

Ontario Fire Code

SECTION 5.14 *SPECIAL PROCESSES INVOLVING FLAMMABLE & COMBUSTIBLE LIQUIDS*

Illustrated Commentary



5.14.1. Quench Tanks

Location

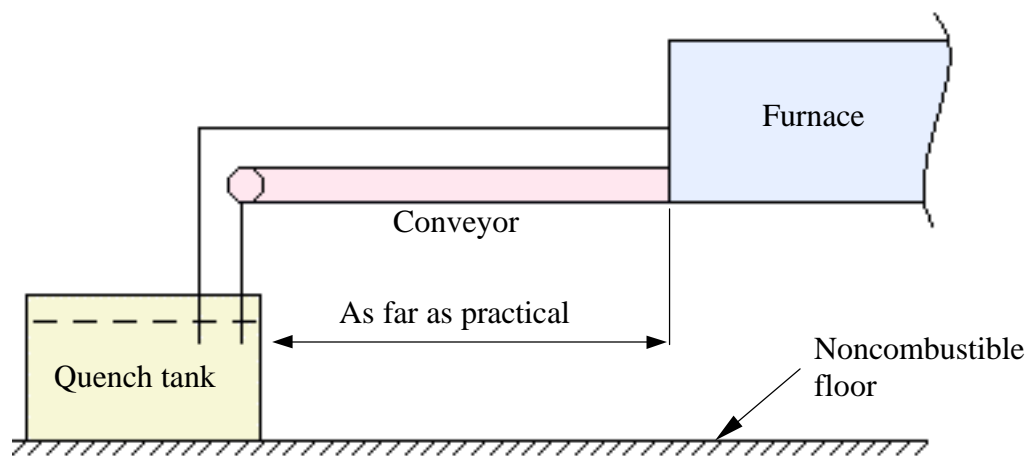
- 5.14.1.1.(1) Quench tanks shall be located as far as practical from annealing, hardening and tempering furnaces.
- (2) Quench tanks shall not be located on or near combustible floors.

Quench tanks must not be located near furnaces where there is a risk of igniting the cooling medium in the quench tanks with heat or sparks from furnaces.

Sentence (2) prohibits the location of the quench tanks on or near combustible floors to eliminate the risk of igniting combustible floor materials.

This can occur:

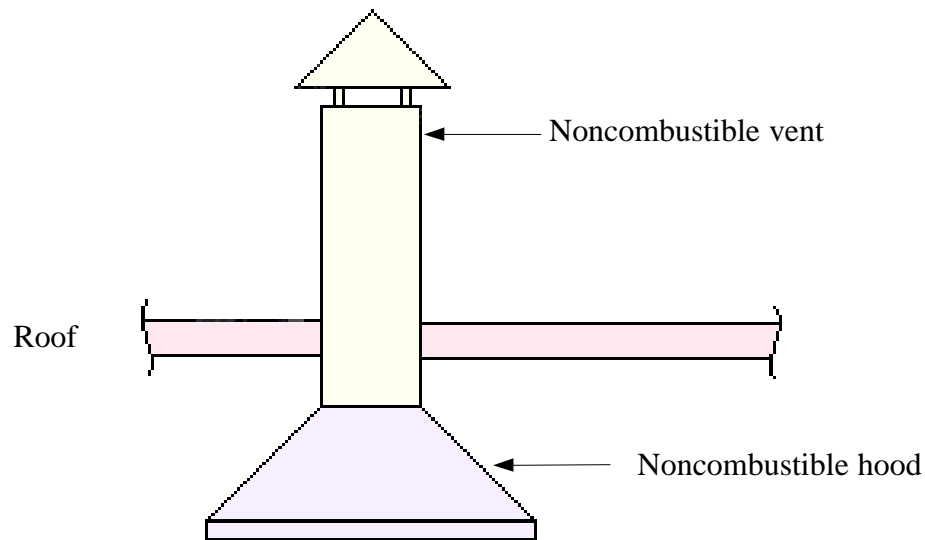
- through contact or proximity with hot objects that are being transferred from the furnaces to the quench tanks,
- through spills or splashes from the quench tank.



5.14.1. Quench Tanks
Hoods and vents

5.14.1.2. Quench tanks shall be provided with a noncombustible hood and vent exhausting to the outside of the **building**.

The primary objective is to minimize the likelihood of flammable vapours from quench tank operations becoming involved in a fire by confining them to a hood and exhaust system that exhaust them to the outdoors. Exhausting the vapours produced by quench tank operations through a noncombustible hood and vent reduces the possibility of a fire within the hood or exhaust system from spreading to other areas of the building.



Building means any structure used or intended for supporting or sheltering any use or occupancy.

5.14.1. Quench Tanks

Hoods and vents

5.14.1.3. Vents for quench tanks shall conform to the requirements for **flue pipes** in Section 2.6.

Outlined below are the requirements under Section 2.6 that also apply to vents serving quench tanks:

1. A vent is required to be inspected
 - at least annually,
 - when a new quench tank is added, or
 - after the vent has been exposed to a fire.
2. The vent must be repaired or replaced if there is any structural deficiency such as distortion, advanced corrosion or separation of sections, or loose or broken supports.
3. Vents that constitute a fire hazard must be repaired or be replaced in accordance with the Building Code.
4. The vent must be cleaned as often as necessary to keep it free of accumulations of combustible deposits.

Flue pipe means the pipe connecting the flue collar of an appliance to a chimney.

5.14.1. Quench Tanks

High temperature limit switches

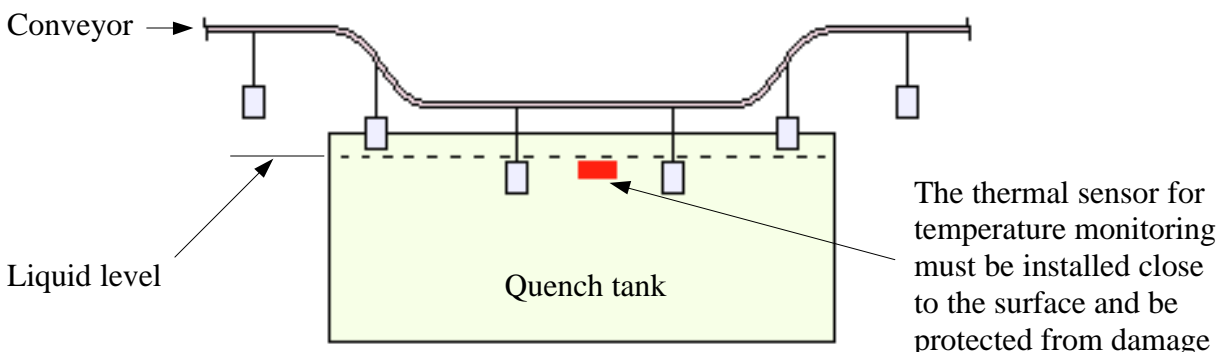
- 5.14.1.4. (1) A high temperature limit switch shall be provided to sound an alarm, shut off heat and stop conveyors when a **flammable** or **combustible liquid** reaches 28°C below its **flash point** in a quench tank.
- (2) The temperature-sensing element for the high temperature limit switch in Sentence (1) shall be located close to the surface of the liquid and be protected from damage.

Fires can occur in quench tanks when the main body of cooling medium (typically quench oil) is heated above its flash point releasing significant quantities of ignitable vapours. This type of fire rapidly reaches its full intensity and can be very difficult to extinguish using portable equipment.

Providing high temperature limit switches on quench tanks is intended to reduce the risk of igniting the cooling medium by:

- alerting the operator to the high temperature condition using an alarm, and
- preventing an additional increase in temperature by shutting off the conveyors that would transfer additional heated materials or products into the tank.

Vapours are released into the atmosphere from the surface of the quench tank liquid. Locating the temperature-sensing element near the surface of the liquid ensures that liquid temperatures are monitored in the vicinity where the liquid will release vapours.



Combustible liquid means any liquid having a flash point at or above 37.8°C and below 93.3°C.

Flammable liquid means a liquid having a flash point below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D 323, "Vapor Pressure of Petroleum Products (Reid Method)".

Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

5.14.1. Quench Tanks

Electrical installations

- 5.14.1.5. Electrical installations conforming to the requirements for dip tanks in Article 5.13.5.6. shall be provided for quench tanks of over 1900 L capacity whose liquid surface area exceeds 2.5 m².

By reference to 5.13.5.6., electrical installations associated with quench tanks of the specified capacity must conform to the Electrical Safety Code made under the Power Corporation Act.



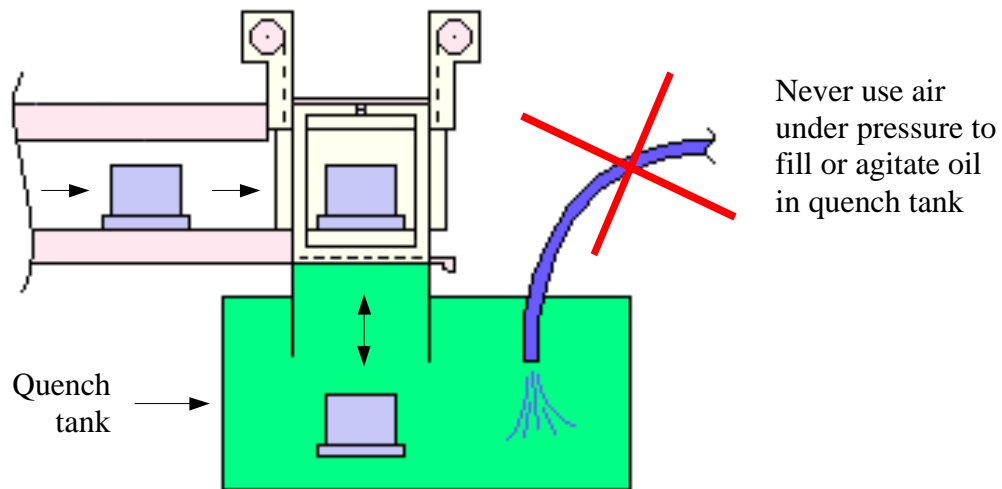
5.14.1. Quench Tanks

Air pressure

5.14.1.6. Air under pressure shall not be used to fill or agitate oil in quench tanks.

Prohibiting the use of compressed air to fill or agitate liquid in quench tanks is intended to:

- reduce the risk of accelerating the evaporation of flammable vapours from tank cooling liquid that could be ignited by the heated objects being immersed,
- avoid creating pockets of air and explosive atmospheres within the liquid that could be ignited with hot objects and result in an explosion, and
- reduce the risk of splashing or spilling tank contents outside of the quench tank which could be ignited.

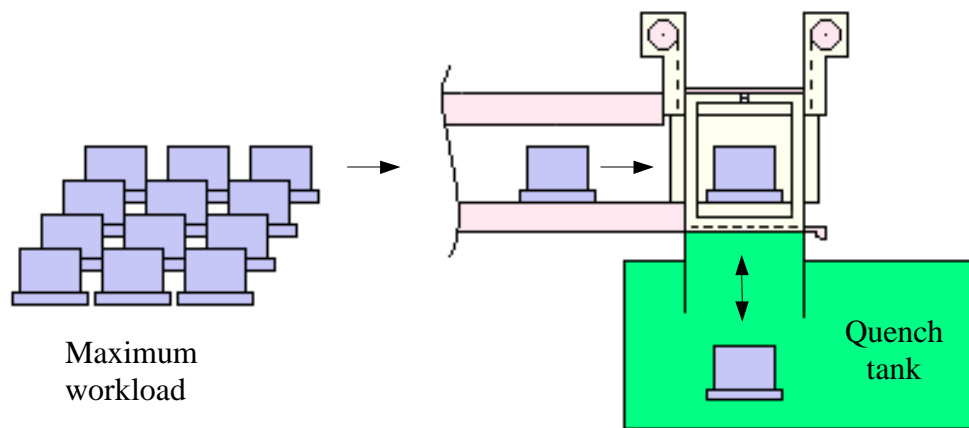


5.14.1. Quench Tanks

Working temperatures

- 5.14.1.7. A quench tank shall be designed so that the maximum workload is incapable of raising the working temperature of the cooling medium to within 28°C of its **flash point**.

The intent is to reduce the risk of igniting quench tank contents. This is accomplished by ensuring that the maximum volume of heated materials or products processed will not overheat the volume of the cooling medium. The temperature of the quench tank coolant must not heat to within 28 C of its flash point.



Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

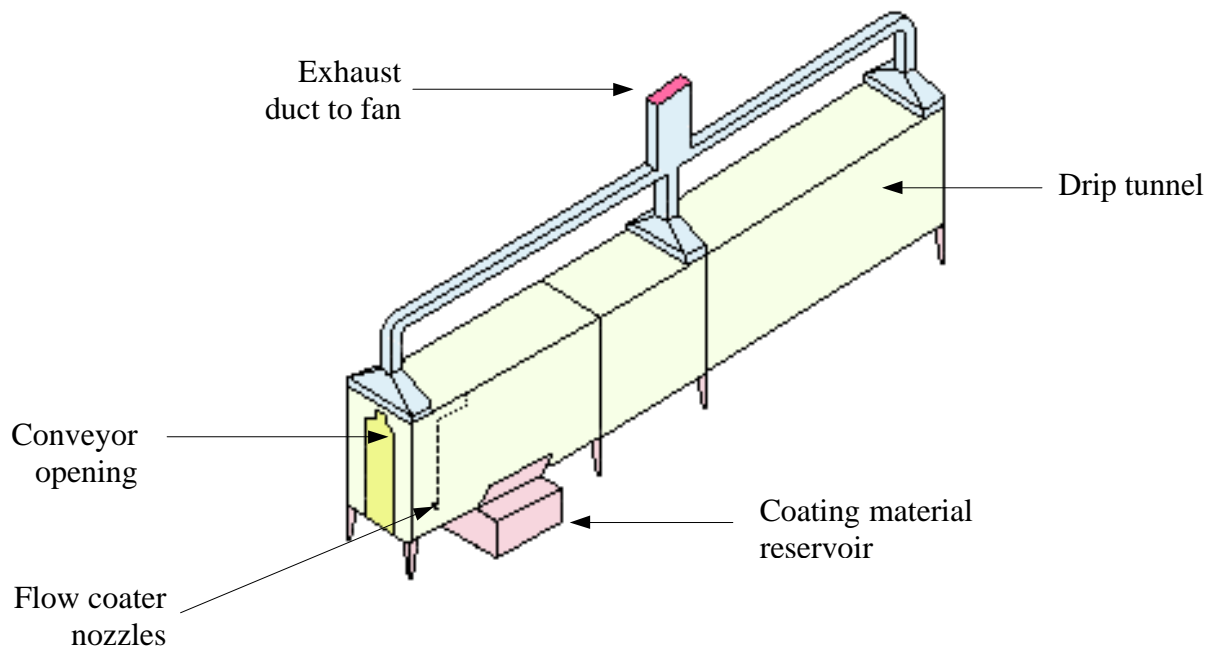
5.14.2. Flow-Coating Operations

Application of dip tank requirements

- 5.14.2.1.(1) The requirements in Section 5.13 for dip tanks shall also apply to flow-coating operations.
- (2) The sump area and any area on which paint flows shall be considered as the dip tank area for the purposes of these provisions.

In flow coating operations, the coating material is applied to the object being coated by nozzles or slots in a non-atomized state. The excess coating material is collected in a trough or sump area below the workpiece and returned to the reservoir.

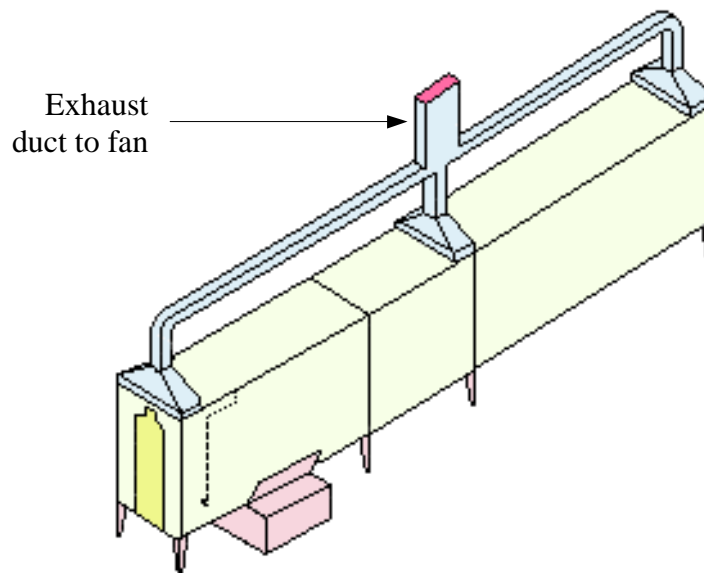
Similar to dip tank hazards, flow coating operations can produce flammable vapours. For this reason, the application of Section 5.13 for dip tanks must apply to flowcoating operations as well.



5.14.2. Flow-Coating Operations
Mechanical ventilation

5.14.2.2. Mechanical ventilation shall be provided at the rate of 63 m³ of fresh air per litre of solvent used.

The intent is to provide mechanical ventilation to remove ignitable concentrations of solvent vapours. The ventilation rate is based on 63 cubic metres of fresh air per litre of solvent used.



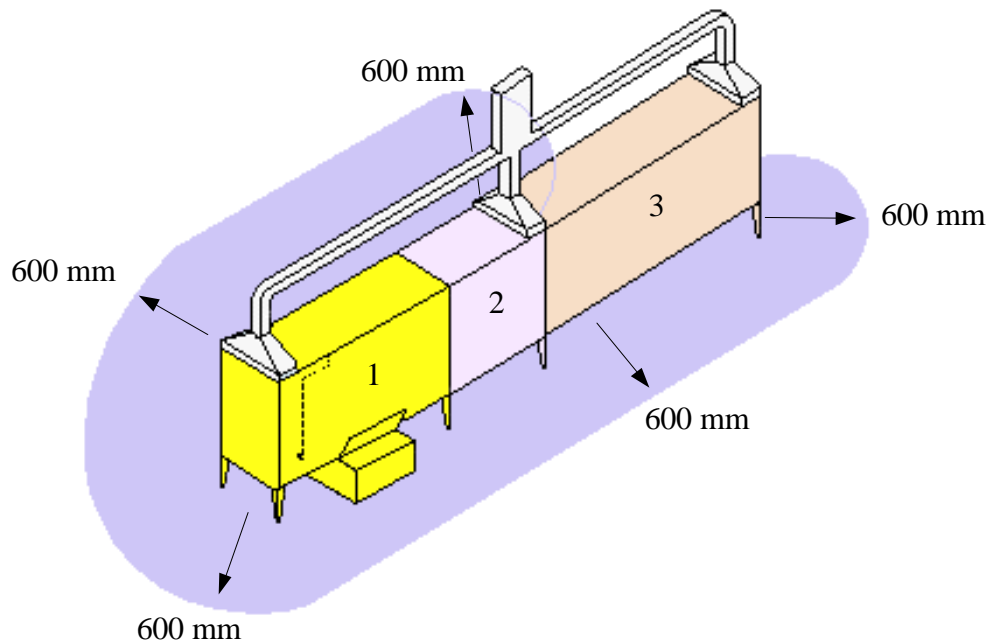
5.14.2. Flow-Coating Operations
Mechanical ventilation

- 5.14.2.3. Ventilation shall be arranged so that the flammable vapour concentration exceeding 25 per cent of the **lower explosive limit** will be confined to within 600 mm of the paint stream and drain area, freshly coated work and the drip tunnel bottom.

The intent is to provide sufficient mechanical ventilation to confine flammable vapour concentrations to the smallest practical space possible.

This space extends to within 600 mm of:

1. paint stream and drain area,
2. freshly coated work, and
3. the drip tunnel bottom.

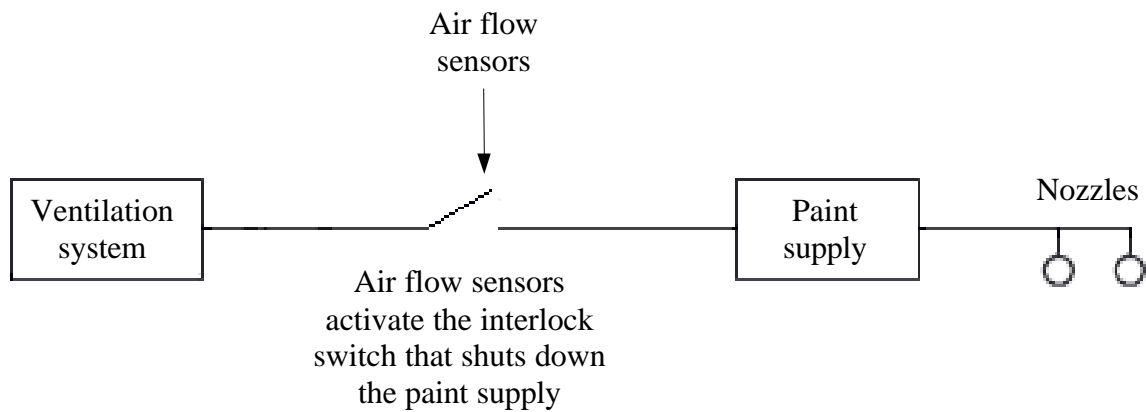


Lower explosive limit means the minimum concentration of vapour in air at which the propagation of flame occurs on contact with a source of ignition.

5.14.2. Flow-Coating Operations
Interlocks

5.14.2.4. The ventilation system shall be interlocked to shut down the paint supply whenever fans are stopped as sensed by the air flow.

This Article requires the paint supply to be shut down when air flow sensors detect that the ventilation fans have stopped.



5.14.2. Flow-Coating Operations

Supply

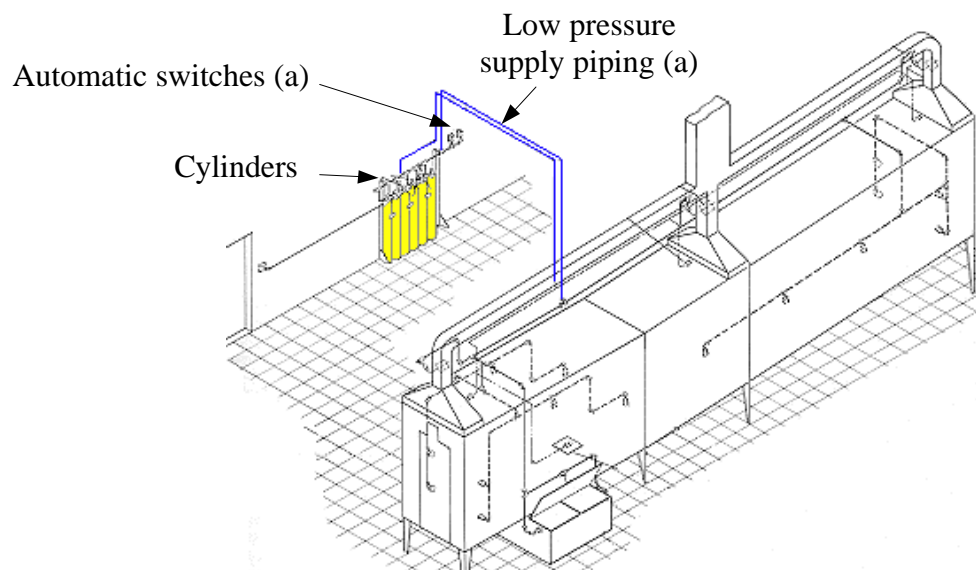
- 5.14.2.5.(1) **Flammable or combustible liquids** shall be supplied by
- (a) direct low pressure pumping arranged to shut down automatically by means of **listed** and labelled devices in the event of fire, or
 - (b) a gravity tank not exceeding 45 L in capacity.

The intent of this Article is to limit the quantity of coating material from an automatic delivery system that can flow into the application area in the event of a fire in that location. This Article permits the coating material to be delivered by a direct low pressure pump or a gravity tank provided certain conditions are satisfied.

The requirements for low pressure pumping are intended to reduce the risk of the coating material being discharged at a high pressure in a fine mist or atomised state. Atomised liquids accelerate evaporation and the development of flammable vapours increasing the fire or explosion hazard.

Having features that shut down the coating liquid supply pump in the event of a fire helps limit the size and intensity of fire by limiting the fuel supply. The use of listed and labelled devices ensures the integrity of the automatic shut down feature.

As an alternative, a gravity tank may be used provided the quantity of coating liquid does not exceed 45 litres.



Combustible liquid means any liquid having a flash point at or above 37.8°C and below 93.3°C.

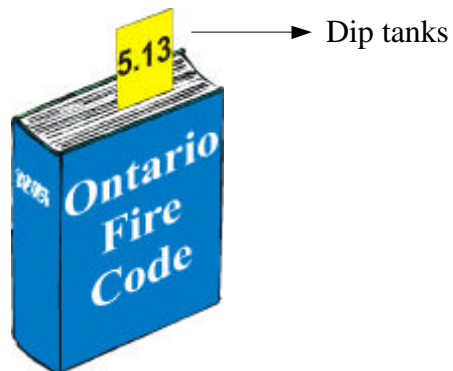
Flammable liquid means a liquid having a flash point below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D 323, "Vapor Pressure of Petroleum Products (Reid Method)".

Listed means equipment or materials included in a list published by a certification organization accredited by the Standards Council of Canada.

5.14.3. Roll-Coating Processes
Application of dip tank requirements

- 5.14.3.1. The requirements in Section 5.13 for dip tanks shall also apply to roll-coating processes.

In roll coating operations, the coating material is applied to the object being coated by bringing the object into contact with one or more liquid coated rollers. Similar to dip tank hazards, roll coating operations can produce flammable vapours. For this reason, Section 5.13 for dip tanks applies to flow coating operations as well.



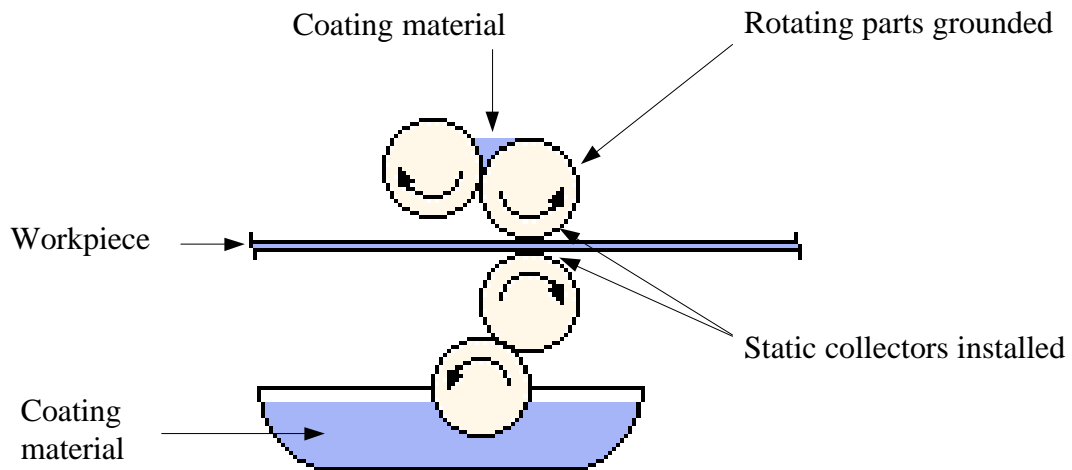
5.14.3. Roll-Coating Processes

Grounding

5.14.3.2.(1) Rotating parts shall be grounded.

(2) Static collectors shall be installed where the material being coated leaves each rotating part.

Sentences (1) and (2) are intended to avoid the build-up of static charges around rotating parts of roll-coating operations by bonding and grounding them. Static charges could generate sparks capable of igniting flammable vapours and cause a fire or explosion hazard.

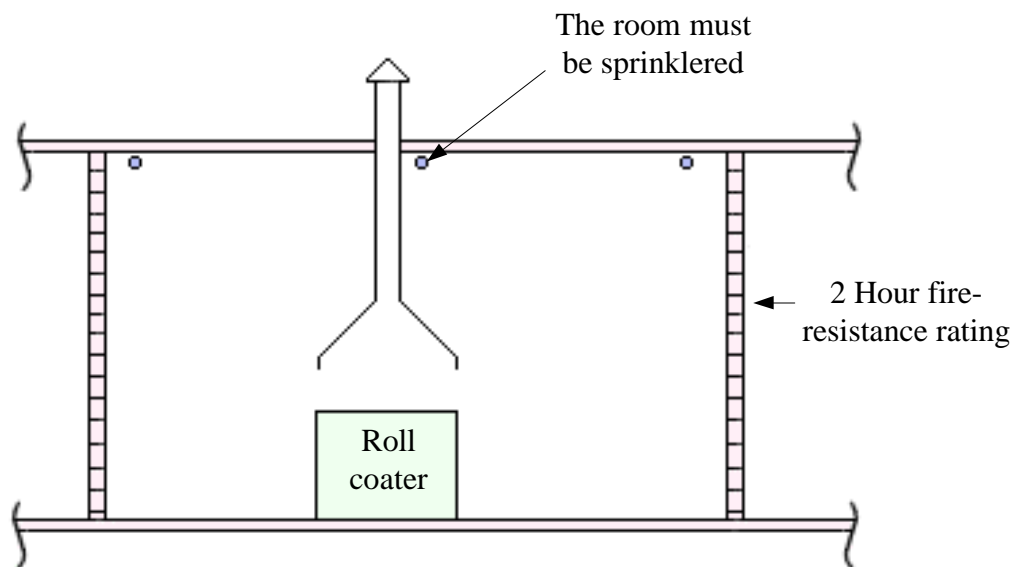


5.14.3. Roll-Coating Processes

Location

- 5.14.3.3. Operations involving materials that have been freshly coated with a liquid containing solvents having a **flash point** less than 43°C shall be located in **sprinklered** rooms that are separated from other **occupancies** by **fire separations** having a 2-hr **fire-resistance rating**.

The requirements in this Article are intended to contain, control or extinguish a fire occurring in roll-coating operations that utilize a liquid having a flash point of less than 43°C.



Fire-resistance rating means the time in hours or fraction thereof that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived therefrom as prescribed in the Building Code.

Fire separation means a construction assembly that acts as a barrier against the spread of fire and may or may not have a fire-resistance rating or a fire-protection rating.

Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Occupancy means the use or intended use of a building or part thereof for the shelter or support of persons, animals or property.

Sprinklered (as applying to a building or part thereof) means that the building or part thereof is equipped with a system of automatic sprinklers.

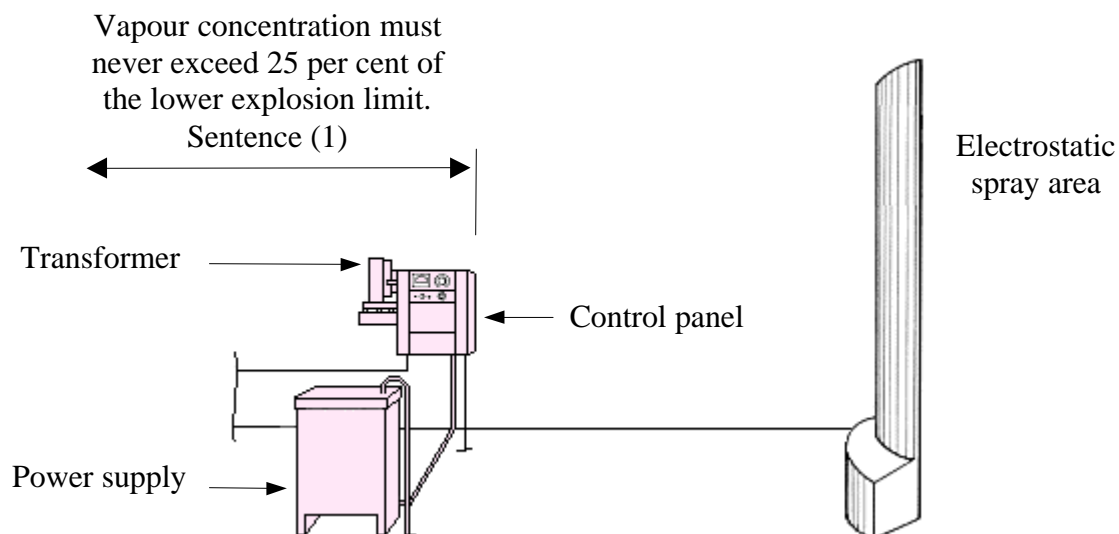
5.14.4. Electrostatic Spraying and Detearing Equipment

Equipment location

- 5.14.4.1.(1) Electrical components including transformers, power packs and control equipment for electrostatic spray applications or for the electrostatic removal of excess coating material (detearing) shall be located in an area where the vapour concentration of **flammable** or **combustible liquids** cannot exceed 25 per cent of the **lower explosive limit**.
- (2) Sentence (1) does not apply to high voltage grids and their connections.

In electrostatic spraying and detearing, electric sparks may occur between the electrodes and the work or the surrounding apparatus. Sentence (1) is intended to eliminate the risk that electrical equipment used in electrostatic spraying and detearing could ignite flammable vapours.

Sentence (2) waives the requirement for high voltage electrical equipment that is an integral part of the electrostatic spraying apparatus that must be located in the spraying area (i.e. in the area for electrostatic spraying where ignitable concentrations of vapours or mists are present).



Combustible liquid means any liquid having a flash point at or above 37.8°C and below 93.3°C.

Flammable liquid means a liquid having a flash point below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D 323, "Vapor Pressure of Petroleum Products (Reid Method)".

Lower explosive limit means the minimum concentration of vapour in air at which the propagation of flame occurs on contact with a source of ignition.

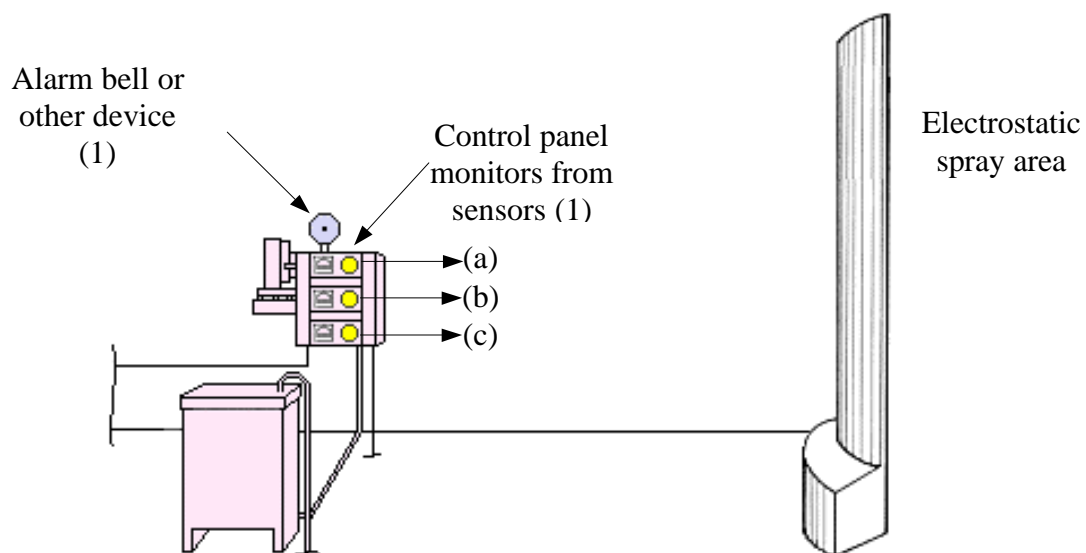
5.14.4. Electrostatic Spraying and Detearing Equipment
Interlocks

- 5.14.4.2.(1) Electrostatic spraying and detearing equipment shall be provided with automatic controls that will operate without a time delay to disconnect power to high voltage transformers and to signal the operator when
- (a) stoppage of the air supply, ventilating fan or conveyor system occurs,
 - (b) there is a ground at any point on the high voltage system, or
 - (c) clearances are reduced below those specified in Article 5.14.4.4.

Automatic safety interlocks for electrostatic spray coating and detearing are intended to reduce the risk of igniting flammable vapours or mists.

This could result from:

- inadequate exhaust ventilation,
- stoppage of the conveyor system holding the objects being sprayed or deteared, and
- sparks generated by the spraying apparatus as a result of a ground condition or insufficient clearance between the objects being sprayed or deteared and electrodes and conductors.



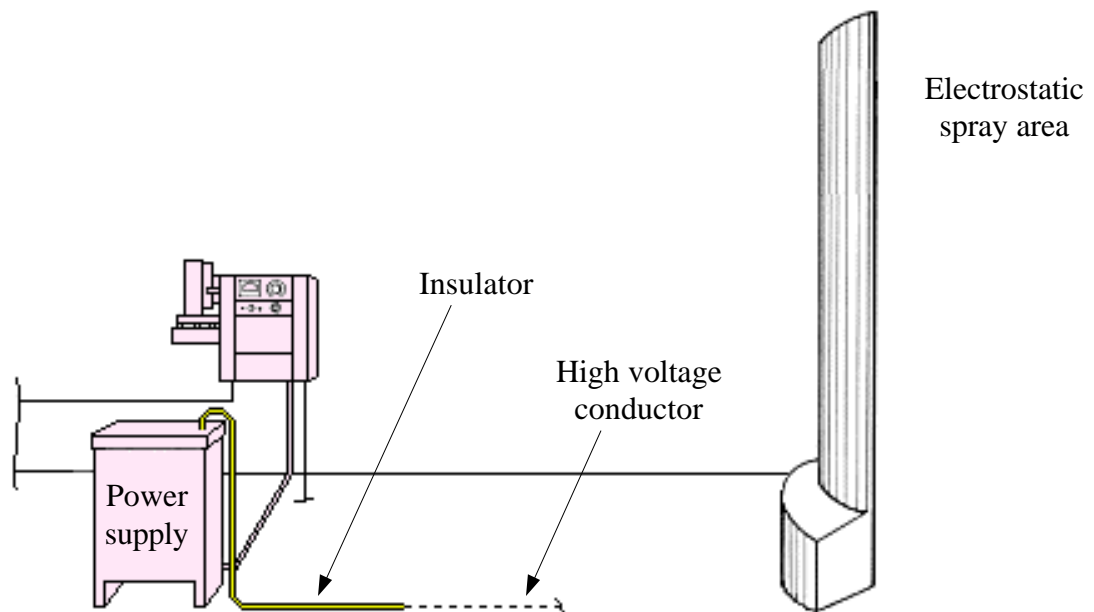
5.14.4. Electrostatic Spraying and Detearing Equipment

Insulators

5.14.4.3. Insulators shall be kept clean and dry.

Insulators for high voltage components of equipment for electrostatic spraying and detearing must be kept clean and dry to reduce the risk of igniting:

- flammable vapours or mists with electrostatic spraying or detearing equipment caused by sparks or electric arcs generated by high voltage components of the spraying apparatus as a result of a ground condition, contact or insufficient clearance caused by the deterioration of insulators, and
- combustible overspray residues that would have accumulated on the insulators.



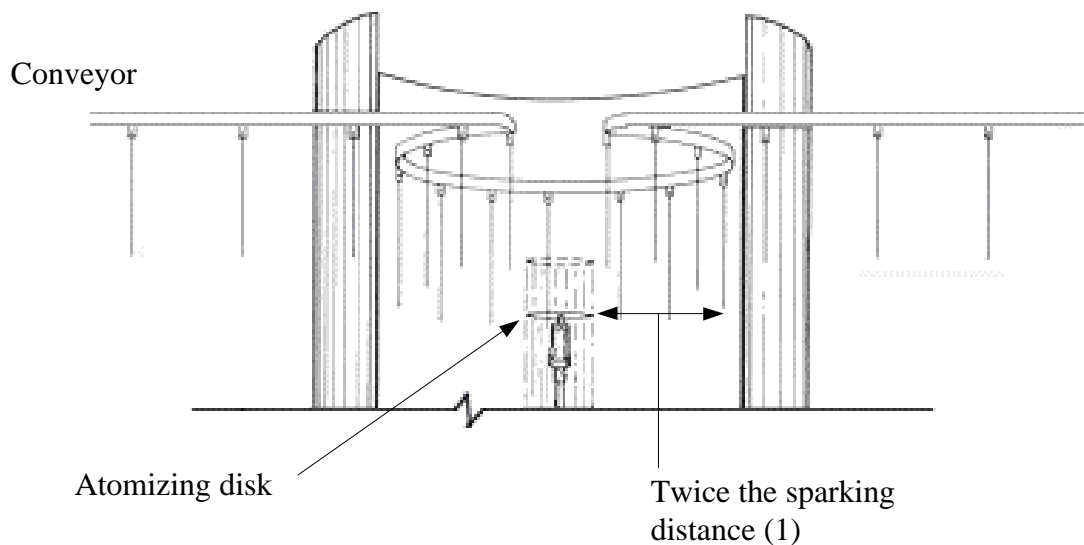
5.14.4. Electrostatic Spraying and Detearing Equipment

Clearances

- 5.14.4.4.(1) A space equivalent to twice the sparking distance shall be maintained between articles being painted or deteared and electrodes or conductors.
- (2) A sign shall be conspicuously posted near an electrical assembly stating the maximum sparking distance.

The clearances specified in Sentence (1) are intended to reduce the risk of igniting flammable vapours or mists from the objects being sprayed or deteared with sparks generated by the spraying apparatus.

The requirement for signs in Sentence (2) is intended to reduce the risk of personnel improperly operating the electrostatic spraying, detearing or conveying equipment i.e. without adequate clearances.

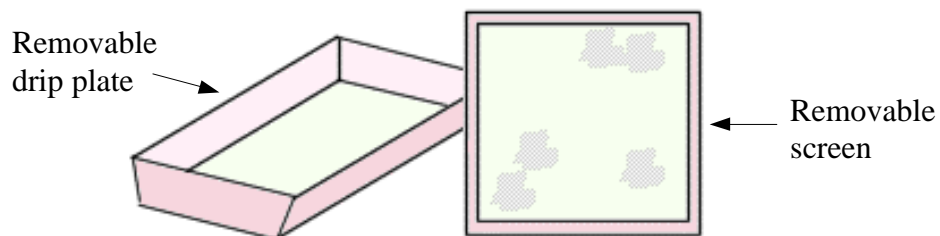


5.14.4. Electrostatic Spraying and Detearing Equipment

Drip plates and screens

- 5.14.4.5. Drip plates and screens subject to paint deposits shall be removable for cleaning.

Drip plates and screens that catch excess coating material, can create a fire or explosion hazard when combustible overspray residues are allowed to accumulate. One hazard, for example, is the possibility of spontaneous combustion of these residues. Removing and cleaning these components limits the fire load and minimizes the risk of a fire in the spraying area spreading to other parts of the building.

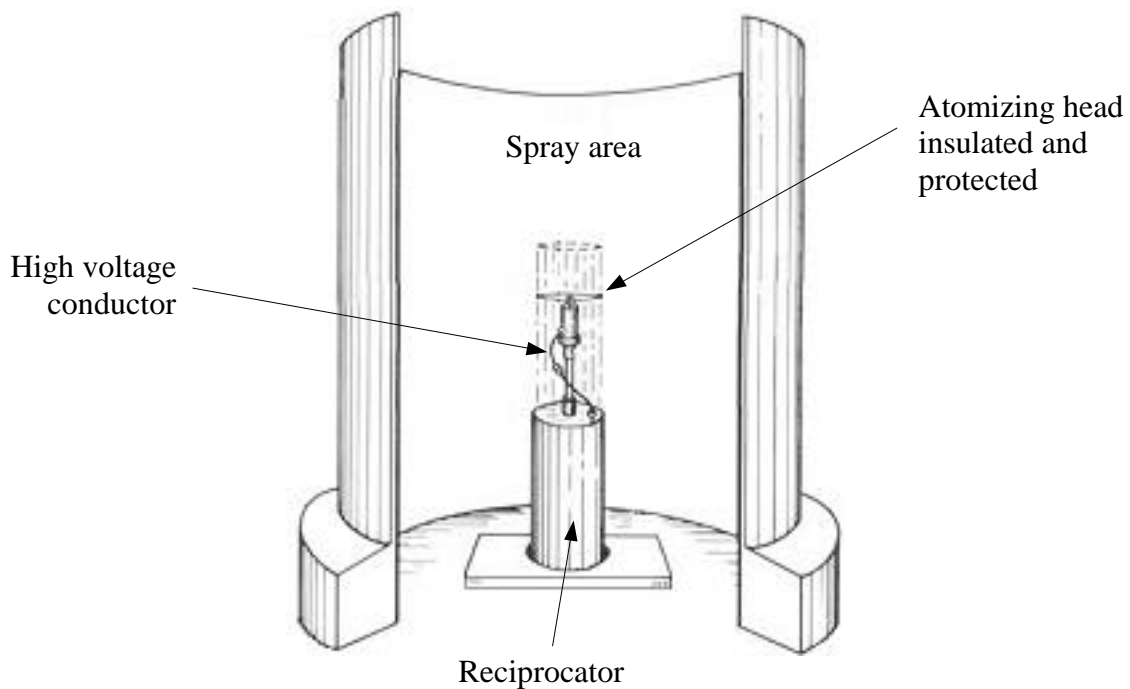


5.14.4. Electrostatic Spraying and Detearing Equipment
Insulating and grounding

- 5.14.4.6. High voltage components, including atomizing heads, shall be insulated and protected against mechanical damage and accidental contact or grounding.

Insulating and protecting high voltage components of electrostatic spraying and detearing equipment reduces the risk that sparks or electric arcs generated by these components could ignite flammable vapours or mists in the event of:

- a ground fault condition,
- contact, or
- insufficient clearance.



5.14.4. Electrostatic Spraying and Detearing Equipment

Insulating and grounding

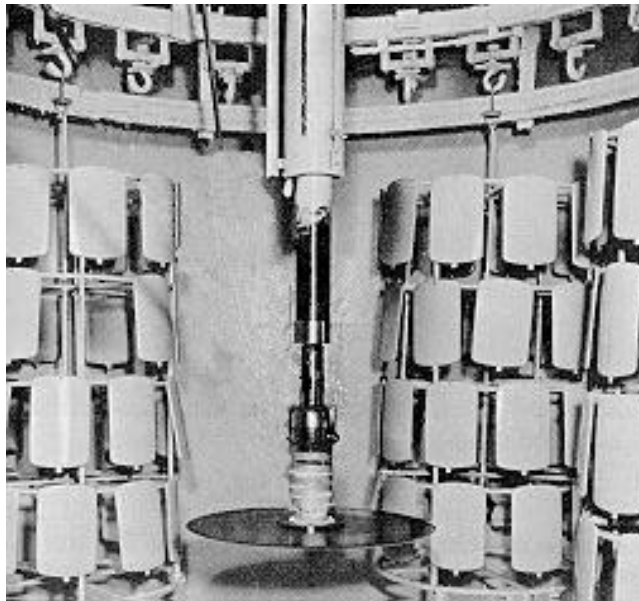
- 5.14.4.7. An automatic means shall be provided for grounding the electrode system when it is de-energized.

Grounding de-energized electrostatic spraying and detearing equipment reduces the risk that sparks between the electrode system and other objects or materials could ignite flammable vapours or mists. Using an automatic device or means ensures that the equipment is grounded every time it is de-energized.

5.14.4. Electrostatic Spraying and Detearing Equipment
Operating distances

- 5.14.4.8. Items being electrostatically sprayed shall not be held by hand nor suspended in such a manner as to reduce the proper operating distance from the atomizing heads.

These requirements ensure the object being sprayed is adequately grounded and the proper operating distances are maintained to prevent sparks or arcs that could ignite the flammable vapours or mists released during the process.



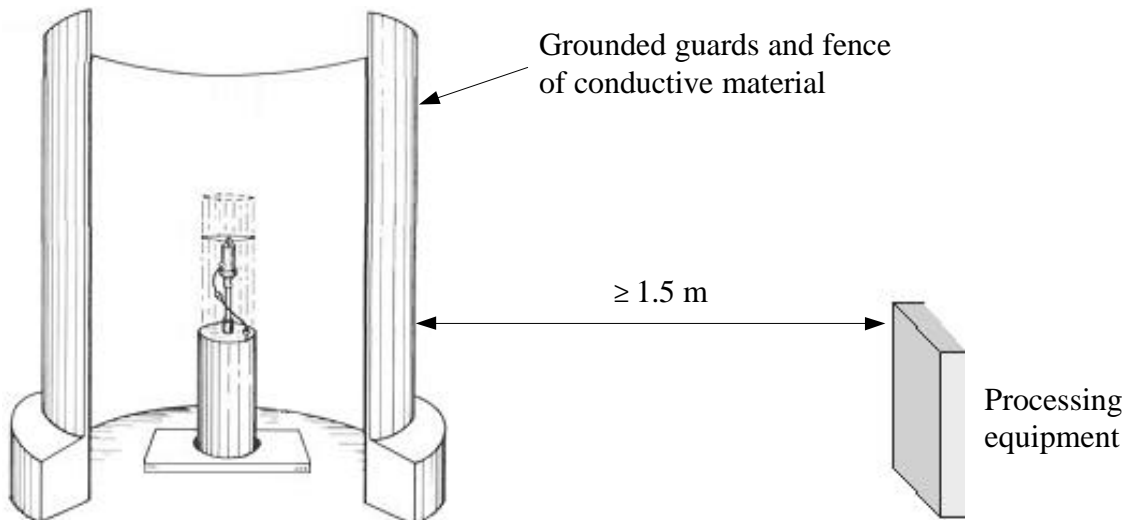
Example shows properly supported workpieces carried by a conveyor

5.14.4. Electrostatic Spraying and Detearing Equipment

Operating distances

- 5.14.4.9. Electrostatic spraying equipment shall be located 1.5 m from processing equipment and isolated from other areas by grounded guards and fences of conducting material.

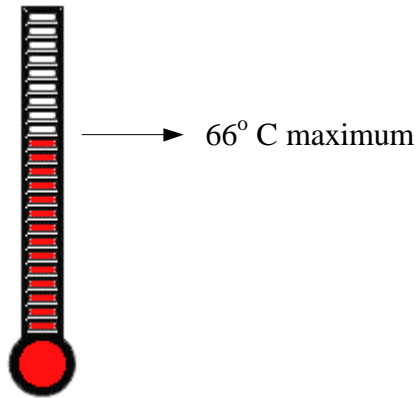
Physically protecting and providing adequate clearance between electrostatic spray coating or detearing equipment and ungrounded equipment or materials in adjacent areas reduces the risk of sparks or arcs migrating to these areas.



5.14.4. Electrostatic Spraying and Detearing Equipment
Surface temperatures

- 5.14.4.10. The surface temperature of equipment in a **spraying area** shall not exceed 66°C.

Limiting the surface temperature of equipment in the spraying area reduces the risk of igniting flammable vapours or combustible residues.



Spraying area means the area that is within 6 m of a spray booth or spraying operation and that is not separated therefrom by a vapour-tight separation.

5.14.4. Electrostatic Spraying and Detearing Equipment

Precautions against shock

- 5.14.4.11. High voltage circuits shall be designed so that any discharge occurring will not ignite vapour-air mixtures or create a shock hazard.

High voltage circuits for electrostatic spraying and detearing equipment must be designed so that during normal operation the following risks are reduced:

- vapour-air mixtures being ignited by sparks or electric arcs, and
 - personnel being injured by electric shocks caused by contact with a grounded object.
-

5.14.4. Electrostatic Spraying and Detearing Equipment

Spray guns

- 5.14.4.12. The energy supply to hand spray guns shall be controlled by a switch that also controls the coating material supply.

Hand spray gun switches must be interlocked to both the energy supply and the coating material supply.

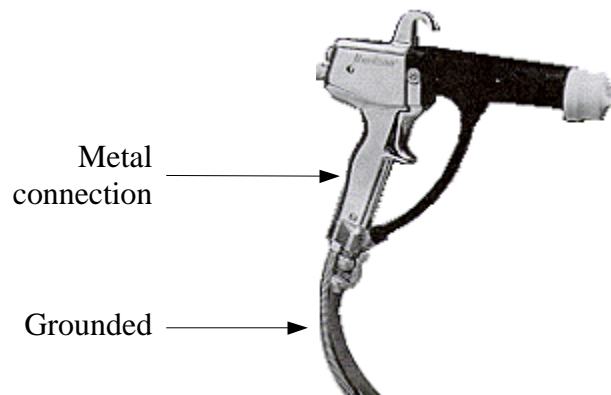


The switch controls the energy supply and the coating material supply

5.14.4. Electrostatic Spraying and Detearing Equipment
Spray guns

- 5.14.4.13. Spray gun handles shall be grounded and have a metallic connection that is in direct contact with the operator's hand during spraying.

This requirement is intended to ensure the operator is grounded through direct contact with the spray gun handle. Grounding the hand spray gun handle helps avoid a build-up of static charges on the spray equipment that could result in sparks being generated. This in turn could ignite flammable vapours or mists and cause a fire or explosion.

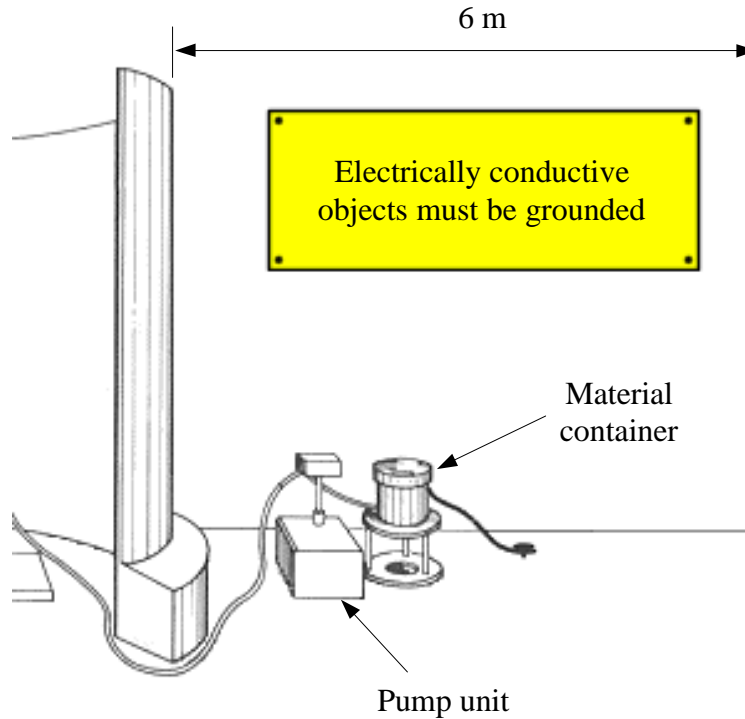


5.14.4. Electrostatic Spraying and Detearing Equipment

Grounding

- 5.14.4.14.(1) Electrically conductive objects in the **spraying area**, including paint containers, wash cans and other objects, shall be grounded.
- (2) A sign shall be posted in the **spraying area** indicating the need for the grounding of electrically conductive objects.

Grounding electrically conductive objects in the spraying area reduces the risk of sparks between these objects and other objects or materials igniting flammable vapours or mists. Posting signs in the area regarding the need for grounding raises the awareness of personnel and helps ensure that proper grounding procedures are adhered to.



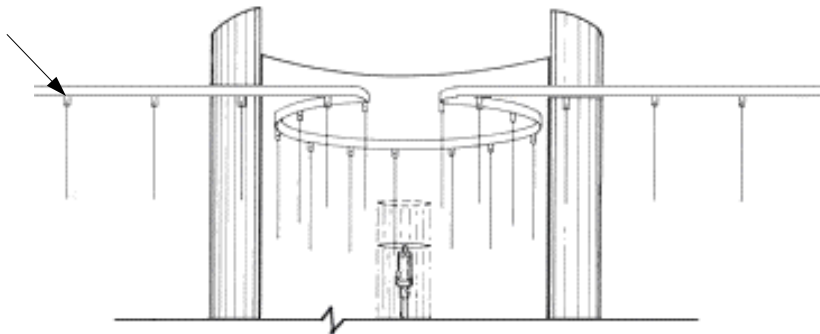
Spraying area means the area that is within 6 m of a spray booth or spraying operation and that is not separated therefrom by a vapour-tight separation.

5.14.4. Electrostatic Spraying and Detearing Equipment
Grounding

5.14.4.15. Hooks and other supports for sprayed items shall be kept clean and free of paint.

Ensuring that supports for sprayed items are clean avoids inadequate contact between the objects and the grounded supports. Inadequate contact may cause a build-up of static charges that could generate sparks and ignite flammable vapours.

Supports clean
and free of paint



5.14.4. Electrostatic Spraying and Detearing Equipment

Warning signs

- 5.14.4.16. Signs designating the **spraying area** as dangerous shall be conspicuously posted.

Posting warning signs to identify the spraying area is intended to ensure all building occupants are aware of the dangers associated with the process. This helps reduce the risk of fire, explosion and personal injury.



Spraying area means the area that is within 6 m of a spray booth or spraying operation and that is not separated therefrom by a vapour-tight separation.

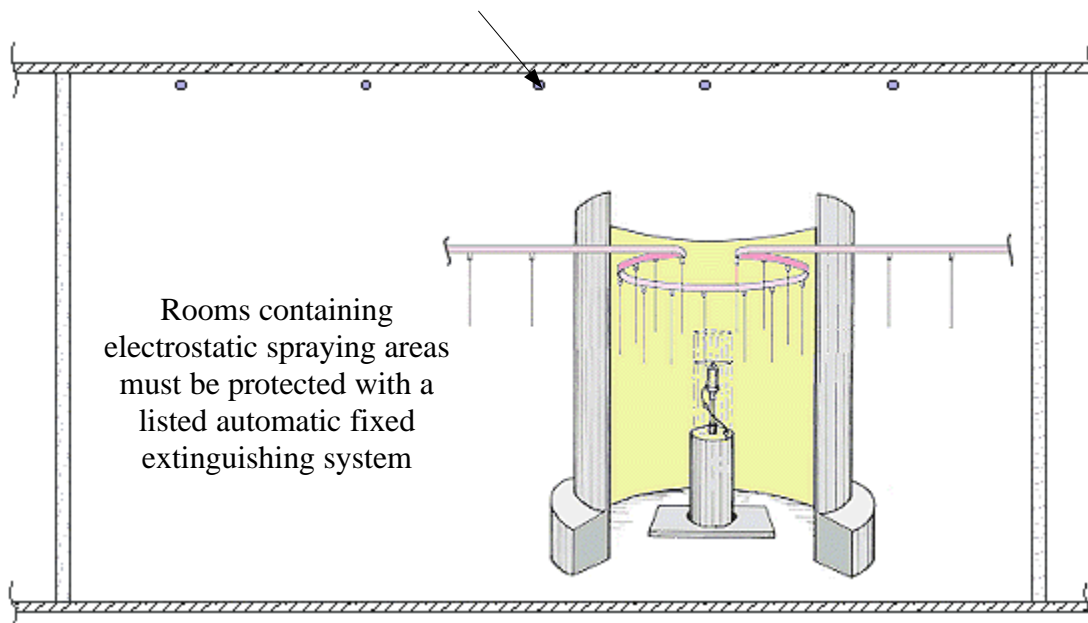
5.14.4. Electrostatic Spraying and Detearing Equipment

Fixed extinguishing equipment

- 5.14.4.17. **Spraying areas** shall be located in rooms protected by **listed** and labelled automatic fixed extinguishing equipment.

To prevent a fire in a spray area from developing and spreading beyond the point of origin, listed extinguishing equipment must be provided as specified.

For example the room
may be sprinklered



Listed means equipment or materials included in a list published by a certification organization accredited by the Standards Council of Canada.

Spraying area means the area that is within 6 m of a spray booth or spraying operation and that is not separated therefrom by a vapour-tight separation.

5.14.5. Automobile Undercoating

5.14.5.1. Automobile undercoating spray operations shall conform to the requirements of Section 5.12 or to the requirements in this Subsection.

Owners of automobile undercoating operations have the option of complying with Subsection 5.14.5. or Section 5.12, since compliance with either set of requirements will ensure an acceptable level of fire safety.



5.14.5. Automobile Undercoating

Undercoating materials

- 5.14.5.2.(1) Automobile undercoating materials shall have a **flash point** of not less than 37.8°C.
- (2) Where the **flash point** of an automobile undercoating is less than 60°C, it shall be applied in a work area where
- (a) there are no work pits,
 - (b) there is a fan with nonferrous blades that provides mechanical ventilation during the application, cleaning and drying cycles at the rate of 72 m³/min per work station,
 - (c) air movement from the air intake and exhaust system is along the length of the vehicle being undercoated, and
 - (d) air is exhausted at a level approximately 1 m above the floor.

The purpose of Sentence (1) is to limit the flash point of undercoating materials utilized in operations where the owner has selected to comply with Subsection 5.14.5., as opposed to compliance with Section 5.12.

Sentence (2) outlines requirements for automobile undercoating work areas where the undercoating has a flash point of between 37.8°C and 60°C.

These provisions are intended to ensure that:

- the operation does not utilize a flammable liquid,
- the operation does not have work pits where flammable vapours (typically heavier than air) may accumulate,
- mechanical ventilation is provided to remove vapours at a specified rate, and
- the fan providing the mechanical ventilation has blades that will not produce sparks (non ferrous).

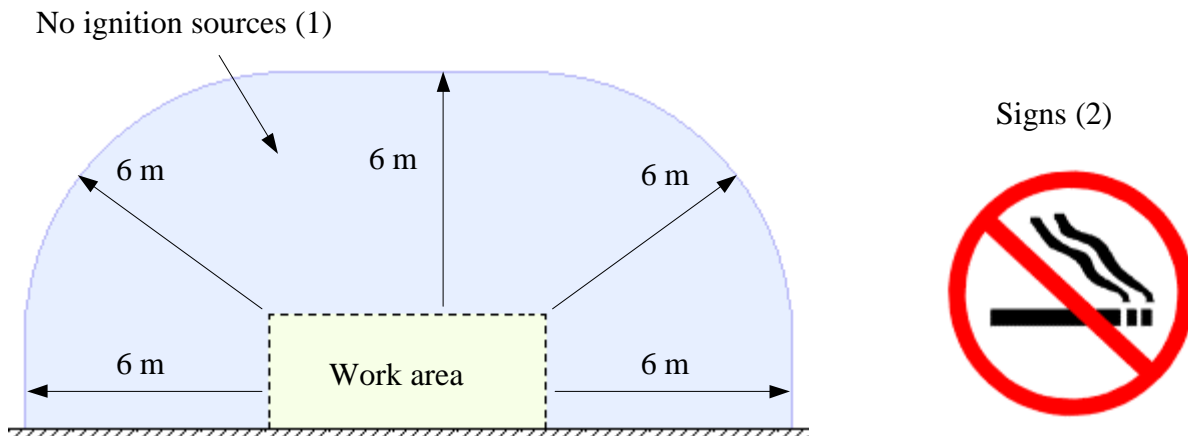
Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

5.14.5. Automobile Undercoating

Ignition sources

- 5.14.5.3.(1) Work stations in Article 5.14.5.2. shall have no source of ignition located within 6 m horizontally of the work area or in the area above it.
- (2) Signs prohibiting smoking that conform to Article 2.4.3.2. shall be posted at the outer limits of the work area.

The prohibitions regarding sources of ignition (for example, spark-producing equipment or appliances and open flames) and smoking are intended to reduce the risk of igniting flammable vapours, combustible mists or overspray residues generated by the spray coating operation.



5.14.5. Automobile Undercoating
Electrical installations

- 5.14.5.4. Except for overhead lighting that is totally enclosed and sealed with gaskets, electrical wiring and equipment within the area of hazard described in Article 5.14.5.3. shall conform to Article 5.1.3.1.

Except for overhead lighting that is totally enclosed and sealed with gaskets, electrical equipment located within a spraying area for automobile undercoating must conform to the Electrical Safety Code made under the Power Corporation Act. This is intended to reduce the risk of fire or explosion caused by electrical equipment.



5.14.5. Automobile Undercoating

- 5.14.5.5. The storage and handling of **flammable** and **combustible liquids** shall be in conformance with Part 4.

This Article is a reminder that the storage and handling of flammable and combustible liquids must comply with Part 4 of the Fire Code.



Combustible liquid means any liquid having a flash point at or above 37.8°C and below 93.3°C.
Flammable liquid means a liquid having a flash point below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D 323, "Vapor Pressure of Petroleum Products (Reid Method)".

5.14.5. Automobile Undercoating

Portable extinguishers

- 5.14.5.6. Portable extinguishers shall be located so that there is one portable extinguisher having a 20BC rating immediately accessible to each work station described in Article 5.14.5.2.

Providing extinguishers for automobile undercoating spray operations in accordance with the specified rating facilitates quick response to extinguish a fire in its incipient stage before it involves additional flammable liquids or combustible deposits.



20BC rating



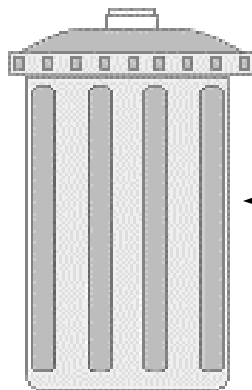
5.14.5. Automobile Undercoating

Refuse disposal

- 5.14.5.7. (1) Areas where automobile undercoating is used shall be kept clean of undercoating deposits and refuse.
- (2) The deposits and refuse shall be placed in covered metal containers.

Undercoating deposits and refuse from automobile undercoating operations are combustible and may give off flammable vapours. To avoid ignition of these materials and spreading fire to other areas:

- accumulations of combustible residues must be cleaned,
- undercoating deposits, refuse and the vapours they generate must be protected from ignition sources by placing them in covered metal containers.



Covered metal
container (2)

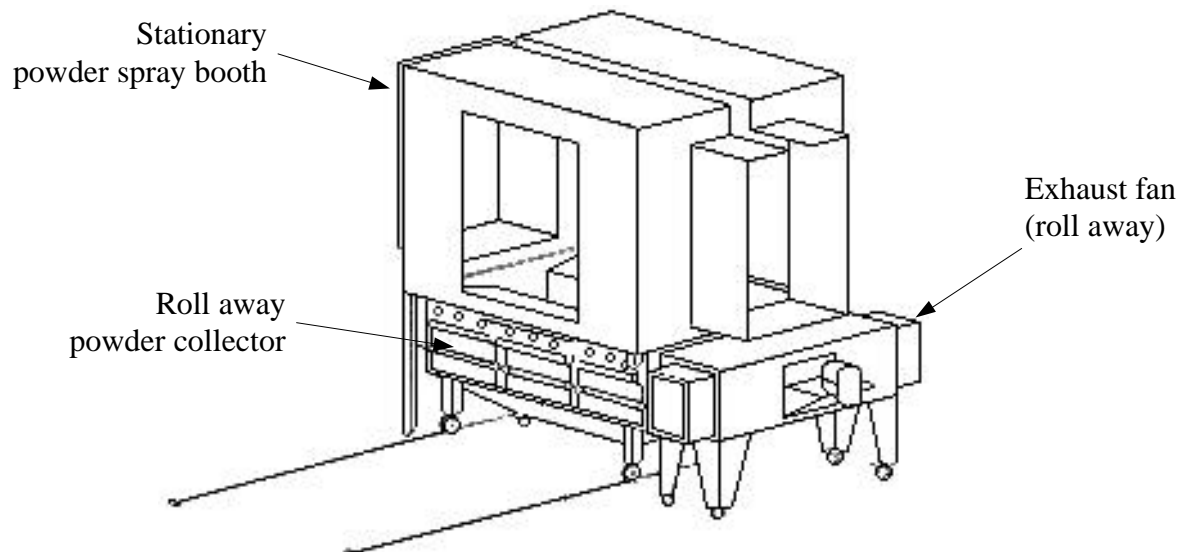
5.14.6. Dry Powder Finishing

Location of operation

5.14.6.1.(1) Processes involving protective finishing material applied in dry powder form by powder spray guns, by electrostatic powder spray guns, by fluidized beds or by electrostatic fluidized beds shall be performed in rooms of **noncombustible construction**, in ventilated, enclosed, powder-coating facilities, or in **spray booths** conforming to Article 5.12.2.1.

This Article provides guidance on the location of powder spray operations. They may be conducted in conventional paint spray booths identical to those used for fluid spray applications (Article 5.12.2.1.), in a ventilated, enclosed, powder-coating facility, or in an open-floor configuration (room of noncombustible construction).

Example below shows a spray booth with the powder recovery system integrated into a single structure.



Noncombustible construction means that type of construction in which a degree of fire safety is attained by the use of noncombustible materials for structural members and other **building** assemblies. **Spray booth** means a power-ventilated structure that encloses or accommodates a spraying operation so that spray vapour and residue can be controlled and exhausted.

5.14.6. Dry Powder Finishing
Installation

5.14.6.1.(2) Electrostatic fluidized beds and associated equipment shall be installed in conformance with good engineering practice.

An electrostatic fluidized bed has a series of high-voltage electrodes mounted near the surface of the fluidized powder mass. Grounded workpieces pass over the electrodes and are coated electrostatically by powder that is attracted to them.

Coating operations involving the use of combustible dry powders applied by electrostatic fluidized beds must be designed in a manner that will not create a fire or explosion hazard in buildings.

Preventive measures involve the storage and handling of powders, powder cloud control, and control of ignition sources.

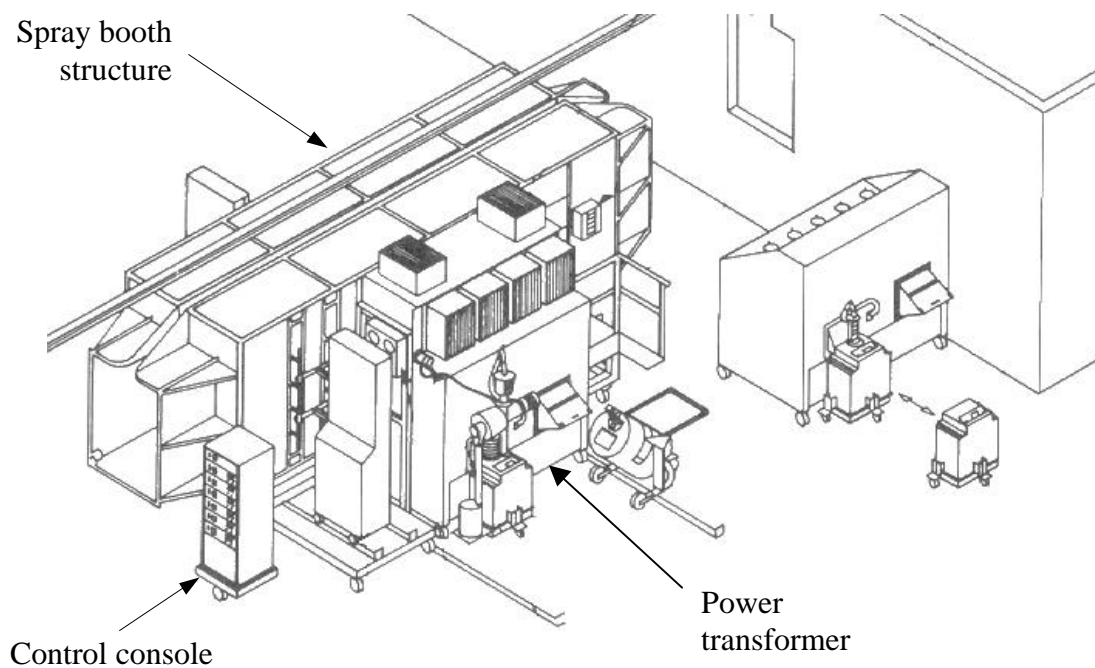
5.14.6. Dry Powder Finishing

Location of electrical equipment

- 5.14.6.2.(1) Transformers, power packs, control apparatus and other electrical components shall be located outside the powder-coating area.
- (2) Sentence (1) does not apply to charging electrodes and their components.

Locating electrical equipment for dry powder finishing operations outside the coating area as specified in Sentence (1) reduces the risk of igniting the cloud of combustible powder with arcs or sparking from electrical equipment.

Sentence (2) waives the prohibition permitting the electrical equipment that is an integral part of the spraying apparatus to be located in the spraying area (i.e. charging electrodes and their connections).



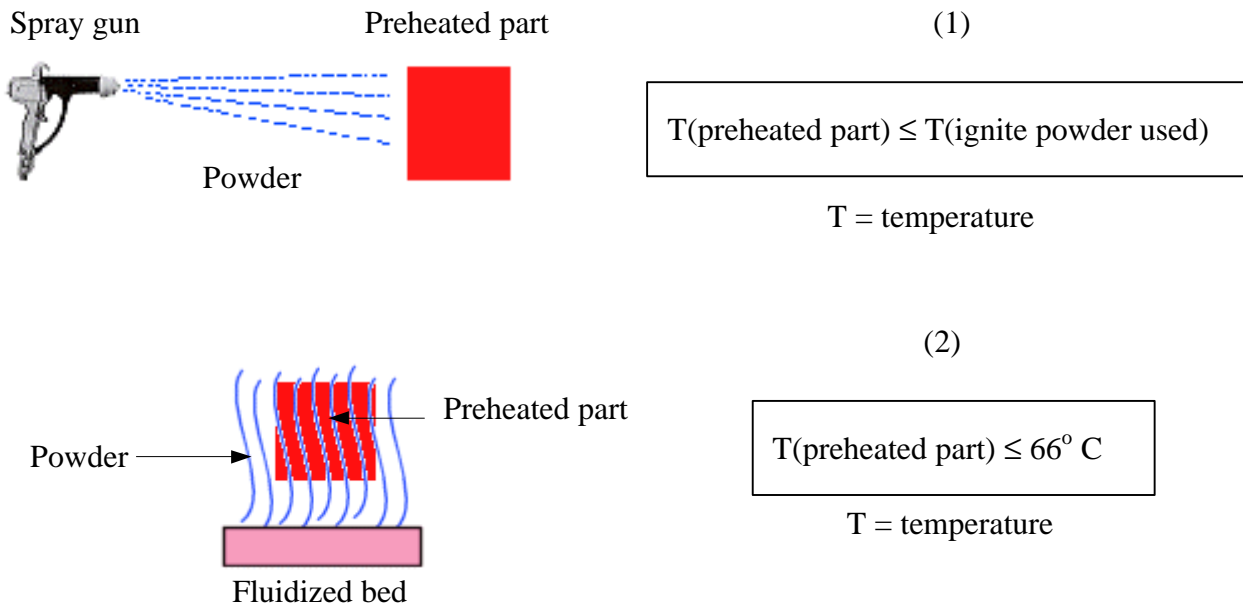
5.14.6. Dry Powder Finishing

Working temperatures

- 5.14.6.3.(1) Where a part to be coated is preheated prior to the application of the powder, the temperature of the part shall not exceed the ignition temperature of the powder being used.
- (2) The surface temperature of electrostatic fluidized bed coating areas shall not exceed 66°C.

Limiting the temperature of the preheated object reduces the risk of igniting the powder cloud when it comes in contact with the surface of the object. The maximum temperature permitted by Sentence (1) for the preheated part must not be greater than the ignition temperature of the powder being used.

When an electrostatic fluidized bed is used, the workpiece may be preheated before entering the coater to a temperature above the melting point of the powder, so that the powder will fuse to the workpiece upon contact. The maximum surface temperature allowed by Sentence (2) is 66°C.



5.14.6. Dry Powder Finishing

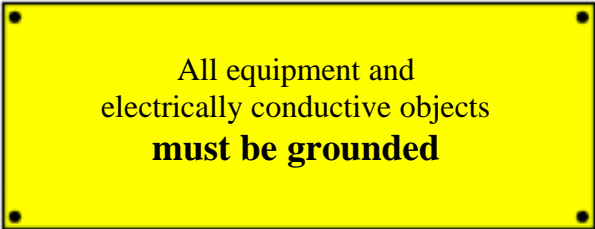
Grounding

- 5.14.6.4.(1) Powder transport, application and recovery equipment shall be grounded.
- (2) Electrically conductive objects within the charging influence of the electrodes of electrostatic fluidized beds shall be grounded.
- (3) A sign shall be posted indicating the necessity of grounding equipment and objects identified in Sentences (1) and (2).

Static electricity is a potential ignition source for airborne clouds of combustible powder. Bonding and grounding the powder transport equipment, application equipment and the recovery equipment can control static electricity. This will bleed static charges to ground before they have had an opportunity to accumulate. [Sentence (1)]

Static accumulations on electrically isolated conductive objects are the major cause of fires in electrostatic powder coating installations. In an electrostatic fluidized bed, the entire volume of the bed can become involved in fire. To prevent this, Sentence (2) requires grounding of all electrically conductive objects within the charging influence of the electrodes.

Given the importance of the measures described, Sentence (3) requires a sign to be posted in the area. It will indicate the necessity of grounding the equipment and objects identified in Sentences (1) and (2) with the continuing intent of reducing the risk of improper procedure or action by the operators.



All equipment and
electrically conductive objects
must be grounded

5.14.6. Dry Powder Finishing
Electrical discharges

- 5.14.6.5. High voltage circuits in electrostatic fluidized beds shall be designed so that any discharge produced when the charging electrodes of the bed are approached or contacted by a grounded object will not be of sufficient intensity to ignite any powder-air mixture likely to be encountered or result in any appreciable shock hazard.

The intent of this Article is to make sure the high-voltage circuits are designed to be incapable of discharging a spark having sufficient energy to:

- ignite any powder-air mixture likely to be encountered, or
- cause injuries to personnel.

An electrostatic fluidized bed has a series of high-voltage electrodes mounted near the surface of the fluidized powder mass. Grounded workpieces pass over the electrodes and are coated electrostatically by powder that is attracted to them. Discharge sparks, when they occur, are often traceable to misracking of parts on a conveyor or swinging of the conveyor racks.

5.14.6. Dry Powder Finishing
Separators

- 5.14.6.6. Separators shall be used to prevent tramp iron or other spark-producing materials from being introduced into the powders being applied.

In some dry powder finishing operations, powder recovered from the finishing operation may be reintroduced to the feeder for the spray gun. Separators required by this Article reduce the risk of foreign tramp iron or other spark producing objects being introduced in the powders being applied. For example, the use of fine grillwork on any recovery exhaust duct will prevent small objects from entering the system and magnetic devices that will catch tramp iron.

5.14.6. Dry Powder Finishing
Recovery systems

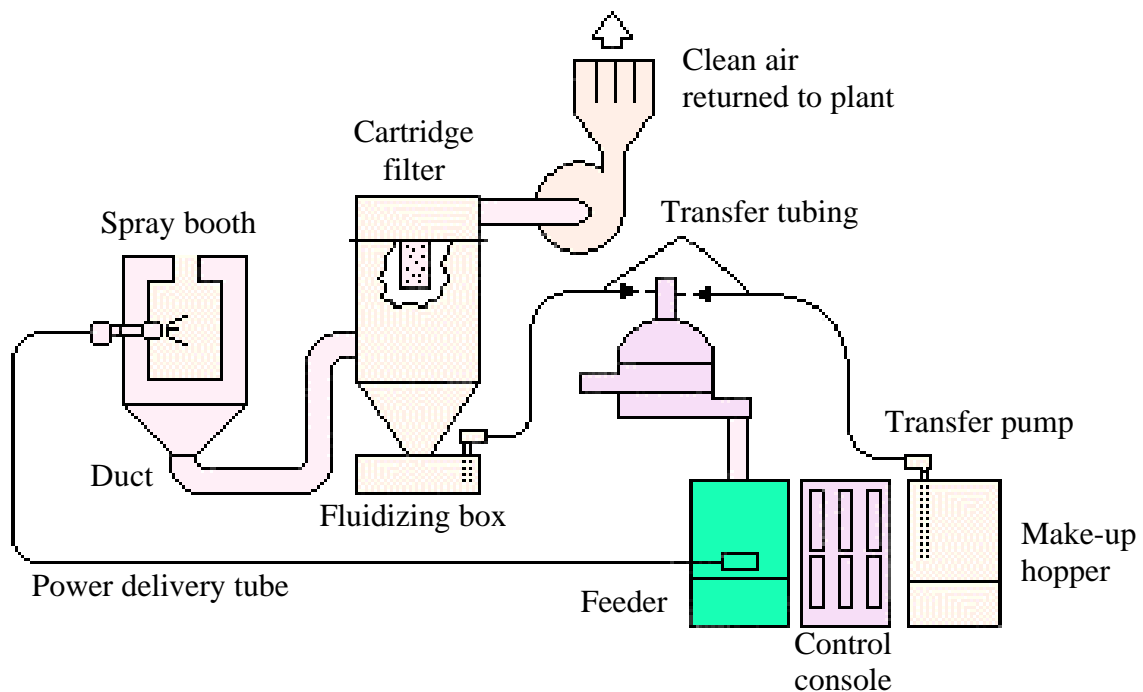
- 5.14.6.7.(1) Waste air-suspended powders shall be safely removed by exhaust ducts to a powder recovery system.
- (2) Waste air-suspended powders shall not be released to the outside atmosphere.

The use of dust collecting systems as specified in Sentence (1) reduces the risk of accumulation of powders in concentrations that could be ignited and cause a fire or explosion.

Collecting dust in a recovery system and not releasing it to the outside atmosphere as specified in Sentence (2) reduces the risk of:

- accumulating powders outside of the building, and
- exhaust powder being returned or introduced into a building through building openings.

Example of an automatic recycle of a powder coating system.



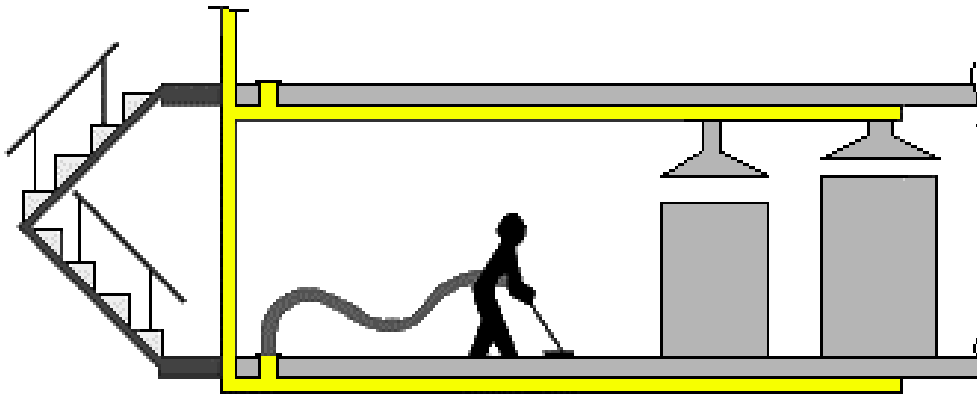
5.14.6. Dry Powder Finishing
Vacuum cleaning

5.14.6.8. Accumulations of waste dust from dry powder finishes shall be removed by vacuum cleaning equipment.

Using only vacuum cleaning equipment to remove dry powder accumulations, prevents the dispersal of dust that could create an ignitable/hazardous accumulation that would normally occur when sweeping the dust or blowing it using compressed air.

Removing accumulations of powder avoids ignition of hazardous accumulations of combustible powders when subject to:

- hot surfaces of building or machinery, or
- any ignition source in presence of a cloud of dust that could be generated by shocks, vibrations, a primary explosion or dust removal operations.



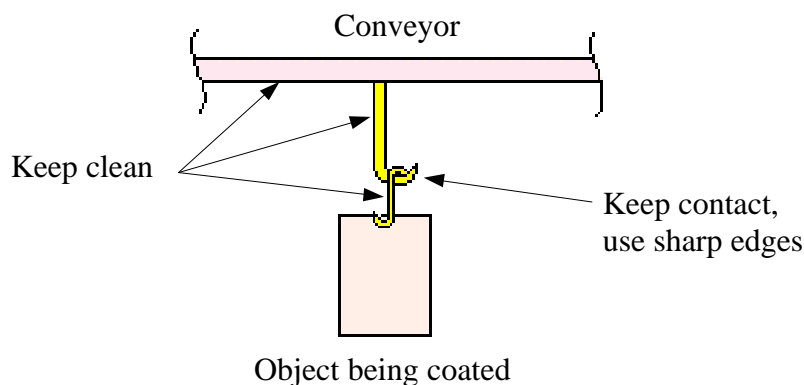
5.14.6. Dry Powder Finishing

Contact points

- 5.14.6.9. Objects being coated shall be maintained in contact with the conveyor or other support.
- 5.14.6.10. Hangers for objects being coated shall be kept clean and have sharp points or edges at areas of contact.

The purpose of this requirement is to minimise the possibility of static electricity producing electrical sparks by requiring direct physical contact between objects being coated with the conveyor or support. Maintaining contact between supports of objects being coated and the objects themselves avoids a build-up of static charges that could generate sparks and ignite combustible powders (5.14.6.9.).

Ensuring the cleanliness of supports is necessary to make sure that contact is made between the support and the part to be coated. The requirement for sharp points or edges at areas of contact is intended to optimize the contact area (5.14.6.10.).



5.14.6. Dry Powder Finishing

Smoking prohibited

- 5.14.6.11.(1) Smoking shall not be permitted at powder-coating areas and in powder storage rooms.
- (2) Signs prohibiting smoking that conform to Article 2.4.3.2. shall be conspicuously posted at all powder-coating areas and powder storage rooms.

The prohibition regarding smoking in areas for coating operations involving the use of combustible dry powders applied by powder spray guns, electrostatic powder spray guns, fluidised beds or electrostatic fluidized beds reduces the risk of igniting clouds of combustible powders or overspray residues with smoking material. Smoking in these areas can cause a fire or explosion.

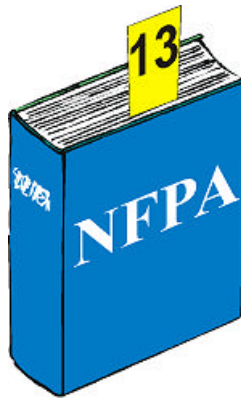


5.14.7. Organic Peroxides and Dual Component Coatings

Location of spraying operations

- 5.14.7.1. Spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in **sprinklered spray booths** as described in Sentence 5.12.8.2.(1).

The purpose of this Article is to clarify that spraying operations involving organic peroxides and other dual component coatings must be conducted in spray booths that are sprinklered in conformance with NFPA 13, “Installation of Sprinkler Systems”.



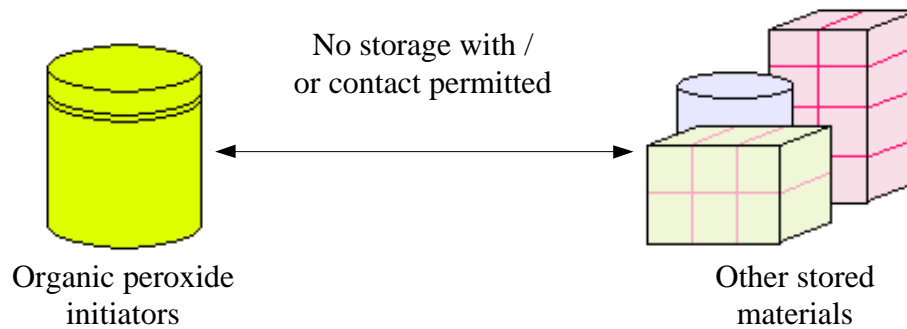
Spray booth means a power-ventilated structure that encloses or accommodates a spraying operation so that spray vapour and residue can be controlled and exhausted.

Sprinklered (as applying to a building or part thereof) means that the building or part thereof is equipped with a system of automatic sprinklers.

5.14.7. Organic Peroxides and Dual Component Coatings
Initiator storage

5.14.7.2. Organic peroxide initiators shall be stored so that they will be kept away from contact with other stored materials.

Proper storage of organic peroxide initiators for spray coating operations reduces the risk of contamination or contact with other materials that could cause the decomposition or violent reaction of the organic peroxide. This could result in a fire or explosion.



5.14.7. Organic Peroxides and Dual Component Coatings

Handling equipment

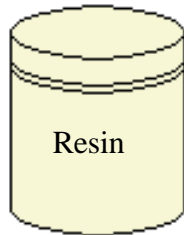
- 5.14.7.3. Handling equipment, including spray guns, that are specifically designed for use with organic peroxides shall be used to apply dual component coatings.

Ensuring that the handling equipment including spray guns are specifically designed for use with organic peroxides reduces the risk of creating a fire or explosion hazard resulting from using improperly designed equipment.

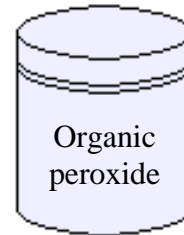
5.14.7. Organic Peroxides and Dual Component Coatings
Containers

5.14.7.4. Separate containers shall be used exclusively for the storage of resin and organic peroxide.

Using separate containers exclusively for storing resin and organic peroxide materials is intended to prevent fire or explosion resulting from contact between the different reactive materials. Contact can lead to decomposition or violent chemical reactions.



Never use the
container for any
other use



Never use the
container for any
other use

5.14.7. Organic Peroxides and Dual Component Coatings

Pressure tank inserts

- 5.14.7.5. Organic peroxide pressure tank inserts shall be constructed of stainless steel, polyethylene or a material that is equally inert to organic peroxide.

Using non-reactive materials in organic peroxide pressure tank inserts reduces the risk that the organic peroxide would decompose or cause a violent reaction. Otherwise this could result in a fire or explosion.

5.14.7. Organic Peroxides and Dual Component Coatings

Elimination of foreign materials

- 5.14.7.6. Precautions shall be taken to prevent any mixing of foreign materials with dusts or overspray residues resulting from the sanding or spraying of finishing materials containing organic peroxides.

The intent is to reduce the risk that foreign materials might come in contact with dusts or overspray residues containing organic peroxides. This could cause the decomposition or violent reaction of the organic peroxide, resulting in a fire or explosion.

5.14.7. Organic Peroxides and Dual Component Coatings

5.14.7.7. RESERVED
