Electrical Passive Fire Protection for Solar Power Plants (PV + BESS)

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

Section A | Electrical Zone-Wise Fire Risk Map

A1. Substations, MCC Rooms & Cable Galleries

Central inverter stations, pooling (collection) substation, grid-connect substation, BESS container enclosure, and the SCADA / control room.

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
Central inverter station (1–5 MW)	Inverter internal fire, cable fire	Structural intumescent on supports, cable coatings, panel FP	**Critical**
String inverter enclosures	Internal electronics fire	Panel FP, firestops	**High**
Inverter transformer (indoor / outdoor)	Transformer oil fire	Fire walls with firestopped penetrations, cable wraps	**Critical**
MV switchgear (at inverter station)	Cable + arc flash fire	Panel FP, cable coatings, firestops	**Critical**
String combiner boxes (SCB / DCDB)	DC arc fault, connector fire	Panel FP, firestops at cable entries	**Critical**
33 kV collection / pooling substation	Transformer + cable fire	Cable coatings, firestops, panel FP	**Critical**
Grid substation / step-up transformer	Transformer oil fire	Fire walls with firestopped penetrations, cable wraps	**Critical**
BESS Li-ion battery container	Thermal runaway, electrolyte fire	Firestops, FR doors, panel FP, thermal runaway containment	**Critical**

Area	Fire Scenario	Stanvac PFP Product Application	Rating / Priority
BESS PCS + BMS cabinets	Cable + electronics fire	Panel FP, cable coatings	**Critical**
SCADA / control room	Panel + cable fire	Panel FP, firestops, FR doors	**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	**Non-negotiable**
BESS thermal runaway detection + gas suppression	BMS to central panel + agent release	Fire-survival cable, panel FP	**Non-negotiable**
Grid protection & tripping	Relay to circuit breaker	Fire-survival cable	**Non-negotiable**
Pooling transformer protection	Differential, buchholz, PRV	Fire-survival cable	**Critical**

Section B | Product-to-Application Matrix

This section maps each of the four priority Stanvac product lines to the specific solar power plants (pv + bess) locations and circuits where they must be specified. Use these tables to build the bill of quantities (BOQ) for any solar power plants (pv + bess) 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
DC cable routing (field to inverter)	All DC cables (DC-rated coating)	**Critical**
MV cable routing (inverter to pooling SS)	All AC collection cables	**Critical**
Pooling substation cable galleries	All HT trays	**Critical**

Zone	Specific Application	Priority
Grid SS cable galleries	Incoming and outgoing	**Critical**
BESS container DC cable routes	Battery module to PCS	**Critical**
BESS AC cable routes	PCS to transformer	**Critical**
SCADA / control room cable routes	Marshalling and protection	**Critical**
Inverter station cable routes	Internal power and control	**Critical**
Tracker motor cable routes	Drive and control	**High**
DG room cable entries	Start, alternator, control	**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
BESS thermal runaway detection + isolation	BMS to central panel to discharge	**Non-negotiable**
BESS gas suppression / abort	Agent release actuation	**Non-negotiable**
DC isolation / rapid shutdown	Module to SCB to inverter	**Critical**
Fire water pump power (electric + diesel)	Switchgear to motor	**Non-negotiable**
Grid protection & tripping	Relay to circuit breaker	**Non-negotiable**
Pooling transformer protection	Differential, buchholz, PRV	**Critical**
SCADA communication to central control	Control centre continuity	**Critical**
Emergency DG start & transfer	Battery to engine panel	**Critical**
F&G detection (H_2 in SS battery, electrolyte in BESS)	Detector to panel	**Non-negotiable**

Circuit Type	Where Applied	Priority
Emergency lighting + PA	BESS container, inverter stations, CCR	**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
BESS container boundary	Cable and HVAC penetrations, thermal runaway containment	**Critical**
BESS module separator walls	Propagation containment between modules	**Critical**
Central inverter station boundary	Cable and pipe penetrations	**Critical**
Pooling SS cable trench to building	Sand-seal + firestop pillows + mortar	**Critical**
Transformer bay fire wall penetrations	HT/LT + control cable openings	**Critical**

Location	Specific Application	Priority
Control room external wall cable entries	Marshalling cable bundles	**Critical**
Cable tunnel transverse barriers	Every 30–50 m	**Critical**
String combiner box (SCB) enclosure	DC cable entry seals	**Critical**
BESS gas suppression room boundary	Cable penetrations	**Critical**
Battery / UPS room boundary	Cable and ventilation duct penetrations	**Critical**
Fire water pump house entries	Power and control cable penetrations	**Non-negotiable**
Inverter transformer bund boundary	Cable and oil pipe 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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