

Application Bulletin 6

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Application Bulletin: **Transformer Rooms** • Technology: **FirePro Condensed Aerosol**

Application
Transformer Rooms

The Risk
High-voltage equipment, insulating oils, cable insulation and continuous thermal loading, with risk of oil-fed fires, electrical faults, insulation failure and arc flash.

This Bulletin Covers
- Design considerations
- Environmental requirements
- End user responsibilities
- Post-discharge procedure
- Myths & comparative analysis

Mandatory Message to End Users
"Following discharge, all electrical equipment must be inspected, cleaned where necessary, and tested before re-energisation."

Condensed Aerosol Fire Suppression in Transformer Rooms

Design Considerations, Environmental Requirements, End User Responsibilities, Myths & Comparative Analysis

1. Introduction

Transformer rooms present a significant fire risk due to the presence of high-voltage electrical equipment, insulating oils, cable insulation, and continuous thermal loading.

Fire scenarios may involve oil-fed fires, electrical faults, insulation failure, and arc flash events.

FirePro condensed aerosol (CA) technology provides an effective, LPCB-certified fire suppression solution for transformer rooms, particularly where traditional systems (water or gas-based) are impractical due to electrical hazards, infrastructure requirements, or space limitations.

This bulletin outlines the design considerations, environmental requirements, end user responsibilities, and common misconceptions relevant to FirePro systems in transformer room applications.

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Ground Floor, Egerton House, Baker Street, Weybridge, UK, KT13 8AL T: +44 (0)8000 314 333 E: sales@fireprouk.com W: www.fireprouk.com



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2. Purpose of FirePro in Transformer Rooms

FirePro is designed to:

- Rapidly suppress fire at its early stages
- Prevent escalation of oil and insulation fires
- Minimise damage to critical electrical infrastructure
- Reduce downtime and operational disruption

However, FirePro is **not designed to**:

- Prevent electrical faults or equipment failure
- Provide cooling of transformer cores or oil
- Replace electrical protection systems

> **Therefore:**
> *FirePro must be used alongside appropriate electrical protection and maintenance regimes.*

This requirement must be clearly communicated during design, installation, and handover.

3. Important Note on Residue and Electrical Equipment

FirePro is not a clean gas agent and does not claim zero-residue discharge.

A light, dry aerosol particulate may settle on surfaces after activation. Within transformer rooms, this may result in:

- Light deposits on transformer casings
- Accumulation on switchgear and cable trays
- Residue on control panels

> **Mandatory message to end users:**
> *"Following discharge, all electrical equipment must be inspected, cleaned where necessary, and tested before re-energisation."*

This is a mandatory operational requirement.

4. Why Sprinklers and Water-Based Systems Are Unsuitable for Transformer Rooms

Water-based systems present major risks in transformer environments.

4.1 Electrical Hazard and Arc Risk

- Water can cause short circuits and arc flash incidents
- Increased risk to personnel and equipment

4.2 Oil Fire Spread

- Transformer oil fires can spread when impacted by water jets
- Water may not effectively suppress oil pool or spray fires

4.3 Equipment Damage

- Water ingress into windings and insulation can permanently damage transformers

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- Switchgear and protection systems can fail

4.4 Thermal Shock

- Rapid cooling of hot components may cause structural stress or cracking

4.5 Water Mist Limitations

- Reduced effectiveness on oil-based fires
- Still introduces moisture into sensitive electrical environments

5. Why FirePro Is Well Suited for Transformer Room Protection

FirePro provides several advantages for electrical environments.

5.1 No Water or Moisture

Eliminates risks of:

- Electrical short circuits
- Insulation failure
- Corrosion due to moisture

5.2 Effective Fire Suppression

- Suitable for:
  - Oil fires (Class B)
  - Cable and insulation fires (Class A)
  - Electrical fires (Class C)

5.3 Rapid Flame Knockdown

- Interrupts combustion chemistry at a molecular level
- Effective in controlling fast-developing fires

5.4 No Cylinders or Pipework

- Ideal for constrained transformer rooms and substations
- Simplifies installation and maintenance

5.5 Minimal Pressure Rise

- No pressure relief vents required
- Suitable for standard electrical rooms

5.6 High Leakage Tolerance

- Effective in ventilated substations

5.7 Long 15-Year Life

- Low lifecycle cost and minimal maintenance

6. Transformer Room Protection Requirements (Mandatory)

6.1 Electrical Protection Integration

- FirePro must work alongside:
  - Overcurrent protection
  - Differential protection
  - Earth fault protection

6.2 Automatic Shutdown and Isolation

- Transformers must be de-energised upon fire detection/discharge
- Isolation of upstream and downstream supply required

6.3 Oil Containment Measures

- Bunding or containment systems must be in place for oil-filled transformers

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- FirePro does not replace spill or oil containment systems

6.4 Ventilation Control

- Ventilation systems must shut down upon activation
- Prevents aerosol dilution during discharge

6.5 Access Control

- Transformer room doors should remain closed during operation
- Access restricted to authorised personnel only

7. Environmental Conditions

Maintaining appropriate environmental conditions improves performance:

TEMPERATURE Within equipment operating limits	**HUMIDITY** Controlled to reduce condensation on electrical equipment
AIRFLOW Must stop during discharge	**POST-DISCHARGE VENTILATION** Ventilate within 10–15 minutes

8. Design Considerations for Transformer Rooms

8.1 Fire Load Assessment

- Consider:
  - Transformer oil volume
  - Cable insulation
  - Ancillary equipment

8.2 Enclosure Volume and Leakage

- Calculate full room volume
- Apply leakage compensation factors

8.3 Aerosol Generator Placement

- Ensure uniform distribution
- Avoid direct obstruction by large transformer bodies

8.4 Detection and Control Integration

- Early detection is critical:
  - Heat detection
  - Smoke detection
  - Flame detection (for oil risks)
- Integration with:
  - Fire alarm system
  - Electrical shutdown
  - HVAC systems

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8.5 Cable and Subfloor Areas

- Consider protection for:
  - ◆ Cable trenches
  - ◆ Subfloor voids
  - ◆ Ceiling voids

9. Post-Discharge Procedure

1. Ensure transformer is de-energised
2. Ventilate the room within 10–15 minutes
3. Inspect transformer and associated systems
4. Clean:
   - Electrical panels
   - Insulators and bushings
   - Control equipment
5. Test insulation resistance and system integrity
6. Confirm no fire re-ignition risk
7. Recommission FirePro system

10. Common Myths & Factual Counterpoints

Myth 1: "Aerosol systems damage electrical equipment."

Fact: FirePro produces a dry particulate that does not harm electrical systems when proper post-discharge cleaning and inspection are carried out.

Myth 2: "Water suppression is safer for transformer fires."

Fact: Water introduces severe electrical hazards and is often ineffective on oil-fed fires.

Myth 3: "Gas systems are always better for electrical rooms."

Fact: Gas systems require sealed enclosures and pressure venting, which can be impractical in many substations. FirePro operates effectively without these constraints.

11. Transparency Statement

FirePro UK maintains full transparency:

- FirePro is designed to suppress fire, not prevent electrical faults

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- FirePro is not a zero-residue agent; a dry particulate is present after discharge
- Electrical inspection and cleaning are mandatory post-discharge
- FirePro does not provide cooling for transformers
- FirePro is not certificated for deep-seated insulation fires
- FirePro introduces no water, avoiding electrical hazards and moisture damage
- FirePro is often the most practical solution where gas or water systems are unsuitable

12. Summary

FirePro condensed aerosol provides an effective and practical fire suppression solution for transformer rooms, particularly in environments where water-based systems create electrical hazards and gaseous systems are difficult to implement.

FirePro's ability to rapidly suppress fire without introducing moisture or requiring complex infrastructure makes it well suited for protecting critical electrical assets.

However, successful protection depends on:

- Proper system design
- Integration with electrical protection systems
- Controlled environmental conditions
- Mandatory post-discharge inspection and cleaning

> **Key operational requirement:**
> *All electrical equipment must be inspected, cleaned, and tested before re-energisation following any FirePro system activation.*

If you would like to learn more about FirePro, or discuss a transformer room application, please visit us at **www.fireprouk.com** – see contact details below.

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