



Spray Finishing Using Flammable and Combustible Materials -- OSHA Standard 1910.107¹

Carol J. Lehtola, Charles M. Brown, and William J. Becker²

The Impact of Safety on Florida Agriculture

Florida agriculture, including forestry and fishing, made an annual economic impact of \$53 billion in 1998. More than 81,000 people work on the 40,000 farms in the state, and more than 50,000 are employed in other activities related to agriculture. The state's agricultural enterprises range from large citrus, vegetable and cattle operations to small family-operated farms.

From 1989 to 1998, there were approximately 240 deaths related to agriculture in Florida, according to data compiled by the Deep South Center for Agricultural Health and Safety. In addition, agriculture has one of the highest injury and death rates among U.S. industries.

Safety in Florida agriculture is challenging because:

- the state's agricultural enterprises are diverse,
- safety knowledge among workers varies,

- manual labor is used extensively,
- the climate creates year-round heat stress.

Therefore, it is vital to assist the public in learning about OSHA documents related to agriculture. More related information is available at the following Web sites:

Florida AgSafe: <<http://www.flagsafe.ufl.edu>>

OSHA Regulations:
<<http://www.osha.gov/comp-links.html>>

Overview

This document, a condensation of Section 1910.107 of the Occupational Safety and Health Act (29 CFR), is not intended to be totally inclusive but rather to highlight the information and requirements in the complete OSHA standard that owners and managers of agricultural businesses should understand. Refer to the OSHA Web site given above for the complete standard and for court interpretations of the standard.

1. This document is AE269, one of a series of the Agricultural and Biological Engineering Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date August 4, 2000. Reviewed February 2008. Visit the EDIS Web Site at <http://edis.ifas.ufl.edu>.

2. Carol J. Lehtola, assistant professor and Extension Safety Specialist; Charles M. Brown, coordinator information/publication services; William J. Becker, professor emeritus; Department of Agricultural and Biological Engineering, Institute of Food and Agricultural Sciences, University of Florida, Gainesville.

Contents of OSHA Standard 1910.107

- Section 1910.107(a) -- Definitions Applicable to This Standard
- Section 1910.107(b) -- Spray Booths
- Section 1910.107(c) -- Electrical and Other Sources of Ignition
- Section 1910.107(d) -- Ventilation
- Section 1910.107(e) -- Flammable and Combustible Liquids: Storage and Handling
- Section 1910.107(f) -- Protection
- Section 1910.107(g) -- Operations and Maintenance
- Section 1910.107(h) -- Fixed Electrostatic Apparatus
- Section 1910.107(i) -- Electrostatic Hand Spraying Equipment
- Section 1910.107(j) -- Drying, Curing, or Fusion Apparatus
- Section 1910.107(k) -- Automobile Undercoating in Garages
- Section 1910.107(l) -- Powder Coating
- Section 1910.107(m) -- Organic Peroxides and Dual Component Coatings
- Section 1910.107(n) -- Scope

NOTE: Some sections of OSHA standards are labeled "Reserved." This label implies either that information has been deleted from the previous version of the standard or that additions to the standard are anticipated. Because standards often reference other standards, it is important that paragraph numbers remain consistent.

Section 1910.107(a) -- Definitions Applicable to This Standard

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.

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.

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.

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.

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:

- 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
- overspray dry filters to minimize dusts; or
- overspray dry filters to minimize dusts or residues entering exhaust ducts; or
- overspray dry filter rolls designed to minimize dusts or residues entering exhaust ducts; or
- where dry powders are being sprayed, with powder collection systems so arranged in the exhaust to capture oversprayed material.

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.

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.

Approved -- Shall mean approved and listed by a nationally recognized testing laboratory. Refer to 1910.7 for definition of nationally recognized testing laboratory.

Listed -- See "Approved" above.

Section 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:

(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.

(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.

(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.

(iv) -- Space within the spray booth on the downstream and upstream sides of filters shall be protected with approved automatic sprinklers.

(v) -- Filters or filter rolls shall not be used when applying a spray material known to be highly susceptible to spontaneous heating and ignition.

(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.

Section 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:

(i) -- Electrostatic apparatus shall conform to the requirements of paragraphs (h) and (i) of this section;

(ii) -- Drying, curing, and fusion apparatus shall conform to the requirements of paragraph (j) of this section;

(iii) -- Automobile undercoating spray operations in garages shall conform to the requirements of paragraph (k) of this section;

(iv) -- Powder coating equipment shall conform to the requirements of paragraph (c)(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, steam pipes, 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.

(i) -- All metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids shall be properly electrically grounded in an effective and permanent manner.

(ii) -- [Reserved]

Section 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.

(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.

(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.

Section 1910.107(e) -- Flammable and Combustible Liquids: Storage and Handling

1910.107(e)(1) -- Conformance. The storage of flammable or combustible liquids in connection with spraying operations shall conform to the requirements of 1910.106, where applicable.

1910.107(e)(2) -- Quantity. The quantity of flammable or combustible liquids 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 or combustible liquids 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 or combustible liquids 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 and combustible liquids from containers having a capacity of greater than 60 gallons shall be by approved pumps. The withdrawal of flammable or combustible liquids 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.

(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.

(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.

(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.

(iv) -- Piping systems conveying flammable or combustible liquids 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 or combustible liquids 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 or combustible liquids are transferred from one container to another, both containers shall be effectively bonded and grounded to prevent discharge sparks of static electricity.

Section 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.

Section 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.

Section 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:

- (i) -- Stoppage of ventilating fans or failure of ventilating equipment from any cause.
- (ii) -- Stoppage of the conveyor carrying goods through the high voltage field.
- (iii) -- Occurrence of a ground or of an imminent ground at any point on the high voltage
- (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.

Section 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.

Section 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 Sec. 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:

- (i) -- Thoroughly ventilate the drying space before the heating system can be started;
- (ii) -- Maintain a safe atmosphere at any source of ignition;
- (iii) -- Automatically shut down the heating system in the event of failure of the 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:

- (i) -- Interior (especially floors) of spray enclosures shall be kept free of overspray
- (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.
- (iii) -- The spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure shall be equipped with suitable interlocks so arranged that:
 - (a) -- The spraying apparatus cannot be operated while the drying apparatus is inside the spray enclosure.
 - (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.
 - (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.
- (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.
- (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.

Section 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.

Section 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

(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.

(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

(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.

(ii) -- Surfaces shall be cleaned in such manner as to avoid scattering dust to other places or creating dust clouds.

(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

(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.

(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.

(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.

(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.

(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.

Section 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.

Section 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.