Electrical Passive Fire Protection for Power Transmission Substations

Substations · Cable Galleries · Control Rooms · Safety-Critical Circuits

Section A | Electrical Zone-Wise Fire Risk Map

A1. Substations, MCC Rooms & Cable Galleries

Outdoor EHV switchyard, GIS / HVDC halls, control & relay building (CRR), cable galleries, battery / UPS rooms, and auxiliary station service switchgear.

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
400 kV / 765 kV outdoor switchyard	Transformer + cable fire	Fire walls, cable wraps, firestops	**Critical**
ICT & reactor transformer bays	Oil fire	Fire walls with firestopped penetrations	**3 hr / Critical**
GIS hall (400 / 765 kV)	SF_6 leak, cable fire, arc fault	Cable coatings, firestops, panel FP	**Critical**
HVDC converter / valve hall	Cable + valve fire	Cable coatings, firestops, panel FP	**Critical**
HVDC AC filter yard	Capacitor fire, cable fire	Cable coatings, panel FP	**Critical**
Control & relay building (CRR)	Panel + cable fire	Panel FP, firestops, FR doors	**Critical**
Main control room	Cable + panel fire	Panel FP, firestops, FR doors	**Critical**
Cable galleries / tunnels	Propagating cable fire	Cable coatings + transverse firestops	**Critical**
Battery / UPS room	H_2 + thermal runaway	Firestops, FR doors, panel FP	**Critical**
Station service switchgear	Cable + panel fire	Panel FP, cable coatings	**Critical**

A2. Safety-Critical Electrical Systems

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
Fire water pump house	Must survive the fire it fights	Fireproofed structure, FR cables	**Critical**
Protection & tripping circuits (Class A / B)	Relay to circuit breaker	Fire-survival cable, panel FP	**Non-negotiable**
HVDC converter control & protection	Valve triggering, protection	Fire-survival cable	**Non-negotiable**
Fire detection in transformer bays	Detector + deluge actuation	Fire-survival cable	**Non-negotiable**

Section B | Product-to-Application Matrix

This section maps each of the four priority Stanvac product lines to the specific power transmission substations locations and circuits where they must be specified. Use these tables to build the bill of quantities (BOQ) for any power transmission substations opportunity.

B1. Cable Coatings — Fire Propagation Prevention

Minimum 240 minutes protection, thickness ≤ 1.6 mm DFT.

Purpose: prevent the spread of fire along cable trays, risers and bunches. The "Browns Ferry" scenario — one cable igniting an entire cable gallery — is the design basis.

Applicable standards: IEC 60332-3 (FM 3971 has limited use — it provides only short-duration protection against arcs and sparks)

Zone	Specific Application	Priority
GIS hall cable galleries	All HV and LV trays + transverse firestops	**Critical**
HVDC valve hall cable routes	All valve and control cables	**Critical**
Outdoor switchyard cable trenches	Inter-bay cable routes	**Critical**
Cable tunnel (switchyard to CRR)	Full-length coating + transverse firestops every 30 m	**Critical**
CRR under-floor cables	All marshalling and protection cables	**Critical**
AC filter yard cable routes	Capacitor and reactor cables	**Critical**

Zone	Specific Application	Priority
Smoothing reactor cable routes	All cables	**High**
Station service cable routes	Auxiliary supply	**High**
DG room cable entries	Start, alternator, control	**High**
Telecom / SCADA cable routes	Communication cables	**High**

B2. Cable Coatings — Fire Survivability

240-minute circuit integrity, thickness ≤ 1.6 mm DFT.

Purpose: keep the cable electrically functional while burning, so the safety circuit continues to operate through the fire event. Fire-survival coatings are specified where loss of the circuit would defeat the fire-fighting or shutdown system itself.

Applicable standards: IEC 60331-21 and IS 17505-1

Circuit Type	Where Applied	Priority
Protection & tripping circuits (Class A / B)	Relay to circuit breaker	**Non-negotiable**
Fire water pump power (electric + diesel)	Switchgear to motor	**Non-negotiable**
DG start & transfer circuits	Battery to engine panel	**Critical**
Emergency lighting + PA	Switchyard + CRR + tunnels	**Critical**
Station service UPS feeders	UPS to critical DC/AC loads	**Critical**
HVDC converter control & protection	Valve triggering, protection	**Non-negotiable**
SF_6 leak detection	Detector to panel	**Critical**
Transformer oil / gas monitoring	Buchholz + gas analyser	**Critical**
Fire detection in transformer bays	Detector + deluge actuation	**Non-negotiable**
Sub-to-control-centre communication	Backbone continuity	**Critical**

B3. Electrical Panel Fireproofing

Purpose: protect field control panels, junction boxes, MCC panels and logic cabinets from external fire and internal electrical fire. Stanvac offers three complementary solutions under this product line.

Option	Stanvac Solution	Description & Typical Use
A	Two-hour rated firestop sealant	For sealing cable gland openings, panel cut-outs, conduit entries and small penetrations at the panel boundary. Silicone / acrylic intumescent sealant certified to UL 1479 / IS 12458 at 2-hour rating.
B	Non-combustible intumescent paint	For external coating of panel enclosures, cable glands and junction boxes exposed to radiant heat or hydrocarbon fire. Non-combustible base with intumescent top-coat.
C	Two-hour rated intumescent translucent coating for small-dia. cables (aerosol spray)	Aerosol-delivered translucent intumescent coating for small-diameter instrumentation, control and signal cables entering panels. Clean application in congested panel interiors; 2-hour rated.

B4. Two-Hour Rated Firestop Barriers

Hybrid combination of mineral wool and firestop mortar.

Purpose: seal every penetration through a fire-rated wall, floor or cable tunnel so compartmentation is maintained. Stanvac's hybrid system combines high-density mineral wool (for bulk void filling and thermal insulation) with firestop mortar (for load-bearing, smoke-tight surface seal). This dual-material approach delivers superior 2-hour rating performance across a wider range of penetration sizes than single-material systems.

Applicable standards: UL 1479 · ASTM E814 · IS 12458

Location	Specific Application	Priority
Transformer bay fire wall penetrations	HT/LT + control cable openings	**Critical**
GIS hall cable entry penetrations	All cable openings	**Critical**
HVDC valve hall boundary	Cable and duct penetrations	**Critical**
Cable tunnel transverse barriers	Every 30–50 m + at ends	**Critical**
CRR external wall cable entries	Marshalling bundles	**Critical**
Main control room boundary	Cable and duct penetrations	**Critical**
Battery / UPS room boundary	Cable and ventilation duct penetrations	**Critical**
Station service switchgear cable entries	Trench + wall penetrations	**Critical**
AC filter yard cable entries	Cable penetrations	**High**
Fire water pump house entries	Power and control cable penetrations	**Critical**

Detailed product data sheets, certifications, specimen specifications and project BOQ support are available on request.

For more information, please connect with us.

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