



LOSS CONTROL SERVICES

Spray booth operation safety



Spray booths and spray rooms are found in a variety of commercial operations from auto garages to industrial manufacturers. Both can pose significant fire and explosion hazards because of the materials being sprayed: flammable and combustible liquids and combustible powders—as well as their vapors, mists and dusts—and the highly combustible deposits and residues that result from their use.

NFPA 33 is the benchmark used by Nationwide when evaluating spray booths and spray rooms from a loss control standpoint.

National Fire Protection Association (NFPA) 33: Standard for Spray Application Using Flammable or Combustible Materials is the benchmark used by Nationwide® when evaluating spray booths and spray rooms from a loss control standpoint. In this brochure, we list some of the highlights of NFPA 33, and we strongly encourage you to obtain a copy of the standard for easy reference. Plus, keep in mind that other aspects of spray booth construction and operation are regulated by other NFPA codes, as well as codes and statutes of other governing agencies.

After you review the following information on NFPA 33 as it pertains to areas such as design, construction and ventilation, be sure to read “3 things that help prevent or contain spray booth fires” in this resource.

NFPA 33 scope and key definitions

The NFPA 33 standard applies to the spray application of flammable or combustible solvent-based and waterborne materials by:

- Airless or hydraulic atomization
- Compressed air atomization
- Electrostatic application
- Other atomized application methods

Key definitions are:

- **Spray booth**—A power-ventilated enclosure for spray application that confines and limits the escape of materials being sprayed, and conducts or directs those materials to an exhaust system. The spray booth is designed to protect building occupants against fires and explosions by providing fire prevention, containment and fire suppression systems. Booths also protect the environment by collecting contaminants before they release into the atmosphere.
- **Spray room**—A power-ventilated, fully enclosed room used exclusively for open spraying of flammable or combustible materials. Spray rooms must meet the same criteria as spray booths, although it's sometimes more difficult to make a spray room compliant with applicable codes due to room size and the possibility that an extra expense will be incurred with the installation of explosion-proof lighting, wiring and ventilation equipment.

Location, design and construction

NFPA 33 requires that spray booths be located to allow for adequate egress for personnel and adequate access for fire-fighting operations. From a design and construction standpoint:

- Booth walls, doors, ceilings and floors should be made of non-combustible or limited combustible materials, such as 18-gauge or heavier metal, concrete or masonry.
- All interior surfaces should be smooth, so as not to trap residue or restrict ventilation or cleaning.
- With floors, a watertight drain should be included if protection is water-based
- Doors should be vapor-tight and installed with door gaskets or a sill high enough to control vapors.
- Spray rooms should be separated from surrounding areas with one-hour fire-rated construction, and should have smooth walls made of non-combustible materials (no wood or drywall).



Ventilation equipment should be interlocked with spray guns and the running fan so that spraying will stop if ventilation ceases.

Ventilation

In your spray booth or room, mechanical ventilation needs to keep the atmosphere of flammable vapors from spraying operations 25% below the lower explosive limit (LEL). The LEL is the lowest concentration of a gas or a vapor in air capable of producing a flash of fire in the presence of an ignition source. In addition:

- Each spray area should be provided with ventilation capable of confining and removing vapors and mists to a safe location, and confining and controlling combustible residues, dusts and deposits.
- The velocity of air through filters, baffles and registers should not exceed 200 feet per minute.
- Vents should operate at all times while spraying is being conducted, and for a sufficient time thereafter to allow vapors to dissipate.
- Air exhausted to the atmosphere from liquid spray operations should flow through ducts directly to the building's exterior, follow the most direct route to the point of discharge, and not penetrate any firewalls.
- Ducts should be 22-gauge sheet metal or heavier and substantially constructed. They should be rigidly braced and with ample doors for cleaning. All doors should have vapor gaskets. An 18" clearance between ducts and all combustible materials should be maintained.

- All fan blades should be non-ferrous and non-sparking (i.e., brass, aluminum or plastic), and fan motors should be induction type (no brushes), sealed, UL Listed and connected with explosion-proof wiring.
- Ventilation equipment should be interlocked with spray guns and the running fan so that spraying will stop if ventilation ceases.

Electrical wiring and devices

The placement of electrical wiring and devices will depend upon where enough flammable gas or vapor might be present in the air to produce an ignitable mixture. NFPA 33 references a detailed electrical class, division and code system to identify levels of required protection, which underscores your need to consult with a qualified electrician. Here are some general principles that apply to all spray booths (and rooms):

- **Inside the booth**—All electrical components within three feet of the booth and in the booth must be UL Listed and be manufactured for Class 1 Division 1 Hazardous Location (NFPA 70E: Standard for Electrical Safety in the Workplace®) atmospheres.
- **Outside the booth**—All other equipment must be located more than three feet from booth doors. Simply turning on a radio, whether electric or battery powered, can cause a spark sufficient to ignite paint fumes.

- **Lighting**—Any lights must be explosion-proof and separated by wired glass with a vapor-tight seal. Plexiglas is not acceptable.
- **Grounding**—All metal elements of the booth, ducts and equipment must be grounded.

3 things that help prevent or contain spray booth fires

An enclosure designed to stop the spread of fire

Booths that comply with NFPA 33 requirements, such as those detailed above, come with the following built-in safety features:

- **Automatic shut-offs**—There are switched interlocks on all doors so that if any door opens, the spray gun automatically shuts off. These switches also connect to the fire suppression circuit so that if an automatic suppression system initiates, the fan and spray gun shut off.
- **Highest available fire rating**—NFPA 33-approved booths feature one-hour firewalls of either steel or concrete. Fire-rated drywall is not an acceptable option as it is easily broken.

An effective fire suppression program

An automatic fire extinguishing suppression (AFES) system is designed to control or limit a fire in its initial stages, using any of a variety of suppression agents including water, carbon dioxide, wet or dry chemicals. Keys to an effective fire suppression system are:

- **Ensuring adequate coverage**—You need enough extinguisher heads in the booth, stack and plenum to accomplish the initial knockdown.
- **Protecting against overspray**—Sprinkler heads and AFES discharge heads should be protected from paint overspray by lightweight paper bags and changed frequently to prevent buildup.
- **Choosing the appropriate fire suppression agent**—See the material safety data sheet for the best suppression agent. If you use several paints and solvents, install the agent for the most dangerous material.
- **Obtaining expert advice**—A professional fire protection contractor is the best resource for proper installation of your suppression system. Once in place, the system should be inspected and serviced annually.
- **Having a secondary means of protection**—A Class B, dry chemical or carbon dioxide fire extinguisher should be situated near the spraying operation and be routinely inspected and replaced in accordance with NFPA 10: Standard for Portable Fire Extinguishers.



A focus on safety across your organization

Rigorous supervision of staff and maintenance are essential to safe spray operations. Here are a few of the areas that require your attention:

- **Staff training**—All personnel involved in the spray application processes covered by NFPA 33 should be instructed in: potential safety and health hazards; operational, maintenance, and emergency procedures; and the importance of constant operator awareness.
- **Operator protection**—A well-designed spray booth will minimize the risk of illness to employee-operators, but you should also have an OSHA-compliant respiratory protection program in place.
- **Ban on smoking**—“No Smoking” signs should be posted in all of your spray areas and paint storage rooms.
- **Safe storage, handling and mixing of flammable and combustible liquids**—These all need to meet the requirements of NFPA 30: Flammable and Combustible Liquids Code. As a rule, only the paint needed to complete a job should be permitted within the booth.
- **Regular and thorough cleaning**—All spray areas, including ducts and fans, should be kept free of combustibles. Removal of overspray accumulations should be performed using non-sparking tools. Residue from cleaning should be removed immediately. Combustible rags should be placed in UL Listed waste cans with self-closing metal lids.

Stay up-to-date with the latest edition of NFPA 33

The newest edition of NFPA 33 helps designers, contractors and installers address fire and electrical safety issues more effectively. Among the updates are clarifications on:

- Various definitions in Chapter 3
- Spray rooms and spray booths in Chapter 5
- Electrical classifications in Chapter 6
- Heating of recirculated air in Chapter 7

Visit nfpa.org and type “NFPA 33” into the Search window to learn more and/or to purchase a copy.

More information about spray painting safety

If you use waterborne spray paints in your business, our [waterborne spray finishing resource](#) provides practical advice to help mitigate your risk.



Providing solutions to help our members manage risk.®

For your risk management and safety needs, contact Nationwide Loss Control Services at 1-866-808-2101 or MyLossControlServices.com

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