UPS System Fire Suppression Using Tubing-Based Technology:

Uninterruptible Power Supply (UPS) systems are vital in maintaining critical operations in data centres, hospitals, industrial plants, and telecom facilities. However, they are also **fire-prone** due to:

- High electrical loads
- Heat from inverters, rectifiers, and batteries
- Short circuits or thermal runaway in battery banks

A **tube-based fire suppression system** provides a **localized, automatic, and non-intrusive** fire protection solution tailored for UPS cabinets and enclosures.

Why Tube-Based Fire Suppression for UPS Systems?

UPS systems are often housed in **metallic enclosures** and operate 24/7. They require fire suppression systems that are:

- 🔌 **Non-conductive**
- 🧼 **Clean (no residue)**

- 🚫 **Self-activating (no power needed)**
- 📦 **Space-efficient and enclosure-ready**

System Overview

🔹 **1. Detection Tube**

- A flexible, pressurized **polymer (nylon or polyamide) tube**
- Routed through the UPS cabinet, near heat-prone areas (batteries, inverters)
- Bursts at ~150–180°C when exposed to flame or intense heat

🔹 **2. Agent Cylinder**

- Mounted externally or inside the cabinet, containing:
  - **NOVEC 1230**
  - **FM-200**
  - **CO_2** *(in unoccupied areas only)*

🔹 **3. Discharge System**

- **Direct System**: Agent released from burst in tube (for small cabinets)
- **Indirect System**: Tube rupture triggers valve to release agent through nozzles (for larger UPS systems or battery banks)

🔹 **4. Optional Features**

- Pressure switch for alarm panel activation
- GSM/SMS alert modules
- Manual release actuator (for engineered versions)

Working Process

1. Fire or heat builds inside UPS cabinet
2. Detection tube ruptures at the hottest point

3. Clean agent is discharged:
    - Directly from the rupture (direct)
    - Through piping and nozzles (indirect)
4. Fire is extinguished **within seconds**, before escalation
5. No water, no damage to electronics

Recommended Clean Agents:

Agent	Key Features
NOVEC 1230	Non-toxic, residue-free, eco-friendly, fast
FM-200	Fast discharge, widely used, safe for electronics
CO_2	Cost-effective but suitable only for unoccupied spaces

Installation Locations in a UPS:

- Above/around battery racks
- Near inverters and rectifiers
- Behind control boards or power supply lines
- Inside battery enclosures or cabinets

Applications

- UPS systems in:
    - **Data Centers**
    - **Telecom Base Stations**
    - **Banks and ATMs**
    - **Industrial Process Facilities**

- **Hospitals**
- **Server and Network Rooms**

Advantages of Tubing Systems for UPS

- ✅ Fully automatic, 24/7 protection
- ✅ No power source or electronics required
- ✅ Minimal space requirement
- ✅ No water or foam = no electrical damage
- ✅ Fast installation and easy maintenance
- ✅ Scalable for small UPS cabinets or full battery rooms

Limitations

- Not suitable for open areas
- Limited agent quantity = only for enclosed spaces
- Tube needs replacement after activation

Standards & Compliance

- NFPA 2001 (Clean Agent Systems)
- ISO 14520 (Gaseous Systems)
- IEC/EN standards for UPS and battery safety
- UL, FM, or CE certified components (depending on manufacturer)