SECTION 1504 SPRAY FINISHING

1504.1 General.

The application of flammable or combustible liquids by means of spray apparatus in continuous or intermittent processes shall be in accordance with the requirements of Sections 1503 and 1504.

1504.2 Location of spray-finishing operations.

Spray finishing operations conducted in buildings used for Group A, E, I or R occupancies shall be located in a spray room protected with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 and separated vertically and horizontally from other areas in accordance with the *International Building Code*. In other occupancies, spray-finishing operations shall be conducted in a spray room, spray booth or spraying space approved for such use.

Exceptions:

- Automobile undercoating spray operations and spray-on automotive lining operations conducted in areas with approved natural or mechanical ventilation shall be exempt from the provisions of Section 1504 when approved and where utilizing Class IIIA or IIIB combustible liquids.
- 2. In buildings other than Group A, E, I or R occupancies, approved limited spraying space in accordance with Section 1504.9.
- 3. Resin application areas used for manufacturing of reinforced plastics complying with Section 1509 shall not be required to be located in a spray room, spray booth or spraying space.

1504.3 Design and construction.

Design and construction of spray rooms, spray booths and spray spaces shall be in accordance with Sections 1504.3 through 1504.3.3.1.

1504.3.1 Spray rooms.

Spray rooms shall be constructed and designed in accordance with this section and the *International Building Code*, and shall comply with Sections 1504.4 through 1504.8.

1504.3.1.1 Floor.

Combustible floor construction in spray rooms shall be covered by approved, noncombustible, nonsparking material, except where combustible coverings, including but not limited to thin paper or plastic and strippable coatings, are utilized over

noncombustible materials to facilitate cleaning operations in spray rooms.

1504.3.2 Spray booths.

The design and construction of spray booths shall be in accordance with Sections 1504.3.2.1 through 1504.3.2.6, Sections 1504.4 through 1504.8 and NFPA 33.

1504.3.2.1 Construction.

Spray booths shall be constructed of approved noncombustible materials. Aluminum shall not be used. Where walls or ceiling assemblies are constructed of sheet metal, single-skin assemblies shall be no thinner than 0.0478 inch (18 gage) (1.2 mm) and each sheet of double-skin assemblies shall be no thinner than 0.0359 inch (20 gage) (0.9 mm). Structural sections of spray booths are allowed to be sealed with latex-based or similar caulks and sealants.

1504.3.2.2 Surfaces.

The interior surfaces of spray booths shall be smooth; shall be constructed so as to permit the free passage of exhaust air from all parts of the interior, and to facilitate washing and cleaning; and shall be designed to confine residues within the booth. Aluminum shall not be used.

1504.3.2.3 Floor.

Combustible floor construction in spray booths shall be covered by approved, noncombustible, nonsparking material, except where combustible coverings, including but not limited to thin paper or plastic and strippable coatings, are utilized over noncombustible materials to facilitate cleaning operations in spray booths.

1504.3.2.4 Means of egress.

Means of egress shall be provided in accordance with Chapter 10.

Exception: Means of egress doors from premanufactured spray booths shall not be less than 30 inches (762 mm) in width by 80 inches (2032 mm) in height.

1504.3.2.5 Clear space.

Spray booths shall be installed so that all parts of the booth are readily accessible for cleaning. A clear space of not less than 3 feet (914 mm) shall be maintained on all sides of the spray booth. This clear space shall be kept free of any storage or combustible construction.

Exceptions:

1. This requirement shall not prohibit locating a spray booth closer than 3 feet (914 mm) to or directly against an interior partition, wall or floor/ceiling assembly that has a fire-resistance rating of not less than 1 hour, provided

the spray booth can be adequately maintained and cleaned.

2. This requirement shall not prohibit locating a spray booth closer than 3 feet (914 mm) to an exterior wall or a roof assembly, provided the wall or roof is constructed of noncombustible material and the spray booth can be adequately maintained and cleaned.

1504.3.2.6 Size.

The aggregate area of spray booths in a building shall not exceed the lesser of 10 percent of the area of any floor of a building or the basic area allowed for a Group H-2 occupancy without area increases, as set forth in the *International Building Code*. The area of an individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1,500 square feet (139 m²).

Exception: One individual booth not exceeding 500 square feet (46 m²).

1504.3.3 Spraying spaces.

Spraying spaces shall be designed and constructed in accordance with the *International Building Code* and Sections 1504.3.3.1 and 1504.4 and through 1504.8 of this code.

1504.3.3.1 Floor.

Combustible floor construction in spraying spaces shall be covered by approved, noncombustible nonsparking material, except where combustible coverings, such as thin paper or plastic and strippable coatings, are utilized over noncombustible materials to facilitate cleaning operations in spraying spaces.

1504.4 Fire protection.

Spray booths and spray rooms shall be protected by an approved automatic fire-extinguishing system complying with Chapter 9. Protection shall also extend to exhaust plenums, exhaust ducts and both sides of dry filters when such filters are used.

1504.4.1 Fire extinguishers.

Portable fire extinguishers complying with Section 906 shall be provided for spraying areas in accordance with the requirements for an extra (high) hazard occupancy.

1504.5 Housekeeping, maintenance and storage of hazardous materials.

Housekeeping, maintenance, storage and use of hazardous materials shall be in accordance with Sections 1503.3, 1503.4, 1504.5.1 and 1504.5.2.

1504.5.1 Different coatings.

Spray booths, spray rooms and spraying spaces shall not be alternately utilized for different types of coating materials where the combination of materials is conducive to spontaneous ignition, unless all deposits of one material are removed from the booth, room or space and

exhaust ducts prior to spraying with a different material.

1504.5.2 Protection of sprinklers.

Automatic sprinklers installed in flammable vapor areas shall be protected from the accumulation of residue from spraying operations in an approved manner. Bags used as a protective covering shall be 0.003-inch-thick (0.076 mm) polyethylene or cellophane or shall be thin paper. Automatic sprinklers contaminated by overspray particles shall be replaced with new automatic sprinklers.

1504.6 Sources of ignition.

Control of sources of ignition shall be in accordance with Sections 1503.2 and 1504.6.1 through 1504.6.2.4.

1504.6.1 Drying operations.

Spray booths and spray rooms shall not be alternately used for the purpose of drying by arrangements or methods that could cause an increase in the surface temperature of the spray booth or spray room except in accordance with Sections 1504.6.1.1 and 1504.6.1.2. Except as specifically provided in this section, drying or baking units utilizing a heating system having open flames or that are capable of producing sparks shall not be installed in a flammable vapor areas.

1504.6.1.1 Spraying procedure.

The spraying procedure shall use low-volume spray application.

1504.6.1.2 Drying apparatus.

Fixed drying apparatus shall comply with this chapter and the applicable provisions of Chapter 21. When recirculation ventilation is provided in accordance with Section 1504.7.2, the heating system shall not be within the recirculation air path.

1504.6.1.2.1 Interlocks.

The spraying apparatus, drying apparatus and ventilating system for the spray booth or spray room shall be equipped with interlocks arranged to:

- 1. Prevent operation of the spraying apparatus while drying operations are in progress.
- 2. Purge spray vapors from the spray booth or spray room for a period of not less than 3 minutes before the drying apparatus is rendered operable.
- 3. Have the ventilating system maintain a safe atmosphere within the spray booth or spray room during the drying process and automatically shut off drying apparatus in the event of a failure of the ventilating system.
- 4. Shut off the drying apparatus automatically if the air temperature within the

booth exceeds 200°F (93°C).

1504.6.1.2.2 Portable infrared apparatus.

When a portable infrared drying apparatus is used, electrical wiring and portable infrared drying equipment shall comply with the ICC *Electrical Code*. Electrical equipment located within 18 inches (457 mm) of floor level shall be approved for Class I, Division 2 hazardous locations. Metallic parts of drying apparatus shall be electrically bonded and grounded. During spraying operations, portable drying apparatus and electrical connections and wiring thereto shall not be located within spray booths, spray rooms or other areas where spray residue would be deposited thereon.

1504.6.2 Illumination.

Where spraying spaces, spray rooms or spray booths are illuminated through glass panels or other transparent materials, only fixed luminaires shall be utilized as a source of illumination.

1504.6.2.1 Glass panels.

Panels for luminaires or for observation shall be of heat-treated glass, wired glass or hammered wire glass and shall be sealed to confine vapors, mists, residues, dusts and deposits to the flammable vapor area. Panels for luminaires shall be separated from the luminaire to prevent the surface temperature of the panel from exceeding 200°F (93°C).

1504.6.2.2 Exterior luminaires.

Luminaires attached to the walls or ceilings of a flammable vapor area, but outside of any classified area and separated from the flammable vapor areas by vapor-tight glass panels, shall be suitable for use in ordinary hazard locations. Such luminaires shall be serviced from outside the flammable vapor areas.

1504.6.2.3 Integral luminaires.

Luminaires that are an integral part of the walls or ceiling of a flammable vapor area are allowed to be separated from the flammable vapor area by glass panels that are an integral part of the luminaire. Such luminaires shall be listed for use in Class I, Division 2 or Class II, Division 2 locations, whichever is applicable, and also shall be suitable for accumulations of deposits of combustible residues. Such luminaires are allowed to be serviced from inside the flammable vapor area.

1504.6.2.4 Portable electric lamps.

Portable electric lamps shall not be used in flammable vapor areas during spraying operations. Portable electric lamps used during cleaning or repairing operations shall be of a type approved for hazardous locations.

1504.7 Ventilation.

Mechanical ventilation of flammable vapor areas shall be provided in accordance with Section 510 of the *International Mechanical Code*.

1504.7.1 Operation.

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 finishing material residue to be exhausted. Spraying equipment shall be interlocked with the ventilation of the flammable vapor areas such that spraying operations cannot be conducted unless the ventilation system is in operation.

1504.7.2 Recirculation.

Air exhausted from spraying operations shall not be recirculated.

Exceptions:

- 1. Air exhausted from spraying operations is allowed to be recirculated as makeup air for unmanned spray operations, provided that:
 - 1.1. The solid particulate has been removed.
 - 1.2. The vapor concentration is less than 25 percent of the LFL.
 - 1.3. Approved equipment is used to monitor the vapor concentration.
 - 1.4. When the vapor concentration exceeds 25 percent of the LFL, the following shall occur:
 - a. An alarm shall sound; and
 - b. Spray operations shall automatically shut down.
 - 1.5. In the event of shutdown of the vapor concentration monitor, 100 percent of the air volume specified in Section 510 of the *International Mechanical Code* is automatically exhausted.
- 2. Air exhausted from spraying operations is allowed to be recirculated as makeup air to manned spraying operations where all of the conditions provided in Exception 1 are included in the installation and documents have been prepared to show that the installation does not pose a life safety hazard to personnel inside the spray booth, spraying space or spray room.

1504.7.3 Air velocity.

Ventilation systems shall be designed, installed and maintained such that the average air velocity over the open face of the booth, or booth cross section in the direction of airflow

during spraying operations, shall not be less than 100 feet per minute (0.51 m/s).

1504.7.4 Ventilation obstruction.

Articles being sprayed shall be positioned in a manner that does not obstruct collection of overspray.

1504.7.5 Independent ducts.

Each spray booth and spray room shall have an independent exhaust duct system discharging to the outside.

Exceptions:

- 1. Multiple spray booths having a combined frontal area of 18 square feet (1.67 m²) or less are allowed to have a common exhaust when identical spray finishing material is used in each booth. If more than one fan serves one booth, fans shall be interconnected such that all fans will operate simultaneously.
- Where treatment of exhaust is necessary for air pollution control or for energy conservation, ducts shall be allowed to be manifolded if all of the following conditions are met:
 - 2.1. The sprayed materials used are compatible and will not react or cause ignition of the residue in the ducts.
 - 2.2. Nitrocellulose-based finishing material shall not be used.
 - 2.3. A filtering system shall be provided to reduce the amount of overspray carried into the duct manifold.
 - 2.4. Automatic sprinkler protection shall be provided at the junction of each booth exhaust with the manifold, in addition to the protection required by this chapter.

1504.7.6 Termination point.

The termination point for exhaust ducts discharging to the atmosphere shall not be less than the following distances:

- 1. Ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from the property line; 10 feet (3048 mm) from openings into the building; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls or openings into the building that are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.
- 2. Other product-conveying outlets: 10 feet (3048 mm) from the property line; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from openings into the

building; 10 feet (3048 mm) above adjoining grade.

1504.7.7 Fan motors and belts.

Electric motors driving exhaust fans shall not be placed inside booths or ducts. Fan rotating elements shall be nonferrous or nonsparking or the casing shall consist of, or be lined with, such material. Belts shall not enter the duct or booth unless the belt and pulley within the duct are tightly enclosed.

1504.7.8 Filters.

Air intake filters that are part of a wall or ceiling assembly shall be listed as Class I or II in accordance with UL 900. Exhaust filters shall be required.

1504.7.8.1 Supports.

Supports and holders for filters shall be constructed of noncombustible materials.

1504.7.8.2 Attachment.

Overspray collection filters shall be readily removable and accessible for cleaning or replacement.

1504.7.8.3 Maintaining air velocity.

Visible gauges, audible alarms or pressure-activated devices shall be installed to indicate or ensure that the required air velocity is maintained.

1504.7.8.4 Filter rolls.

Spray booths equipped with a filter roll that is automatically advanced when the air velocity is reduced to less than 100 feet per minute (0.51 m/s) shall be arranged to shut down the spraying operation if the filter roll fails to advance automatically.

1504.7.8.5 Filter disposal.

Discarded filter pads shall be immediately removed to a safe, detached location or placed in a noncombustible container with a tight-fitting lid and disposed of properly.

1504.7.8.6 Spontaneous ignition.

Spray booths using dry filters shall not be used for spraying materials that are highly susceptible to spontaneous heating and ignition. Filters shall be changed prior to spraying materials that could react with other materials previously collected. An example of a potentially reactive combination includes lacquer when combined with varnishes, stains or primers.

1504.7.8.7 Waterwash spray booths.

Waterwash spray booths shall be of an approved design so as to prevent excessive

accumulation of deposits in ducts and residue at duct outlets. Such booths shall be arranged so that air and overspray are drawn through a continuously flowing water curtain before entering an exhaust duct to the building exterior.

1504.8 Interlocks.

Interlocks for spray application finishes shall be in accordance with Sections 1504.8 through 1504.8.2.

1504.8.1 Automated spray application operations.

Where protecting automated spray application operations, automatic fire-extinguishing systems shall be equipped with an approved interlock feature that will, upon discharge of the system, automatically stop the spraying operations and workpiece conveyors into and out of the flammable vapor areas. Where the building is equipped with a fire alarm system, discharge of the automatic fire-extinguishing system shall also activate the building alarm notification appliances.

1504.8.1.1 Alarm station.

A manual fire alarm and emergency system shutdown station shall be installed to serve each flammable vapor area. When activated, the station shall accomplish the functions indicated in Section 1504.8.1.

1504.8.1.2 Alarm station location.

At least one manual fire alarm and emergency system shutdown station shall be readily accessible to operating personnel. Where access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an exit from the area.

1504.8.2 Ventilation interlock prohibited.

Air makeup and flammable vapor area exhaust systems shall not be interlocked with the fire alarm system and shall remain in operation during a fire alarm condition.

Exception: Where the type of fire-extinguishing system used requires such ventilation to be discontinued, air makeup and exhaust systems shall shut down and dampers shall close.

1504.9 Limited spraying spaces.

Limited spraying spaces shall comply with Sections 1504.9.1 through 1504.9.4.

1504.9.1 Job size.

The aggregate surface area to be sprayed shall not exceed 9 square feet (0.84 m²).

1504.9.2 Frequency.

Spraying operations shall not be of a continuous nature.

1504.9.3 Ventilation.

Positive mechanical ventilation providing a minimum of six complete air changes per hour shall be installed. Such system shall meet the requirements of this code for handling flammable vapor areas. Explosion venting is not required.

1504.9.4 Electrical wiring.

Electrical wiring within 10 feet (3048 mm) of the floor and 20 feet (6096 mm) horizontally of the limited spraying space shall be designed for Class I, Division 2 locations in accordance with the ICC *Electrical Code*.