

**Carlsbad Fire Department
Fire Prevention Bureau**

Guideline for Spray Booth Operations



Approved and Authorized By:

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PURPOSE

The intent of this guideline is to provide the information necessary to ensure that the design and installation of spray booths will comply with the applicable provisions of the 2019 California Fire Code (CFC), 2019 California Building Code (CBC), 2019 California Electrical Code (CEC), 2019 California Mechanical Code (CMC), and 2016 NFPA 33 as adopted by the State of California, and locally adopted ordinances enforced by the City of Carlsbad, Office of the Fire Marshal (CFD).

SCOPE

This guideline is applicable to any spray booth in which spraying operations utilizing flammable or combustible liquids and combustible powders are conducted per CFC and NFPA 33.

SUBMITTAL REQUIREMENTS

1. General Requirements

- A. new plan submittals and revisions will consist of 3 plan hard copies. Plans and the appropriate equipment data sheets for the spray booth(s) shall be reviewed and approved by CFD prior to installation. These plans shall be drawn with all dimensions identified or drawn to scale, and they must demonstrate compliance with the CFC, CBC, and the provisions in this guideline.
- B. An approved Chemical Classification Packet shall be required prior to plan approval of any equipment utilizing flammable and/or combustible liquids. The storage, use, and handling of flammable and combustible liquids shall be in accordance with CFC Chapter 57. A chemical inventory shall be provided for CFD review. Follow the requirements contained in the CFD "Chemical Classification Packet" guideline. CFC 2403.3
- C. Plans for the extinguishing system required in the booth rooms shall be submitted by a licensed fire protection contractor (C-16 license) responsible for the work. Spray Booth plans shall be approved prior submittal of the extinguishing system CFC 2404.4
- D. Following the plan review process, contact the CFD Inspection Scheduling office at 760-602-4660 to request an inspection to verify compliance with the approved plans, codes, and standards and to witness testing of any chemical-based fire extinguishing system.

2. Additional Requirements

- A. Spray booths shall be substantially constructed of steel not less than 0.0478 inches (18 gauge) in thickness or other approved noncombustible material. CFC 2404.3.3.1

- B. The aggregate area of spray booths in a building shall not exceed the lesser of 10% of the area of any floor of the building or the basic area allowed for a Group H, Division 2 occupancy, without area increases, as set forth in CFC 2404.3.3.6.
- C. The area of any individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1500 square feet. CFC 2404.3.3.6
- D. Spray booths shall be separated from other operations by not less than three feet, by a wall or partition, or by a greater distance as required by the Fire Chief when specific conditions are defined. CFC 2404.3.3.5.
- E. For spray application operations conducted in an open-face or open-front spray booth, the ventilation system shall be designed, installed and maintained so that the average air velocity into the spray booth through all openings is not less than 100 feet per minute (0.51 in/s).
- F. All portions of spray booths shall be readily available for cleaning, and a clear space of not less than three feet around the booth shall be kept free of storage or combustible materials. The space required for cleaning would no longer be required if the space adjacent to the wall or partition is sealed. CFC 2404.3.3.5.
 - a) Exit doors from pre-manufactured paint spray booths shall not be less than two feet six inches wide by six feet eight inches tall. CFC 2404.3.3.4.
 - b) Areas Subject to Overspray Deposits – Electrical equipment in spraying areas that is located such that deposits of combustible residues could readily accumulate shall be specifically approved for locations containing deposits of readily ignitable residue and explosive vapors. CFC 2403.2.1.4.
 - c) Areas Not Subject to Overspray Deposits – Electrical wiring and equipment not subject to deposits of combustible residues but located in a spraying area shall be of an explosion-proof type approved for use in a Class I, Division 1 hazardous located in accordance with the California Electrical Code (CEC). CFC 2403.2.1.2 and CEC
 - d) Electrical wiring, motors, and other equipment located outside of but within 20 feet of a spraying area and not separated from the spraying area by partitions shall not produce sparks under normal operating conditions. Such areas shall be considered a Class I, Division 2 hazardous in accordance with the CEC. CFC 2403.2.1 CEC Chapter 6 has been revised to recognize the Zone 21 and Zone 22 hazardous (classified) area classifications for combustible dusts. This correlates with NFPA 70®, National Electrical Code®, with respect to the latter’s recognition of Zones 21 and 22 for electrical systems.
 - i. Class I or Class II, Division 1 Locations
 - ii. All interior locations of spray booths and rooms except as specifically provided in Section 516-3(c) of the CEC for portable equipment.
 - iii. All interior portions of exhaust ducts.
 - iv. All areas in the direct path of spray operations.
 - v. Class I or Class II, Division 2 Locations
 - a) Locations measuring 5 feet horizontally and 3 feet vertically when the exhaust ventilation system is interlocked with the

- spray application equipment.
 - b) Locations measuring 10 feet horizontally and 3 feet vertically when the exhaust ventilation system is not interlocked with the spray application equipment.
 - c) Locations measuring 3 feet vertically above the booth and within 3 feet of other booth openings when spraying operations are conducted within an open-top spraying booth (Figure 2).
- vi. Zone 20. As defined in 506.5(B)(1) of NFPA70, National Electrical Code, a Zone 20 location shall be any location where one of the following conditions exists:
 - a) An ignitable concentration of combustible dust is present continuously.
 - b) An ignitable concentration of combustible dust is present for long periods of time.
 - c) Equipment is operated or processes are carried on of such a nature that equipment breakdown or faulty operations could result in the release of an ignitable concentration of combustible dust and also cause simultaneous failure of electrical equipment in a mode to cause the electrical equipment to become a source of ignition.
 - d) An ignitable concentration of combustible dust could be communicated from an adjacent Zone 20 location, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.
- vii. Zone 22. As defined in 506.5(B)(3) of NFPA70, National Electrical Code, a Zone 22 location shall be any location where one of the following conditions exists:
 - a) An ignitable concentration of combustible dust is not likely to occur in normal operation, and if it does occur, will only persist for a short period.
 - b) A combustible dust is handled, processed, or used, but the dust is normally confined within closed containers or closed systems from which it can escape only as a result of the abnormal operation of the equipment with which the dust is handled, processed, or used.
 - c) An ignitable concentration of combustible dust could be communicated from an adjacent Zone 21 location, unless communication is prevented by adequate positive pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

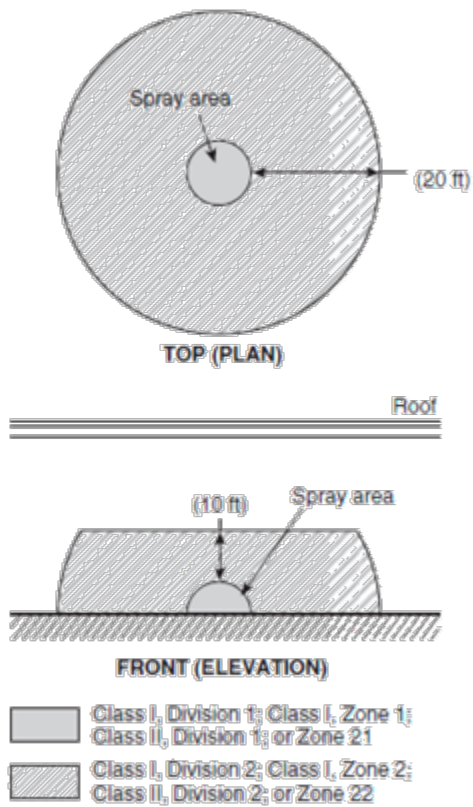


Figure 1

Electrical Area Classification for Unenclosed Spray Areas

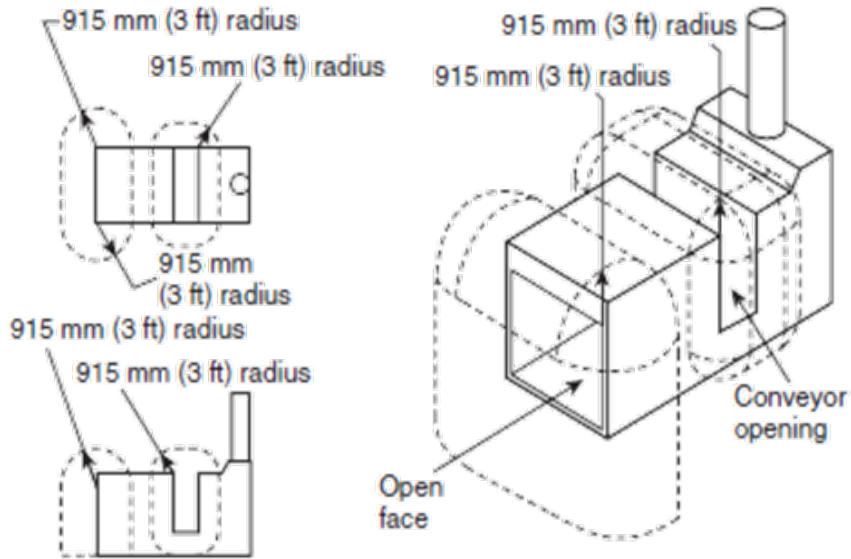


FIGURE 6.5.2 Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations Adjacent to an Open-Face or Open-Front Spray Booth or Spray Room.

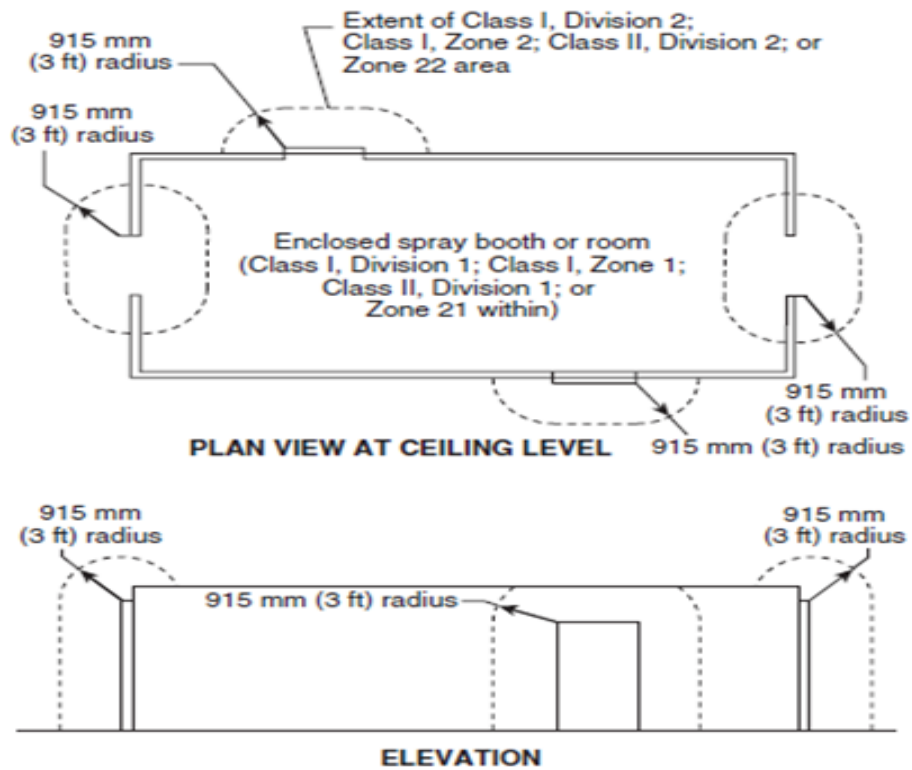


FIGURE 6.5.4 Class I, Division 2; Class I, Zone 2; Class II, Division 2; or Zone 22 Locations Adjacent to an Enclosed Spray Booth or Spray Room.

G. Ventilation

- a) Each spray booth shall have an independent exhaust system discharging to the building exterior. CFC 2404.7.5.
- b) Electric motors driving exhaust fans shall not be placed inside booths or ducts. Fan rotating elements shall be nonferrous or non-sparking or casings shall consist of or be lined with such material. Belts shall not enter ducts or booths unless belts and pulleys within a duct or booth are tightly enclosed. CFC 2404.7.7.
- c) Exhaust ducts shall be constructed of steel having a thickness in accordance with California Mechanical Code (CMC) Table 5-5.
- d) The termination point for exhaust ducts shall not be less than the distances shown in the following table.
- e) Exhaust ducts shall have a clearance from combustible construction or material of not less than 18 inches. CMC 506.7.1
- f) When combustible construction is provided with the following protection features applied to all surfaces within 18 inches of the exhaust duct, clearances shall not be less than those indicated below: CMC 507.3

- g) Clean-out openings shall be provided at intervals that allow thorough cleaning of ducts. Clean-out openings shall have tight-fitting sliding or hinged doors with metal equal to or greater than the thickness of the duct or pipe and the doors shall latch tightly. CMC 510.3.

Duct Type:	Distance:				
	from property line	from openings into the building	from exterior walls or roofs	from combustible walls or openings into the building which are in the direction of the exhaust discharge	above adjoining grade
Ducts conveying explosive or flammable vapors, fumes, or dust	30'	10'	6'	30'	10'
Other product-conveying outlets	10'	10'	3'		10'
Environmental air duct exhaust	3'	3'			

Protection	Clearance
0.013 inch (28 gauge) sheet metal on 1/4" insulating millboard	12 inches
0.013 inch (28 gauge) sheet metal on 1/8" insulating millboard spaced out one inch on noncombustible spacers	9 inches
0.027 inch (22 gauge) sheet metal on 1-inch rockwool batts reinforced with wire mesh or the equivalent	3 inches

H. Drying Apparatus

The spraying apparatus, drying equipment, and ventilating system for the spray booth or spraying room shall be equipped with suitable interlocks which shall (CFC 2404.6.1.2.1):

- a) Prevent the operation of spraying apparatus while drying operations are in progress.
- b) Purge spray vapors from the spray booth or spraying room for a period of not less than three minutes before drying apparatus can be operated.
- c) Have the ventilating system maintain a safe atmosphere within the spray booth or spraying room during the drying process and automatically shut off drying apparatus in the event of a failure of the ventilating system.

- d) Automatically shut off the drying apparatus if the air temperature within the booth exceeds 200°F, when other than portable infrared drying apparatus is used.

Fire Protection Equipment

- A. Spray booths, spraying rooms shall be protected by approved automatic fire extinguishing systems. These systems shall be extended to protect exhaust plenums, exhaust ducts, and both sides of dry filters when such filters are used, any solvent concentrator units, and recirculation air supply units. CFC 2404.4 and 2015 NFPA 33 Section 9.1
- B. If a building's sprinkler system is monitored for waterflow by a central monitoring station and the same fire sprinkler system is used to protect the spray booth, then the valve for the sprinkler system required for the spray booth shall have a tamper switch. CFC 903.4

City of Carlsbad Notes

Place All of the Following notes, verbatim, on the plan:

- 1) City of Carlsbad final inspection required. Please schedule all field inspections at least 48 hours in advance.
- 2) Smoking shall be prohibited in spray finishing areas, mixing rooms, and in the vicinity of dip tanks. **"NO SMOKING"** signs shall be conspicuously posted in such areas. CFC 2403.2.6.
- 3) 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 permanent partition.
- 4) Welding warning signs shall be posted in the vicinity of spraying areas, dipping operations, and paint storage rooms with the following warning: **"NO WELDING — The use of welding and/or cutting equipment in or near this area is dangerous because of fire and explosion hazards. Welding and cutting shall be done only under the supervision of the person in charge."** CFC 2403.2.7.
- 5) Electrical wiring and equipment shall be in accordance with CFC 24, NFPA 33, NFPA 70, and the California Electrical Code. CFC 2403.2.1.
- 6) Interior surfaces of spray booths shall be smooth and continuous without edges and otherwise designed to prevent pocketing of residue, to allow free passage of exhaust air from all pockets of the interior, and to facilitate washing and cleaning without injury. CFC 2404.3.3.2.
- 7) Floors shall be of noncombustible material or shall be covered with a noncombustible, non-sparking material of such character to facilitate safe cleaning and removal of residue. CFC 2404.3.3.2.
- 8) When spray booths are illuminated, fixed lighting units that transmit light into the spray booth through heat-treated or hammered wire glass shall be used. Glass panels shall be arranged to minimize breakage and so that normal accumulation of residue on the exposed surface of a panel will not be raised to 200°F by the heat from the source of the illumination. CFC 2404.6.2.

- 9) Portable electric lamps shall not be used in spraying areas during a spraying operation. CFC 2404.6.2.4.
- 10) Metal parts of spray booths, exhaust ducts, and piping systems conveying Class I or Class II liquids shall be electrically grounded in accordance with the National Electrical Code. CFC 2403.2.5.
- 11) Spraying areas shall be provided with mechanical ventilation adequate to prevent the dangerous accumulation of vapors. CFC 2404.7.
- 12) Mechanical ventilation shall always be kept in operation 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. CFC 2404.7.1.
- 13) Spraying equipment shall be interlocked with the ventilation of the spraying area such that spraying operations cannot be conducted unless the ventilation system is in operation. CFC 2404.8.
- 14) Recirculation ventilation systems shall have approved vapor detection systems. If the approved vapor concentration in the re-circulated air stream exceeds 25 percent of the lower flammability limit, the system shall automatically shut down the spraying operation, switch the ventilation system to 100 percent outdoor exhaust and sound an alarm. CFC 2404.7.2.
- 15) 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 lineal feet per minute. CFC 2404.7.3.
- 16) Portable fire extinguishers shall be provided for spraying areas in accordance with the requirements for an extra (high) hazard occupancy (e.g., 4-A:40-BC within 30 feet of the booth). CFC 2404.4.1 and 906.
- 17) Spray booths and spraying rooms shall not be alternately used for the purpose of drying arrangements which would cause a material to increase the surface temperature of the spray booth or room unless used for automobile refinishing in accordance with Section CFC 2404.6.1 and 2404.6.1.2.2.
- 18) Housekeeping, maintenance and storage of hazardous materials. Housekeeping, maintenance, storage and use of hazardous materials shall be in accordance with Sections 2403.3, 2403.4, 2404.5.1 and 2404.5.2.
- 19) Waste cans: Approved metal waste cans equipped with self-closing lids shall be provided whenever rags or waste are impregnated with finishing materials. Such rags and waste shall be deposited therein immediately after being utilized. The content of waste cans shall be properly deposited of at least once daily and at the end of each shift.