



Spray Finishing

Spray finishing guidelines and regulations are needed for two main purposes: to protect the health of the employees involved in spray finishing and to reduce the fire and explosion hazard inherent with spray finishing operations utilizing flammable or combustible materials.

The potential for the wide-spread use of paint-spray booths and rooms in several different types of industry has also necessitated the need for the regulation.

www.saif.com/employer

- ▶ Safety
- ▶ Safety & health guides

S-849

last updated

April 2011

© SAIF Corporation

This publication provides practical loss control and safety information to assist you in making your workplace safer. It is not legal advice. SAIF Corporation has made every effort to bring significant Oregon Occupational Safety and Health Administration (OR-OSHA) regulations to your attention. Nonetheless, compliance with OR-OSHA remains your responsibility. You should read and understand all relevant OR-OSHA regulations that apply to your job site(s). You may want to consult with your own attorney regarding aspects of OR-OSHA that may affect you.

Note: The information in this publication is time sensitive. Do not rely upon this document if its publication date is more than three years old. Please check the Employer Guide "Safety" section of our web site at www.saif.com/employer for a more recent, printable copy. You'll also find a variety of other valuable safety information designed to help your business prevent injuries and control costs.

Table of Contents

Introduction	3
History	3
When this Regulation Applies	3
Rules for All Spray Finishing Operations	4
General.....	4
Combustible materials.....	5
Spray booths.....	5
Electrical and other sources of ignition.....	8
Ventilation.....	9
Rules for Spray Finishing with Flammable and Combustible Liquids ..	11
Storage and handling of flammable and combustible liquids.....	11
Operations and maintenance.....	13
Mixing.....	13
Rules for Electrostatic Spray Finishing ..	14
Fixed electrostatic apparatus.....	14
Electrostatic hand spraying equipment.....	15
Drying, Curing, or Fusion Apparatus	16
Powder Coating	17
Ventilation.....	17
Operation and maintenance.....	18
Electrostatic fluidized beds.....	18
Definitions ..	19
Resources ..	21

Introduction

Spray finishing is generally a part of many manufacturing processes. Spray finishing rooms and booths may be small for the production of small articles or as large as a motor home. Industries where spray finishing may be found include: automobile repair and painting, wood furniture and cabinet finishing, metal fabrication, etc.

As an employer you need to be aware of the requirements of this regulation in order to protect your employees' health and your business.

Common examples of noncompliance with this regulation are:

- Storage of painting materials within a paint booth
- Inadequate ventilation or lack of knowledge whether ventilation is adequate
- Inadequate maintenance program
- Inadequate mixing area
- Inadequate housekeeping
- Inappropriate use of the manometer (or other ventilation static pressure measuring device)

History

This Code was titled OAR Division 119 Spray Finishing Operations until May 1, 1992. At that time, Division 119 along with several other codes were replaced by Division 2 Subdivision H Hazardous Materials 1910.101 – 1910.120. More recently, 1910.107 and 1910.94(c) were replaced with Section 437-002-0107, Spray Finishing. The Spray Finishing Code begins on page 83 of Subdivision H. If you are involved with spray finishing, it is advisable that you obtain a copy of this OSHA regulation. To obtain a copy, call the OR-OSHA Resource Center at (503) 378-3272, write OR-OSHA Resource Center, 350 Winter St. N.E., Salem, OR 97310, or access a copy from the OR-OSHA website:

http://www.cbs.state.or.us/osha/subjects/spray_finishing.html

When this Regulation Applies

This regulation applies to spray finishing materials when applied by any means in a continuous or intermittent process. It also covers the application of powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds. The regulation also applies to any sprayed material that produces combustible deposits or residue. It 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.

Rules for All Spray Finishing Operations

Oregon OSHA has established the following rules for all spray finishing operations.

General

- Spray finishing must be conducted in a spray booth provided with local exhaust ventilation **except**:
 - a) When spraying is infrequent and of short duration (see Definition section for clarification on infrequent and short); or
 - b) When spraying is a single "airbrush;" or
 - c) The object to be sprayed is too large and heavy and impracticable to move it into a spray booth; or
 - d) When only noncombustible or Class IIIB combustible liquids are used for spraying. This exception for Class IIIB combustible liquids only applies when the liquid is not heated for use to within 30 degrees F (16.7 degrees C) of the flashpoint; or
 - e) When spray painting is conducted out-of-doors. OSHA states that spray painting out-of-doors means an area away from the main building and completely open at all times on at least two sides.
- Spray finishing **outside** of a booth for objects that are large and heavy (see "c" above) and using noncombustible liquids (see "d" above), must be done only in a spray area that meets the following requirements:
 - a) All light switches, fans, receptacles, overhead lights and all ignition sources within 20 horizontal feet and 10 vertical feet of the overspray area meet Class I, Group D, explosion-proof types as specified in the National Electrical Code, NFPA 33-2000 and ANSI C2-2002 or no longer operate.
 - b) All building construction including floors, walls, ceilings, beams, etc., within 20 horizontal feet and 10 vertical feet of the overspray area must be noncombustible (see Definition at the end of the guide) or be protected by noncombustible materials.
 - c) All areas within 20 feet of the overspray area must be protected with automatic sprinklers or other fire protection system that has been authorized in writing by the local fire authority.
 - d) Aisles leading to the exits from the spray finishing area must be clear at all times.

- e) The spray finishing area must be provided with at least six air changes per hour of airflow.
 - f) Maintain a 20 feet distance from overspray for those not involved in the operation and follow the combustible materials requirements (see section below).
- Individuals not involved in spray finishing operations must not be allowed within 20 feet of the spraying and overspray area.
 - Those employees that are spray finishing must be provided with and wear appropriate respiratory protection (as determined by air monitoring results) unless exhaust ventilation is provided and reduces employee exposure to any material in the finish or its solvent to below the limits established for air contaminants (see Resources at the end of this Guide).

Combustible materials

- Do not store or allow combustible materials to accumulate in the spraying and overspray area unless specifically authorized in writing by the local fire authority.
- The spraying and overspray area should receive daily housekeeping and maintenance while in use and be kept free of any accumulation between uses.
- Use only nonsparking tools for cleaning.
- Combustible material, such as paper, may be used to cover floors and walls in the spray and overspray area, but must be removed between uses. Check with your fire department and get written approval if combustible material is to remain in place after more than one use.

Spray booths

- Spray booths are generally pre-manufactured, although some are actually constructed on-site by employers.
- Below are the OSHA requirements on spray booth construction:
 - a) Must be constructed of substantially supported steel, concrete, or masonry.
 - b) When used only for intermittent or low volume spraying, other substantial noncombustible material may be used.

- c) It must be designed to sweep air currents toward the ventilation exhaust outlet.
- d) Construction materials must have fire resistance rating of at least 1-hour or as otherwise required by the Oregon Building Codes Division.
- The interior surfaces must be smooth and continuous without edges, and surfaces must be designed to prevent residue build-up and for easy cleaning and washing.
- When the floor surface of a spray booth and the working area is combustible, it must be covered with a noncombustible material designed to prevent residue build-up and ease cleaning and washing.
- A spray booth should have:
 - a) A water washing system to minimize dusts or residues entering exhaust ducts and to recover overspray; or
 - b) Distribution or baffle plates to create even flow of air through the booth or remove overspray before it enters the exhaust duct; or
 - c) Overspray dry filters to minimize dusts or residues entering exhaust ducts.
- If dry powders are sprayed, the powder collection systems in the exhaust should be arranged to capture overspray.
- Distribution or baffle plates must be noncombustible and readily removable or accessible on both sides for cleaning. These plates should not be located in exhaust ducts.
- If conventional dry type spray booths with overspray dry filter or filter rolls are used:
 - a) Inspect filter rolls and replace filter media on a regular schedule.
 - b) Used filter pads and filter rolls that have been removed should be immediately placed in a safe area away from the spray finishing operation. They can be placed in a water-filled metal container and disposed of at the close of the day's operation unless they remain completely submerged.
 - c) Do not use filter or filter rolls when spraying a material known to be highly susceptible to spontaneous heating and ignition.

- d) Clean filters or filter rolls must be noncombustible or authorized by the local fire authority.
- e) If using the same filter for different types of coating materials, make sure that the combination of materials does not create the possibility of spontaneous ignition.
- Spray booths with an opening/entry larger than 9 square feet must have a metal deflector or curtain at least 4.5 inches deep installed at the upper outer edge of the booth over the opening.
- The opening for the conveyor used to carry work into or out of spray booths, must be as small as practical.
- Each spray booth must be separated from all other nonspray finishing operations by at least three feet, a wall, or a partition.
- All portions of the booth must be accessible for cleaning.
- There must be a clearance of at least three feet on all sides of the booth exterior. Materials should not be stored within this clear space. All construction within three feet of all sides of the spray booth must be noncombustible. However, this requirement does not apply to a spray room. There is also an exception for spray booths closer than three feet to an exterior wall or roof that is constructed of noncombustible material (see the OR OSHA regulation for the exception).
- When lighting for the spray areas are through glass or panels, they should be fixed.
 - a) Panels must be sealed to isolate the spraying area from the lighting unit.
 - b) Lights must be protected from breaking. Protection material must be noncombustible.
 - c) Panels should be arranged so that normal accumulations of overspray on the surface will not be raised to a dangerous temperature by radiation or conduction from the lighting.
- The water spray from the automatic sprinkler system should be able to reach all spaces in the entire spray booth and the system should be acceptable to the local fire authority.
 - a) When filters are used, automatic sprinklers must be on both the downstream and upstream sides of the filters.

- b) Clean sprinkler heads daily if necessary. Keep sprinkler heads as free of overspray as possible. If they are covered to protect them for overspray, the material and method must be authorized by the local fire authority.
- c) If unable to have automatic sprinklers, then there must be another fire protection system that is approved by the local fire department. Obtain the authorization in writing.

Electrical and other sources of ignition

- Keep all open flame or spark producing equipment at least 20 feet from the spray area, unless separated by a partition.
- Do not place heaters, steam pipes, or hot surfaces in a spraying area where overspray may accumulate.
- All electrical wiring and equipment must meet the OSHA rules for spray finishing and OAR 437, Division 2, Subdivision S, Electrical.
- All wiring must be in rigid conduit or in boxes or fittings that do not contain taps, splices, or terminal connections.
- Unless approved/certified for the area, electrical equipment must not be placed in the spray/overspray area.
- Electrical wiring and equipment located in a spraying area must be explosion-proof, approved for Class I, Group D locations, and meet the requirements of OAR 437, Division 2, Subdivision S, for Class I, Division 1, Hazardous Locations.
- Electrical wiring, motors and other equipment outside of but within 20 feet of any spraying area, and not separated by partitions, must not produce sparks under normal operating conditions and must meet the requirements of OAR 437, Division 2, Subdivision S for Class I, Division 2, Hazardous Locations.
- Electric lamps outside of the spraying area but within 20 feet and not separated by a partition, must be totally enclosed to prevent contact with hot particles and must be protected from physical damage.
- Do not use portable electric lamps in any spraying area during spraying. If portable electric lamps are used during cleaning or repair, use only the type approved for hazardous Class I locations.
- All metal parts of the spray booth and exhaust duct must be electrically ground. Piping systems that convey flammable or combustible liquids or aerated solids must also be electrically ground.

Ventilation

- Mechanical ventilation must remove flammable vapors, mists, or powders to a safe location and confine and control combustible overspray. It should be continuously operating while spraying and for a period of time afterwards.
- Interlock the spray equipment and the ventilation so that the spray equipment cannot be turned on unless the ventilation system is operating.
- Air velocity throughout the spray booth must be enough to keep airborne contaminants below 25 percent of the lower explosive limit (LEL).
 - a) Open-faced booths must maintain at least an average of 100 feet per minute (fpm) of airflow across the open face of the booth.
 - b) Enclosed booths must maintain at least an average of 100 fpm of airflow of cross-sectional area at the operators' position.
 - c) The local fire department can authorize anything different than what is specified in a) and b) above, but this must be documented in writing
 - d) A visible gauge, alarm, or pressure activated device must be installed on each spray booth to reveal that the required air velocity is maintained.
- Each spray booth must have an independent exhaust duct system that discharges to the exterior of the building. Multiple spray booths may have a common exhaust when the spray material is identical and the opening area of those booths is not more than 18 square feet.
- All fans that serve a booth must be interconnected so that one fan cannot operate without all fans operating.
- The rotating parts of the fan must be nonferrous (not made of iron) or nonsparking, or the casing must be lined or made of such material.
 - a) The rotating parts and the casing must have clearance between them to avoid a fire by friction.
 - b) The fan blades must be mounted on a shaft that can maintain perfect alignment even when the blades are loaded.
 - c) The bearings must be either self-lubricating or can be lubricated from the outside duct.
- The electric motor that drives the exhaust fan must be placed outside the booth or duct.

- When belts and pulleys are located inside the duct or booth, they must be enclosed.
- Exhaust ducts should be constructed of substantially supported steel. Although ducts without dampers are preferred, if dampers are installed, they must be fully opened when the ventilation system is operating.
 - a) Ducts must be protected against damage and at least 18 inches from combustible construction or other combustible material.
 - b) If combustible construction is used with the following protection applied to all surfaces within 18 inches of the exhaust duct, clearances may be reduced to the following distances:

Protection material	Distance
28-gage sheet metal on 1/4-inch insulating millboard	12 inches
28-gage sheet metal on 1/8-inch insulating millboard spaced out 1-inch on noncombustible spacers	9 inches
22-gage sheet metal on 1-inch rockwood batts reinforced with wire mesh or the equivalent	3 inches

- The exhaust discharge point must be at least 6 feet from any combustible wall or roof.
- The discharge point must not discharge in the direction of any combustible construction or unprotected opening in any noncombustible wall within 30 feet.
- Keep air exhaust from spray operations away from makeup air supplied air or other ventilation intakes.
- Do not recirculate air exhausted from spray operations.
- Supply clean fresh air, free of contamination from exhaust systems, chimneys, stacks, or vents, to a spray booth in quantities equal to the volume of air exhausted through the booth.

- Exhaust ducts should have as many access doors as necessary to facilitate cleaning.
- Air intake openings to rooms containing spray finishing operations should be adequate for the operation of exhaust fans and placed to minimize dead air pockets.
- Freshly sprayed articles should dry only in spaces provided with adequate ventilation to prevent the formation of explosive vapors.

Rules for Spray Finishing with Flammable and Combustible Liquids

These rules apply to spray finishing with Class I flammable liquids, Class II combustible liquids and Class IIIA combustible liquids. It also applies to Class IIIB combustible liquids when they are heated for use to within 30 degrees F (16.7 degrees C) of their flashpoint.

Storage and handling of flammable and combustible liquids

- The storage of flammable or combustible liquids must comply with the requirements of OAR 437-002-1910.106.
- Keep only the minimum quantity of flammable or combustible liquids required for operations in the vicinity of spraying operations. Do not exceed a supply for one day or one shift.
- Bulk storage of portable containers of flammable or combustible liquids must be in a separate, constructed building detached from other important buildings or cut off in a standard manner.
- Use only the original closed containers, approved portable tanks, approved safety cans, or piping system for bringing flammable or combustible liquids into the spray area.
- Do not use open or glass containers.
- Use approved pumps to withdraw flammable and combustible liquids from containers that are 61 gallons or more.
- Withdraw and fill containers with flammable or combustible liquids only in a mixing room or in a spraying area when the ventilating system operating.
- Take adequate precautions to avoid spilling liquids and sources of ignition. Containers must conform to the following requirements:

- a) Use only closed containers to supply spray nozzles. Use metal covers to close containers that are not closed.
 - b) Use metal support or wire cables to support containers that are not on the floor.
 - c) When spray nozzles are supplied by gravity flow, do not use containers that exceed 10 gallons capacity.
 - d) Do not use air pressure in the original shipping containers to supply spray nozzles.
- Containers under air pressure supplying spray nozzles must:
 - a) Use only containers that only hold enough material for one day's operation.
 - b) Use only containers that are designed and approved for such use.
 - c) Containers must be provided with a relief valve and meet the requirements of the Oregon Building Codes Division OAR 918-225, "Boilers and Pressure Vessels."
 - Pipes and hoses
 - a) All containers of piping with flexible connection (e.g., hose) must have a shutoff valve at the connection. Keep valves shut when not spraying.
 - b) When a pump is used, use only piping, tubing, hoses, and accessories that are designed to withstand the maximum working pressure of the pump or have an automatic pressure discharge that limits the level to within the design of the piping, tubing, hoses, and accessories.
 - c) Regularly inspect all pressure hose and couplings. Test the hose and couplings with the hose extended using the "in service maximum operating pressures." Repair or discard any hose and coupling showing deterioration, damage, signs of leakage, or weakness.
 - d) Flammable or combustible liquid piping systems must be steel or other material with comparable damage and heat resistance properties.
 - e) Properly bond and ground piping systems.
 - Use approved electrically powered spray liquid heaters. Do not put heaters in spray booths or any other location where overspray or combustible material accumulate.

- Use an approved relief valve on the pump discharge line if flammable or combustible liquids are supplied by positive displacement pumps, or incorporate a system that will stop the flow if the discharge pressure exceeds the safe operating pressure.
- Bond and ground containers whenever flammable or combustible liquids are transferred from one container to another.
- Install an adequate supply of suitable portable fire extinguishers near all spray areas.

Operations and maintenance

- Immediately remove and dispose overspray scrapings and contaminated material from the premises.
- Deposit all rags or waste with spray material in tightly-closing metal waste cans immediately after use. Dispose of the contents of waste cans at least once a day or at the end of each shift.
- Do not leave clothing worn during spray finishing on the premises overnight unless they are kept in metal lockers.
- Only use solvents for cleaning operations with flashpoints at or above the flashpoints of material normally used. It must be done inside a spray booth with the ventilation system on. If unable to do so in an operating booth, contact the local fire authority to determine and approve an authorized area. Be sure to get the authorization in writing.
- Do not use spray booths for different types of coating materials when the materials are incompatible with each other, unless all overspray of the first material is removed from the booth and exhaust ducts prior to spraying with the second material.

Mixing

- Mix materials only in a mixing room, in a spray area that meets the requirements specified in the General rule above, or in a spray booth. When a spray area or spray booth is used for mixing, the ventilation system must be on.
- Mixing rooms should be constructed of noncombustible materials, supported steel, concrete, or masonry.
- Design mixing rooms so that spills remain inside the room.

- Provide at least 150 cubic feet per minute (CFM) of airflow in each mixing room. When the flooring of the mixing room is greater than 150 square feet, provide at least 1 CMF per square foot of flooring. The ventilation system for each mixing room must be on and operational at all times.
- Follow all of the requirements listed in the section, "Electrical and other sources of ignition," above.
- Protect all spaces within the mixing room with automatic sprinklers acceptable to the local fire authority. Where automatic sprinklers are not available, use other automatic extinguishing equipment. Alternatives may be used only when authorized in writing by the local fire authority.

Rules for Electrostatic Spray Finishing

Fixed electrostatic apparatus

- Use only approved electrostatic equipment and devices in connection with coating operations.
- 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, must be located outside of the spraying area, or must otherwise meet to the requirements listed in the section, "Rules for all spray finishing operations."
- Electrodes and electrostatic atomizing heads should be supported in permanent locations and effectively insulated from the ground. Electrodes and electrostatic atomizing heads which are permanently attached to their bases, supports, or reciprocators are considered to comply. Use only nonporous and noncombustible insulators.
- Properly insulate and protect high-voltage leads to electrodes from mechanical injury or exposure to destructive chemicals. Effectively and permanently support electrostatic atomizing heads on suitable insulators and effectively guard against accidental contact or grounding. Provide an automatic means for grounding the electrode system when it is electrically de-energized for any reason. Keep all insulators clean and dry.
- Maintain a safe distance between goods being painted and electrodes or electrostatic atomizing heads or conductors of at least twice the sparking distance. Conspicuously post a sign indicating this safe distance near the assembly.

- Support goods being painted using this process on conveyors. Arrange the conveyors 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 must be rigidly supported to prevent swinging or movement which would reduce the clearance to less than that specified in the above paragraph.
- Equip electrostatic apparatus with automatic controls that immediately disconnect the power supply to the high voltage transformer and signals the operator when:
 - a) Any failure occurs in the ventilation equipment.
 - b) The conveyor carrying goods through the high voltage field stops.
 - c) Occurrence of a ground or of an imminent ground at any point on the high voltage system.
 - d) The safe distance listed above is not maintained.

Electrostatic hand spraying equipment

This section applies to any equipment that uses 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.

- Use only approved electrostatic hand spray apparatus and devices in connection with the coating operations. The high voltage circuits must be designed so it does not produce a spark of sufficient intensity to ignite any vapor-air mixtures or 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 must be capable of being energized only by a switch which also controls the coating material supply.
- Locate transformers, powerpacks, control apparatus, and all other electrical portions of the equipment outside of the spraying area. This requirement does not apply to the handgun itself and its connections to the power supply.
- Electrically connect the handle of the spraying gun to ground by a metallic connection. Operators, while in their normal operating position, must be in contact with the grounded handle.
- Adequately ground all electrically conductive objects in the spraying area. This requirement applies to paint containers, wash cans, and any other

objects or devices in the area. Prominently and permanently install a warning on the equipment regarding the necessity for this grounding feature.

- Maintain metallic contact between objects being painted or coated and the conveyor or other grounded support. Regularly clean hooks to ensure this contact.
- Areas of contact must be sharp points or knife edges where possible.
- Conceal points of support of the object from random spray where feasible
- When objects being sprayed are supported from a conveyor, the point of attachment to the conveyor must not collect spray material during normal operation.
- Interlock the electrical equipment with the ventilation of the spraying area so that the equipment cannot be operated unless the ventilation fans are on.

Drying, Curing, or Fusion Apparatus

- Equipment must meet the NFPA standard (NFPA No. 86-1999) for ovens and furnaces.
- Do not use a spray area for drying, especially if drying can increase the surface temperature of the spray area.
- Do not install an open flame heating system for drying, curing, or fusion in a spray area. There is an exception for automobile refinishing spray booths, see requirements below.
- Drying, curing, or fusion units may be installed adjacent to spray areas only when an interlocked ventilating system can:
 - a) Thoroughly ventilate the drying space before the heating system can be started;
 - b) Maintain a safe atmosphere at any source of ignition;
 - c) Automatically shut down the heating system in the event of failure of the ventilating system.
- Automobile refinishing spray booths or enclosures, may be used for drying with portable electrical infrared drying but it must meet the following:

- a) The interior (especially floors) of spray enclosures are kept free of overspray deposits.
- b) The drying equipment is kept out of the spray and overspray area while spray finishing is in progress.
- c) The drying equipment and the ventilating system are interlocked so:
 - i) Spraying and drying cannot occur together.
 - ii) The spray enclosure is purged of spray vapors for at least three minutes before the drying begins.
 - iii) The ventilation maintains a safe atmosphere within the enclosure during drying, and the drying equipment will automatically shut off when the ventilation fails.
- d) All electrical wiring and equipment of the drying equipment meets the requirements of OAR 437, Division 2, Subdivision S. Only equipment approved for Class I, Division hazardous locations will be located within 18 inches of floor level. All metallic parts of the drying equipment is properly bonded and grounded.
- e) Place a warning sign on the drying equipment that specifies that the ventilation must be operating during drying and that spraying must not occur in the vicinity where spray will deposit on equipment.

Powder Coating

Ventilation

- The ventilation must maintain the atmosphere below the lowest explosive limits for the materials being applied. All nondeposited air-suspended powders are safely removed to the powder recovery cyclone or receptacle.
- Do not release powders to the outside atmosphere.

Operation and maintenance

- Keep all areas free of dust accumulation, especially horizontal surfaces, beams, pipes, hoods, booths, and floors.
- Avoid scattering dust to other places or creating dust clouds when cleaning.
- Post "No Smoking" signs in large letters on contrasting color background at all powder coating areas and storage rooms.

Electrostatic fluidized beds

- Use only approved electrostatic fluidized beds and equipment.
- The maximum surface temperature of this equipment in the coating area must not exceed 150 degrees F.
- Use only high voltage circuits that will not produce a spark to ignite any powder-air mixtures.
- Use circuits designed to eliminate shock hazards upon coming in contact with a grounded object under normal operation conditions.
- Locate transformers, powerpacks, control apparatus, and all other electrical portions of the equipment outside of the powder coating area, with the exception of the charging electrodes and their connections to the power supply.
- Adequately ground all electrically conductive objects within the charging influence of the electrodes. The powder coating equipment must carry a prominent, permanently installed warning regarding the necessity for grounding these objects.
- Objects being coated must be in contact with the conveyor or other for proper grounding. Clean hangers regularly so that there is effective contact and the areas of contact are sharp points or knife edges where possible.

- Interlock the electrical equipment with the ventilation system so the equipment cannot be operated unless the ventilation fans are in operation.

Definitions

Aerated solid powders – Any powdered material used as a coating material 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.

Approved – Approved and listed by a nationally recognized testing laboratory. Refer to OAR 1910.7 for definition of nationally recognized testing laboratory.

Electrostatic fluidized bed – A chamber holding powder coating material that is aerated from below to form an air-supported, expanded cloud of the powder. The powder is electrically charged with a charge opposite to that of the object or material being coated.

Fluidized bed – A chamber holding powder coating material that is aerated from below to form an air-supported, expanded cloud of powder. The object or material being coated is preheated, and then immersed into the cloud.

Infrequent and of short duration – Spray finishing that is:

1. Less than 9 square feet surface area per job, and
2. Uses less than 1-gallon of material in 1-day, and
3. Intermittent spraying where enough time elapses between spraying episodes to dilute the concentration of vapors essentially to zero before spraying is resumed.

LEL – Lower explosive limit, Lower limit of flammability or explosibility of a gas or vapor at ordinary ambient temperatures expressed in percent of the gas/vapor in air by volume

Listed – See “approved.”

Noncombustible materials – Materials that have a fire resistance rating of at least 1-hour

OAR – Oregon Administrative Rule

Overspray – Any sprayed material that is not deposited on the intended object

Spray area – any area in which potentially 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 and 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.

Spray room – A room designed to accommodate a spraying operation. The OR-OSHA standard states that the term “spray booth” includes spray rooms except where specifically noted in the standard.

Resources

Spray booth, spray equipment manufacturers and virtual shop:

Col-Met Spray Booths: <http://www.colmetsb.com/>

Global Finishing Solutions: <http://www.globalfinishing.com/>

Spray Systems Inc.: <http://www.spraysystems.com/>

Finish Pro Spray Booths: <http://www.thefinishpro.com/>

CCAR-*GreenLink*® Virtual Shops:
<http://www.ccar-greenlink.org/cshops/index.html>

ITW Binks: <http://www.binks.com/>

DeVilbiss: <http://www.devilbiss.com/>

Occupational Safety & Health Administration

Spray Operations: <http://www.osha.gov/SLTC/sprayoperations/index.html>

Oregon OSHA, Division 2, Subdivision A (contains 1910.7):
http://www.cbs.state.or.us/osha/pdf/rules/division_2/div2_a.pdf

Oregon OSHA, Spray Finishing:
http://www.cbs.state.or.us/osha/subjects/spray_finishing.html

Oregon OSHA, Air Contaminants:
http://www.cbs.state.or.us/osha/subjects/air_contaminants.html

Oregon OSHA, Division 2, Subdivision S, Electrical:
http://www.cbs.state.or.us/osha/pdf/rules/division_2/div2_s.pdf

Oregon OSHA, Program Directive, A-243, Spray Finishing:
Assessing Fire Safety and Industrial Hygiene Issues for Diisocyanates:
<http://www.cbs.state.or.us/oshapdf/pds/pd-243.pdf>

Primer on Isocyanates:
<http://www.osha.gov/SLTC/isocyanates/index.html>

Controlling Lead Exposures in the Construction Industry,
including Spray Finishing Operations:
http://www.osha.gov/dts/osta/otm/otm_v/otm_v_3.html

National Institute for Occupational Safety & Health

Control of Paint Overspray in Autobody Repair Shops:
<http://www.cdc.gov/niosh/paintovr.html>

Preventing Asthma and Death from MDI Exposure
During Spray-on Truck Bed Liner and Related Application:
<http://www.cdc.gov/niosh/docs/2006-149/>