustible liquids or that produce combustible deposits or residues. [33:1.1.3]

43.1.1.3 Section 43.1 shall not apply to the following:

- (1)* Spray operations that use less than 1 L (33.8 fl oz) of flammable or combustible liquid in any 8-hour period
- (2)* Spray application processes or operations that are conducted outdoors
- (3)* Portable spraying equipment that is not used repeatedly in the same location
- (4) Use of aerosol products in containers up to and including 1 L (33.8 oz) capacity that are not used repeatedly in the same location
- (5) Spray application of noncombustible materials
- (6) The hazards of toxicity or industrial health and hygiene

[33:1.1]

43.1.1.4 Permits. Permits, where required, shall comply with Section 1.12.

43.1.2 Location of Spray Application Operations.

43.1.2.1* General. Spray application operations and processes shall be confined to spray booths, spray rooms, or spray areas, as defined in this Code. [33:4.1]

43.1.2.2 Locations in Other Occupancies. Spray application operations and processes shall not be conducted in any building that is classified as an assembly, educational, institutional, or residential occupancy, unless they are located in a room that is separated both vertically and horizontally from all surrounding areas by construction having a fire resistance rating of not less than 2 hours. The room shall be protected by an approved automatic sprinkler system designed and installed in accordance with Section 13.3. [33:4.2]

43.1.3 Construction and Design of Spray Areas, Spray Rooms, and Spray Booths.

43.1.3.1* Walls and Ceilings. Walls, doors, and ceilings that intersect or enclose a spray area shall be constructed of noncombustible or limited-combustible materials or assemblies and shall be securely and rigidly mounted or fastened. The interior surfaces of the spray area shall be smooth, designed and installed to prevent pockets that can trap residues, and designed to facilitate ventilation and cleaning. [33:5.1]

43.1.3.1.1 Air intake filters that are a part of a wall or ceiling assembly shall be listed as Class 1 or Class 2, in accordance with ANSI/UL 900, *Standard for Air Filter Units*. [33:5.1.1]

43.1.3.1.2 The floor of the spray area shall be constructed of noncombustible material, limited-combustible material, or combustible material that is completely covered by noncombustible material. [33:5.1.2]

43.1.3.1.3 Aluminum shall not be used for structural support members or the walls or ceiling of a spray booth or spray room enclosure. Aluminum also shall not be used for ventilation ductwork associated with a spray booth or spray room. Aluminum shall be permitted to be used for interior components, such as platforms, spray apparatus components, and other ancillary devices. [33:5.1.3]

43.1.3.1.4 If walls or ceiling assemblies are constructed of sheet metal, single-skin assemblies shall be no thinner than 0.0478 in. (1.2 mm), and each sheet of double-skin assemblies shall be no thinner than 0.0359 in. (0.9 mm). [33:5.1.4]

43.1.3.1.5 Structural sections of spray booths shall be permitted to be sealed with a caulk or sealant to minimize air leakage. [33:5.1.5]

43.1.3.1.6 Spray rooms shall be constructed of and separated from surrounding areas of the building by construction assemblies that have a fire resistance rating of 1 hour. [33:5.1.6]

43.1.3.1.7 Enclosed spray booths and spray rooms shall be provided with means of egress that meet the requirements of NFPA 101. [33:5.1.7]

43.1.3.1.8 Spray booths that are used exclusively for powder coating shall meet the requirements of Section 43.6. They shall be permitted to be constructed of fire-retardant combustible materials where approved by the AHJ.

Exception: Listed spray booth assemblies that are constructed of other materials shall be permitted. [33:5.1.8]

43.1.3.2 Conveyor Openings. Conveyor openings that are necessary for transporting or moving work into and out of the spray area shall be as small as practical. [33:5.2]

43.1.3.3* Separation from Other Occupancies. Spray booths shall be separated from other operations by a minimum distance of 3 ft (915 mm) or by a partition, wall, or floor/ceiling assembly having a minimum fire resistance rating of 1 hour. Multiple connected spray booths shall not be considered as "other operations" except as provided for in Section 13.3 of NFPA 33. [33:5.3]

43.1.3.3.1 Spray booths shall be installed so that all parts of the booth are readily accessible for cleaning. [33:5.3.1]

43.1.3.3.2 A clear space of not less than 3 ft (915 mm) shall be maintained on all sides and above the spray booth. This clear space shall be kept free of any storage or combustible construction.

Exception No. 1: This requirement shall not prohibit locating a spray booth closer than 3 ft (915 mm) to or directly against an interior partition, wall, or floor/ceiling assembly that has a fire resistance rating of not less than 1 hour, provided the spray booth can be maintained and cleaned.

Exception No. 2: This requirement shall not prohibit locating a spray booth closer than 3 ft (915 mm) to an exterior wall or a roof assembly, provided the wall or roof is constructed of noncombustible material and provided the spray booth can be maintained and cleaned. [33:5.3.2]

43.1.3.4 Movement of Powered Vehicles. Powered vehicles shall not be moved into or out of a spray area or operated in a spray area unless the spray application operation or process is stopped and the ventilation system is maintained in operation.

Exception: This requirement shall not apply to vehicles that are listed for the specific hazards of the spray area. [33:5.4]

43.1.3.5 Vision and Observation Panels.

43.1.3.5.1 Panels for light fixtures or for observation shall be of heat-treated glass, laminated glass, wired glass, or hammered-wired glass and shall be sealed to confine vapors, mists, residues, dusts, and deposits to the spray area.

Exception: Listed spray booth assemblies that have vision panels constructed of other materials shall be permitted. [33:5.5.1]

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

43.1.3.5.3 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]

43.1.3.5.4 Observation panels for spray booths that are used exclusively for powder coating processes shall be permitted to be constructed of fire-resistant combustible materials. [33:5.5.4]

43.1.3.6 Ventilation. Spray areas that are equipped with ventilation distribution or baffle plates or with dry overspray collection filters shall meet the requirements of 43.1.3.6.1 through 43.1.3.6.5. [33:5.6]

43.1.3.6.1 Distribution plates or baffles shall be constructed of noncombustible materials and shall be readily removable or accessible for cleaning on both sides. [33:5.6.1]

43.1.3.6.2 Filters shall not be used when applying materials known to be highly susceptible to spontaneous heating or spontaneous ignition. [33:5.6.2]

43.1.3.6.3 Supports and holders for filters shall be constructed of noncombustible materials. [33:5.6.3]

43.1.3.6.4 Overspray collection filters shall be readily removable or accessible for cleaning or replacement. [33:5.6.4]

43.1.3.6.5 Filters shall not be alternately used for different types of coating materials if the combination of the materials might result in spontaneous heating or ignition. (See also Section 10.9 of NFPA 33.) [33:5.6.5]

43.1.4 Electrical and Other Sources of Ignition.

43.1.4.1* General.

43.1.4.1.1 Electrical wiring and utilization equipment shall meet all applicable requirements of Articles 500, 501, 502, 505, and 516 of NFPA 70 and all applicable requirements of this chapter.

Exception No. 1: Powered vehicles shall meet the requirements of 43.1.3.4.

Exception No. 2: Resin application operations shall meet the requirements of Chapter 17 of NFPA 33. [33:6.2.1]

43.1.4.1.2* For the purposes of this Code, the Zone system of electrical area classification shall be applied as follows:

- (1) The inside of open or closed containers or vessels shall be considered a Class I, Zone 0 location.
- (2) A Class I, Division 1 location shall be permitted to be alternatively classified as a Class I, Zone 1 location.

- (3) A Class I, Division 2 location shall be permitted to be alternatively classified as a Class I, Zone 2 location.
- (4) A Class II, Division 1 location shall be permitted to be alternatively classified as a Zone 21 location.
- (5) A Class II, Division 2 location shall be permitted to be alternatively classified as a Zone 22 location. [33:6.2.2]

43.1.4.1.3 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]

43.1.4.1.4 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]

43.1.4.1.5* Open flames, spark-producing equipment or processes, and equipment whose exposed surfaces exceed the autoignition 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 covered by Section 43.4. [33:6.2.5]

43.1.4.1.6* 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 shall be of the totally enclosed type or shall be constructed to prevent the escape of sparks or particles of hot metal. [33:6.2.6]

43.1.4.2 Electrical Area Classification.

43.1.4.2.1* Class I Locations. A Class I location shall be any location where a flammable gas or vapor is present or might be present in the air in quantities sufficient to produce an explosive or ignitable mixture. [33:6.3.1]

43.1.4.2.1.1* Class I, Division 1 Locations. As defined in 500.5(B)(1) of NFPA 70, a Class I, Division 1 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of flammable gas or vapor can exist under normal operating conditions.
- (2) An ignitable concentration of flammable gas or vapor can exist frequently because of repair or maintenance operations or because of leakage.
- (3) Breakdown or faulty operation of equipment or processes might release an ignitable concentration of flammable gas or vapor and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition. [33:6.3.1.1]

43.1.4.2.1.2* Class I, Division 2 Locations. As defined in 500.5(B)(2) of NFPA 70, a Class I, Division 2 location shall be any location where one of the following conditions exists:

- (1) A flammable gas or a volatile flammable liquid is handled, processed, or used, but any flammable gas, vapor, or liquid is confined within a closed container or a closed system from which it can escape only in case of accidental rupture or breakdown of the container or system or in case of abnormal operation of the equipment.
- (2) An ignitable concentration of flammable gas or vapor is normally prevented by positive mechanical ventilation but might exist because of failure or abnormal operation of the ventilating equipment.

- (3) An ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Division 1 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [33:6.3.1.2]

43.1.4.2.1.3* Class I, Zone 0 Locations. As defined in 505.5(B)(1) of *NFPA 70*, a Class I, Zone 0 location shall be any location where an ignitable concentration of flammable gas or vapor is present either continuously or for long periods of time. [33:6.3.1.3]

43.1.4.2.1.4* Class I, Zone 1 Locations. As defined in 505.5(B)(2) of *NFPA 70*, a Class I, Zone 1 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of flammable gas or vapor is likely to exist under normal operating conditions.
- (2) An ignitable concentration of flammable gas or vapor might exist frequently because of repair or maintenance operations or because of leakage.
- (3) Breakdown or faulty operation of equipment or processes might release an ignitable concentration of flammable gas or vapor and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.
- (4) An ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Zone 0 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [33:6.3.1.4]

43.1.4.2.1.5 Class I, Zone 2 Locations. As defined in 505.5(B)(3) of *NFPA 70*, a Class I, Zone 2 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of a flammable gas or vapor is not likely to exist under normal operating conditions, and if an ignitable concentration does exist, will exist only for a short period of time.
- (2) A flammable gas or a volatile flammable liquid is handled, processed, or used, but any flammable gas, vapor, or liquid is confined within a closed container or a closed system from which it can escape only in case of accidental rupture or breakdown of the container or system or in case of abnormal operation of the equipment.
- (3) An ignitable concentration of flammable gas or vapor is normally prevented by positive mechanical ventilation but might exist because of failure or abnormal operation of the ventilating equipment.
- (4) An ignitable concentration of flammable gas or vapor might occasionally be transmitted from an adjacent Class I, Zone 1 location, unless such transmission is prevented by positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. (See also A.43.1.4.2.1.2.) [33:6.3.1.5]

43.1.4.2.2 Class II Locations. A Class II location shall be any location that might be hazardous because of the presence of a combustible dust. [33:6.3.2]

43.1.4.2.2.1* Class II, Division 1 Locations. As defined in 500.5(C)(1) of *NFPA 70*, a Class II, Division 1 location shall be any location where one of the following conditions exists:

- (1) Combustible dust is in the air in quantities sufficient to produce explosive or ignitable mixtures under normal operating conditions.

- (2) Mechanical failure or abnormal operation of machinery or equipment might cause an explosive or ignitable mixture of combustible dust in air and might also provide a source of ignition through simultaneous failure of electrical equipment, operation of protection devices, or from other causes.
- (3) Group E combustible dusts might be present in quantities sufficient to be hazardous. [33:6.3.2.1]

43.1.4.2.2.2* Class II, Division 2 Locations. As defined in 500.5(C)(2) of *NFPA 70*, a Class II, Division 2 location shall be any location where one of the following conditions exists:

- (1) Combustible dust due to abnormal operations might be present in the air in quantities sufficient to produce explosive or ignitable mixtures.
- (2) Combustible dust accumulations are present but are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus, but could as a result of infrequent malfunctioning of handling or processing equipment become suspended in the air.
- (3) Combustible dust accumulations on, in, or in the vicinity of the electrical equipment could be sufficient to interfere with the safe dissipation of heat from electrical equipment, or could be ignitable by abnormal operation or failure of electrical equipment. [33:6.3.2.2]

43.1.4.2.2.3* Zone 20. As defined in 506.5(B)(1) of *NFPA 70*, a Zone 20 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of combustible dust is present continuously.
- (2) An ignitable concentration of combustible dust is present for long periods of time. [33:6.3.2.3]

43.1.4.2.2.4* Zone 21. As defined in 506.5(B)(2) of *NFPA 70*, a Zone 21 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of combustible dust is likely to exist occasionally under normal operating conditions.
- (2) An ignitable concentration of combustible dust might exist frequently because of repair or maintenance operations or because of leakage.
- (3) Equipment is operated or processes are carried on of such a nature that equipment breakdown or faulty operations could result in the release of an ignitable concentration of combustible dust and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition.
- (4) An ignitable concentration of combustible dust could be communicated from an adjacent Zone 20 location, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [33:6.3.2.4]

43.1.4.2.2.5* Zone 22. As defined in 506.5(B)(3) of *NFPA 70*, a Zone 22 location shall be any location where one of the following conditions exists:

- (1) An ignitable concentration of combustible dust is not likely to occur in normal operation, and if it does occur, will only persist for a short period.
- (2) A combustible dust is handled, processed, or used, but the dust is normally confined within closed containers or closed systems from which it can escape only as a result of the abnormal operation of the equipment with which the dust is handled, processed, or used.

- (3) An ignitable concentration of combustible dust could be communicated from an adjacent Zone 21 location, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. [33:6.3.2.5]

43.1.4.3 Electrical Devices in Spray Areas.

43.1.4.3.1 The spray area as defined in NFPA 33 shall be Class I, Division 1; Class I, Zone 1; Class II, Division 1; or Zone 21, whichever is applicable. [33:6.4.1]

43.1.4.3.2 Electrical wiring and utilization equipment that is located in the spray area and is not subject to deposits of combustible residues shall be suitable for Class I, Division 1; Class I, Zone 1; Class II, Division 1; or Zone 21 locations, whichever is applicable. [33:6.4.2]

43.1.4.3.3* Electrical wiring and utilization equipment that is located in the spray area and is subject to deposits of combustible residues shall be listed for such exposure and shall be suitable for Class I, Division 1; Class I, Zone 1; Class II, Division 1; or Zone 21 locations, whichever is applicable. [33:6.4.3]

43.1.4.4 Electrical Devices in Areas Adjacent to or Connected to Spray Areas. Electrical wiring and utilization equipment located in areas adjacent to or connected to the spray area, including but not limited to vestibules and tunnels, shall be classified in accordance with 43.1.4.4.1 through 43.1.4.4.5. [33:6.5]

43.1.4.4.1 Electrical wiring and utilization equipment located outside, but within 20 ft (6100 mm) horizontally and 10 ft (3050 mm) vertically, of an unenclosed spray area and not separated from the spray area by partitions extending to the boundaries of the area designated as Division 2, Zone 2; or Zone 22 in Figure 43.1.4.4.1 shall be suitable for Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable. [33:6.5.1]

43.1.4.4.2 If spray application operations are conducted within a closed-top, open-face or open-front booth or room, as shown in Figure 43.1.4.4.2, any electrical wiring or utilization equipment located outside the booth or room but within 3 ft (915 mm) of any opening shall be suitable for Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable. [33:6.5.2]

43.1.4.4.3 If spray application operations are conducted within an open-top booth, any electrical wiring or utilization equipment located within the space 3 ft (915 mm) vertically from the top of the booth shall be suitable for Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable. In addition, any electrical wiring or utilization equipment located within 3 ft (915 mm) in all directions of openings other than the open top also shall be suitable for Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 locations, whichever is applicable. [33:6.5.3]

43.1.4.4.4 If spray application operations are confined to an enclosed spray booth or room, electrical area classification shall be as follows:

- (1) The area within 3 ft (915 mm) of any opening shall 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 43.1.4.4.4.
- (2) Where exhaust air is recirculated and all requirements of 43.1.5.5 are met, both of the following shall apply:

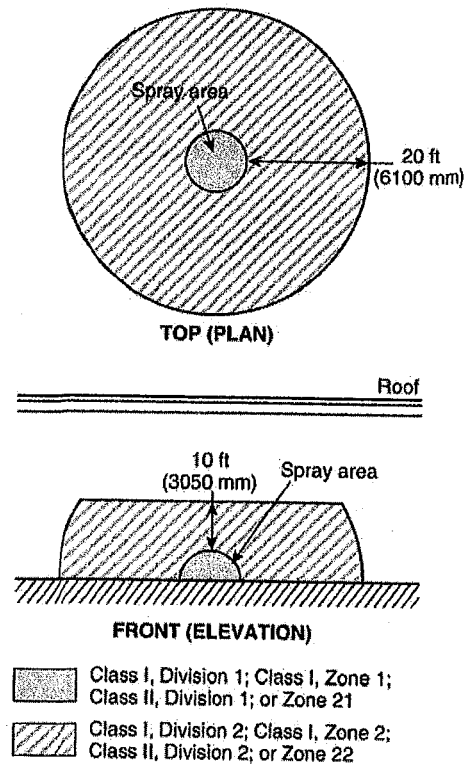


FIGURE 43.1.4.4.1 Electrical Area Classification for Unenclosed Spray Areas. [33:Figure 6.5.1]

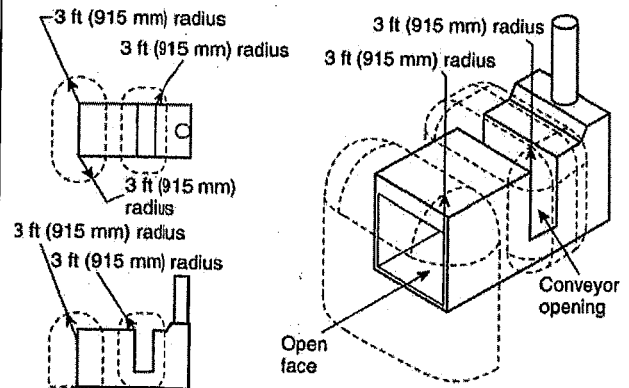


FIGURE 43.1.4.4.2 Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations Adjacent to an Open-Face or Open-Front Spray Booth or Spray Room. [33:Figure 6.5.2]

- (a) The interior of any recirculation path from the secondary particulate filters up to and including the air supply plenum shall 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 recirculated, the interior of fresh air supply ducts and fresh air supply plenums shall be unclassified. [33:6.5.4]

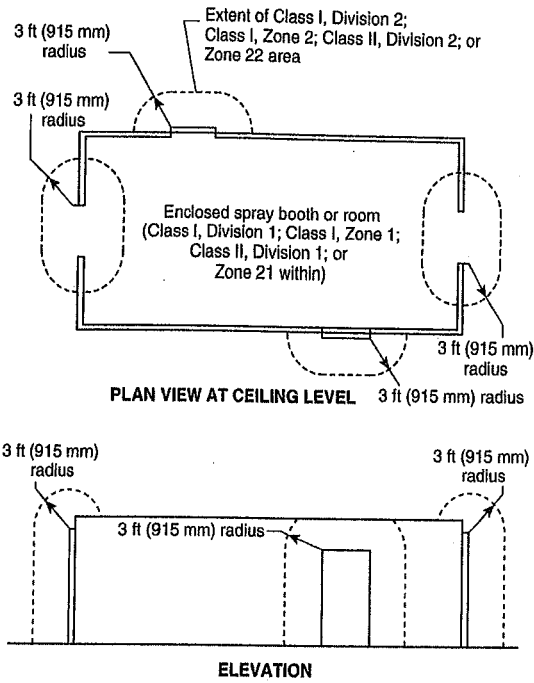


FIGURE 43.1.4.4.4 Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations Adjacent to an Enclosed Spray Booth or Spray Room. [33:Figure 6.5.4]

43.1.4.4.5 Open containers, supply containers, waste containers, spray gun cleaners, and solvent distillation units that contain Class I liquids shall be located in areas ventilated in accordance with applicable requirements of 43.1.5. [33:6.5.5]

43.1.4.4.5.1 Electrical area classification shall be as follows:

- (1) The area within 3 ft (915 mm) in all directions from any such container or equipment and extending to the floor or grade level shall be classified as Class I, Division 1 or Class I, Zone 1, whichever is applicable.
- (2) The area extending 2 ft (610 mm) beyond the Division 1 or Zone 1 location shall be classified as Class I, Division 2 or Class I, Zone 2, whichever is applicable.
- (3) The area extending 5 ft (1525 mm) horizontally beyond the area described in 43.1.4.4.5.1(2) up to a height of 18 in. (460 mm) above the floor or grade level shall be classified as Class I, Division 2 or Class I, Zone 2, whichever is applicable.
- (4) The area inside any tank or container shall be classified as Class I, Division 1 or Class I, Zone 0, whichever is applicable. [33:6.5.5.1]

43.1.4.4.5.2 Electrical wiring and utilization equipment installed in these areas shall be suitable for the location, as shown in Figure 43.1.4.4.5.2. [33:6.5.5.2]

43.1.4.5 Light Fixtures.

43.1.4.5.1 Light fixtures, like that shown in Figure 43.1.4.5.1, 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 that meet the requirements of 43.1.3.5 shall be suitable for use in unclassified locations. Such fixtures shall be serviced from outside the spray area. [33:6.6.1]

43.1.4.5.2 Light fixtures, like that shown in Figure 43.1.4.5.1, that are attached to the walls or ceiling of a spray area; that are separated from the spray area by glass panels that meet the requirements of 43.1.3.5; 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]

43.1.4.5.3 Light fixtures, like that shown in Figure 43.1.4.5.3, 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 shall be permitted to be serviced from inside the spray area. [33:6.6.3]

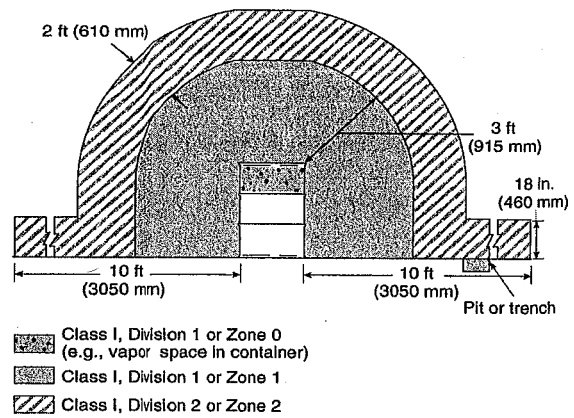


FIGURE 43.1.4.4.5.2 Electrical Area Classification for Class I Liquid Operations Around Open Containers, Supply Containers, Waste Containers, Spray Gun Cleaners, and Solvent Distillation Units. [33:Figure 6.5.5.2]

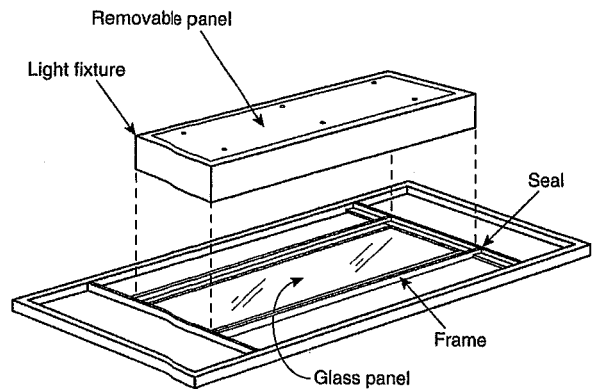


FIGURE 43.1.4.5.1 Example of a Light Fixture Mounted Outside of the Spray Area and Serviced from Outside the Spray Area. [33:Figure 6.6.1]

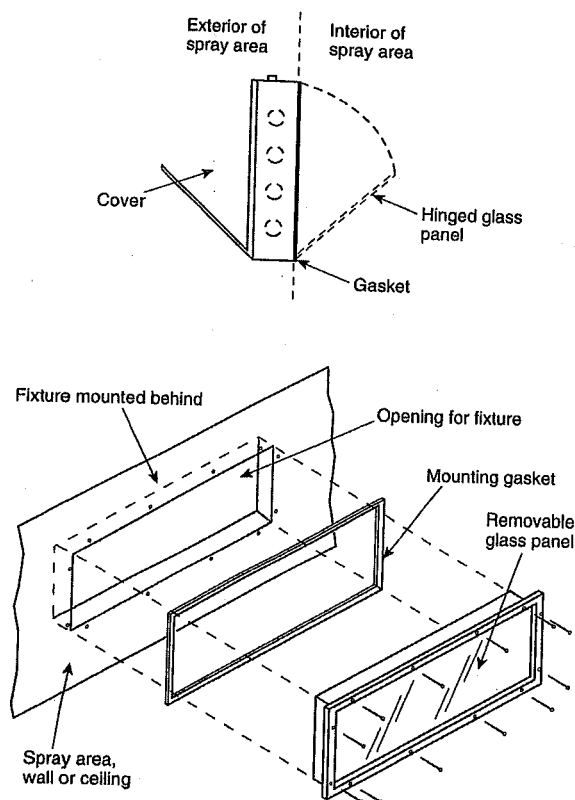


FIGURE 43.1.4.5.3 Examples of Light Fixtures That Are Integral Parts of the Spray Area and That Are Serviced from Inside the Spray Area. [33:Figure 6.6.3]

43.1.4.5.4 Light fixtures that are located inside the spray area shall meet the requirements of 43.1.4.3 and 43.1.4.6. [33:6.6.4]

43.1.4.6* Static Electricity. All electrically conductive objects in the spray area, except those objects required by the process to be at high voltage, shall be electrically connected to ground with a resistance of not more than 1 megohm (10^6 ohms). This requirement shall apply to containers of coating material, wash cans, guards, hose connectors, brackets, and any other electrically conductive objects or devices in the area. This requirement shall also apply to any personnel who enter the spray area. [33:6.7]

43.1.4.7 Flexible Power Cords. For automated equipment and robotic equipment, flexible power cords shall be permitted to be used in hazardous (classified) locations and shall be permitted to be connected to the fixed part of the electrical circuit, provided they meet all of the following conditions:

- (1) They are approved for extra-hard usage.
- (2) They are equipped with a grounding conductor that meets the requirements of Section 400.2 of *NFPA 70*.
- (3) They are connected to terminals or conductors in an approved manner.

- (4) They are supported by a positive mechanical clamp in such a manner that permits the cord to be readily replaced and prevents strain at the cord connections within the terminal enclosure.
- (5) They are provided with explosionproof seals for liquid applications or dusttight seals for powder applications where the cord enters junction boxes, fittings, or enclosures.
- (6) They are listed for deposits of combustible residues. [33:6.8]

43.1.4.8 Portable Electric Lights. Portable electric light fixtures shall not be used in any spray area while spray application operations are being conducted.

Exception: Where portable electric light fixtures are required for use in spaces that are not illuminated by fixed light fixtures within the spray area, they shall meet the requirements of 43.1.4.3.3. [33:6.9]

43.1.5 Ventilation.

43.1.5.1 General. Ventilating and exhaust systems shall be designed and installed in accordance with the applicable requirements of *NFPA 91* except as amended by the requirements of 43.1.5. [33:7.1]

43.1.5.2 Performance Requirements. Each spray area shall be provided with mechanical ventilation that is capable of confining and removing vapors and mists to a safe location and is capable of confining and controlling combustible residues, dusts, and deposits. The concentration of the vapors and mists in the exhaust stream of the ventilation system shall not exceed 25 percent of the lower flammable limit. (See Annex B of *NFPA 33* for additional guidance on determining the lower flammable limit.)

Exception: In confined spaces, where ventilation might not be capable of providing the necessary ventilation, a properly applied inerting procedure shall be permitted to be used. Such procedures shall meet the applicable requirements of *NFPA 69* and shall be acceptable to the *AHJ*. [33:7.2]

43.1.5.2.1* Spray areas equipped with overspray collection filters shall have an effective means to ensure that the performance requirements of 43.1.5.2 are met. [33:7.2.1]

43.1.5.2.2 Powder Coating Systems. Powder coating systems also shall meet the requirements of Section 15.8 of *NFPA 33*. [33:7.2.2]

43.1.5.2.3 Mechanical ventilation shall be kept in operation at all times while spray operations are being conducted and for a sufficient time thereafter to allow the vapors from drying coated objects or material and residues to be exhausted. Where spray operations are conducted automatically without an attendant constantly on duty, the operating controls of the spray apparatus shall be arranged so that the spray apparatus cannot function unless the exhaust fans are operating. [33:7.2.3]

43.1.5.3* Make-Up Air. An adequate supply of clean make-up air shall be provided to compensate for the air exhausted from spray operations. The intake for this make-up air shall be located so that the air exhausted from spray operations is not recirculated. [33:7.3]

43.1.5.4 Routing of Exhaust Ducts. Air exhausted to the atmosphere from liquid spray operations shall be conducted by ducts directly to the outside of the building. Exhaust ducts shall follow the most direct route to the point of discharge but shall not penetrate a fire wall. The exhaust discharge shall be directed away from any fresh air intakes. The exhaust duct discharge point shall be at least 6 ft (1830 mm) from any exterior wall or

roof. The exhaust duct shall not discharge in the direction of any combustible construction that is within 25 ft (7625 mm) of the exhaust duct discharge point, nor shall it discharge in the direction of any unprotected opening in any noncombustible or limited-combustible construction that is within 25 ft (7625 mm) of the exhaust duct discharge point. [33:7.4]

43.1.5.5 Recirculation of Exhaust.

43.1.5.5.1* Air exhausted from spray areas shall not be recirculated unless all of the following requirements are met:

- (1) Recirculation shall be allowed only for unmanned spray operations and for cascading to subsequent unmanned spray operations.
- (2) Solid particulates shall be removed from the recirculated air.
- (3) The concentration of vapors in the exhaust airstream shall not exceed 25 percent of the lower flammable limit.
- (4) Listed equipment shall be used to monitor the concentration of vapors in all exhaust airstreams.
- (5) The equipment specified in 43.1.5.5.1(4) shall sound an alarm and shall automatically shut down the spray operation if the concentration of any vapor in the exhaust airstream exceeds 25 percent of the lower flammable limit.
- (6) All equipment installed to process and remove contaminants from the air exhausted from spray operations shall be approved. [33:7.5.1]

43.1.5.5.2* The provisions of 43.1.5.5.1 shall not disallow recirculation of air to occupied spaces. However, other requirements addressing the toxicity and permissible exposure limits shall also apply. (See ANSI/AIHA Z9.7, *Recirculation of Air from Industrial Process Exhaust Systems*.) [33:7.5.2]

43.1.5.6* **Manifolding of Exhaust Ducts.** Individual spray booths shall be separately ducted to the building exterior.

Exception No. 1: Multiple cabinet spray booths whose combined frontal area does not exceed 18 ft² (1.7 m²) shall be permitted to be manifolded if the sprayed materials used will not react and cause ignition of the residue in the ducts.

Exception No. 2: Where treatment of exhaust is necessary for air pollution control or for energy conservation, ducts shall be permitted to be manifolded if all of the following conditions are met:

- (1) *The sprayed materials used will not react and cause ignition of the residue in the ducts.*
- (2) *No nitrocellulose-based finishing material is used.*
- (3) *An air-cleaning system is provided to reduce the amount of overspray carried into the duct manifold.*
- (4) *Automatic sprinkler protection is provided at the junction of each booth exhaust with the manifold, in addition to the protection required by 43.1.7.*
- (5) *The installation is approved by the AHJ. [33:7.6]*

43.1.5.7* **Materials of Construction.** Exhaust plenums and exhaust ducts and fasteners shall be constructed of steel, except as allowed in 43.1.5.7.1, 43.1.5.7.2, and 43.1.5.7.3. [33:7.7]

43.1.5.7.1 For spray booths used exclusively for powder coating, ducts shall be permitted to be constructed of fire-retardant combustible materials. [33:7.7.1]

43.1.5.7.2 Concrete shall be permitted to be used. The interior surfaces of the concrete exhaust plenum or exhaust duct shall be smooth and sealed to facilitate cleaning. [33:7.7.2]

43.1.5.7.3 Other materials of construction shall be permitted to be used in cases where the conveyed materials are not compatible with steel. [33:7.7.3]

43.1.5.8* **Support of Exhaust Ducts.** Exhaust ducts shall be supported to prevent collapse under fire conditions. [33:7.8]

43.1.5.8.1 Duct supports shall be designed to carry the weight of the duct system itself, plus the anticipated weight of any residues. If sprinkler protection is provided inside the duct system, then the duct supports also shall be designed to carry the anticipated weight of any accumulation of sprinkler discharge. [33:7.8.1]

43.1.5.8.2 Hangers and supports shall be fastened securely to the building or to the structure to avoid vibration and stress on the duct system. [33:7.8.2]

43.1.5.8.3 Hangers and supports shall be designed to allow for expansion and contraction. [33:7.8.3]

43.1.5.8.4 Exhaust ducts shall not use building walls, floors, ceilings, or roofs as component parts. [33:7.8.4]

43.1.5.8.5 The provisions of 43.1.5.8.4 shall not disallow the use of concrete exhaust plenums or exhaust ducts where some or all of the plenum or duct is part of the concrete floor. [33:7.8.5]

43.1.5.9 **Exhaust Duct Access Openings.** Exhaust ducts shall be provided with doors, panels, or other means to facilitate inspection, maintenance, cleaning, and access to fire protection devices. [33:7.9]

43.1.5.10 Exhaust Fans and Drives.

43.1.5.10.1 The rotating element of the exhaust fan shall be nonferrous, or the fan shall be constructed so that a shift of the impeller or shaft will not permit two ferrous parts of the fan to rub or strike. There shall be ample clearance between the rotating element and fan casing to avoid a fire by friction, with necessary allowances being made for ordinary expansion and loading and to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft that is sufficiently heavy to maintain alignment even when the blades of the fan are heavily loaded. All bearings shall be of the self-lubricating type or shall be lubricated from a point outside the duct and preferably shall be located outside the duct and the booth. [33:7.10.1]

43.1.5.10.2 Electric motors that drive exhaust fans shall not be placed inside any spray area unless they meet the provisions of 43.1.4.3.3. [33:7.10.2]

43.1.5.10.3 Belts shall not enter any spray area unless the belt and pulley within the spray area are completely enclosed. [33:7.10.3]

43.1.5.11* **Drying Areas.** Freshly sprayed workpieces shall be dried only in spaces that are ventilated to prevent the concentration of vapors from exceeding 25 percent of the lower flammable limit. (See also Section 43.4.) [33:7.11]

43.1.6 Storage, Handling, and Distribution of Flammable and Combustible Liquids.

43.1.6.1* **General.** Storage, handling, and mixing of flammable and combustible liquids shall meet all the applicable requirements of NFPA 30 and 43.1.6. [33:8.1]

43.1.6.2 Storage in Process Areas.

43.1.6.2.1 The volume of Class I, Class II, and Class IIIA liquids stored in a storage cabinet shall not exceed 120 gal (454 L). [33:8.2.1]

43.1.6.2.1.1 The total aggregate volume of Class I, Class II, and Class IIIA liquids in a group of storage cabinets shall not exceed the maximum allowable quantity of flammable and combustible liquids per control area based on the occupancy where the cabinets

are located, as set forth in Section 9.6 of NFPA 30, *Flammable and Combustible Liquids Code*. [33:8.2.1.1]

43.1.6.2.1.2 For industrial occupancies, the total aggregate volume of Class I, Class II, and Class IIIA liquids in a group of storage cabinets in a single area shall not exceed the maximum allowable quantity (MAQ) of flammable and combustible liquids per control area for industrial occupancies as set forth in Table 43.1.6.2.1.2. [33:8.2.1.2]

Table 43.1.6.2.1.2 Maximum Allowable Quantity of Flammable and Combustible Liquids per Control Area

	Liquid Classes	Quantity		Notes
		L	gal	
Flammable liquids	IA	115	30	1, 2
	IB & IC	460	120	1, 2
	IA, IB, IC combined	460	120	1, 2, 3
Combustible liquids	II	460	120	1, 2
	IIIA	1,265	330	1, 2

Source: Table 34.1.3.1 of NFPA 5000, *Building Construction and Safety Code*, 2009 edition.

Notes:

- (1) Quantities are permitted to be increased 100 percent where all liquids are stored in approved flammable liquids storage cabinets or in safety cans. Where Note 2 also applies, the increase for both notes is permitted to be applied accumulatively.
- (2) Quantities are permitted to be increased 100 percent in buildings equipped throughout with an automatic sprinkler system installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems*. Where Note 1 also applies, the increase for both notes is permitted to be applied accumulatively.
- (3) Containing not more than the maximum allowable quantity per control area of Class IA, Class IB, or Class IC flammable liquids, individually. [33: Table 8.2.1.2]

43.1.6.2.2 The quantity of liquid located in the vicinity of spraying operations but outside of identified storage areas, such as storage cabinets, an inside liquid storage area, or a warehouse or outside of other specific process areas that are cut off by at least a 2-hour fire separation from the spraying operations shall not exceed the quantity given in either of the following, whichever is greater:

- (1)* The amount required to supply spraying operations for one continuous 24-hour period
- (2) The aggregate sum of the following:
 - (a) 25 gal (95 L) of Class IA liquids in containers
 - (b) 120 gal (454 L) of Class IB, Class IC, Class II, or Class III liquids in containers
 - (c) 1585 gal (6000 L) of either of the following:
 - i. Class IB, IC, II, or IIIA liquids in metal portable tanks or metal intermediate bulk containers, each not exceeding 793 gal (3000 L)
 - ii. Class II or Class IIIA liquids in nonmetallic intermediate bulk containers, each not exceeding 793 gal (3000 L)

43.1.6.2.3 The quantity of flammable and combustible liquids located in a spray area or in a mixing room adjacent to a spray area shall meet the requirements of 43.1.6.3. [33:8.2.3]

43.1.6.3 Mixing.

43.1.6.3.1 Dispensing or transfer of liquids from containers and filling of containers, including portable mixing tanks and "pressure pots," shall be done only in a spray area with the ventilation in operation or in a mixing room. [33:8.3.1]

43.1.6.3.2 Mixing rooms shall meet all of the following requirements:

- (1) The mixing room shall meet the construction requirements of 43.1.3.
- (2) The area of the mixing room shall not exceed 150 ft² (14 m²).
- (3) The mixing room shall be designed to contain a spill of the contents in the room.
- (4) The mixing room used for mixing and dispensing operations shall be provided with continuous mechanical ventilation capable of providing air movement of not less than 1 ft³/min per square foot of floor area (0.3 m³/min/m²) or 150 ft³/min (4 m³/min), whichever is greater. The ventilation system shall be in operation at all times.
- (5) Dispensing and mixing rooms shall be classified, for purposes of electrical area classification, the same as enclosed spray booths, in accordance with 43.1.4.4.4.
- (6) The mixing room shall be provided with an approved automatic fire protection system that meets all applicable requirements of 43.1.7.
- (7) The mixing room shall be provided with portable fire extinguishers located in accordance with Section 13.6.

Exception: See 43.1.6.3.6. [33:8.3.2]

43.1.6.3.3 The amount of liquid permitted in a single spray area shall not exceed 60 gal (227 L). [33:8.3.3]

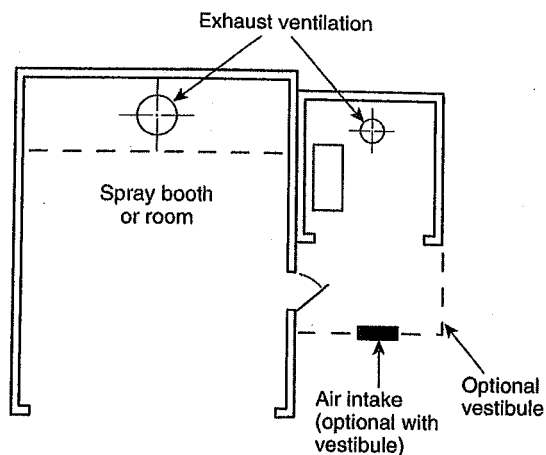
43.1.6.3.4 Where a separate mixing room is provided and the mixing room is located adjacent to or within 6 ft (1830 mm) of an adjacent spray area or areas, as shown in Figure 43.1.6.3.4(a) and Figure 43.1.6.3.4(b), the combined quantities of liquids located in the spray areas and the mixing room shall not exceed 120 gal (454 L).

Exception: See 43.1.6.3.6. [33:8.3.4]

43.1.6.3.5 Where a separate mixing room is provided and the mixing room is located more than 6 ft (1830 mm) from an adjacent spray area or areas, the quantity of liquid permitted in the mixing room shall not exceed 2 gal/ft² (80 L/m²), up to a maximum of 300 gal (1135 L), as shown in Figure 43.1.6.3.5. The amount of liquid in the spray area shall not exceed 60 gal (227 L).

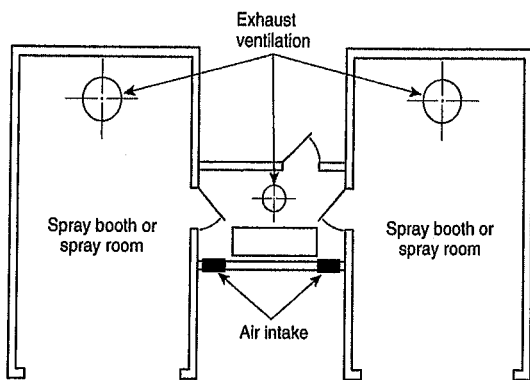
Exception: See 43.1.6.3.6. [33:8.3.5]

43.1.6.3.6 Where the quantities of liquids required or the floor area necessary to provide a suitable mixing room exceeds the limits specified in 43.1.6.3.2 through 43.1.6.3.5, the mixing room shall meet all applicable requirements of NFPA 30. [33:8.3.6]



Maximum volumes of liquid allowed:
 Spray area, 60 gal (227 L)
 Spray area and mix room, 120 gal (454 L)

FIGURE 43.1.6.3.4(a) Mixing Room Within 6 ft (1830 mm) of Spray Area, Including Maximum Volume of Liquid Allowed. [33:Figure 8.3.4(a)]



Maximum volumes of liquid allowed:
 Spray area, 60 gal (227 L)
 Spray area and mix room, 120 gal (454 L)

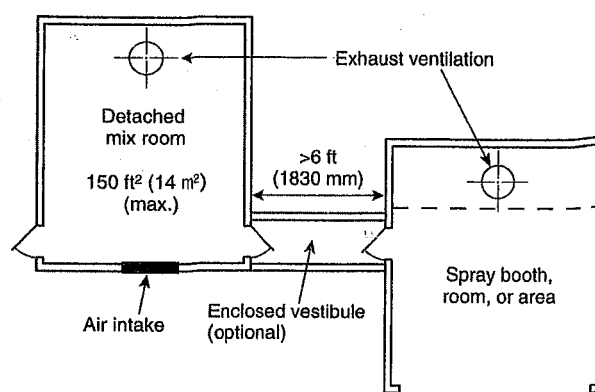
FIGURE 43.1.6.3.4(b) Mixing Room Within 6 ft (1830 mm) of Spray Area and with Direct Entry to Spray Area, Including Maximum Volume of Liquid Allowed. [33:Figure 8.3.4(b)]

43.1.6.4 Distribution Systems — Piping.

43.1.6.4.1* Piping systems that convey flammable or combustible liquids between storage tanks, mixing rooms (paint kitchens), and spray areas shall be of steel or other material having comparable properties of resistance to heat and physical damage. Piping systems shall be properly bonded and grounded. [33:8.4.1]

43.1.6.4.2* Piping systems within the spray area shall be of steel or material having comparable heat and physical resistance where possible. Where tubing or hose is used, a shutoff valve shall be provided on the steel pipe at the connection. [33:8.4.2]

43.1.6.4.3* Tubing or hose shall be inspected and replaced as necessary. Replacement tubing or hose shall be that recommended by the equipment manufacturer. [33:8.4.3]



Maximum volumes of liquid allowed:
 Spray area, 60 gal (227 L)
 Spray area and mix room, 360 gal (1362 L)

FIGURE 43.1.6.3.5 Mixing Room More Than 6 ft (1830 mm) from Spray Area, Including Maximum Volume of Liquid Allowed. [33:Figure 8.3.5]

43.1.6.4.4 Where a pump is used to supply the liquid used in the spray application process, piping, tubing, hose, and other accessories shall be designed to withstand the maximum working pressure of the pump, or means shall be provided to limit the discharge pressure of the pump. [33:8.4.4]

43.1.6.4.5* Where a pump is used to supply the liquid used in the spray application process, an automatic means shall be provided to shut off the supply of liquid in event of fire. When pressurized tanks larger than 5 gal (19 L) are used to supply the liquid used in the spray application process, an automatic means shall be provided to shut off liquid flow at the tank outlet in the event of fire. [33:8.4.5]

43.1.6.4.6 All pressure tubing, hose, and couplings shall be inspected at regular intervals. With the hose extended, the hose and couplings shall be tested using the in-service maximum operating pressure. Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings shall be replaced. [33:8.4.6]

43.1.6.5 Distribution Systems — General.

43.1.6.5.1 Liquids shall be transported by means of closed containers, approved safety cans, or approved portable tanks or shall be transferred by means of a piping system. Open containers shall not be used for moving or storing liquids. [33:8.5.1]

43.1.6.5.2* Wherever liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to dissipate static electricity. [33:8.5.2]

43.1.6.5.3 Containers that supply spray nozzles shall be of the closed type or shall be provided with metal covers that are kept closed. Containers that do not rest on the floor shall have supports or shall be suspended by wire cables. Containers that supply spray nozzles by gravity flow shall not exceed 10 gal (38 L) capacity. [33:8.5.3]

43.1.6.5.4 Original shipping containers shall not be subjected to air pressure for supplying spray nozzles. [33:8.5.4]

43.1.6.5.5 Containers that are pressurized to supply spray nozzles, air storage tanks, and coolers shall comply with all applicable requirements of the ASME *Boiler and Pressure Vessel Code*, Section VIII, for construction, tests, and maintenance.

Exception: The following need not meet this requirement.

- (1) Pressure containers less than 6 in. (150 mm) in diameter
- (2) Pressure containers that operate at less than a gauge pressure of 15 psi (1.03 kPa)
- (3) Siphon-type spray cups [33:8.5.5]

43.1.6.5.6 If a heater is used to heat the liquid being sprayed, it shall be low-pressure steam, low-pressure hot water, or electric. If electric, it shall be approved and listed for the specific location in which it is used. (See 43.1.4.) Heaters shall not be located in spray booths or other locations subject to the accumulation of deposits of combustible residue. Agitators, if used, shall be driven by compressed air, water, low-pressure steam, or electricity. If the agitators are powered by an electric motor, the motor shall meet the requirements of 43.1.4. [33:8.5.6]

43.1.6.5.7 Methods for cleaning paint circulation systems shall meet the requirements of 7.3.7 of NFPA 30. [33:8.5.7]

43.1.6.5.8 Compressed air shall be permitted to be used for cleaning paint delivery hoses for individual applicators in a spray booth, provided both of the following requirements are met:

- (1) The booth ventilation is operating.
- (2) The maximum air pressure does not exceed the maximum working pressure of any component of the piping or hose system. [33:8.5.8]

43.1.7 Protection.

43.1.7.1* General. Spray areas, which include by definition any associated exhaust plenums and exhaust ductwork, any particulate filters, any solvent concentrator units, any recirculation air supply units, and mixing rooms, shall be protected with an approved automatic fire protection system. [33:9.1]

43.1.7.1.1 The automatic fire protection system shall be permitted to be, and shall be installed in accordance with, any of the following:

- (1) An automatic water sprinkler system that meets all applicable requirements of NFPA 13
- (2) An automatic foam water sprinkler system that meets all applicable requirements of NFPA 16
- (3) A carbon dioxide extinguishing system that meets all applicable requirements of NFPA 12
- (4) A dry chemical extinguishing system that meets all applicable requirements of NFPA 17
- (5) A gaseous agent extinguishing system that meets all applicable requirements of NFPA 2001 [33:9.1.1]

43.1.7.1.2 The automatic fire protection system also shall meet all applicable requirements of 43.1.7.2 and 43.1.7.3. [33:9.1.2]

43.1.7.1.3 The fire alarm and fire protection system shall be supervised in accordance with NFPA 72. [33:9.1.3]

43.1.7.2 Continuous Spray Application Operations.

43.1.7.2.1 For continuous spray application operations, activation of the automatic fire protection system shall automatically accomplish all of the following:

- (1) Activate a local alarm in the vicinity of the spraying operation
- (2) Transmit an alarm signal to the facility's fire alarm system, if such a system is provided
- (3) Shut down the coating material delivery system

- (4) Shut down all spray application operations
- (5) Stop any conveyors into and out of the spray area [33:9.2.1]

43.1.7.2.1.1 For continuous spray application operations, the additional requirements of 43.1.7.7, for automated powder application equipment, or 43.1.7.8, for automated liquid electrostatic spray application equipment, whichever is applicable, shall also apply. [33:9.2.1.1]

43.1.7.2.2 Emergency Shutdown. For continuous spray application operations, one or more manual emergency system shutdown stations shall be installed to serve each spray area. When activated, the stations shall accomplish at least the functions listed in 43.1.7.2.1(1) and 43.1.7.2.1(3) through 43.1.7.2.1(5). At least one such station shall be within ready access of operating personnel. If access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area. [33:9.2.2]

43.1.7.3 Ventilation Systems. Air make-up systems and spray area exhaust systems shall remain functioning during any fire alarm condition.

Exception No. 1: Where the type of automatic fire protection system requires that ventilation be discontinued, air make-up systems and spray area exhaust systems shall be permitted to be shut down and dampers shall be permitted to close.

Exception No. 2: For powder coating systems, the requirements of 43.1.7.7 shall be met instead of those of this paragraph. [33:9.3]

43.1.7.4* Automatic Sprinkler Systems.

43.1.7.4.1* The automatic sprinkler system shall be a wet pipe system, a dry pipe system, a preaction system, or an open-head deluge system, whichever is most appropriate for the portion of the spray operation being protected. [33:9.4.1]

43.1.7.4.2 The automatic sprinkler system shall be designed for Extra Hazard (Group 2) occupancies, as defined in NFPA 13.

Exception No. 1: For spray application of styrene cross-link thermoset resins, Section 17.3 of NFPA 33 shall apply.

Exception No. 2: Automatic sprinkler systems for powder coating operations shall be designed for Ordinary Hazard (Group 2), as defined in NFPA 13. [33:9.4.2]

43.1.7.4.3 The water supply shall be sufficient to supply all sprinklers likely to open in any one fire incident without depleting the available water for use in hose streams. [33:9.4.3]

43.1.7.4.4 Where sprinklers are installed to protect spray areas and mixing rooms only, water shall be permitted to be supplied from domestic water systems, provided the domestic supply can meet the demand for the design criteria of 43.1.7.4.2. [33:9.4.4]

43.1.7.4.5 The sprinkler system shall be controlled by a separate, listed indicating valve(s), operable from floor level. [33:9.4.5]

43.1.7.4.6* Sprinkler systems protecting stacks or ducts shall meet all of the following requirements:

- (1) Sprinklers shall be spaced no more than 12 ft (3.7 m) apart.
- (2) If exhaust ducts are manifolded, a sprinkler shall be located in the manifold at the junction of each exhaust duct with the manifold.

- (3) Sprinklers shall provide a minimum flow of 30 gpm (114 L/min) per head at a minimum of 15 psi (1 bar) pressure.
- (4) Sprinklers shall be ordinary temperature rated, unless required to be higher due to operating temperatures measured in the ducts, in which case the operating temperature shall be at least 50°F (28°C) above the inside temperature of the duct. [33:9.4.6]

43.1.7.4.6.1 Stacks and exhaust ducts shall be provided with access openings for inspection and cleaning of sprinklers. [33:9.4.6.1]

43.1.7.4.6.2 Sprinkler systems protecting stacks and ducts that are subject to freezing shall be of a nonfreezing type or be a manually controlled open-head system. [33:9.4.6.2]

43.1.7.4.7 Sprinklers shall be protected against overspray residue, either by location or covering, so that they will operate quickly in event of fire. [33:9.4.7]

43.1.7.4.7.1 Sprinklers shall be permitted to be covered only by cellophane bags having a thickness of 0.003 in. (0.08 mm) or less or by thin paper bags. These coverings shall be replaced frequently so that heavy deposits of residue do not accumulate. [33:9.4.7.1]

43.1.7.4.7.2 Sprinklers that have been painted or coated by overspray or residues shall be replaced with new sprinklers. [33:9.4.7.2]

43.1.7.5* Automatic Carbon Dioxide, Dry Chemical, and Clean Agent Systems. The fire protection system shall be capable of discharging its contents into the entire protected area simultaneously, including the exhaust plenum and exhaust ductwork. [33:9.5]

43.1.7.6 Portable Fire Extinguishers. Portable fire extinguishers shall be provided and located in accordance with Section 13.6. [33:9.6]

43.1.7.7* Protection for Automated Powder Application Equipment.

43.1.7.7.1 Automated powder application equipment, both listed and unlisted, shall be further protected by listed optical flame detection, installed and supervised in accordance with *NFPA 72*. The optical flame detection shall, in event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:

- (1) Stop any conveyors into and out of the spray area
- (2) Shut off ventilation
- (3) Shut off application, transfer, and powder collection equipment
- (4) Close segregation dampers in associated ductwork to interrupt airflows from application equipment to powder collectors
- (5) Disconnect power to the high-voltage elements in the spray area and de-energize the system [33:9.7.1]

43.1.7.7.2 Automated powder application equipment that is unlisted shall be further protected by the following:

- (1) In addition to meeting the requirements in 43.1.7.2.1 and 43.1.7.7.1, the optical flame detection system shall also activate the automatic fire protection system, if provided.
- (2) Automatic electrostatic equipment enclosures inside the booth shall be protected with an approved automatic fire protection system. Activation of this system shall automatically accomplish the requirements of 43.1.7.2.1 and 43.1.7.7.1.

- (3) Manual activation stations shall be installed. At least one such station shall be within ready access of operating personnel. If access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area. These devices shall activate the fire protection system as specified in 43.1.7.1.1 for the affected automated zone, if applicable, and accomplish the requirements in 43.1.7.7.1.

Exception: This requirement shall not apply to a closed-head wet pipe automatic sprinkler system. [33:9.7.2]

43.1.7.8* Protection for Automated Liquid Electrostatic Spray Application Equipment.

43.1.7.8.1 Automated liquid electrostatic spray application equipment, both listed and unlisted, shall be further protected by listed optical flame detection, installed and supervised in accordance with *NFPA 72*. The optical flame detection shall, in event of ignition, react to the presence of flame within one-half (0.5) second and shall accomplish all of the following:

- (1) Meet all of the requirements of 43.1.7.2.1
- (2) Disconnect power to the high-voltage elements in the spray area and de-energize the system [33:9.8.1]

43.1.7.8.2 Automated liquid electrostatic spray application equipment that is unlisted shall be protected further by the following:

- (1) In addition to meeting the requirements in 43.1.7.8.1, the optical flame detection system shall also activate one of the following over each zone in which fire has been detected:
 - (a) An open head deluge system designed to discharge a minimum density of 0.6 gpm/ft² (24.4 mm/min)
 - (b) A carbon dioxide extinguishing system
 - (c) A dry chemical extinguishing system
 - (d) A gaseous agent extinguishing system
- (2) Manual activation stations shall be installed. At least one such station shall be within ready access of operating personnel. If access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area. These devices shall activate the fire protection system as specified in 43.1.7.8.2(1) and accomplish the requirements of 43.1.7.2.1 and 43.1.7.8.1(2).
- (3) A wet pipe sprinkler system shall also be provided throughout the spray booth. This system shall meet all the applicable requirements of *NFPA 13* for Extra Hazard (Group 2) occupancies.
- (4) Automatic electrostatic equipment enclosures inside the booth systems shall be protected with an approved automatic fire protection system. Activation of this system shall automatically accomplish the requirements of 43.1.7.2.1 and 43.1.7.8.1(2). [33:9.8.2]

43.1.8 Operations and Maintenance.

43.1.8.1* General. Maintenance procedures shall be established to ensure that all spray application apparatus and processes are operated and maintained in accordance with the manufacturers' specifications and the requirements of this *Code*. Maintenance shall be the responsibility of the users of the apparatus and processes. [33:10.1]

43.1.8.1.1* Spray application operations shall not be conducted outside predetermined spray areas. [33:10.1.1]

43.1.8.1.2 Inspection of extinguishing systems shall be conducted to ensure that the performance of the extinguishing system components will not be affected by overspray and residues. [33:10.1.2]

43.1.8.2* Combustible Deposits.

43.1.8.2.1 All spray areas shall be kept free of excessive accumulation of deposits of combustible residues. [33:10.2.1]

43.1.8.2.2 Combustible coverings (thin paper, plastic) and strippable coatings shall be permitted to be used to facilitate cleaning operations in spray areas. [33:10.2.2]

43.1.8.2.2.1 Where plastic covering is used, it shall be of a static dissipative nature or shall have a maximum breakdown voltage of 4 kV to prevent accumulation of a hazardous static electric charge. [33:10.2.2.1]

43.1.8.2.3 If residue accumulates to excess in booths, duct or duct discharge points, or other spray areas, all spraying operations shall be discontinued until conditions have been corrected. [33:10.2.3]

43.1.8.3 High-Pressure Hose Lines. High-pressure hose lines that convey flammable or combustible coating material in "airless" spray application operations shall be inspected frequently and shall be repaired or replaced as necessary. Hose lines and equipment shall be located so that, in the event of a leak or rupture, coating material will not be discharged into any space having a source of ignition. [33:10.3]

43.1.8.4 Maintenance Procedures.

43.1.8.4.1 Maintenance procedures shall be established to ensure that overspray collector filters are replaced before excessive restriction to airflow occurs. Overspray collectors shall be inspected after each period of use and clogged filters shall be discarded and replaced. [33:10.4.1]

43.1.8.4.2 At the close of the day's operation, all discarded overspray collector filters, residue scrapings, and debris contaminated with residue shall be removed immediately to a designated storage location, placed in a noncombustible container with a tight-fitting lid, or placed in a water-filled metal container. [33:10.4.2]

43.1.8.5* Waste Containers.

43.1.8.5.1 Approved waste containers shall be provided wherever rags or waste are impregnated with sprayed material, and all such rags or waste shall be deposited therein immediately after use. The contents of waste containers shall be placed in a designated storage location. [33:10.5.1]

43.1.8.5.2 Waste containers containing flammable liquids shall be located in ventilated areas that meet the requirements of 43.1.5. Such areas shall also meet the electrical area classification requirements of 43.1.4.4.5. [33:10.5.2]

43.1.8.5.3* Waste containers for flammable liquids shall be constructed of conductive materials and shall be bonded and grounded. [33:10.5.3]

43.1.8.5.4 Waste containers for flammable liquids shall be handled and stored in accordance with 43.1.6. [33:10.5.4]

43.1.8.6 Clothing. Employees' clothing contaminated with sprayed material shall not be left on the premises overnight unless kept in metal lockers. [33:10.6]

43.1.8.7 Cleaning Operations.

43.1.8.7.1 Scope. Paragraph 43.1.8.7 shall apply to the use of flammable or combustible liquids for the flushing and cleaning of equipment. [33:10.7.1]

43.1.8.7.2 Liquids. Class I and Class II liquids used in cleaning operations shall be in original shipping containers or in listed safety containers. [33:10.7.2]

43.1.8.7.3 Location. Cleaning operations using flammable or combustible liquids shall be conducted inside a spray area with ventilating equipment operating or in ventilated areas that meet the requirements of 43.1.5. Such areas shall also meet the electrical area classification requirements of 43.1.4.4.5. [33:10.7.3]

43.1.8.7.4* Equipment. Equipment using flammable or combustible liquids shall meet the requirements of 43.1.4.4.5 and shall be bonded and grounded. [33:10.7.4]

43.1.8.7.5 Manual Cleaning. Individual manual cleaning operations shall be limited to not more than 1 gal (4 L) of flammable or combustible liquid for each cleaning operator. [33:10.7.5]

43.1.8.7.6 Liquid Storage. Flammable and combustible liquids shall be handled and stored in accordance with 43.1.6. Containers used for handling, storage, or recovery of Class I liquids shall be constructed of conductive materials and shall be bonded and grounded. [33:10.7.6]

43.1.8.8 Solvent Distillation Units (Solvent Recyclers).

43.1.8.8.1 Scope.

43.1.8.8.1.1 Paragraph 43.1.8.8 shall apply to solvent distillation units having distillation chambers or still pots that do not exceed 60 gal (230 L) capacity and are used to recycle Class I, Class II, and Class IIIA liquids. [30:19.6.1.1]

43.1.8.8.1.2 Paragraph 43.1.8.8 shall not apply to research, testing, or experimental processes; to distillation processes carried out in petroleum refineries, chemical plants, or distilleries; or to distillation equipment used in dry cleaning operations. [30:19.6.1.2]

43.1.8.8.2 Equipment. Solvent distillation units shall be approved or shall be listed in accordance with ANSI/UL 2208, *Standard for Solvent Distillation Units*. [30:19.6.2]

43.1.8.8.3 Solvents. Solvent distillation units shall only be used to distill liquids for which they have been investigated and that are listed on the unit's marking or contained within the manufacturer's literature. [30:19.6.3]

43.1.8.8.3.1 Unstable or reactive liquids or materials shall not be processed unless they have been specifically listed on the system's markings or contained within the manufacturer's literature. [30:19.6.3.1]

43.1.8.8.4 Location.

43.1.8.8.4.1 Solvent distillation units shall be located and operated in locations in accordance with their approval or listing. [30:19.6.4.1]

43.1.8.8.4.2 Solvent distillation units shall not be used in basements. [30:19.6.4.2]

43.1.8.8.4.3 Solvent distillation units shall be located away from potential sources of ignition, as indicated on the unit's marking. [30:19.6.4.3]

43.1.8.8.5 Liquid Storage. Distilled liquids and liquids awaiting distillation shall be stored in accordance with NFPA 30. [33:10.8.5]

43.1.8.9* Spontaneous Ignition Hazards. The same spray booth shall not be alternately used for different types of coating materials if the combination of the materials is conducive to spontaneous ignition, unless all deposits of the first-used coating material are removed from the booth and exhaust ducts prior to spraying with the second coating material. [33:10.9]

43.1.8.10* Chlorinated Solvents. Coating materials containing chlorinated solvents shall not be used with spray application apparatus or fluid-handling equipment if the chlorinated solvent will come into contact with aluminum within a piping system, pump, enclosed container, or any enclosure that is capable of being pressurized by the potential reaction. This shall apply even if the container or system has been constructed with pressure relief devices. [33:10.10]

43.1.8.11 Smoking. Signs stating NO SMOKING OR OPEN FLAMES in large letters on contrasting color background shall be conspicuously posted at all spray areas and paint storage rooms. [33:10.11]

43.1.8.12* Hot Work. Welding, cutting, and other spark-producing operations shall not be permitted in or adjacent to spray areas until a written permit authorizing such work has been issued. The permit shall be issued by a person in authority following his or her inspection of the area to ensure that precautions have been taken and will be followed until the job is completed. [33:10.12]

43.2 Automated Electrostatic Spray Equipment. For information on the installation and use of automated electrostatic spray application apparatus, see Chapter 11 of NFPA 33.

43.3 Handheld Electrostatic Spray Equipment. For information on the installation and use of handheld electrostatic spray application apparatus, see Chapter 12 of NFPA 33.

43.4 Drying, Curing, or Fusion Processes. For information on drying, curing, or fusion apparatus used in connection with spray application of flammable and combustible materials, see Chapter 13 of NFPA 33.

43.5 Miscellaneous Spray Operations.

43.5.1 Vehicle Undercoating and Body Lining.

43.5.1.1 Spray undercoating or spray body lining of vehicles that is conducted in an area that has adequate natural or mechanical ventilation shall be exempt from the provisions of this Code, if all of the requirements of 43.5.1.1.1 through 43.5.1.1.4 are met. [33:14.1.1]

43.5.1.1.1 There shall be no open flames or spark-producing equipment within 20 ft (6100 mm) of the spray operation while the spray operation is being conducted. [33:14.1.1.1]

43.5.1.1.2 There shall be no drying, curing, or fusion apparatus in use within 20 ft (6100 mm) of the spray operation while the spray operation is being conducted. [33:14.1.1.2]

43.5.1.1.3 Any solvent used for cleaning procedures shall have a flash point not less than 100°F (37.8°C). [33:14.1.1.3]

43.5.1.1.4 The coating or lining materials used shall meet one of the following criteria:

- (1) Be no more hazardous than UL Class 30-40, when tested in accordance with ANSI/UL 340, *Test for Comparative Flammability of Liquids*

- (2) Not contain any solvent or component that has a flash point below 100°F (37.8°C)
- (3) Consist only of Class IIIB liquids and not include any organic peroxide catalyst [33:14.1.1.4]

43.5.1.2 Noncomplying Undercoating Operations. Spray undercoating operations that do not meet the requirements of 43.5.1 shall meet all applicable requirements of this Code pertaining to spray finishing operations. [33:14.1.2]

43.5.2 Preparation Workstations. If spray finishing operations are performed at or in a preparation workstation, the preparation workstation shall be considered an unenclosed spray area and shall meet all requirements of an unenclosed spray area.

Exception: A preparation workstation that is designed and operated in accordance with 43.5.3 shall be considered a limited finishing workstation and not an unenclosed spray area. [33:14.2]

43.5.3 Limited Finishing Workstations. A limited finishing workstation shall be designed and operated in accordance with the requirements of 43.5.3.1 through 43.5.3.9. [33:14.3]

43.5.3.1 A limited finishing workstation shall be designed and constructed to have all of the following:

- (1) A dedicated make-up air supply and air supply plenum
- (2) Curtains or partitions that are noncombustible or limited combustible, as defined in 3.3.164 and 3.3.173.10 or that can successfully pass Test Method 2 of NFPA 701
- (3) A dedicated mechanical exhaust and filtration system
- (4)* An approved automatic extinguishing system that meets the requirements of 43.1.7 [33:14.3.1]

43.5.3.2 The amount of material sprayed in a limited finishing workstation shall not exceed 1 gal (3.8 L) in any 8-hour period. [33:14.3.2]

43.5.3.3 The limited finishing workstation shall meet all applicable requirements of 43.1.2 through 43.1.8 and Section 43.10. [33:14.3.3]

43.5.3.4 Curtains or partitions shall be fully closed during any spray application operations. [33:14.3.4]

43.5.3.5 The area inside the curtains or partitions shall be considered a Class I, Division 1; Class I, Zone 1; Class II, Division 1; or Zone 21 hazardous (classified) location, as defined by NFPA 70. [33:14.3.5]

43.5.3.5.1 A Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 hazardous (classified) location, as applicable, shall extend 3 ft (915 mm) both horizontally and vertically beyond the volume enclosed by the outside surface of the curtains or partitions as shown in Figure 43.5.3.5.1. [33:14.3.5.1]

43.5.3.5.2 For the purposes of this subsection, *interlocked* shall mean that the spray application equipment cannot be operated unless the exhaust ventilation system is operating and functioning properly and spray application is automatically stopped if the exhaust ventilation system fails. [33:14.3.5.2]

43.5.3.6 Any limited finishing workstation used for spray application operations shall not be used for any operation that is capable of producing sparks or particles of hot metal or for operations that involve open flames or electrical utilization equipment capable of producing sparks or particles of hot metal. [33:14.3.6]

43.5.3.7 Drying, curing, or fusion apparatus shall be permitted to be used in a limited finishing workstation if they meet the requirements of Section 43.4 and the requirements of 43.5.3.7.1 through 43.5.3.7.3. [33:14.3.7]

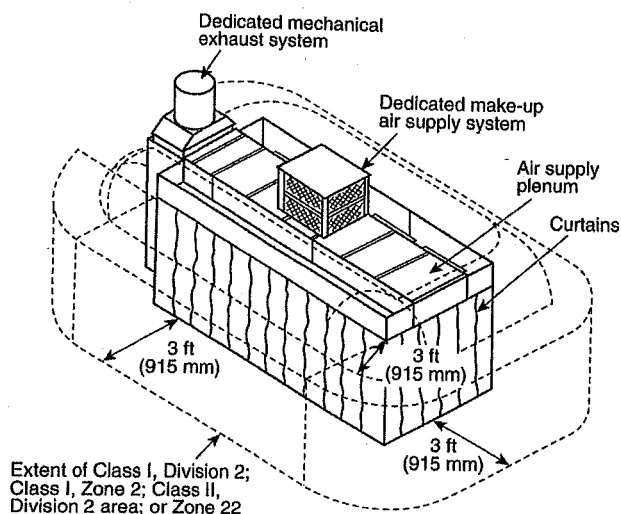


FIGURE 43.5.3.5.1 Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations Adjacent to a Limited Finishing Workstation. [33:Figure 14.3.5.1]

43.5.3.7.1 When industrial air heaters are used to elevate the air temperature for drying, curing, or fusing operations, a high limit switch shall be provided to automatically shut off the drying apparatus if the air temperature in the limited finishing workstation exceeds the maximum discharge-air temperature allowed by the standard that the heater is listed to or 200°F (93°C), whichever is less. [33:14.3.7.1]

43.5.3.7.2* A means shall be provided to show that the limited finishing workstation is in the drying or curing mode of operation and that the limited finishing work station is to be unoccupied. [33:14.3.7.2]

43.5.3.7.3 Any containers of flammable or combustible liquids shall be removed from the limited finishing workstation before the drying apparatus is energized. [33:14.3.7.3]

43.5.3.8 Portable spot-drying, curing, or fusion apparatus shall be permitted to be used in a limited finishing workstation, provided that it is not located within the hazardous (classified) location defined in 43.5.3.5 when spray application operations are being conducted. [33:14.3.8]

43.5.3.9 Recirculation of exhaust air shall be permitted only if all provisions of 43.1.5.5 are met. [33:14.3.9]

43.6 Powder Coating. For information on the installation and use of powder coating application apparatus, see Chapter 15 of NFPA 33.

43.7 Organic Peroxides and Plural Component Coatings.

43.7.1* Scope. Section 43.7 shall apply to the spray application operations that involve the use of organic peroxide formulations and other plural component coatings.

Exception: As covered in Section 43.8. [33:16.1]

43.7.2 General. Spray application operations that involve the use of organic peroxide formulations and other plural component coatings shall be conducted in spray areas that are protected by approved automatic sprinkler systems that meet the requirements of 43.1.7. [33:16.2]

43.7.3 Prevention of Contamination. Measures shall be taken to prevent the contamination of organic peroxide formulations with any foreign substance. Only spray guns and related handling equipment that are specifically manufactured for use with organic peroxide formulations shall be used. Separate fluid-handling equipment shall be used for the resin and for the catalyst, and they shall not be interchanged. [33:16.3]

43.7.3.1 The wetted portions of equipment and apparatus that handle organic peroxide formulations shall be constructed of stainless steel (300 series), polyethylene, Teflon®, or other materials that are specifically recommended for the application. [33:16.3.1]

43.7.3.2* Measures shall be taken to prevent contamination of organic peroxide formulations with dusts or overspray residues resulting from the sanding or spray application of finishing materials. [33:16.3.2]

43.7.3.3 Spills of organic peroxide formulations shall be promptly removed so there are no residues. Spilled material shall be permitted to be absorbed by use of a noncombustible absorbent, which is then disposed of promptly in accordance with the manufacturer's recommendations. [33:16.3.3]

43.7.4 Storage of Organic Peroxides. Organic peroxide formulations shall be stored in accordance with the requirements of Chapter 70 and with the manufacturers' recommendations. [33:16.4]

43.7.5 Handling of Organic Peroxides. Measures shall be taken to prevent handling of organic peroxide formulations to avoid shock and friction, which can cause decomposition and violent reaction. [33:16.5]

43.7.6* Mixing of Organic Peroxides with Promoters. Organic peroxide formulations shall not be mixed directly with any cobalt compounds or other promoters or accelerators, due to the possibility of violent decomposition or explosion. To minimize the possibility of such accidental mixing, these materials shall not be stored adjacent to each other. [33:16.6]

43.7.7 Smoking. Smoking shall be prohibited, NO SMOKING signs shall be prominently displayed, and only nonsparking tools shall be used in any area where organic peroxide formulations are stored, mixed, or applied. [33:16.7]

43.7.8 Trained Personnel. Only designated personnel trained to use and handle organic peroxide formulations shall be permitted to use these materials. [33:16.8]

43.7.9 Material Safety Data Sheets. Where organic peroxide formulations are used, the material safety data sheet (MSDS) or its equivalent shall be consulted. [33:16.9]

43.8 Styrene Cross-Linked Composites Manufacturing (Glass Fiber-Reinforced Plastics).

43.8.1* Scope. Section 43.8 shall apply to manufacturing processes involving spray application of styrene cross-linked thermoset resins (commonly known as glass fiber-reinforced plastics) for hand lay-up or spray fabrication methods, that is, resin application areas, and where the processes do not produce vapors that exceed 25 percent of the lower flammable limit. [33:17.1]

43.8.2 Resin Application Equipment. The equipment and apparatus for spray application of the resin shall be installed and used in accordance with the requirements of Sections 43.7 and 43.8. [33:17.2]

43.8.3* Fire Protection. Resin application areas shall be protected in accordance with 43.1.7. If an automatic sprinkler system is utilized, it shall be permitted to be designed and installed in accordance with the requirements of NFPA 13 for at least Ordinary Hazard, Group 2 occupancies. [33:17.3]

43.8.4 Resin Storage. The quantity of flammable and combustible liquids located in the vicinity of resin application areas outside an inside storage room or storage cabinet in any one process area shall not exceed the greater of any of the following:

- (1) A supply for one day
- (2) The sum of 25 gal (95 L) of Class IA liquids in containers and 120 gal (454 L) of Class IB, IC, II, or III liquids in containers
- (3) One approved portable tank not exceeding 660 gal (2500 L) of Class IB, IC, II, or III liquids [33:17.4]

43.8.5 Electrical and Other Hazards.

43.8.5.1 Electrical wiring and utilization equipment located in resin application areas that is not subject to deposits of combustible residues shall be installed in accordance with the requirements of NFPA 70 for Ordinary Hazard locations. [33:17.5.1]

43.8.5.2 Electrical wiring and utilization equipment located in resin application areas that is subject to deposits of combustible residues shall be listed for such exposure and shall be suitable for Class I, Division 2 or Class I, Zone 2 locations if applicable as defined in 43.1.4.2.1.2. [33:17.5.2]

43.8.5.3* All metal parts of resin application areas, exhaust ducts, ventilation fans, spray application equipment, workpieces or containers that receive the spray stream, and piping that conveys flammable or combustible liquids shall be electrically grounded. [33:17.5.3]

43.8.5.4 Space heating appliances or other hot surfaces in resin application areas shall not be located where deposits or residues accumulate. [33:17.5.4]

43.8.6 Ventilation.

43.8.6.1 Mechanical ventilation shall be designed and installed throughout the resin application area in accordance with the requirements of 43.1.5.

Exception: Buildings that are not enclosed for at least three-quarters of their perimeter shall not be required to meet this requirement. [33:17.6.1]

43.8.6.2 Local ventilation shall be provided where personnel are under or inside of the workpiece being fabricated. [33:17.6.2]

43.8.7 Use and Handling.

43.8.7.1 The storage and use of organic peroxide formulations shall meet the requirements of Section 43.7. [33:17.7.1]

43.8.7.2 Excess catalyzed resin, while still in the liquid state, shall be drained into an open-top, noncombustible container. Enough water shall be added to the container to cover the contained resin by at least 2 in. (50 mm). [33:17.7.2]

43.8.7.3 In areas where chopper guns are used, paper, polyethylene film, or similar material shall be provided to cover the exposed surfaces of the walls and floor to allow the buildup of overchop to be removed. When the accumulated overchop has reached an average thickness of 2 in. (50 mm), it shall be disposed of after a minimum curing time of 4 hours.

Exception: A single day's accumulation of more than an average of 2 in. (50 mm) shall be permitted, provided that it is properly cured and disposed of before operations are resumed. [33:17.7.3]

43.8.7.3.1 Used paper, polyethylene film, or similar material shall be placed in a noncombustible container and disposed of when removed from the facility. [33:17.7.3.1]

43.9 Dipping, Coating, and Printing Processes.

43.9.1 Dipping, roll coating, flow coating, curtain coating, printing, cleaning, and similar processes, hereinafter referred to as "coating processes" or "processes," in which articles or materials are passed through tanks, vats, or containers, or passed over rollers, drums, or other process equipment that contain flammable or combustible liquids shall comply with NFPA 34, *Standard for Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids*, and Section 43.9. [34:1.1.1]

43.9.1.1 Section 43.9 shall also apply to cleaning processes that utilize a solvent vapor, such as vapor degreasing processes. [34:1.1.2]

43.9.1.2 Section 43.9 shall also apply to processes that use water-borne, water-based, and water-reducible materials that contain flammable or combustible liquids or that produce combustible deposits or residues. [34:1.1.3]

43.9.1.3 Section 43.9 shall not apply to processes that use only noncombustible liquids for processing and cleaning. This standard shall also not apply to processes that use only Class IIIB liquids for processing or cleaning, provided the liquids or mixtures thereof maintain their Class IIIB classification at their point of use. [34:1.1.4]

43.9.1.4 Section 43.9 shall not apply to processes that use a liquid that does not have a fire point when tested in accordance with ASTM D 92, *Standard Test Method for Flash and Fire Points by Cleveland Open Cup*, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change. [34:1.1.5]

43.9.1.5 Section 43.9 shall not apply to fluidized bed powder application. (See Chapter 15 of NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*.) [34:1.1.6]

43.9.1.6* Section 43.9 shall not apply to quench tanks that are addressed in Chapter 51 of this Code.

43.9.2* Where unusual industrial processes are involved, the AHJ shall be permitted to require additional safeguards or modifications to the requirements of NFPA 34, provided equivalent safety is achieved.

43.10 Training.

43.10.1* General. All personnel involved in the spray application processes covered by this Code shall be instructed in the following:

- (1) Potential safety and health hazards
- (2) Operational, maintenance, and emergency procedures required
- (3) Importance of constant operator awareness [33:18.1]

43.10.1.1 Personnel required to handle or use flammable or combustible materials shall be instructed in the safe handling, storage, and use of the materials, as well as emergency procedures. [33:18.1.1]