# Flammable Liquids & Spray Finishing

- 1910 Subpart H


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# Most Frequently Cited - 2001

- ✓ 1910.101(b) Compressed gas – Handling, storage and use
- ✓ 1910.106(e)(6)(ii) Class I liquids – Dispensing
- ✓ 1910.107(b)(5)(i) Spray booth – Air velocity
- ✓ 1910.107(c)(6) Spray areas – Approved wiring
- ✓ 1910.107(g)(2) Spray areas – Free from combustible residue

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# Flammble Liquid Storage & Handling

- This standard applies to the handling, storage, and use of flammable and combustible liquids with a flash point (FP) below 200°F

# Flash Point

- The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid
- Flash point is normally an indication of susceptibility to ignition

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- *Combustible liquid* means any liquid having a flash point at or above 100°F (37.8°C)
- Combustible liquids are divided into two classes as follows:
  - *Class II liquids* shall include those with flash points at or above 100°F (37.8°C) and below 140°F
  - *Class III liquids* shall include those with flash points at or above 140°F
    - *Class IIIA liquids* shall include those with flash points at or above 140°F (60°C) and below 200°F
    - *Class IIIB liquids* shall include those with flash points at or above 200°F

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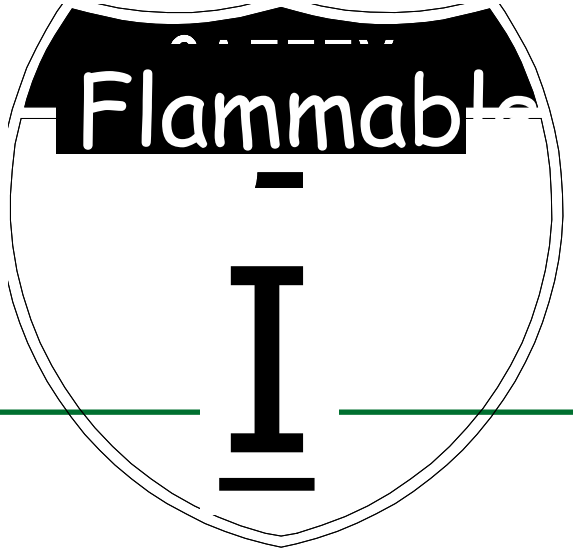
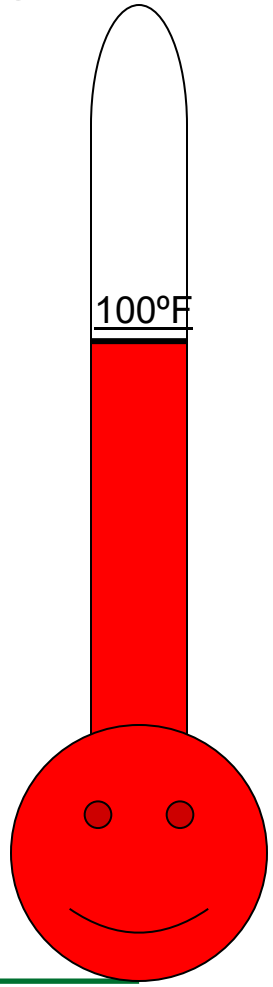
# Flammable Liquid

- *Flammable liquid* means any liquid having a flash point below 100°F
- Flammable liquids are known as Class I liquids



# Flammable Liquid

- Class I liquids are divided into three classes as follows:
  - Class IA shall include liquids having flash points below 73°F and having a boiling point below 100°F
  - Class IB shall include liquids having flash points below 73°F and having a boiling point at or above 100°F
  - Class IC shall include liquids having flash points at or above 73°F and below 100°F

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# Flammable (Explosive) Limits

- **Flammable range: The proper proportion of air and vapor from a flammable or combustible liquid in which an explosion can occur**

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# Flammable (Explosive) Limits

- **Lower flammable limit: minimum concentration of vapor in air below which propagation of flame does not occur**
- **Upper flammable limit: maximum concentration of vapor in air above which propagation of flame does not occur**

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# Storage Cabinets

- ✓ Not more than 60 gallons of Class I or Class II liquids, or 120 gallons of Class III liquids may be stored in a cabinet
- ✓ Internal temperature must not exceed 325° F when subjected to a 10 minute fire test
- ✓ Conspicuously labeled, "Flammable – Keep Fire Away"

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FLAMMABLE
KEEP FIRE AWAY

# Storage Rooms

- ✓ Class I liquids approved under Subpart S
- ✓ Class II & III liquids must be approved for general use

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# Ventilation

- ✓ **Every inside storage room must be provided with either a gravity or a mechanical exhaust ventilation system**
- ✓ **Must provide a complete change of air at least 6 times per hour**

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# Storage Rooms

- ✓ Aisle at least 3’ wide
- ✓ Containers over 30 gallons must not be stacked
- ✓ Dispensing only by approved pump or self-closing faucet

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# Grounding & Bonding

- ✓ **Flammable liquid, when dropping through the air, creates it's own static electricity**
- ✓ **Grounding - Class I liquid containers must be grounded to a proper ground**
- ✓ **Bonding - Class I liquids must not be dispensed into containers unless the nozzle and container are electrically interconnected**

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Is This Bonding or Grounding?

# Test

- What is generally considered a flammable liquid?
- Answer – A Liquid with a flashpoint of <100 Deg. F
- What is generally considered a combustible liquid?
- Answer – A Liquid with a flashpoint of >100 Deg. F
- What is a UEL?
- Answer – Upper Explosive Limit
- What is a TLV? Where would you find this information?
- Threshold Limit Value, MSDS or ACGIH Handbook

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# Spray Finishing


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# Spray Finishing - Flammable & Combustible Materials

- ✓ **Based on NFPA 33, *Spray Finishing Using Flammable and Combustible Materials***
- ✓ **Does not apply to outdoor spray application nor to portable spraying apparatus not used repeatedly in the same location**

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# Construction of Spray Booths

- ✓ **Spray booths must be constructed of steel or concrete or masonry**
- ✓ **Spray booths may be made of aluminum for low volume spraying operations**
- ✓ **Spray booths must be designed to sweep the air flow toward the exhaust outlet**

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NO SMOKING

# Construction of Spray Booths

- ✓ **Inside walls must not have sharp edges that could cause injury**
- ✓ **Designed in a way that keeps paint residue from building up to facilitate easy cleaning**
- ✓ **Floors should be made of, or covered with, a non-combustible material that is easy to clean**

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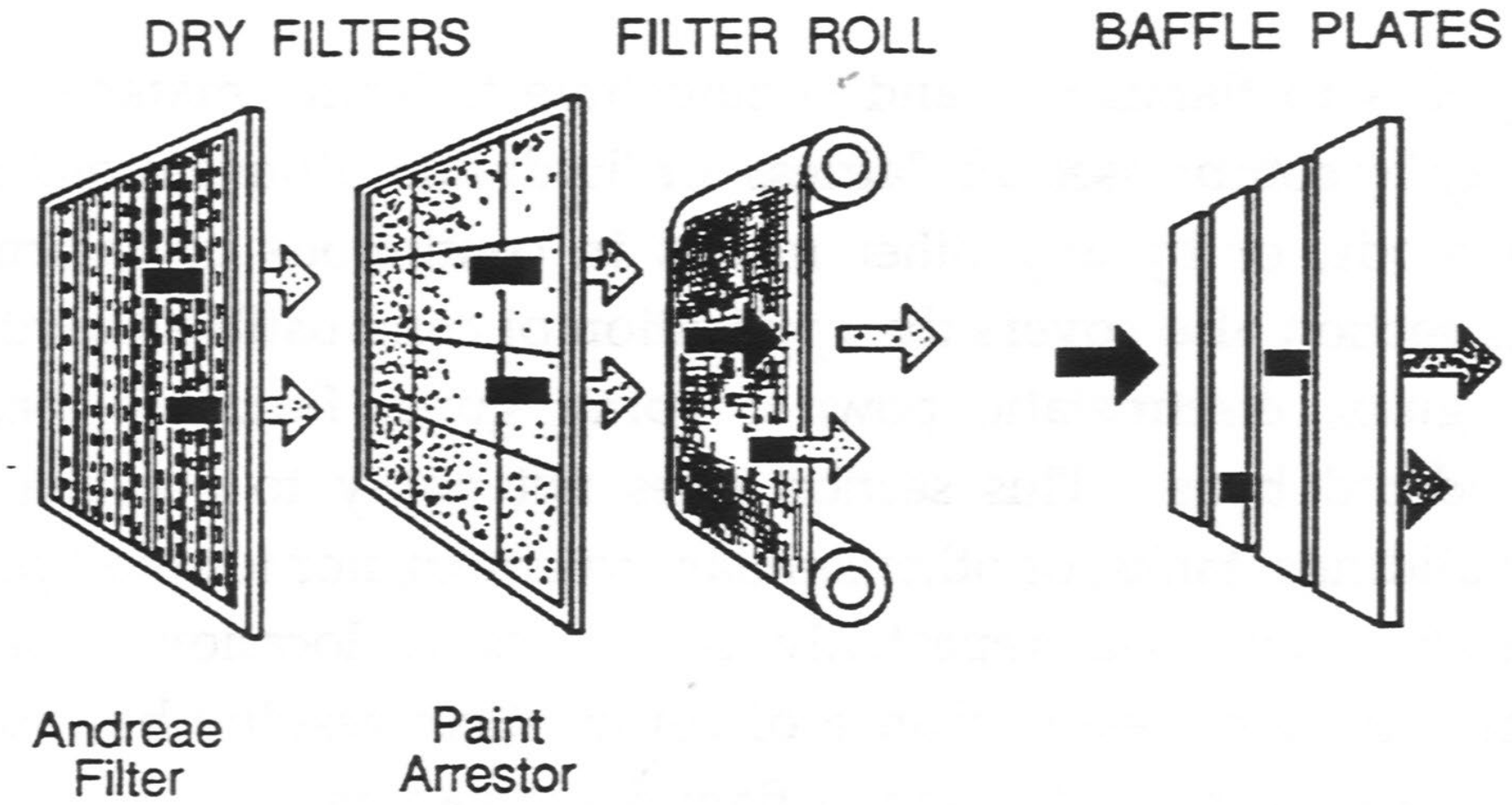
# Different types of filters used in spraying operations.



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# Baffle Plates

- ✓ Made of a non-combustible material
- ✓ Accessible on both sides for cleaning purposes
- ✓ Not located in the exhaust ducts

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# Dry-Type Overspray Collectors

- ✓ Air flow over the open face of the booth must be at least 100 feet per minute(fpm) for operations other than electrostatic spraying
- ✓ For electrostatic spraying the air flow over the open face of the booth must be at least 60 fpm
- ✓ Must have visible gauges or audible alarms that justify the proper air flow

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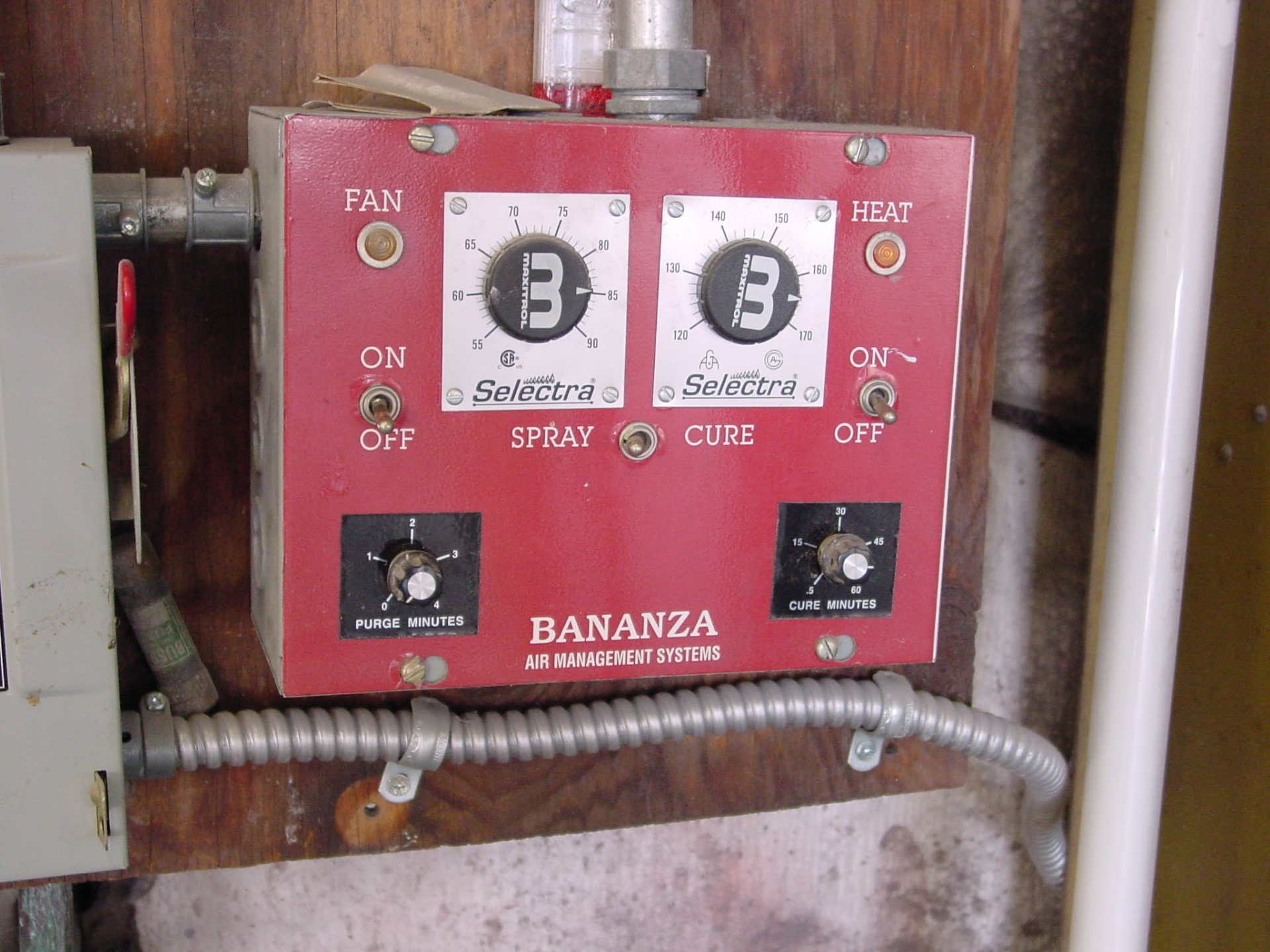
FAN
HEAT
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OFF
SPRAY
CURE
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OFF
MAXITROL
Selectra
PURGE MINUTES
CURE MINUTES
BANANZA
AIR MANAGEMENT SYSTEMS

# Dry-Type Overspray Collectors

- ✓ **Filter rolls and pads inspected frequently**
- ✓ **When cleaning or replacing filter rolls and pads, they must be immediately moved to a safe place and put in a metal container that is filled with water**
- ✓ **Should be thrown away at the end of the day or kept completely underwater in the container**

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# Dry-Type Overspray Collectors

- ✓ **The space inside the booth on the downstream and upstream sides of the filters must be protected with an automatic sprinkler or a dry chemical or carbon dioxide extinguisher**

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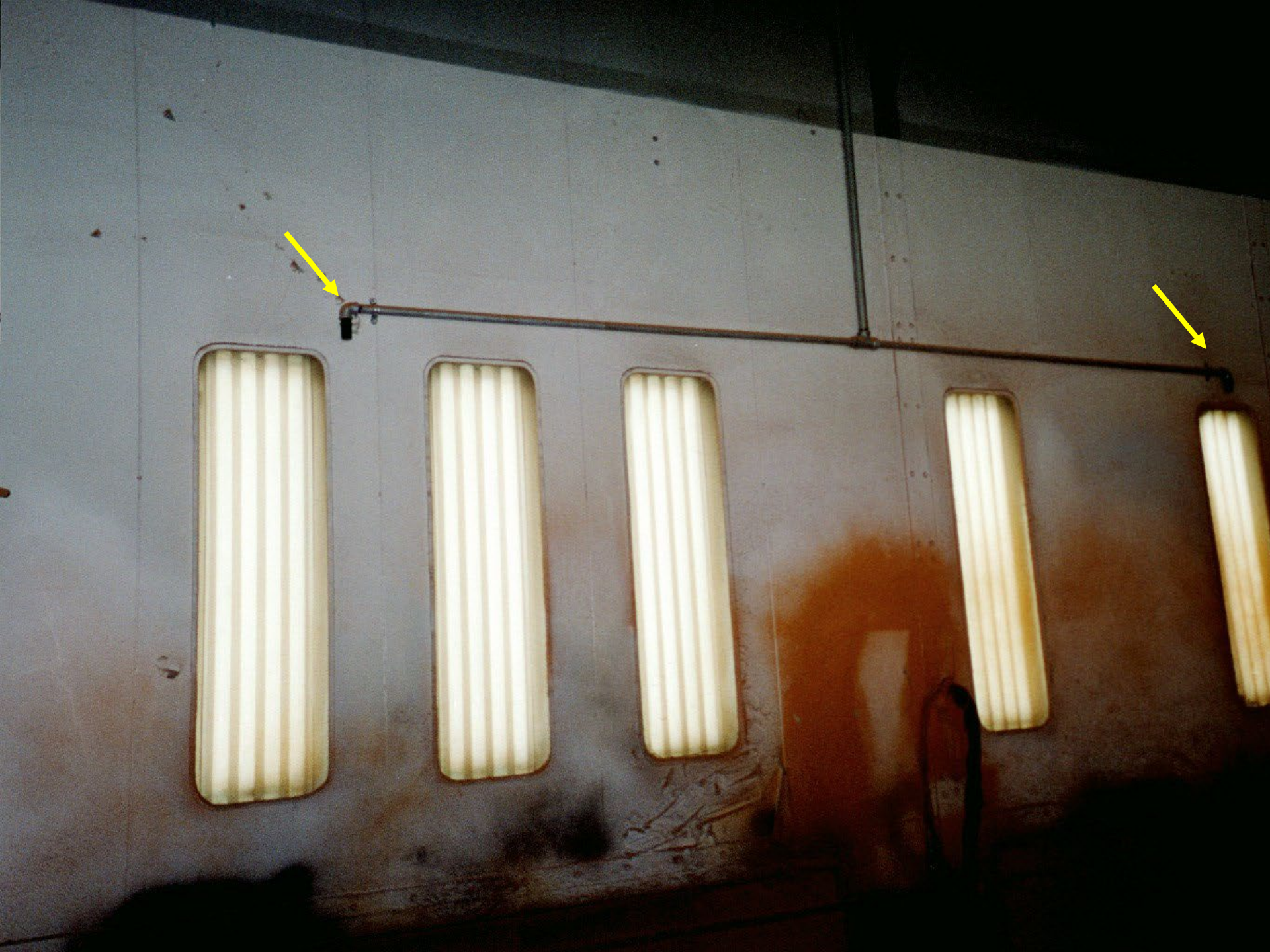

# Dry-Type Overspray Collectors

- ✓ **Filters or filter rolls must not be used when spraying a material that is easily combustible**
- ✓ **Filters must be made of a material that is not combustible**
- ✓ **Filters must not be used with different spraying materials that are combustible when mixed together**

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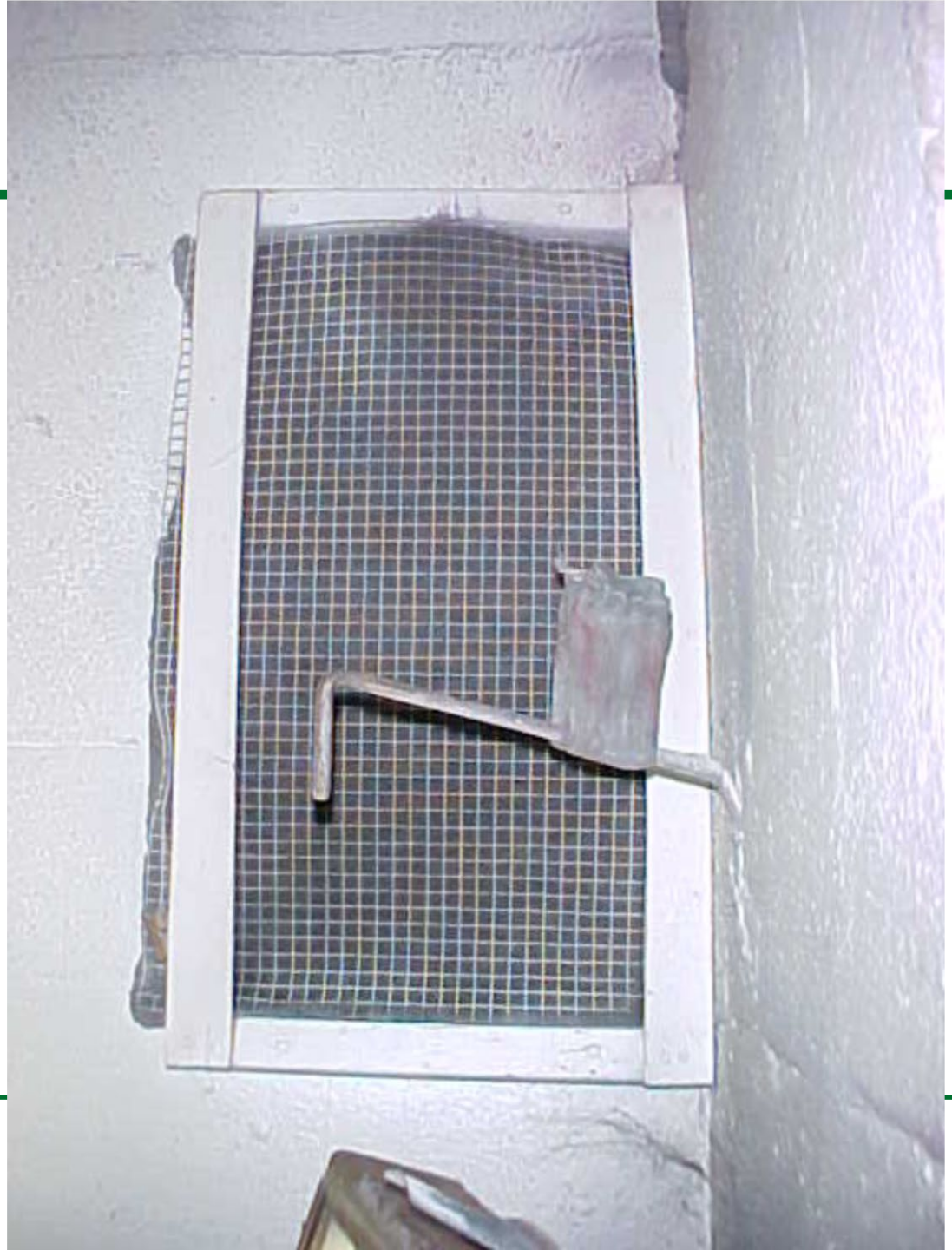

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# Separation of Operations

- ✓ **Spray booths must be separated from other operations by at least 3 feet or by a wall**
- ✓ **All sides need to be accessible for cleaning**
- ✓ **Keep stored materials at least 3 feet away from all sides of the booth**

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FACT-RE-FINISH
NAPA

# Fire and Electrical Hazards

- ✓ **Sparks and open flames must be at least 20 feet away unless completely separated by a wall**
- ✓ **Keep space heaters away from spray booths**
- ✓ **Electrical equipment must be kept away so flammable material doesn't accumulate creating a fire hazard**

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# Fire and Electrical Hazards

- ✓ Keep portable electric lamps away from spray booths when you are spraying

- ✓ All metal parts of spray booths must be permanently grounded

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# Ventilation

- ✓ **Spray areas must have a form of mechanical ventilation that moves harmful vapors and powders to a safe location**
- ✓ **Must continue to be ventilated even after spraying stops so any harmful vapors are removed from the area**

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# Ventilation

- ✓ **Electric motors for exhaust fans must not be placed inside the booth**
- ✓ **Items sprayed must be dried in a well ventilated area**

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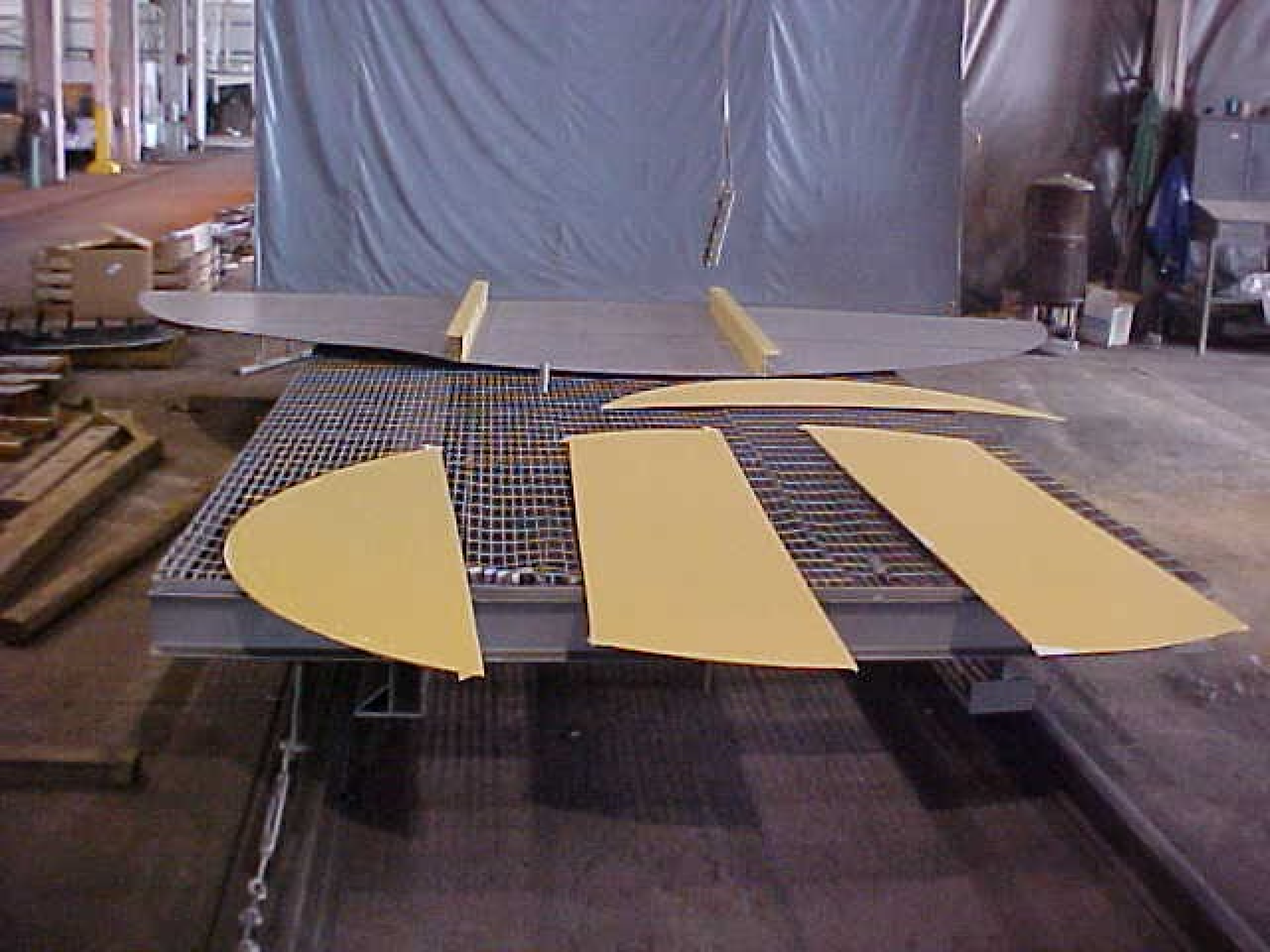

# Material Storage Requirements

- ✓ Only keep enough spray material near the booth for one day or one work shift
- ✓ Do not bring flammable liquids into a spray area in open containers.
- ✓ Use original closed containers or approved safety cans or a safe piping system
- ✓ Keep the container that supplies the spray nozzle closed with a metal cover

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THIS SIDE UP
carboline

# Material Storage Requirements

- ✓ **Containers that supply the spray nozzle by gravity flow must not hold more than ten gallons**
- ✓ **When transferring flammable liquids from one container to another, both must be grounded.**

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# Air Supplied Spray Nozzles

- ✓ Original shipping containers must not be used to supply the spray nozzle
- ✓ Only keep enough material in the spray container for one days work
- ✓ Make sure that the shut off valve on the spray container works properly
- ✓ The spray container must have an air pressure gauge that is easily visible

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# Pipes & Hoses

- ✓ All pipes & hoses connected to a spray container must have a shut off valve at the connection
- ✓ Valves kept closed when not in use
- ✓ Replace damaged hose immediately
- ✓ All piping systems must be properly grounded

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# Fire Protection of Spray Booths

- ✓ **Sprinkler heads that protect spray areas must be kept clean from spray material**
- ✓ **Clean them daily if necessary**
- ✓ **The proper type of fire extinguisher must be nearby for emergency use**

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# Spraying Safely

- ✓ Only spray in the designated area
- ✓ Cleaning tools must be made of a non-sparking material
- ✓ Waste & debris must be properly disposed of in an approved metal waste can
- ✓ Waste can must be emptied daily or at the end of each shift

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# Spraying Safely

- ✓ Clothing must not be left at the workplace overnight unless kept in a metal locker
- ✓ “No Smoking” signs must be easily visible around the booth and storage area

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# Safety Requirements for Electrostatic Equipment

- ✓ High-voltage leads to electrodes must be properly insulated and protected from mechanical injury
- ✓ Insulators must be kept clean and dry
- ✓ A safe distance must be maintained between electrodes and objects being painted of at least twice the sparking distance
- ✓ A sign, easily visible, must be posted near the assembly that shows this distance

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# Safety Requirements for Electrostatic Equipment

- ✓ **Conveyors are required when using this process to support objects being painted**
- ✓ **The spray area must be well ventilated**

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# Safety Requirements for Electrostatic Equipment

**Electrostatic equipment must be equipped with automatic controls that will disconnect the power supply when:**

- ✓ **Ventilating fans stop working**
- ✓ **The conveyor carrying objects through the high voltage field stops working**
- ✓ **The safe distance clearance is reduced**

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# Electrostatic Hand Spraying Grounding

- ✓ The handle of the gun must be grounded
- ✓ In normal operating positions the operator must be in contact with the grounded handle
- ✓ Containers, wash cans, and any other electrically conductive objects in the spray area must be grounded.

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# Electrostatic Hand Spraying Grounding

- Objects being painted must maintain a metallic contact with the conveyor in order to be properly grounded
- Hooks must be cleaned regularly to keep this contact

# Ventilation

- ✓ **Electrical equipment must be designed in a way that it will not function unless the ventilation fans are in operation**
- ✓ **The spraying area must be adequately ventilated to remove harmful solvent vapors.**

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# Ovens & Furnaces

- ✓ **Pre-ventilate the work area before starting the oven to avoid an explosion**
- ✓ **The heating system must automatically shut down if the ventilation system stops working**
- ✓ **Do not use the booth for drying or other operations that could raise the surface temperature of the booth**

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# Powder Coating

- ✓ Protected from open flames & sparks
- ✓ Booths & equipment must be grounded
- ✓ Portable lamps may not be used
- ✓ Only approved lamps may be used during cleaning & repair work
- ✓ Spray area must be well ventilated

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# Powder Coating

- ✓ **Keep the booth and spray area clean. Do not allow combustible dust to build up**
- ✓ **Electrostatic equipment must not create a fire hazard**
- ✓ **Equipment must never reach temperatures over 150° F**

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# Special Coatings

- ✓ Organic Peroxides

- ✓ **Dual Component Coatings**
  - – **Epoxy**

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# Special Coatings

- ✓ Highly hazardous chemicals
- ✓ The most widely used are benzoyl peroxide and methyl ethyl ketone(MEX) peroxide
- ✓ Burn more rapidly than ordinary flammable liquids or combustible solids

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# Special Coatings

- ✓ Spraying operations must be done in spray booths with approved sprinklers
- ✓ “No Smoking” signs posted in any area where organic peroxides are stored, mixed or applied
- ✓ Only non-sparking tools may be used in these areas

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# Special Coatings

**Reference should be made to various industry recognized documents which address control methods relating to these processes and materials.**

- ✓ **NFPA 43A, Liquid, Solid Oxidizing Materials**
- ✓ **NFPA 43B, Organic Peroxide Formulations**
- ✓ **NFPA 49, Hazardous Chemicals Data**

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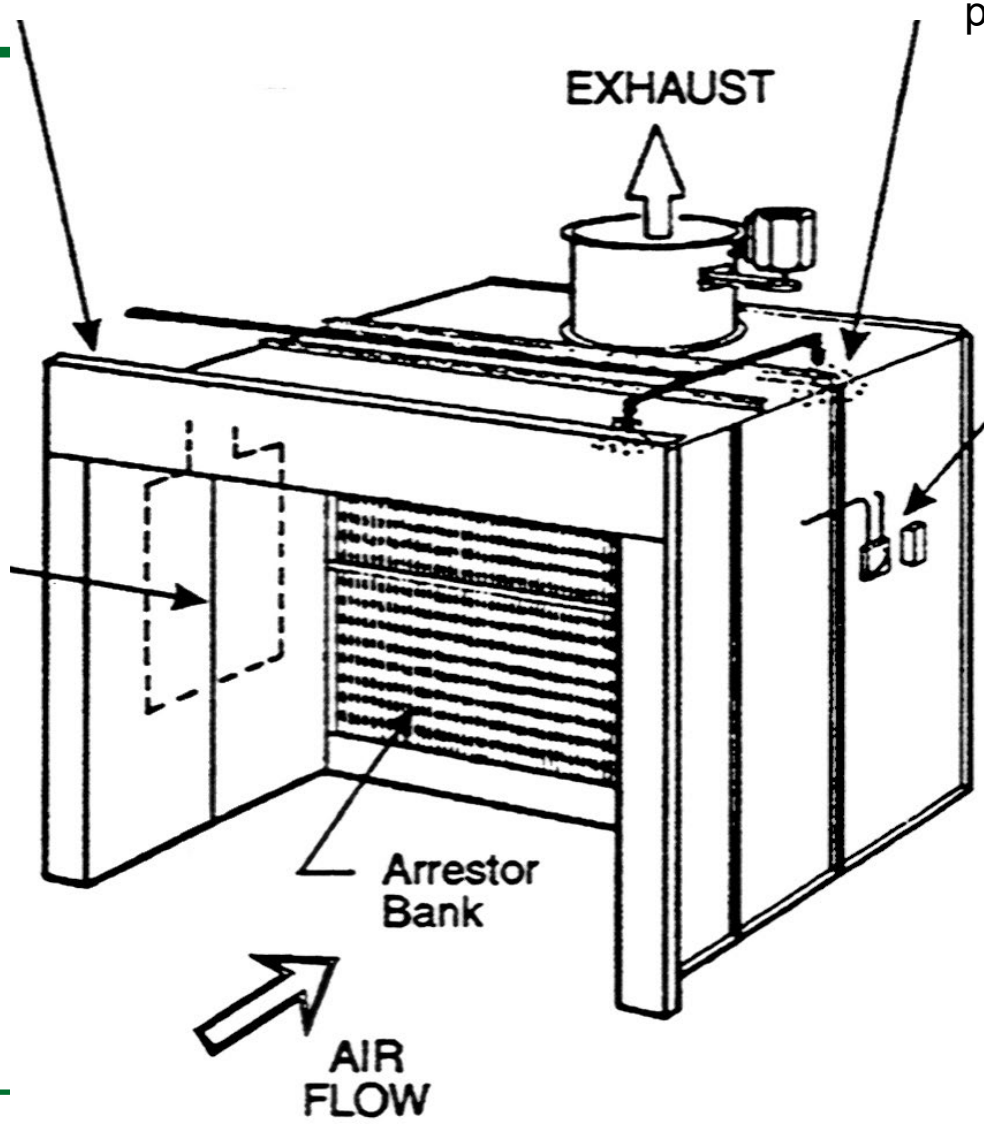
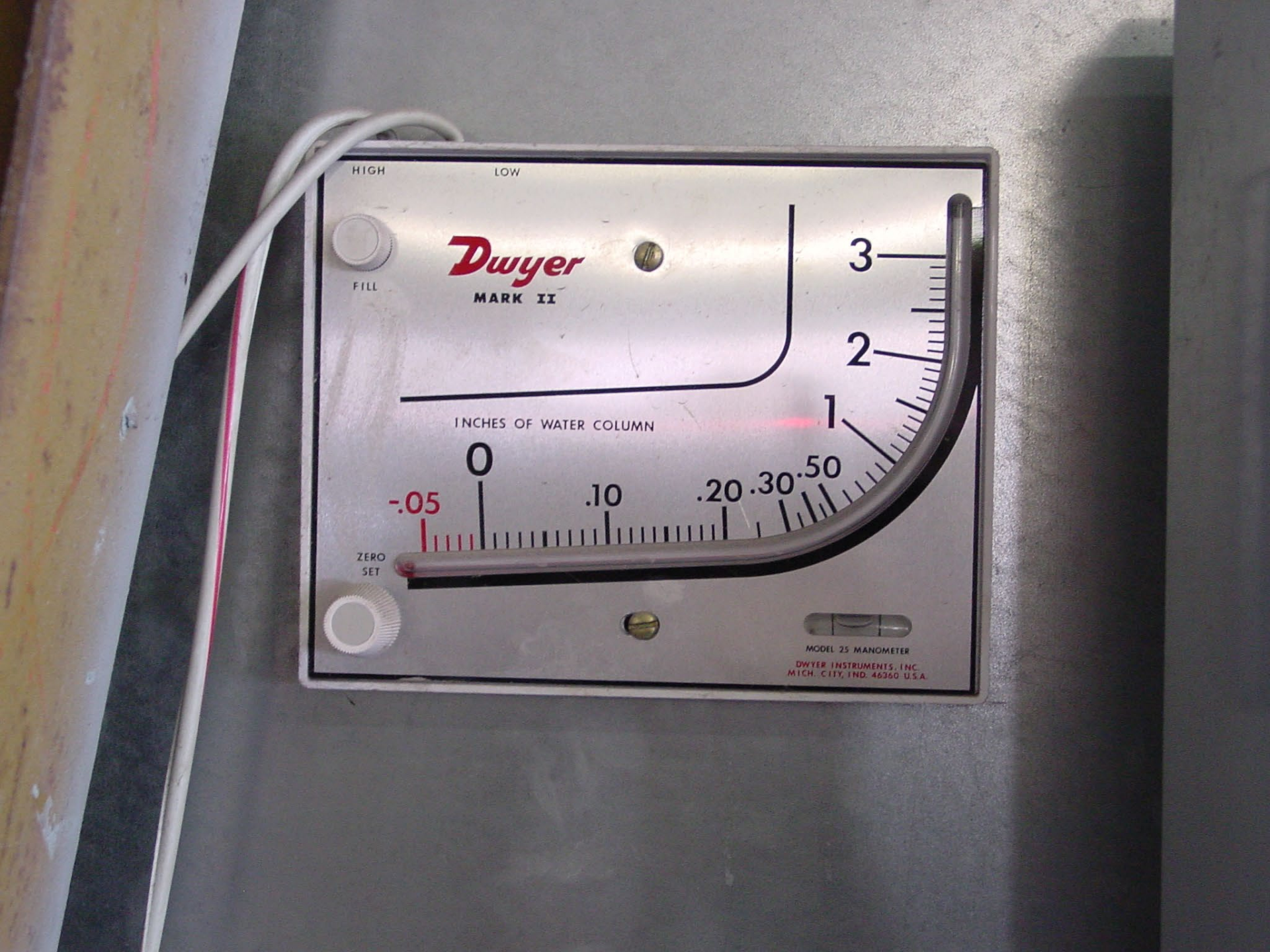
Metal deflector or curtain not less than 2 ½ inches deep

Automatic sprinklers for fire protection




Alarms & visible gauges

Conveyors enter here. Opening must be as small as possible.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Dwyer
MARK II
INCHES OF WATER COLUMN
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.50
1
2
3
ZERO SET
MODEL 25 MANOMETER
DWYER INSTRUMENTS, INC.
MICH. CITY, IND. 46360 U.S.A.

ON

APPLETON

OFF

# Common Citations

- **1910.107(b)(5)(i)** Air Velocity at the Face of the Booth
- **1910.107(c)(5)** Combustible Residue
- **1910.107(c)(6)** Approved Wiring (Explosion Proof)
- **1910.107(e)(2)** Quantity of Flammable Liquids in the Work Area
- **1910.107(e)(4)** Flammable Liquid & Dispensing (Grounding & Bonding)

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# Objectives

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# Thank You For Attending!

## Final Questions?

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