

Foam Fire suppression system

Paint booth fire protection system

Foam Fire suppression system (Codes and Standard)

For a **paint spray booth**, the primary standard governing foam suppression systems is **NFPA 33: Standard for Spray Application Using Flammable or Combustible Materials**. This outlines all design and installation requirements for fire protection, including foam suppression.

NFPA 33 (Latest Edition)

Section 9.1.1 mandates that spray booths must be protected by an automatic fire suppression system — this can be foam–water, dry chemical, CO₂, or water spray/sprinklers.

Foam–water systems (e.g., AFFF) are acceptable. Foam agent must be suitable for solvent-based/flammable finishes .

Integration features:

- Automatic detection**, such as heat sensors.

- Manual pull stations**.

- Interlocks**: shut down exhaust fans, lighting, and power when foam discharges

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Here's a detailed, well-structured overview of an **automatic fire detection and foam suppression system**—ideal for environments like paint booths, industrial tanks, or solvent-handling areas:

1. System Overview

Automatic fire suppression systems combine **early detection**, **rapid foam deployment**, and **interlock mechanisms** to ensure fires are detected and extinguished instantly, minimizing damage and safeguarding personnel.

2. Fire Detection & Actuation

Heat detectors or fusible links (set to ~100–140 °C) monitor the protected zone, such as booths, plenum areas, or carpet filters .

Flame/optical sensors are often used in powder booths to detect ignition within 0.5 seconds .

Upon detection:

- Solenoid valve** on the foam line receives electrical signal to open.

- Manual pull-stations** allow human override if needed

3. Foam Suppression Process

Agent mixing: AFFF/AR-AFFF concentrate blends with water via proportioners or bladder tanks.

Foam release: Solenoid activation opens valves, feeding pressurized foam solution through piping to nozzles, flooding the booth.

Blanket formation: Foam creates a vapor-sealing layer—extinguishing and preventing re-ignition.

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4. Ventilation & Safety Interlocks

Ventilation shutdown: Exhaust fans stop immediately to prevent flame spread.

Power shutdown: Lighting, conveyors, and spray equipment are cut off to prevent reignition.

Duct control: Dampers close to isolate the booth.

Audible/visual alarms warn personnel to evacuate.

5. Pressure Supervision & Nitrogen Backing

N₂ pressurization of foam or detection lines prevents corrosion and maintains readiness .

Pressure switches continuously monitor system pressure; any drop triggers a fault alarm.

6. Reset & Maintenance

After discharge:

System recharge—foam concentrate, water, and N₂ restoration.

Testing—functionality via thermal links, solenoid, valve operation.

Annual or semi-annual maintenance, including proportioning accuracy, nozzle integrity, and interlock validation as per NFPA and local fire codes

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System Advantages

Automatic and fast response limits fire spread and damage .

Solenoid control ensures precise, reliable discharge.

Foam blanket effectively suppresses vapors and heat—ideal for solvent-based hazards.

Integrated safety via ventilation and power shutoff.

Continuous supervision and maintenance alerts guarantee operational readiness.

Summary Flow

Detection → Solenoid actuation → Foam discharge → Ventilation/power shutdown → Alarms sound → Recharge & reset

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