Electrical Passive Fire Protection for Aluminium Smelters

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

Section A | Electrical Zone-Wise Fire Risk Map

A1. Substations, MCC Rooms & Cable Galleries

Main substation, rectifier station (single largest electrical block), pot-line DC cable gallery, cast house MCC, CPP electrical backbone, and the central CCR.

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
Main 400/220/132 kV substation	Transformer + cable fire	Cable coatings, firestops, panel FP	**Critical**
Rectifier transformer & SCR bay	Transformer oil + cable fire	Fire walls with firestopped penetrations, cable wraps	**3 hr / Critical**
Pot-line DC cable gallery	Propagating cable fire (single longest cable run in any industry)	Cable coatings + transverse firestops every 30 m	**Critical**
Pot-line local control panels	DC bus fault exposure	Panel FP, cable coatings	**Critical**
Cast house MCC & pulpit panels	Molten metal splash, hydraulic oil fire	Panel FP, cable coatings, ablative wraps overhead	**Critical**
Anode baking control panels	Pitch + gas fire	Panel FP, cable coatings	**High**
Alumina refinery control panels (if integrated)	Caustic + fire exposure	Panel FP (corrosion-resistant), cable coatings	**High**
CPP electrical backbone	Full CPP fire exposure	Cable coatings, firestops, panel FP	**Critical**

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
CCR / DCS	Panel + cable fire	Panel FP, firestops, FR doors	**Critical**
Battery / UPS room	H_2 accumulation	Firestops, FR doors, panel FP	**High**

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	**Non-negotiable**
Pot-line emergency shutdown + rectifier trip	Trip circuit integrity	Fire-survival cable, panel FP	**Non-negotiable**
CPP turbine emergency trip	Trip circuit integrity	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 aluminium smelters locations and circuits where they must be specified. Use these tables to build the bill of quantities (BOQ) for any aluminium smelters 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
Pot-line DC cable galleries	All DC cables + transverse firestops every 30 m	**Critical**
CPP cable tunnels	All HT and LT trays	**Critical**
Main substation cable galleries	Incoming and outgoing	**Critical**
Rectifier station cable routes	AC + DC cable bunches	**Critical**

Zone	Specific Application	Priority
Cast house overhead cable trays	Molten metal splash exposure	**Critical**
Anode baking cable routes	Ring furnace cables	**High**
Alumina refinery cable routes	Caustic-resistant coatings	**High**
CCR / DCS under-floor cables	All incoming marshalling	**Critical**
Fire water pump house cables	Incomer + motor	**Critical**
DG room cable entries	Start, alternator, control	**Critical**

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
Pot-line emergency shutdown	Rectifier trip, pot isolation	**Non-negotiable**
Rectifier protection circuits	DC fault protection	**Non-negotiable**
Fire water pump power (electric + diesel)	Switchgear to motor	**Non-negotiable**
Emergency DG start & transfer	Battery to engine panel	**Critical**
CPP turbine emergency trip	ETS system	**Non-negotiable**
Cast house emergency e-stop	Molten metal hazard	**Critical**
Emergency lighting + PA / GA	Plant-wide egress	**Critical**
F&G detection (H_2 in battery, HF in pots)	Detector to F&G panel	**Critical**
UPS feeders to DCS / SCADA	UPS to marshalling	**Critical**
Anode change machine safety	Machine safety circuits	**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
Pot-line cable gallery transverse barriers	Every 30–50 m	**Critical**
Rectifier station wall cable penetrations	All AC and DC cable openings	**Critical**
Cast house to adjacent area boundary	Cable and pipe penetrations	**Critical**
CPP boundary	Cable, pipe, duct penetrations	**Critical**
Main substation cable trench to building	Sand-seal + firestop pillows + mortar	**Critical**
CCR external wall cable entries	Marshalling bundles	**Critical**
Anode baking building boundary	Cable and pipe penetrations	**High**

Location	Specific Application	Priority
Alumina refinery compartment walls	Cable and caustic pipe penetrations	**High**
DG room boundary	Fuel and cable penetrations	**Critical**
Fire water pump house entries	Power and control cable penetrations	**Non-negotiable**
HVAC duct penetrations	Fire dampers + collar seals	**High**

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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