



Fire Department

HEADQUARTERS

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CODE SUMMARY

PERMITS - FLAMMABLE FINISHES SPRAYING/DIPPING OPERATIONS

A code summary is a compilation of code sections related to a specific occupancy or permit. This code summary lists sections of code pertaining to occupancies and operations as defined by the **California Fire Code**. Under each heading you will find the correlating code language and the reference cited. These requirements pertain to existing buildings. New construction may be subject to additional requirements. Please feel free to direct any questions to the Fire Prevention Division at (805) 681-5500.

SCOPE:

This guideline is applicable to any location or area where the following activities are conducted, per CFC Chapter 24:

1. Application of flammable or combustible paint, varnish, lacquer, stain, fiberglass resins or other flammable or combustible liquid applied by means of spray apparatus in continuous or intermittent processes.
2. Dip-tank operations in which articles or materials are passed through contents of tanks, vats or containers of flammable or combustible liquids, including coating, finishing, treatment and similar processes.
3. Application of combustible powders when applied by powder spray guns, electrostatic powder spray guns, fluidized beds or electrostatic fluidized beds.
4. Floor surfacing or finishing operations in areas exceeding 350 s.f.
5. The application of dual-component coatings or Class I or II liquids when applied by brush or roller in quantities exceeding 1 gallon.
6. Spraying and dipping operations.

DEFINITIONS:

Spray Booth: A spray booth is a mechanically-ventilated appliance of varying dimensions and construction provided to enclose or accommodate a spraying operation and to confine and limit the escape of spray vapor and residue and to exhaust it safely.

Spray Room: A room designed to accommodate spraying operations constructed in accordance with the California Building Code and separated from the remainder of the building by a minimum 1-hr fire barrier.

Spraying Space: An area in which dangerous quantities of flammable vapors or combustible residues, dusts or deposits are present due to the operation of spraying processes. The fire code official is authorized to define the limits of the spraying space in any specific case.

PERMITS:

A permit is required for spraying or dipping operations utilizing flammable or combustible liquids, or the application of combustible powders regulated by CFC Chapter 24. A construction permit is required to install or modify a spray room, dip tank or booth. Prior to issuance of this permit or a building permit, plans that detail compliance with the applicable codes must be submitted for review and approval. Plan review and inspection services are provided on a fee-for-service basis. A permit to operate is issued after the booth has been installed and inspected. The permit for spraying and/or dipping is reissued annually. The permit for use of flammable and/or combustible liquids and hazardous materials is reissued annually.

1. Electrical wiring and equipment shall be in accordance with CFC 2403.2.1 and California Electrical Code.

- A. Electrical wiring and equipment in flammable vapor areas or drying operations shall be of an explosion proof type approved for use in such hazardous locations. Such areas shall be considered to be Class 1, Division 1 or Class 2, Division 1 hazardous locations in accordance with the *California Electrical Code*. (CFC 2403.2.1.1)
- B. Electrical equipment and wiring that is subject to dripping or splashing of flammable liquid, or subject to deposits of combustible residues shall be listed for such exposure and shall be installed as required for hazardous (classified) locations. (CFC 2403.2.1.2)
- C. Electrical equipment and wiring located outside of, but within 5 feet horizontally and 3 feet vertically of openings in a spray booth or a spray room, shall be approved for Class 1, Division 2 or Class 2, division 2 hazardous locations, whichever is applicable. (CFC 2403.2.1.3)

2. Sources of ignition shall be controlled.

- A. Open flames and spark-producing devices shall not be located in flammable vapor areas and shall not be located within 20 feet of such areas unless separated by a permanent partition. (CFC 2304.2.2)
- B. Heated surfaces having a temperature sufficient to ignite vapors shall not be located in flammable vapor areas. (2403.2.3)
- C. Metal parts of spray booths, exhaust ducts and piping systems conveying Class 1 or Class 2 liquids shall be electrically grounded. (CFC 2403.2.5)
- D. Smoking shall be prohibited in flammable vapor areas and hazardous materials storage rooms associated with flammable finish processes. 'NO SMOKING' signs shall be conspicuously posted in such areas. (CFC 2403.2.6)
- E. Welding, cutting or other spark producing operations shall not be conducted in or adjacent to flammable vapor areas. 'NO WELDING' signs shall be conspicuously posted in such areas. (CFC 2403.2.7)

3. Locations of spray finishing operations.

- A. 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 and separated vertically and horizontally from other areas in accordance with the *California Building Code*. (CFC 2404.2)
- B. In other occupancies, spray-finishing operations shall be conducted in a spray room, spray booth or spraying space approved for such use. (CFC 2404.2)

4. Design and construction of spray rooms, spray booths and spray spaces shall be in accordance with CFC Sections 2404.3 through 2404.3.3.1.

- A. Spray rooms shall be constructed in accordance with the California Building Code. (CFC 2404.3.1)
- B. Combustible floor construction in spray rooms shall be covered by approved, noncombustible, non-sparking 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. (CFC 2404.3.1.1)
- C. Spray booths shall be constructed of approved noncombustible materials. Aluminum shall not be used. See CFC for sheet metal requirements. (CFC 2404.3.2.1)
- D. 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. (CFC 2404.3.2.2)
- E. Means of egress shall be provided in accordance with CBC Chapter 10. (CFC 2404.3.2.4)

Exception:

- 1. Means of egress doors from premanufactured booths shall not be less than 30 inches in width by 80 inches in height.

- F. All portions of spray booths shall be readily available for cleaning, and a clear space of not less than 3 feet shall be kept free of storage or combustible materials. (CFC 2404.3.2.5)

Exceptions:

1. This requirement shall not prohibit locating a spray booth closer than 3 feet 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 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.
- G. The aggregate area of spray booths in a building shall not exceed the lesser of 10% 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 California Building Code. The area of any individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1500 square feet. An allowable exception to these limitations is a single, individual booth not exceeding 500 square feet. (CFC 2404.3.2.6)
- H. Electrical wiring and equipment shall comply with CFC Chapter 15 and the California Electrical Code. (CFC 2403.2.1)
- I. Electrical wiring and equipment in flammable vapor area shall be of an explosion-proof type approved for use in such hazardous locations. Such areas shall be considered to be Class I, Division 1 or Class II, Division 1 hazardous locations in accordance with the California Electrical Code. (NEC). (CFC 2403.2.1.1)
- J. Open flames and spark-producing devices shall not be located in flammable vapor areas and shall not be located within 20 feet of such areas unless separated by a permanent partition. (CFC 2403.2.2)

5. FIRE protection required for spray rooms and spray booths.

Spray booths and spraying rooms shall be protected by approved automatic fire extinguishing systems complying with CFC Chapter 9. Protection shall also extend to exhaust plenums, exhaust ducts and both sides of dry filters when filters are used. (CFC 2404.4)

- A. Portable fire extinguishers complying with CFC Section 906 shall be provided for spraying areas in accordance with the requirements for an extra (high) hazard occupancy. (CFC 2404.4.1)
- B. 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 protective covering shall be 0.0003-inch thick polyethylene or cellophane or thin paper. (CFC 2404.5.2)

6. Drying operations requirements:

- A. 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 CFC 2404.6.1.1 and 2404.6.1.2.
 1. The spraying procedure shall use a low-volume spray application (CFC 2404.6.1.1)
 2. Fixed drying apparatus shall comply with the applicable provisions of CFC Chapter 30. When recirculation ventilation is provided in accordance with CFC 2404.7.2, the heating system shall not be within the recirculation path. (CFC 2404.6.1.2)
 - 2.1. The spraying apparatus, drying apparatus and ventilating system for the spray booth or spray room shall be equipped with interlocks arranged to:
 - 2.1.1 Prevent operation of the spraying apparatus while drying operations are in progress,
 - 2.1.2 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.
 - 2.1.3 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,
 - 2.1.4 Shut off the drying apparatus automatically if the air temperature within the booth exceeds 200° F.

7. Illumination requirements:

- A. 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. (CFC 2406.2)
 - 1. 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. (CFC 2404.6.2.1)
 - 2. 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. (CFC 2404.6.2.2)
 - 3. 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 1, 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. (CFC 2404.6.2.3)
 - 4. Portable electric lamps shall not be used in flammable vapor areas during spraying operations. Portable electric lamps used during cleaning or repair operations shall be of a type approved for hazardous locations. (CFC 2404.6.2.4)

Ventilation requirements:

- A. Mechanical ventilation of flammable vapor areas shall be provided in accordance with Section 510 of the California Mechanical Code. (CFC 2404.7)
- B. 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. (CFC 2404.7.1)
- C. Air shall not be re-circulated. (CFC 2404.7.2)
 - 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 % of the LFL,
 - 1.3 Approved equipment is used to monitor the vapor concentration,
 - 1.4 When the vapor concentration exceeds 25% of the LFL, the following shall occur:
 - a. An alarm shall sound; and
 - b. Spraying operations shall automatically shut down.
 - 1.5 In the event of shutdown of the vapor concentration monitor, 100% of the air volume specified in the California 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 of spray room.
- D. 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 air flow during spraying operations, shall not be less than 100 ft. per minute. (CFC 2404.7.3)
- E. Each spray booth shall have an independent exhaust system discharging to the outside. (CFC 2404.7.5)
 - Exceptions:
 - 1. Multiple spray booths having a combined frontal area of 18 square feet 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.

2. 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 CFC Chapter 15.
- F. The termination point for exhaust ducts discharging to the atmosphere shall not be less than the following distances: (CFC 2404.7.6)
 1. Ducts conveying explosive or flammable vapors, fumes or dusts; 30' from property line; 10' from openings into the building; 6' from exterior walls and roofs; 30' from combustible walls or openings into the building which are in the direction of exhaust discharge; 10' above adjoining grade.
 2. Other product conveying outlets: 10' from property line; 3' from exterior wall and roofs; 10' from openings into the building; 10' above adjoining grade.
- G. Electric motors driving exhaust fans shall not be placed inside booths or ducts. Fan rotating elements shall be nonferrous or non-sparking or the casing shall consist of, or be lined with, such material. Belts shall not enter duct or booth unless the belt and pulley within the duct are tightly enclosed. (CFC 2404.7.7)

Spray booths using dry filters:

- A. Spray booths equipped with a filter roll which automatically advances when the air velocity is less than 100 feet per minute shall be arranged to shut down the spraying operation if the filter roll fails to advance automatically. (CFC 2404.7.8.4)
- B. Visible gauges, audible alarms or pressure activated devices shall be installed to indicate or ensure that the required air velocity is maintained. (CFC 2404.7.8.3).
- C. 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. (CFC 2404.7.8.5)
- D. Articles being sprayed shall be positioned in a manner that does not obstruct collection of overspray. (CFC 2404.7.4)
- E. Spray booths using dry filters shall not be used for spraying materials that are known to be 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. (CFC 2404.7.8.6)

Storage, use, and handling of flammable and combustible liquids:

- A. The storage, use and handling of flammable and combustible liquids shall be in accordance with CFC 2403.3 and CFC Chapter 57.
- B. Containers supplying spray nozzles shall be of a closed type or provided with metal covers which are kept closed. Containers not resting on floors shall be on noncombustible supports or suspended by wire cables. Containers supplying spray nozzles by gravity flow shall not exceed 10 gallons capacity. (CFC 2403.3.1)
- C. Containers and piping to which a hose or flexible connection is attached shall be provided with a shutoff valve at the connection. Such valves shall be kept closed when hoses are not in use. (CFC 2403.3.2)
- D. Where flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, pump discharge lines shall be equipped with an approved relief valve discharging to pump suction or a safe detached location. (CFC 2403.3.3)
- E. Where a flammable mixture is transferred from one portable container to another, a bond shall be provided between the two containers. At least one container shall be grounded. Piping systems for Class I and Class II liquids shall be permanently grounded. (CFC 2403.3.4)

- F. Cleaning machines for spray guns and equipment shall not be located in areas open to the public and shall be separated from ignition sources in accordance with their listings, or by a distance of 3', whichever is greater. The quantity of solvent used in a machine shall not exceed the design capacity of the machine. (CFC 2403.3.5.1)
- G. When solvents are used for cleaning spray nozzles-and auxiliary equipment within spray booths and spray rooms, the ventilating equipment shall be operated during cleaning. (CFC 2403.3.5.2)
- H. Solvents used outside of spray booths, spray rooms or listed and approved spray gun and equipment cleaning machines shall be restricted to Class II and III liquids. (CFC 2403.3.6)
- I. Approved metal waste cans equipped with self-closing lids shall be provided wherever rags or waste are impregnated with finishing material. Such rags and waste shall be deposited therein immediately after being utilized. The contents of waste cans shall be properly disposed of at least once daily and at the end of each shift. (CFC 2403.4.3)