

July 1, 2010

SANTA ROSA FIRE DEPARTMENT FIRE PREVENTION BUREAU STANDARD



FLAMMABLE/COMBUSTIBLE LIQUID SPRAY BOOTH INSTALLATION

DEFINITION

A spray booth is a mechanically ventilated appliance provided to enclose or accommodate a spraying operation, to confine and limit the escape of spray, vapor and residue, and exhausting it safely. Spray booths are manufactured or constructed in a variety of forms to control the unique hazards associated with flammable sprays and vapors.

PURPOSE

This standard outlines the general requirements for the installation and maintenance of spray booth operations.

This guideline is applicable to any spray booth in which spraying operations utilizing flammable or combustible liquids and combustible powders are conducted per CFC. Information contained herein applies to typical instances and may not address all circumstances.

CODE REFERENCES

2007 California Building Code (CBC)

2007 California Fire Code (CFC) Chapter

Santa Rosa City Code Chapters 18-16,18-44

NFPA Standard 33, Flammable Spraying Operations

PERMIT(S) REQUIRED

A permit is required for spraying or dipping operations utilizing flammable or combustible liquids, or the application of combustible powders regulated by the CFC.

The Fire Department requires four (4) separate permits:

- an installation permit;
- a fixed extinguishing system or automatic sprinkler system permit to be obtained by the installer prior to system installation;
- an operational permit; and
- a hazardous material permit. The installation permit shall be obtained by the installer. The operational and hazardous material permits are the responsibility of the business owner and are issued annually

Submit information to Bay Area Air Quality Management District (BAAQMD) for air quality permit requirement.

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 required annually.

ATTACHMENTS

- 1) Plan Review Checklist
- 2) Inspection Checklist

REQUIRED INSPECTIONS

Inspections shall be scheduled a minimum of 48 hours in advance. Directions for scheduling are found at: <http://ci.santa-rosa.ca.us/news/Pages/AutomatedFireInspectionRequestSystem.aspx>

SUBMITTAL REQUIREMENTS

Applicant shall furnish the following information before any permit may be processed:

- Four (4) copies of detailed plans shall be submitted to the City of Santa Rosa Fire and Life Safety Plan Review Division. Plans for equipment, devices and extinguishing systems shall be submitted and approved prior to installation. These plans shall show a minimum of the following:
 - Floor plan (to scale) showing the location of spraying or dipping operations.
 - Detailed construction plans and the appropriate equipment data sheets for the installation of the spray booth(s) or dip tank(s).
 - Location of electrical outlets and electrical equipment. (A separate permit is required from the Building Department for electrical and mechanical installations).
 - Provide manufacturer specification sheets for electrical equipment.
 - Type of ventilation and controls.
 - The locations and method of storage of Class I, Class II and Class III-A flammable liquids.
 - A summary of flammable and/or combustible liquids in use and storage.
 - Additional details may be required based upon quantities and the associated hazards.
 - The type of heating and/or drying systems used in spraying or dipping areas.
 - Location and classification of fire extinguishers.
 - Three (3) copies of the extinguishing system plans shall be submitted for review and approval by the licensed contractor responsible for the work, prior to installation.

REQUIREMENTS AND LIMITATIONS

Hazardous Materials Management Plan (HMMP). (CFC 2701.5.1). A management plan, site map, and chemical inventory shall be submitted through the Unidocs website at www.unidocs.org. Follow the requirements contained in CFC 2701.5.2 and/or the Hazardous Materials Management Plan

Electrical wiring and equipment. (CFC 1503.2.1) Electrical wiring and equipment shall be in accordance with CFC Chapter 15, NFPA 70, and the National Electrical Code.

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Construction. (CFC 1504.3.2.1) 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 and each sheet of double-skin assemblies shall be no thinner than 0.0359 inch (20 gage). Structural sections of spray booths are not allowed to be sealed with latex-based or similar caulks and sealants.

Smoking prohibited. (CFC 1503.2.6) Smoking shall be prohibited in spray finishing areas and in the vicinity of dip tanks. “**NO SMOKING**” signs shall be conspicuously posted in such areas.

Welding warning signs. (CFC 1503.2.7) 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 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.

Size. (CFC 1504.3.2.6) The aggregate area of spray booth(s) 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, Division 2 occupancy without area increases, as set forth in *California Building Code*. The area of an individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1500 square feet. **Exception:** One individual booth not exceeding 500 square feet.

Surfaces. (CFC 1504.3.2.2) 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.

Floor. (CFC 1504.3.2.3) 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.

Clear space. (CFC 1504.3.2.5) 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 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 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.

Glass panels. (CFC 1504.6.2.1) 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.

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Means of egress. (CFC 1504.3.2.4) 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 in width by 80 inches in height.

Flammable vapor area. (CFC 1503.2.1.1) Electrical wiring and equipment in flammable vapor areas 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*.

Areas subject to deposits of residues. (CFC 1503.2.1.2) Electrical equipment, flammable vapor areas or drying operations that are subject to splashing or dripping of liquids shall be specifically approved for locations containing deposits of readily ignitable residue and explosive vapors.

Exceptions:

- This provision shall not apply to wiring in rigid conduit, threaded boxes or fittings not containing taps, splices or terminal connections.
- This provision shall not apply to electrostatic equipment allowed by Section 1507.

In resin application areas, electrical wiring and equipment that is subject to deposits of combustible residues shall be listed for such exposure and shall be installed as required for hazardous (classified) locations. Electrical wiring and equipment not subject to deposits of combustible residues shall be installed as required for ordinary hazard locations.

Illumination. (CFC 1504.6.2) 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.

Portable electric lamps. (CFC 1504.6.2.4) Portable electric lamps shall not be used in flammable vapor areas during spraying operations.

Grounding. (CFC 1503.2.5) Metal parts of spray booths, exhaust ducts and piping systems conveying Class I or II liquids shall be electrically grounded in accordance with the *California Electrical Code*. Metallic parts located in resin application areas, including but not limited to exhaust ducts, ventilation fans, spray application equipment, workpieces and piping, shall be electrically grounded.

Areas subject to overspray deposits. (CFC 1503.2.1.4) Electrical equipment in flammable vapor areas located such that deposits of combustible residues could readily accumulate thereon shall be specifically approved for locations containing deposits of readily ignitable residue and explosive vapors in accordance with the California Electrical Code.

Exceptions:

- 1. Wiring in rigid conduit.
- 2. Boxes or fittings not containing taps, splices or terminal connections.
- 3. Equipment allowed by Sections 1504 and 1507 and Chapter 21.

Open flames and sparks. (CFC 1503.2.2) 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. **Exception:** Drying and baking apparatus complying with Section 1504.6.1.2.

Drying operations. (CFC 1504.6.1) 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

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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 flammable vapor areas.

Spraying procedure. (CFC 1504.6.1.1) The spraying shall use low-volume spray application.

Drying apparatus. (CFC 1504.6.1.2) 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.

Interlocks. (CFC 1504.6.1.2.1) 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.

FIRE PROTECTION EQUIPMENT

Fire protection. (CFC 1504.4) 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.

Fire extinguishers. (CFC 1504.4.1 and 906) Portable fire extinguishers complying with Section 906 shall be provided for spraying areas in accordance with the requirements for an extra (high) hazard occupancy (e.g., 4-A:40BC within 30 feet of the booth).

Sprinkler system monitoring and alarms. (CFC 903.4) All valves controlling the water supply for automatic sprinkler systems, pumps, tanks, water levels and temperatures, critical air pressures, and water-flow switches on all sprinkler systems shall be electrically supervised. **Exception.** Control valves to spray booths or dip tanks that are sealed or locked in the open position.

VENTILATION

Ventilation. (CFC 1504.7) Mechanical ventilation of flammable vapor areas shall be provided in accordance with Section 510 of the *California Mechanical Code*.

Operation. (CFC 1504.7.1) 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.

Recirculation. (CFC 1054.7.2) Air exhausted from spraying operations shall not be recirculated. See exceptions.

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Air velocity. (CFC 1504.7.3) 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.

Independent ducts. (CFC 1504.7.5) Each spray booth and spray room shall have an independent exhaust duct system discharging to the outside. See exceptions.

Fan motors and belts. (CFC 1504.7.7) 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 the duct or booth unless the belt and pulley within the duct are tightly enclosed.

Termination point. (CFC 1504.7.6) The termination point for exhaust ducts discharging to the atmosphere shall not be less than the following distances:

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'			

- (CMC 506.7) Exhaust ducts shall have a clearance from combustible construction or material of not less than 18 inches.
- (CMC 507.2) 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:

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 1 inch on noncombustible spacers	9 inches
0.027 inch (22 gauge) sheet metal on 1 inch rock wool batts reinforced with wire mesh or the equivalent	3 inches

- (2003 NFPA 33 Section 7.9) 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.

SPRAY BOOTHS USING DRY FILTERS

Filter rolls. (CFC 1504.7.8.4) Spray booths equipped with a filter roll that is automatically advanced when the air velocity is reduced to less than 100 feet per minute shall be arranged to shut down the spraying operation if the filter roll fails to advance automatically.

Maintaining air velocity. (CFC 1504.7.8.3) Visible gauges, audible alarm devices or pressure-activated devices shall be installed to indicate or ensure that the required air velocity is maintained. Manometers shall be marked according to manufactures specifications.

Filter disposal. (CFC 1504.7.8.5) 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.

Ventilation obstruction. (CFC 1504.7.4) Articles being sprayed shall be positioned in a manner that does not obstruct collection of overspray.

Spontaneous ignition. (CFC 1504.7.8.6) 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.

Filters. (CFC 1504.7.8) 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.

STORAGE, USE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

Storage, use and handling of flammable and combustible liquids. (CFC 1503.3) The storage, use and handling of flammable and combustible liquids shall be in accordance with this section and Chapter 34.

Use. (CFC 1503.3.1) 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 in capacity.

Valves. (CFC 1503.3.2) 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 shut when hoses are not in use.

Sources of ignition. (CFC 1503.2) Protection against sources of ignition shall be provided in accordance with Sections 1503.2.1 through 10503.2.8.

Pumped liquid supplies. (CFC 1503.3.3) 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.

Liquid transfer. (CFC 1503.3.4) 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.

DRYING APPARATUS

Drying operations. (CFC 1504.6.1) Spray booths and spray rooms shall not be alternately used for the purpose of drying by arrangements or methods that could cause an increase 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.

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Drying apparatus. (CFC 1504.6.1.2) 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.

Interlocks. (CFC 1504.6.1.2.1) The spraying apparatus, drying apparatus and ventilating system for the spray booth or spray room shall be equipped with interlocks arranged to:

Prevent the operation of spraying apparatus while drying operations are in progress.

Purge spray vapors from the spray booth or spray room for a period of not less than 3 minutes before drying apparatus is rendered operable.

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.

Shut off the drying apparatus automatically if the air temperature within the booth exceeds 200° F.

DIPPING OPERATONS

Construction of dip tanks. (CFC 1505.3) Dip tanks shall be constructed in accordance with Sections 1505.3.1 through 1505.3.4.3 and NFPA 34. Dip tanks, including drain boards, shall be constructed of substantial noncombustible material and their supports shall be of heavy metal, reinforced concrete or masonry.

Overflow. (CFC 1505.3.1) Dip tanks greater than 150 gallons in capacity or 10 square feet in liquid surface area shall be equipped with a trapped overflow pipe leading to an approved location outside building. The bottom of the overflow connection shall not be less than 6 inches below the top of the tank.

Bottom drains. (CFC 1505.3.2) Dip tanks greater than 500 gallons in liquid capacity shall be equipped with bottom drains that are arranged to automatically and manually drain the tank quickly in the event of a fire unless the viscosity of the liquid at normal atmospheric temperature makes this impractical. Manual operation shall be from a safe, accessible location. Where gravity flow is not practical, automatic pumps shall be provided. Such drains shall be trapped and discharged to a closed, vented salvage tank or to an approved outside location.

Conveyor interlock. (CFC 1505.8) Dip tanks utilizing a conveyor system shall be arranged such that in the event of a fire, the conveyor system shall automatically cease motion and the required tank bottom drains shall open.

Ventilation of flammable vapor areas. (CFC 1505.7) Flammable vapor areas shall be provided with mechanical ventilation adequate to prevent the dangerous accumulation of vapors. Required ventilation systems shall be arranged such that the failure of any ventilating fan shall automatically stop the dipping conveyor system.

Dip-tank covers. (CFC 1505.3.4) Dip-tanks covers allowed by Section 1505.4.1 shall be capable of manual operation and shall be automatic closing by approved automatic-closing devices designed to operate in the event of a fire.

Construction. (CFC 1505.3.4.1) Covers shall be constructed of noncombustible material or be of a tin-clad type with enclosing metal applied with locked joints.

Supports. (CFC 1505.3.4.2) Chain or wire rope shall be utilized for cover supports or operating mechanisms.

Closed covers. (CFC 1505.3.4.3) Covers shall be kept closed when tanks are not in use.

ELECTROSTATIC APPARATUS

General. (CFC 1507.1) Electrostatic apparatus and devices used in connection with paint-spraying and paint-detering operations shall be of an approved type.

Location and clear space. (CFC 1507.2) A space of at least twice the sparking distance shall be maintained between goods being painted or deteared and electrodes, electrostatic atomizing heads or conductors. A sign stating the sparking distance shall be conspicuously posted near the assembly.

Emergency shutdown. (CFC 1507.8) Electrostatic apparatus shall be equipped with automatic controls operating without time delay to disconnect the power supply to the high-voltage transformer and signal the operator under any of the following conditions:

- Stoppage of ventilating fans or failure of ventilating equipment from any cause.
- Stoppage of the conveyor carrying articles past the high-voltage grid.
- Occurrence of a ground or an imminent ground at any point of the high voltage system.
- Reduction of clearance below that required in Section 1507.2.

Barriers. (CFC 1507.3.1) Booths, fencing, railings or guards shall be placed about the equipment such that either by their location or character, or both, isolation of the process is maintained from plant storage and personnel. Railings, fencing and guards shall be conductive material, adequately grounded and shall be at least 5 feet from processing equipment.

Signs. (CFC 1507.5.2) Signs shall be posted to provide the following information:

- Designate the process zone as dangerous with respect to fire and accident
- Identify the grounding requirements for all electrically conductive objectives in the flammable vapor area, including persons.
- Restrict access to qualified personnel only.

Maintenance. (CFC 1507.5.1) Insulators shall be kept clean and dry. Drip plates and screens subject to paint deposits shall be removable and taken to a safe place for cleaning.

Ventilation. (CFC 1507.7) The flammable vapor area shall be ventilated in accordance with Section 1504.7.

Ventilation interlock. (CFC 1507.9) Hand electrostatic equipment shall be interlocked with the ventilation system for the spraying area so that the equipment cannot be operated unless the ventilating system is in operation.

Fire protection. (CFC 1507.4) Areas used for electrostatic spray finishing with fixed equipment shall be protected with an approved automatic fire-extinguishing system complying with Chapter 9 and Section 1507.4.1.

POWDER COATING

Location. (CFC 1506.2) Powder coating operations shall be conducted in enclosed rooms constructed and protected in accordance with Section 1506.

Fire protection. (CFC 1506.4) Areas used for powder coating shall be protected by an approved automatic fire extinguishing system complying with Chapter 9.

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Fire extinguishers. (CFC 1506.4.2) Portable fire extinguishers complying with Section 906 shall be provided for areas used for powder coating in accordance with the requirements for an extra hazard occupancy.

Sources of ignition. (CFC 1506.6) Control of sources of ignition shall be in accordance with Sections 1503.2 and 1506.6.1 through 1506.6.4.

Operation and maintenance. (CFC 1506.5) Powder coating areas shall be kept free from the accumulation of powder coating dusts, including horizontal surfaces such as ledges, beams, pipes, hoods, booths and floors.

Preheated parts. (CFC 1506.6.3) When parts are heated prior to coating, the temperature of the parts shall not exceed the ignition temperature of the powder to be used.

Spark-producing metals. (CFC 1506.6.2) Iron or spark-producing metals shall be prevented from being introduced into the powders being applied by magnetic separators, filter-type separators or by other approved means.