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DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

DIRECTOR'S OFFICE

GENERAL INDUSTRY SAFETY STANDARDS

Filed with the Secretary of State on November 15, 1989 (as amended August 2, 1993)
(as amended May 24, 2007) **(as amended January 10, 2014)**

These rules become effective immediately upon filing with the Secretary of State
unless adopted under section 33, 44, or 45a(6) of 1969 PA 306.

Rules adopted under these sections become effective 7 days after filing with the Secretary of State.

(By authority conferred on the director of the department of licensing and regulatory affairs
by sections 16 and 21 of 1974 PA 154, MCL 408.1016 to 408.1021,
and Executive Reorganization Order Nos. 1996-2, 2003-1, 2008-4, and 2011-4,
MCL 445.2001, 445.2011, 445.2025, and 445.2030)

R 408.17601 and R 408.17602 of the Michigan Administrative Code are amended as follows:

PART 76. SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

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R 408.17601 Adoption of standards by reference.

Rule 7601. (1) The following federal occupational safety and health administration (OSHA) regulations are adopted by reference in these rules:

(a) 29 C.F.R. §1910.107 “Spray finishing using flammable and combustible materials,” effective March 26, 2012.

(b) 29 C.F.R. §1910.94(c) “Ventilation for spray finishing operations,” effective September 9, 2009.

(2) All of the following provisions apply with respect to the regulations adopted in subrule (1) of this rule:

(a) A reference to Subpart S means General Industry Safety Standard Part 39 “Design Safety Standards for Electrical Systems,” and General Industry Safety Standard Part 40 “Electrical Safety-Related Work Practices,” as referenced in R 408.17602.

(b) A reference to 29 C.F.R. §1910.106 “Flammable liquids,” means General Industry Safety Standard Part 75 “Flammable Liquids,” as referenced in R 408.17602.

(c) A reference to 29 C.F.R. §1910.159 “Automatic sprinkler systems,” means General Industry Safety Standard Part 9 “Fixed Fire Equipment” as referenced in R 408.17602

(d) A reference to “Dip Tank Operations” means Occupational Health Standard Part 526 “Dipping and Coating Operations,” as referenced in R 408.17602.

(3) The provisions of 29 C.F.R. §1910.107 and 29 C.F.R. §1910.94 have the same force and effect as rules promulgated under 1974 PA 154, the Michigan Occupational Safety and Health Act (MIOSHA), MCL 408.1001 to 408.1094.

(4) The standards adopted in subrule (1) of this rule are available from the United States Department of Labor, Occupational Safety and Health Administration website: www.osha.gov, at no charge as of the time of adoption of these rules.

(5) The standards adopted in subrule (1) of this rule are also available for inspection at the Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, Lansing, Michigan, 48909-8143.

(6) The standards adopted in subrule (1) of this rule may be obtained from the publisher or may also be obtained from the Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143, plus $20.00 for shipping and handling.

R 408.17602 MIOSHA referenced standards.

Rule 7602. The following Michigan occupational safety and health (MIOSHA) standards are referenced in these rules. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website: www.michigan.gov/mioshastandards. For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.

(a) General Industry Safety Standard Part 9 “Fixed Fire Equipment,” R 408.10901 to R 408.10999.

(b) General Industry Safety Standard Part 39 “Design Safety Standards for Electrical Systems,” R 408.13901 to R 408.13902.

(c) General Industry Safety Standard Part 40 “Electrical Safety-Related Work Practices,” R 408.14001 to R 408.14009.

(d) General Industry Safety Standard Part 75 “Flammable Liquids,” R 408.17501 to R 408.17502.

(e) Occupational Health Standard Part 526 “Dipping and Coating Operations,” R 325.52601 to R 325.52602.

1910.107
SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

1910.107(a) Definitions applicable to this section

1910.107(a)(1) Aerated solid powders. Aerated powders shall mean any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below. It is common practice to fluidize such materials to form a fluidized powder bed and then dip the part to be coated into the bed in a manner similar to that used in liquid dipping. Such beds are also used as sources for powder spray operations.

1910.107(a)(2) Spraying area. Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.

1910.107(a)(3) Spray booth. A power-ventilated structure provided to enclose or accommodate a spraying operation to confine and limit the escape of spray, vapor, and residue, and to safely conduct or direct them to an exhaust system.

1910.107(a)(4) Waterwash spray booth. A spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.

1910.107(a)(5) Dry spray booth. A spray booth not equipped with a water washing system as described in subparagraph (4) of this paragraph. A dry spray booth may be equipped with

1910.107(a)(5)(i) distribution or baffle plates to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct; or

1910.107(a)(5)(ii) overspray dry filters to minimize dusts; or

1910.107(a)(5)(iii) overspray dry filters to minimize dusts or residues entering exhaust ducts; or

1910.107(a)(5)(iv) overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or

1910.107(a)(5)(v) where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.

1910.107(a)(6) Fluidized bed. A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.

1910.107(a)(7) Electrostatic fluidized bed. A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported, through the container immediately above the charged and aerated materials in order to be coated.

1910.107(a)(8) Approved. Shall mean approved and listed by a nationally recognized testing laboratory. Refer to 1910.7 for definition of nationally recognized testing laboratory.

1910.107(a)(9) Listed. See "approved" in 1910.107(a)(8).

1910.107(b) Spray booths

1910.107(b)(1) Construction. Spray booths shall be substantially constructed of steel, securely and rigidly supported, or of concrete or masonry except that aluminum or other substantial noncombustible material may be used for intermittent or low volume spraying. Spray booths shall be designed to sweep air currents toward the exhaust outlet.

1910.107(b)(2) Interiors. The interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residues and facilitate cleaning and washing without injury.

1910.107(b)(3) Floors. The floor surface of a spray booth and operator's working area, if combustible, shall be covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues.

1910.107(b)(4) Distribution or baffle plates. Distribution or baffle plates, if installed to promote an even flow of air through the booth or cause the deposit of overspray before it enters the exhaust duct, shall be of noncombustible material and readily removable or accessible on both sides for cleaning. Such plates shall not be located in exhaust ducts.

1910.107(b)(5) Dry type overspray collectors - (exhaust air filters). In conventional dry type spray booths, overspray dry filters or filter rolls, if installed, shall conform to the following:

1910.107(b)(5)(i) The spraying operations except electrostatic spraying operations shall be so designed, installed and maintained that the average air velocity over the open face of the booth (or booth cross section during spraying operations) shall be not less than 100 linear feet per minute. Electrostatic spraying operations may be conducted with an air velocity over the open face of the booth of not less than 60 linear feet per minute, or more, depending on the volume of the finishing material being applied and its flammability and explosion characteristics. Visible gauges or audible alarm or pressure activated devices shall be installed to indicate or insure that the required air velocity is maintained. Filter rolls shall be inspected to insure proper replacement of filter media.

1910.107(b)(5)(ii) All discarded filter pads and filter rolls shall be immediately removed to a safe, well-detached location or placed in a water-filled metal container and disposed of at the close of the day's operation unless maintained completely in water.

1910.107(b)(5)(iii) The location of filters in a spray booth shall be so as to not reduce the effective booth enclosure of the articles being sprayed.

1910.107(b)(5)(iv) Space within the spray booth on the downstream and upstream sides of filters shall be protected with approved automatic sprinklers.
1910.107(b)(5)(v) Filters or filter rolls shall not be used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.
1910.107(b)(5)(vi) Clean filters or filter rolls shall be noncombustible or of a type having a combustibility not in excess of class 2 filters as listed by Underwriters' Laboratories, Inc. Filters and filter rolls shall not be alternately used for different types of coating materials, where the combination of materials may be conducive to spontaneous ignition. See also paragraph (g)(6) of this section.
1910.107(b)(6) Frontal area. Each spray booth having a frontal area larger than 9 square feet shall have a metal deflector or curtain not less than 2 1/2 inches deep installed at the upper outer edge of the booth over the opening.
1910.107(b)(7) Conveyors. Where conveyors are arranged to carry work into or out of spray booths, the openings therefor shall be as small as practical.
1910.107(b)(8) Separation of operations. Each spray booth shall be separated from other operations by not less than 3 feet, or by a greater distance, or by such partition or wall as to reduce the danger from juxtaposition of hazardous operations. See also paragraph (c)(1) of this section.
1910.107(b)(9) Cleaning. Spray booths shall be so installed that all portions are readily accessible for cleaning. A clear space of not less than 3 feet on all sides shall be kept free from storage or combustible construction.
1910.107(b)(10) Illumination. When spraying areas are illuminated through glass panels or other transparent materials, only fixed lighting units shall be used as a source of illumination. Panels shall effectively isolate the spraying area from the area in which the lighting unit is located, and shall be of a noncombustible material of such a nature or so protected that breakage will be unlikely. Panels shall be so arranged that normal accumulations of residue on the exposed surface of the panel will not be raised to a dangerous temperature by radiation or conduction from the source of illumination.

1910.107(c) Electrical and other sources of ignition
1910.107(c)(1) Conformance. All electrical equipment, open flames and other sources of ignition shall conform to the requirements of this paragraph, except as follows:
1910.107(c)(1)(i) Electrostatic apparatus shall conform to the requirements of paragraphs (h) and (i) of this section;
1910.107(c)(1)(ii) Drying, curing, and fusion apparatus shall conform to the requirements of paragraph (j) of this section;
1910.107(c)(1)(iii) Automobile undercoating spray operations in garages shall conform to the requirements of paragraph (k) of this section;
1910.107(c)(1)(iv) Powder-coating equipment shall conform to the requirements of paragraph (l)(1) of this section.
1910.107(c)(2) Minimum separation. There shall be no open flame or spark producing equipment in any spraying area nor within 20 feet thereof, unless separated by a partition.
1910.107(c)(3) Hot surfaces. Space-heating appliances, steampipes, or hot surfaces shall not be located in a spraying area where deposits of combustible residues may readily accumulate.
1910.107(c)(4) Wiring conformance. Electrical wiring and equipment shall conform to the provisions of this paragraph and shall otherwise be in accordance with subpart S of this part.
1910.107(c)(5) Combustible residues, areas. Unless specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors, there shall be no electrical equipment in any spraying area, whereon deposits of combustible residues may readily accumulate, except wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.
1910.107(c)(6) Wiring type approved. Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area as herein defined shall be of explosion-proof type approved for Class I, group D locations and shall otherwise conform to the provisions of subpart S of this part, for Class I, Division 1, Hazardous Locations. Electrical wiring, motors, and other equipment outside of but within twenty (20) feet of any spraying area, and not separated therefrom by partitions, shall not produce sparks under normal operating conditions and shall otherwise conform to the provisions of subpart S of this part for Class I, Division 2 Hazardous Locations.
1910.107(c)(7) Lamps. Electric lamps outside of, but within twenty (20) feet of any spraying area, and not separated therefrom by a partition, shall be totally enclosed to prevent the falling of hot particles and shall be protected from mechanical injury by suitable guards or by location.
1910.107(c)(8) Portable lamps. Portable electric lamps shall not be used in any spraying area during spraying operations. Portable electric lamps, if used during cleaning or repairing operations, shall be of the type approved for hazardous Class I locations.
1910.107(c)(9) Grounding.
1910.107(c)(9)(i) All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) or aerated solids shall be properly electrically grounded in an effective and permanent manner.
1910.107(c)(9)(ii) [Reserved]

1910.107(d) Ventilation

1910.107(d)(1) Conformance. Ventilating and exhaust systems shall be in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961, which is incorporated by reference as specified in Sec. 1910.6, where applicable and shall also conform to the provisions of this section.

1910.107(d)(2) General. All spraying areas shall be provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life is not endangered. Mechanical ventilation shall be kept in operation at all times while spraying operations are being conducted and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted.

1910.107(d)(3) Independent exhaust. Each spray booth shall have an independent exhaust duct system discharging to the exterior of the building, except that multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust. If more than one fan serves one booth, all fans shall be so interconnected that one fan cannot operate without all fans being operated.

1910.107(d)(4) Fan-rotating element. The fan-rotating element shall be nonferrous or nonsparking or the casing shall consist of or be lined with such material. There shall be ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction, necessary allowance being made for ordinary expansion and loading to prevent contact between moving parts and the duct or fan housing. Fan blades shall be mounted on a shaft sufficiently heavy to maintain perfect alignment even when the blades of the fan are heavily loaded, the shaft preferably to have bearings outside the duct and booth. All bearings shall be of the self-lubricating type, or lubricated from the outside duct.

1910.107(d)(5) Electric motors. Electric motors driving exhaust fans shall not be placed inside booths or ducts. See also paragraph (c) of this section.

1910.107(d)(6) Belts. Belts shall not enter the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed.

1910.107(d)(7) Exhaust ducts. Exhaust ducts shall be constructed of steel and shall be substantially supported. Exhaust ducts without dampers are preferred; however, if dampers are installed, they shall be maintained so that they will be in a full open position at all times the ventilating system is in operation.

1910.107(d)(7)(i) Exhaust ducts shall be protected against mechanical damage and have a clearance from unprotected combustible construction or other combustible material of not less than 18 inches.

1910.107(d)(7)(ii) If combustible construction is provided with the following protection applied to all surfaces within 18 inches, clearances may be reduced to the distances indicated:

(a) 28-gage sheet metal on 1/4-inch asbestos mill board	12 inches
(b) 28-gage sheet metal on 1/8-inch asbestos mill board spaced out 1 inch on noncombustible spacers	9 inches
(c) 22-gage sheet metal on 1-inch rockwool batts reinforced with wire mesh or the equivalent.	3 inches
(d) Where ducts are protected with an approved automatic sprinkler system, properly maintained, the clearance required in subdivision (i) of this subparagraph may be reduced to 6 inches.	

1910.107(d)(8) Discharge clearance. Unless the spray booth exhaust duct terminal is from a water-wash spray booth, the terminal discharge point shall be not less than 6 feet from any combustible exterior wall or roof nor discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet.

1910.107(d)(9) Air exhaust. Air exhaust from spray operations shall not be directed so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes, nor directed so as to create a nuisance. Air exhausted from spray operations shall not be recirculated.

1910.107(d)(10) Access doors. When necessary to facilitate cleaning, exhaust ducts shall be provided with an ample number of access doors.

1910.107(d)(11) Room intakes. Air intake openings to rooms containing spray finishing operations shall be adequate for the efficient operation of exhaust fans and shall be so located as to minimize the creation of dead air pockets.

1910.107(d)(12) Drying spaces. Freshly sprayed articles shall be dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors. In the event adequate and reliable ventilation is not provided such drying spaces shall be considered a spraying area. See also paragraph (j) of this section.

1910.107(e) Flammable liquids and liquids with a flashpoint greater than 199.4 °F (93 °C)

1910.107(e)(1) Conformance. The storage of flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) in connection with spraying operations shall conform to the requirements of 1910.106, where applicable.

1910.107(e)(2) Quantity. The quantity of flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) kept in the vicinity of spraying operations shall be the minimum required for operations and should ordinarily not exceed a supply for 1 day or one shift. Bulk storage of portable containers of flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) shall be in a separate, constructed building detached from other important buildings or cut off in a standard manner.

1910.107(e)(3) Containers. Original closed containers, approved portable tanks, approved safety cans or a properly arranged system of piping shall be used for bringing flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) into spray finishing room. Open or glass containers shall not be used.

1910.107(e)(4) Transferring liquids. Except as provided in paragraph (e)(5) of this section the withdrawal of flammable liquids and liquids with a flashpoint greater than 199.4 °F (93 °C) from containers having a capacity of greater than 60 gallons shall be by approved pumps. The withdrawal of flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) from containers and the filling of containers, including portable mixing tanks, shall be done only in a suitable mixing room or in a spraying area when the ventilating system is in operation. Adequate precautions shall be taken to protect against liquid spillage and sources of ignition.

1910.107(e)(5) Spraying containers. Containers supplying spray nozzles shall be of closed type or provided with metal covers kept closed. Containers not resting on floors shall be on metal supports or suspended by wire cables. Containers supplying spray nozzles by gravity flow shall not exceed 10 gallons capacity. Original shipping containers shall not be subject to air pressure for supplying spray nozzles. Containers under air pressure supplying spray nozzles shall be of limited capacity, not exceeding that necessary for 1 day's operation; shall be designed and approved for such use; shall be provided with a visible pressure gage; and shall be provided with a relief valve set to operate in conformance with the requirements of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code - 1968, which is incorporated by reference as specified in Sec. 1910.6. Containers under air pressure supplying spray nozzles, air-storage tanks and coolers shall conform to the standards of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code - 1968 for construction, tests, and maintenance.

1910.107(e)(6) Pipes and hoses.

1910.107(e)(6)(i) All containers or piping to which is attached a hose or flexible connection shall be provided with a shutoff valve at the connection. Such valves shall be kept shut when spraying operations are not being conducted.

1910.107(e)(6)(ii) When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose.

1910.107(e)(6)(iii) All pressure hose and couplings shall be inspected at regular intervals appropriate to this service. The hose and couplings shall be tested with the hose extended, and using the "inservice maximum operating pressures." Any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings, shall be withdrawn from service and repaired or discarded.

1910.107(e)(6)(iv) Piping systems conveying flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) 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.

1910.107(e)(7) Spray liquid heaters. Electrically powered spray liquid heaters shall be approved and listed for the specific location in which used (see paragraph (c) of this section). Heaters shall not be located in spray booths nor other locations subject to the accumulation of deposits or combustible residue. If an electric motor is used, see paragraph (c) of this section.

1910.107(e)(8) Pump relief. If flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) are supplied to spray nozzles by positive displacement pumps, the pump discharge line shall be provided with an approved relief valve discharging to a pump suction or a safe detached location, or a device provided to stop the prime mover if the discharge pressure exceeds the safe operating pressure of the system.

1910.107(e)(9) Grounding. Whenever flammable liquids or liquids with a flashpoint greater than 199.4 °F (93 °C) are transferred from one container to another, both containers shall be effectively bonded and grounded to prevent discharge sparks of static electricity.

1910.107(f) Protection

1910.107(f)(1) Conformance. In sprinklered buildings, the automatic sprinkler system in rooms containing spray finishing operations shall conform to the requirements of 1910.159. In unsprinklered buildings where sprinklers are installed only to protect spraying areas, the installation shall conform to such standards insofar as they are applicable. Sprinkler heads shall be located so as to provide water distribution throughout the entire booth.

1910.107(f)(2) Valve access. Automatic sprinklers protecting each spray booth (together with its connecting exhaust) shall be under an accessibly located separate outside stem and yoke (OS&Y) subcontrol valve.

1910.107(f)(3) Cleaning of heads. Sprinklers protecting spraying areas shall be kept as free from deposits as practical by cleaning daily if necessary. (See also paragraph (g) of this section.)

1910.107(f)(4) Portable extinguishers. An adequate supply of suitable portable fire extinguishers shall be installed near all spraying areas.

1910.107(g) Operations and maintenance

1910.107(g)(1) Spraying. Spraying shall not be conducted outside of predetermined spraying areas.

1910.107(g)(2) Cleaning. All spraying areas shall be kept as free from the accumulation of deposits of combustible residues as practical, with cleaning conducted daily if necessary. Scrapers, spuds, or other such tools used for cleaning purposes shall be of nonsparking material.

1910.107(g)(3) Residue disposal. Residue scrapings and debris contaminated with residue shall be immediately removed from the premises and properly disposed of. Approved metal waste cans shall be provided wherever rags or waste are impregnated with finishing material and all such rags or waste deposited therein immediately after use. The contents of waste cans shall be properly disposed of at least once daily or at the end of each shift.

1910.107(g)(4) Clothing storage. Spray finishing employees' clothing shall not be left on the premises overnight unless kept in metal lockers.

1910.107(g)(5) Cleaning solvents. The use of solvents for cleaning operations shall be restricted to those having flashpoints not less than 100 deg. F.; however, for cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations may be used. Such cleaning shall be conducted inside spray booths and ventilating equipment operated during cleaning.

1910.107(g)(6) Hazardous materials combinations. Spray booths shall not be alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, unless all deposits of the first used material are removed from the booth and exhaust ducts prior to spraying with the second used material.

1910.107(g)(7) "No Smoking" signs. "No smoking" signs in large letters on contrasting color background shall be conspicuously posted at all spraying areas and paint storage rooms.

1910.107(h) Fixed electrostatic apparatus

1910.107(h)(1) Conformance. Where installation and use of electrostatic spraying equipment is used, such installation and use shall conform to all other paragraphs of this section, and shall also conform to the requirements of this paragraph.

1910.107(h)(2) Type approval. Electrostatic apparatus and devices used in connection with coating operations shall be of approved types.

1910.107(h)(3) Location. Transformers, power packs, control apparatus, and all other electrical portions of the equipment, with the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, shall be located outside of the spraying area, or shall otherwise conform to the requirements of paragraph (c) of this section.

1910.107(h)(4) Support. Electrodes and electrostatic atomizing heads shall be adequately supported in permanent locations and shall be effectively insulated from the ground. Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators, shall be deemed to comply with this section. Insulators shall be nonporous and noncombustible.

1910.107(h)(5) Insulators, grounding. High-voltage leads to electrodes shall be properly insulated and protected from mechanical injury or exposure to destructive chemicals. Electrostatic atomizing heads shall be effectively and permanently supported on suitable insulators and shall be effectively guarded against accidental contact or grounding. An automatic means shall be provided for grounding the electrode system when it is electrically deenergized for any reason. All insulators shall be kept clean and dry.

1910.107(h)(6) Safe distance. A safe distance shall be maintained between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. A suitable sign indicating this safe distance shall be conspicuously posted near the assembly.

1910.107(h)(7) Conveyors required. Goods being painted using this process are to be supported on conveyors. The conveyors shall be so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times. Any irregularly shaped or other goods subject to possible swinging or movement shall be rigidly supported to prevent such swinging or movement which would reduce the clearance to less than that specified in paragraph (h)(6) of this section.

1910.107(h)(8) Prohibition. This process is not acceptable where goods being coated are manipulated by hand. When finishing materials are applied by electrostatic equipment which is manipulated by hand, see paragraph (i) of this section for applicable requirements.

1910.107(h)(9) Fail-safe controls. Electrostatic apparatus shall be equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and to signal the operator under any of the following conditions:

1910.107(h)(9)(i) Stoppage of ventilating fans or failure of ventilating equipment from any cause.

1910.107(h)(9)(ii) Stoppage of the conveyor carrying goods through the high voltage field.

1910.107(h)(9)(iii) Occurrence of a ground or of an imminent ground at any point on the high voltage system.

1910.107(h)(9)(iv) Reduction of clearance below that specified in paragraph (h)(6) of this section.

1910.107(h)(10) Guarding. Adequate booths, fencing, railings, or guards shall be so placed about the equipment that they, either by their location or character or both, assure that a safe isolation of the process is maintained from plant storage or personnel. Such railings, fencing, and guards shall be of conducting material, adequately grounded.
1910.107(h)(11) Ventilation. Where electrostatic atomization is used the spraying area shall be so ventilated as to insure safe conditions from a fire and health standpoint.
1910.107(h)(12) Fire protection. All areas used for spraying, including the interior of the booth, shall be protected by automatic sprinklers where this protection is available. Where this protection is not available, other approved automatic extinguishing equipment shall be provided.

1910.107(i) Electrostatic hand spraying equipment
1910.107(i)(1) Application. This paragraph shall apply to any equipment using electrostatically charged elements for the atomization and/or, precipitation of materials for coatings on articles, or for other similar purposes in which the atomizing device is hand held and manipulated during the spraying operation.
1910.107(i)(2) Conformance. Electrostatic hand spraying equipment shall conform with the other provisions of this section.
1910.107(i)(3) Equipment approval and specifications. Electrostatic hand spray apparatus and devices used in connection with coating operations shall be of approved types. The high voltage circuits shall be designed so as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions. The electrostatically charged exposed elements of the handgun shall be capable of being energized only by a switch which also controls the coating material supply.
1910.107(i)(4) Electrical support equipment. Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself and its connections to the power supply shall be located outside of the spraying area or shall otherwise conform to the requirements of paragraph (c) of this section.
1910.107(i)(5) Spray gun ground. The handle of the spraying gun shall be electrically connected to ground by a metallic connection and to be so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle.
1910.107(i)(6) Grounding - general. All electrically conductive objects in the spraying area shall be adequately grounded. This requirement shall apply to paint containers, wash cans, and any other objects or devices in the area. The equipment shall carry a prominent permanently installed warning regarding the necessity for this grounding feature.
1910.107(i)(7) Maintenance of grounds. Objects being painted or coated shall be maintained in metallic contact with the conveyor or other grounded support. Hooks shall be regularly cleaned to insure this contact and areas of contact shall be sharp points or knife edges where possible. Points of support of the object shall be concealed from random spray where feasible and where the objects being sprayed are supported from a conveyor, the point of attachment to the conveyor shall be so located as to not collect spray material during normal operation.
1910.107(i)(8) Interlocks. The electrical equipment shall be so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation.
1910.107(i)(9) Ventilation. The spraying operation shall take place within a spray area which is adequately ventilated to remove solvent vapors released from the operation.

1910.107(j) Drying, curing, or fusion apparatus
1910.107(j)(1) Conformance. Drying, curing, or fusion apparatus in connection with spray application of flammable and combustible finishes shall conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, which is incorporated by reference as specified in § 1910.6, where applicable and shall also conform with the following requirements of this paragraph.
1910.107(j)(2) Alternate use prohibited. Spray booths, rooms, or other enclosures used for spraying operations shall not alternately be used for the purpose of drying by any arrangement which will cause a material increase in the surface temperature of the spray booth, room, or enclosure.
1910.107(j)(3) Adjacent system interlocked. Except as specifically provided in paragraph (j)(4) of this section, drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks shall not be installed in a spraying area, but may be installed adjacent thereto when equipped with an interlocked ventilating system arranged to:
1910.107(j)(3)(i) Thoroughly ventilate the drying space before the heating system can be started;
1910.107(j)(3)(ii) Maintain a safe atmosphere at any source of ignition;
1910.107(j)(3)(iii) Automatically shut down the heating system in the event of failure of the ventilating system.
1910.107(j)(4) Alternate use permitted. Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus when conforming with the following:
1910.107(j)(4)(i) Interior (especially floors) of spray enclosures shall be kept free of overspray deposits.

1910.107(j)(4)(ii) During spray operations, the drying apparatus and electrical connections and wiring thereto shall not be located within spray enclosure nor in any other location where spray residues may be deposited thereon.
1910.107(j)(4)(iii) The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:
1910.107(j)(4)(iii)(a) The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.
1910.107(j)(4)(iii)(b) The spray enclosure will be purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized.
1910.107(j)(4)(iii)(c) The ventilating system will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus will automatically shut off in the event of failure of the ventilating system.
1910.107(j)(4)(iv) All electrical wiring and equipment of the drying apparatus shall conform with the applicable sections of subpart S of this part. Only equipment of a type approved for Class I, Division 2 hazardous locations shall be located within 18 inches of floor level. All metallic parts of the drying apparatus shall be properly electrically bonded and grounded.
1910.107(j)(4)(v) The drying apparatus shall contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus.

1910.107(k) Automobile undercoating in garages.
Automobile undercoating spray operations in garages, conducted in areas having adequate natural or mechanical ventilation, are exempt from the requirements pertaining to spray finishing operations, when using undercoating materials not more hazardous than kerosene (as listed by Underwriters' Laboratories in respect to fire hazard rating 30-40) or undercoating materials using only solvents listed as having a flash point in excess of 100 deg. F. Undercoating spray operations not conforming to these provisions are subject to all requirements of this section pertaining to spray finishing operations.

1910.107(l) Powder coating
1910.107(l)(1) Electrical and other sources of ignition. Electrical equipment and other sources of ignition shall conform to the requirements of paragraphs (c)(1) (i)-(iv), (8) and (9)(i) of this section and subpart S of this part.
1910.107(l)(2) Ventilation.
1910.107(l)(2)(i) In addition to the provisions of paragraph (d) of this section, where applicable, exhaust ventilation shall be sufficient to maintain the atmosphere below the lowest explosive limits for the materials being applied. All nondeposited air-suspended powders shall be safely removed via exhaust ducts to the powder recovery cyclone or receptacle. Each installation shall be designed and operated to meet the foregoing performance specification.
1910.107(l)(2)(ii) Powders shall not be released to the outside atmosphere.
1910.107(l)(3) Drying, curing, or fusion equipment. The provisions of the Standard for ovens and furnaces, NFPA No. 86A-1969 shall apply where applicable.
1910.107(l)(4) Operation and maintenance.
1910.107(l)(4)(i) All areas shall be kept free of the accumulation of powder coating dusts, particularly such horizontal surfaces as ledges, beams, pipes, hoods, booths, and floors.
1910.107(l)(4)(ii) Surfaces shall be cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.
1910.107(l)(4)(iii) "No Smoking" signs in large letters on contrasting color background shall be conspicuously posted at all powder coating areas and powder storage rooms.
1910.107(l)(5) Fixed electrostatic spraying equipment. The provisions of paragraph (h) of this section and other subparagraphs of this paragraph shall apply to fixed electrostatic equipment, except that electrical equipment not covered therein shall conform to paragraph (l)(1) of this section.
1910.107(l)(6) Electrostatic hand spraying equipment. The provisions of paragraph (i) of this section and other subparagraphs of this paragraph, shall apply to electrostatic handguns when used in powder coating, except that electrical equipment not covered therein shall conform to paragraph (l)(1) of this section.
1910.107(l)(7) Electrostatic fluidized beds.
1910.107(l)(7)(i) Electrostatic fluidized beds and associated equipment shall be of approved types. The maximum surface temperature of this equipment in the coating area shall not exceed 150 deg. F. The high voltage circuits shall be so designed as to not produce a spark of sufficient intensity to ignite any powder-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions.
1910.107(l)(7)(ii) Transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the charging electrodes and their connections to the power supply shall be located outside of the powder coating area or shall otherwise conform to the requirements of paragraph (l)(1) of this section.
1910.107(l)(7)(iii) All electrically conductive objects within the charging influence of the electrodes shall be adequately grounded. The powder coating equipment shall carry a prominent, permanently installed warning regarding the necessity for grounding these objects.

1910.107(l)(7)(iv) Objects being coated shall be maintained in contact with the conveyor or other support in order to insure proper grounding. Hangers shall be regularly cleaned to insure effective contact and areas of contact shall be sharp points or knife edges where possible.
1910.107(l)(7)(v) The electrical equipment shall be so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation.

1910.107(m) Organic peroxides and dual component coatings
1910.107(m)(1) Conformance. All spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in approved sprinklered spray booths meeting the requirements of this section.
1910.107(m)(2) Smoking. Smoking shall be prohibited and "No Smoking" signs shall be prominently displayed and only nonsparking tools shall be used in any area where organic peroxides are stored, mixed or applied.

1910.107(n) Scope.
This section applies to flammable and combustible finishing materials when applied as a spray by compressed air, "airless" or "hydraulic atomization," steam, electrostatic methods, or by any other means in continuous or intermittent processes. The section also covers the application of combustible powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds. The section does not apply to outdoor spray application of buildings, tanks, or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

[39 FR 23502, June 27, 1974, as amended at 45 FR 60704, Sept. 12, 1980; 49 FR 5322, Feb. 10, 1984; 53 FR 12121, Apr. 12, 1988; 61 FR 9227, March 7, 1996; 72 FR 71069, Dec. 14, 2007; 77 FR 17776, March 26, 2012]

1910.94 VENTILATION
1910.94(c) SPRAY FINISHING OPERATIONS.

1910.94(c)(1) Definitions applicable to this paragraph.

1910.94(c)(1)(i) Spray-finishing operations. Spray-finishing operations are employment of methods wherein organic or inorganic materials are utilized in dispersed form for deposit on surfaces to be coated, treated, or cleaned. Such methods of deposit may involve either automatic, manual, or electrostatic deposition but do not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems.

1910.94(c)(1)(ii) Spray booth. Spray booths are defined and described in § 1910.107(a).

1910.94(c)(1)(iii) Spray room. A spray room is a room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas.

1910.94(c)(1)(iv) Minimum maintained velocity. Minimum maintained velocity is the velocity of air movement which must be maintained in order to meet minimum specified requirements for health and safety.

1910.94(c)(2) Location and application.

Spray booths or spray rooms are to be used to enclose or confine all operations. Spray-finishing operations shall be located as provided in sections 201 through 206 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969.

1910.94(c)(3) Design and construction of spray booths.

1910.94(c)(3)(i) Spray booths shall be designed and constructed in accordance with § 1910.107(b)(1) through (b)(4) and (b)(6) through (b)(10). for a more detailed discussion of fundamentals relating to this subject, see ANSI Z9.2-1960, which is incorporated by reference as specified in § 1910.6.

1910.94(c)(3)(i)(a) Lights, motors, electrical equipment, and other sources of ignition shall conform to the requirements of § 1910.107(b)(10) and (c).

1910.94(c)(3)(i)(b) In no case shall combustible material be used in the construction of a spray booth and supply or exhaust duct connected to it.

1910.94(c)(3)(ii) Unobstructed walkways shall not be less than 6 1/2 feet high and shall be maintained clear of obstruction from any work location in the booth to a booth exit or open booth front. In booths where the open front is the only exit, such exits shall be not less than 3 feet wide. In booths having multiple exits, such exits shall not be less than 2 feet wide, provided that the maximum distance from the work location to the exit is 25 feet or less. Where booth exits are provided with doors, such doors shall open outward from the booth.

1910.94(c)(3)(iii) Baffles, distribution plates, and dry-type overspray collectors shall conform to the requirements of § 1910.107(b)(4) and (b)(5).

1910.94(c)(3)(iii)(a) Overspray filters shall be installed and maintained in accordance with the requirements of § 1910.107(b)(5), and shall only be in a location easily accessible for inspection, cleaning, or replacement.

1910.94(c)(3)(iii)(b) Where effective means, independent of the overspray filters, are installed which will result in design air distribution across the booth cross section, it is permissible to operate the booth without the filters in place.

1910.94(c)(3)(iv) -

1910.94(c)(3)(iv)(a) For wet or water-wash spray booths, the water-chamber enclosure, within which intimate contact of contaminated air and cleaning water or other cleaning medium is maintained, if made of steel, shall be 18 gage or heavier and adequately protected against corrosion.

1910.94(c)(3)(iv)(b) Chambers may include scrubber spray nozzles, headers, troughs, or other devices. Chambers shall be provided with adequate means for creating and maintaining scrubbing action for removal of particulate matter from the exhaust air stream.

1910.94(c)(3)(v) Collecting tanks shall be of welded steel construction or other suitable non-combustible material. If pits are used as collecting tanks, they shall be concrete, masonry, or other material having similar properties.

1910.94(c)(3)(v)(a) Tanks shall be provided with weirs, skimmer plates, or screens to prevent sludge and floating paint from entering the pump suction box. Means for automatically maintaining the proper water level shall also be provided. Fresh water inlets shall not be submerged. They shall terminate at least one pipe diameter above the safety overflow level of the tank.

1910.94(c)(3)(v)(b) Tanks shall be so constructed as to discourage accumulation of hazardous deposits.

1910.94(c)(3)(vi) Pump manifolds, risers, and headers shall be adequately sized to insure sufficient water flow to provide efficient operation of the water chamber.

1910.94(c)(4) Design and construction of spray rooms.
1910.94(c)(4)(i) Spray rooms, including floors, shall be constructed of masonry, concrete, or other noncombustible material.
1910.94(c)(4)(ii) Spray rooms shall have noncombustible fire doors and shutters.
1910.94(c)(4)(iii) Spray rooms shall be adequately ventilated so that the atmosphere in the breathing zone of the operator shall be maintained in accordance with the requirements of paragraph (c)(6)(ii) of this section.
1910.94(c)(4)(iv) Spray rooms used for production spray-finishing operations shall conform to the requirements for spray booths.

1910.94(c)(5) Ventilation.
1910.94(c)(5)(i) Ventilation shall be provided in accordance with provisions of § 1910.107(d), and in accordance with the following:
1910.94(c)(5)(i)(a) Where a fan plenum is used to equalize or control the distribution of exhaust air movement through the booth, it shall be of sufficient strength or rigidity to withstand the differential air pressure or other superficially imposed loads for which the equipment is designed and also to facilitate cleaning. Construction specifications shall be at least equivalent to those of paragraph (c)(5)(iii) of this section.
1910.94(c)(5)(ii) Inlet or supply ductwork used to transport makeup air to spray booths or surrounding areas shall be constructed of noncombustible materials.
1910.94(c)(5)(ii)(a) If negative pressure exists within inlet ductwork, all seams and joints shall be sealed if there is a possibility of infiltration of harmful quantities of noxious gases, fumes, or mists from areas through which ductwork passes.
1910.94(c)(5)(ii)(b) Inlet ductwork shall be sized in accordance with volume flow requirements and provide design air requirements at the spray booth.
1910.94(c)(5)(ii)(c) Inlet ductwork shall be adequately supported throughout its length to sustain at least its own weight plus any negative pressure which is exerted upon it under normal operating conditions.
1910.94(c)(5)(iii) -
1910.94(c)(5)(iii)(a) Exhaust ductwork shall be adequately supported throughout its length to sustain its weight plus any normal accumulation in interior during normal operating conditions and any negative pressure exerted upon it.
1910.94(c)(5)(iii)(b) Exhaust ductwork shall be sized in accordance with good design practice which shall include consideration of fan capacity, length of duct, number of turns and elbows, variation in size, volume, and character of materials being exhausted. See American National Standard Z9.2-1960 for further details and explanation concerning elements of design.
1910.94(c)(5)(iii)(c) Longitudinal joints in sheet steel ductwork shall be either lock-seamed, riveted, or welded. For other than steel construction, equivalent securing of joints shall be provided.
1910.94(c)(5)(iii)(d) Circumferential joints in ductwork shall be substantially fastened together and lapped in the direction of airflow. At least every fourth joint shall be provided with connecting flanges, bolted together, or of equivalent fastening security.
1910.94(c)(5)(iii)(e) Inspection or clean-out doors shall be provided for every 9 to 12 feet of running length for ducts up to 12 inches in diameter, but the distance between cleanout doors may be greater for larger pipes. A clean-out door or doors shall be provided for servicing the fan, and where necessary, a drain shall be provided.
1910.94(c)(5)(iii)(f) Where ductwork passes through a combustible roof or wall, the roof or wall shall be protected at the point of penetration by open space or fire-resistive material between the duct and the roof or wall. When ducts pass through firewalls, they shall be provided with automatic fire dampers on both sides of the wall, except that three-eighth-inch steel plates may be used in lieu of automatic fire dampers for ducts not exceeding 18 inches in diameter.
1910.94(c)(5)(iii)(g) Ductwork used for ventilating any process covered in this standard shall not be connected to ducts ventilating any other process or any chimney or flue used for conveying any products of combustion.

1910.94(c)(6) Velocity and air flow requirements.
1910.94(c)(6)(i) Except where a spray booth has an adequate air replacement system, the velocity of air into all openings of a spray booth shall be not less than that specified in Table G-10 for the operating conditions specified. An adequate air replacement system is one which introduces replacement air upstream or above the object being sprayed and is so designed that the velocity of air in the booth cross section is not less than that specified in Table G-10 when measured upstream or above the object being sprayed.

TABLE G-10
MINIMUM MAINTAINED VELOCITIES INTO SPRAY BOOTHS

Operating conditions for objects completely inside booth	Crossdraft, f.p.m.	Airflow velocities, f.p.m.	
		Design	Range
Electrostatic and automatic air-less operation contained in booth without operator.	Negligible	50 Large booth	50-75
Air-operated guns, manual or automatic…	Up to 50…	100 small booth 100 large booth	75-125 75-125
Air-operated guns, manual or automatic…	Up to 100…	150 small booth 150 large booth	125-175 125-175
		200 small booth	150-250

NOTES:

[1] Attention is invited to the fact that the effectiveness of the spray booth is dependent upon the relationship of the depth of the booth to its height and width.

[2] Crossdrafts can be eliminated through proper design and such design should be sought. Crossdrafts in excess of 100 fpm (feet per minute) should not be permitted.

[3] Excessive air pressures result in loss of both efficiency and material waste in addition to creating a backlash that may carry overspray and fumes into adjacent work areas.

[4] Booths should be designed with velocities shown in the column headed "Design." However, booths operating with velocities shown in the column headed "Range" are in compliance with this standard.

1910.94(c)(6)(ii) In addition to the requirements in paragraph (c)(6)(i) of this section, the total air volume exhausted through a spray booth shall be such as to dilute solvent vapor to at least 25 percent of the lower explosive limit of the solvent being sprayed. An example of the method of calculating this volume is given below.

Example: To determine the lower explosive limits of the most common solvents used in spray finishing, see Table G-11. Column 1 gives the number of cubic feet of vapor per gallon of solvent and column 2 gives the lower explosive limit (LEL) in percentage by volume of air. Note that the quantity of solvent will be diminished by the quantity of solids and nonflammables contained in the finish.

To determine the volume of air in cubic feet necessary to dilute the vapor from 1 gallon of solvent to 25 percent of the lower explosive limit, apply the following formula:
Dilution volume required per gallon of solvent = 4 (100 - LEL) (cubic feet of vapor per gallon) divided by LEL
Using toluene as the solvent.
[1] LEL of toluene from Table G-11, column 2, is 1.4 percent.
[2] Cubic feet of vapor per gallon from Table G-11, column 1, is 30.4 cubic feet per gallon.
[3] Dilution volume required = 4 (100 - 1.4) 30.4 divided by 1.4 = 8,564 cubic feet.
[4] To convert to cubic feet per minute of required ventilation, multiply the dilution volume required per gallon of solvent by the number of gallons of solvent evaporated per minute.

TABLE G-11
LOWER EXPLOSIVE LIMIT OF SOME COMMONLY USED SOLVENTS

Solvent	**Cubic feet per gallon of vapor of liquid at 70 deg. F.**	**Lower explosive limit in percent by volume of air at 70 deg. F.**
	Column 1	**Column 2**
Acetone	44.0	2.6
Amyl Acetate (iso)	21.6	(1) 1.0
Amyl Alcohol (n)	29.6	1.2
Amyl Alcohol (iso)	29.6	1.2
Benzene	36.8	(1) 1.4
Butyl Acetate (n)	24.8	1.7
Butyl Alcohol (n)	35.2	1.4
Butyl Cellosolve	24.8	1.1
Cellosolve	33.6	1.8
Cellosolve Acetate	23.2	1.7
Clyclohexanone	31.2	(1) 1.1
1,1 Dichloroethylene	42.4	5.9
1, 2 Dichloroethylene	42.4	9.7
Ethyl Acetate	32.8	2.5
Ethyl Alcohol	55.2	4.3
Ethyl Lactate	28.0	(1) 1.5
Methyl Acetate	40.0	3.1
Methyl Alcohol	80.8	7.3
Methyl Cellosolve	40.8	2.5
Methyl Ethyl Ketone	36.0	1.8
Methyl n-Propyl Ketone	30.4	1.5
Naphtha (VM&P) (76 deg. Naphtha)	22.4	0.9
Naphtha (100 deg. Flash) Safety Solvent – Stoddard Solvent	23.2	1.0
Propyl Acetate (n)	27.2	2.8
Propyl Acetate (iso)	28.0	1.1
Propyl Alcohol (n)	44.8	2.1
Propyl Alcohol (iso)	44.0	2.0
Toluene	30.4	1.4
Turpentine	20.8	0.8
Xylene (o)	26.4	1.0

Footnote (1)At 212 deg. F.

1910.94(c)(6)(iii) -
1910.94(c)(6)(iii)(a) When an operator is in a booth downstream of the object being sprayed, an air supplied respirator or other type of respirator must be used by employees that has been approved by the NIOSH under 42 CFR part 84 for the material being sprayed.
1910.94(c)(6)(iii)(b) Where downdraft booths are provided with doors, such doors shall be closed when spray painting.

1910.94(c)(7) Make-up air.

1910.94(c)(7)(i) Clean fresh air, free of contamination from adjacent industrial exhaust systems, chimneys, stacks, or vents, shall be supplied to a spray booth or room in quantities equal to the volume of air exhausted through the spray booth.

1910.94(c)(7)(ii) Where a spray booth or room receives make-up air through self-closing doors, dampers, or louvers, they shall be fully open at all times when the booth or room is in use for spraying. The velocity of air through such doors, dampers, or louvers shall not exceed 200 feet per minute. If the fan characteristics are such that the required air flow through the booth will be provided, higher velocities through the doors, dampers, or louvers may be used.

1910.94(c)(7)(iii) -

1910.94(c)(7)(iii)(a) Where the air supply to a spray booth or room is filtered, the fan static pressure shall be calculated on the assumption that the filters are dirty to the extent that they require cleaning or replacement.

1910.94(c)(7)(iii)(b) The rating of filters shall be governed by test data supplied by the manufacturer of the filter. A pressure gage shall be installed to show the pressure drop across the filters. This gage shall be marked to show the pressure drop at which the filters require cleaning or replacement. Filters shall be replaced or cleaned whenever the pressure drop across them becomes excessive or whenever the air flow through the face of the booth falls below that specified in Table G-10.

1910.94(c)(7)(iv) -

1910.94(c)(7)(iv)(a) Means for heating make-up air to any spray booth or room, before or at the time spraying is normally performed, shall be provided in all places where the outdoor temperature may be expected to remain below 55 deg. F. for appreciable periods of time during the operation of the booth except where adequate and safe means of radiant heating for all operating personnel affected is provided. The replacement air during the heating seasons shall be maintained at not less than 65 deg. F. at the point of entry into the spray booth or spray room. When otherwise unheated make-up air would be at a temperature of more than 10 deg. F. below room temperature, its temperature shall be regulated as provided in section 3.6.3 of ANSI Z9.2-1960.

1910.94(c)(7)(iv)(b) As an alternative to an air replacement system complying with the preceding section, general heating of the building in which the spray room or booth is located may be employed provided that all occupied parts of the building are maintained at not less than 65 deg. F. when the exhaust system is in operation or the general heating system supplemented by other sources of heat may be employed to meet this requirement.

1910.94(c)(7)(iv)(c) No means of heating make-up air shall be located in a spray booth.

1910.94(c)(7)(iv)(d) Where make-up air is heated by coal or oil, the products of combustion shall not be allowed to mix with the make-up air, and the products of combustion shall be conducted outside the building through a flue terminating at a point remote from all points where make-up air enters the building.

1910.94(c)(7)(iv)(e) Where make-up air is heated by gas, and the products of combustion are not mixed with the make-up air but are conducted through an independent flue to a point outside the building remote from all points where make-up air enters the building, it is not necessary to comply with paragraph (c)(7)(iv)(f) of this section.

1910.94(c)(7)(iv)(f) Where make-up air to any manually operated spray booth or room is heated by gas and the products of combustion are allowed to mix with the supply air, the following precautions must be taken:

1910.94(c)(7)(iv)(f)(1) The gas must have a distinctive and strong enough odor to warn workmen in a spray booth or room of its presence if in an unburned state in the make-up air.

1910.94(c)(7)(iv)(f)(2) The maximum rate of gas supply to the make-up air heater burners must not exceed that which would yield in excess of 200 p.p.m. (parts per million) of carbon monoxide or 2,000 p.p.m. of total combustible gases in the mixture if the unburned gas upon the occurrence of flame failure were mixed with all of the make-up air supplied.

1910.94(c)(7)(iv)(f)(3) A fan must be provided to deliver the mixture of heated air and products of combustion from the plenum chamber housing the gas burners to the spray booth or room.

1910.94(c)(8) Scope.

Spray booths or spray rooms are to be used to enclose or confine all spray finishing operations covered by this paragraph (c). This paragraph does not apply to the spraying of the exteriors of buildings, fixed tanks, or similar structures, nor to small portable spraying apparatus not used repeatedly in the same location.

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