## TECHNICAL SPECIFICATION FOR FIRE BREAK MATERIAL

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REFERENCE SPECIFICATION NO. PC-E-393 Rev. No. R1 (specification for RAPP 7&8, KAPP 3&4)
Industrial & fire safety guideline; Application of fire retardant coating (fire break) on cables
I&FS/2015/Gl-09 dated 05/08/2015
Technical Specification for Fire Retardant Compound

1.0 This specification covers the design, material, construction features, manufacture, inspection and testing at the contractors / his sub-contractors works, packing, transportation, delivery at site and installation of fire retardant compound over cable to form fire break listed below, complete in all respects as described in this specification.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Item</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>1.</td>
<td>Design manufacturing, testing &amp; Supply of fire retardant compound for cable to form fire break capable of preventing propagation of fire for 30 min. for indoor and outdoor cables as per specifications</td>
<td>6000 Kg</td>
</tr>
<tr>
<td>2.</td>
<td>Application of fire retardant compound over cable to form fire break capable of preventing propagation of fire for 30 min at our site inside operating island as per attached annexure-I for detail scope of work</td>
<td>6000 Kg</td>
</tr>
</tbody>
</table>

Note: 1.0. Whether called specifically or not all accessories required for the fire barrier material are deemed to be considered as a part of the contractors scope of supply.

2.0. It is not the intent to specify completely herein, all details of design and construction of the fire barrier system. However, the system shall confirm in all respects to high standards of engineering, design and workmanship and be capable of performing in continuous commercial operation up to the contractor’s guarantees in a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which, in his judgment, is not in full accordance therewith.

1.0 The design, material, construction, manufacture, inspection, testing and performance of fire barrier system and associated accessories supplied shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the CONTRACTOR of his responsibility. Where no standards are available, the supply items shall be of good quality and workmanship and backed by test results. Any supply items,
which are bought out by the CONTRACTOR, shall be procured from MANUFACTURERS approved by the PURCHASER.

2.0 Fire barrier system shall conform to the latest applicable standards and codes of practice as mentioned in this specification. In case of conflict between the standards, stringent specifications out of these standards shall govern, whereas in case of conflict between the standards and this specification, requirements of this specification shall govern.

3.0 Other National Standards are acceptable if they are established to be equivalent to or superior to the listed standards subject to approval by the PURCHASER and the CONTRACTOR shall provide English version of standards and codes applicable.

4.0 The fire barrier system and accessories shall conform to the currently applicable standards and codes of practice and reports as listed below:

4.1 **Indian standards:**

<table>
<thead>
<tr>
<th>SN</th>
<th>CODE</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>1)</td>
<td>IS:12458</td>
<td>Method of test for fire resistance of fire Stops</td>
</tr>
<tr>
<td>2)</td>
<td>IS:12459</td>
<td>Code of practice for fire protection of cable runs</td>
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1.0 Whether called specifically or not all accessories required for the best performance of fire barrier system are deemed to be considered as part of the Contractor's scope of supply.

**2.0 Fire Breaks**

2.1 Types of cable used: XLPE/PVC/EPR insulated and FRLS PVC/EVA sheathed power and control cables.

2.2 Fire breaks on cables in cable trays outdoor and indoor installation

a) Fire rating required: 30 minutes for coating length of 1m

b) Distance between fire-breaks for straight runs: 6 meters

c) Fire break coating shall be applied for 1 m length in all directions at cable tray crossings, cross-joints and T- joints in cable trays. Fire break coating shall also be applied on cables for 1m length above electrical panels having top cable entry.
1.0 Cable Fire Breaks:

Cable fire breaks are passive fire protection system which prevents the propagation of fire along the cable trays horizontally and vertically in a fire compartment.

1.1 TECHNICAL REQUIREMENTS OF FIRE BREAKS:

a) All material shall be new, freshly manufactured and of first class quality.

b) The firebreak shall prevent propagation of fire for a minimum period of 30 min. when tested for the largest number of cables in cable pans.

c) Fire break shall be totally asbestos free

d) Fire break shall be compatible with the FRLS PVC, PVC, EVA, S.R.I or neoprene sheathing of cable

e) Fire break shall have long life with life expectancy of at least 40 years.

f) Fire break shall not affect the current carrying capacity of the cables and shall be demonstrated by actual test on a length of 10 M of fully coated cable.

g) Fire break shall be water resistant.

h) Fire break shall be resistant to the corrosive gases and to the effect of vapors of chemicals like hydrocarbons, acids, alkaline etc. and bidder shall produce test reports to this effect from reputed test laboratories.

i) Fire break shall not crack, peel off due to bending of cables and shall be very flexible.

j) Fire break shall not contain any flammable solvents or toxic materials.

k) Fire break shall not be irritant to skin nor it shall produce any itching while carrying out application.

l) Fire break material shall be brushable/ sprayable. It shall be possible to easily apply fire break on cables located one above other in the fully loaded cable trays alongside wall. All other conditions being same preference will be given to the product for which application is easy and time required for curing is minimum.

m) It shall be possible to remove or lay individual cables in a coated cable bunch. It should be possible to easily repair the damaged fire break without deterioration of properties.

n) The fire break shall prevent propagation of fire along cables horizontally and vertically arising from (a) internal short circuit/overheating of cables (b) exposure of cables to external flames.

o) It shall not require any special or chemical cleaning prior to its application.

p) It shall also be suitable for outdoor use in cable trenches/tunnels and shall not be vulnerable to moisture.
q) Fire protection system after curing, shall be mechanically strong enough to withstand foot traffic without damage.

r) Fire retardant coating shall be composed of fire retardant chemicals/inorganic noncombustible fibers, fillers and pigments along with water base or nonflammable oil base thermoplastic resin

s) In case of fire, fire breaks shall not evolve any toxic gas or fumes.

t) There shall be no effect of oil, dust, saline atmosphere, acid, alkali and corrosive fumes and continuous exposure to sun etc. on the coating.

u) The fire protection system shall have following additional properties:

i. It shall be odorless.

ii. It shall have high oxygen index. (Greater than 60%)

iii. It shall exhibit no damage when immersed in water at room temperature for 7 days.

iv. It shall exhibit no damage when immersed in alkaline solution of 5% sodium hydroxide for 3 days.

v. It shall show no damage when immersed in an acidic solution of 5% HCL for 3 days.

vi. It shall show no damage / crack when tested for accelerated storage test at 850 for 3 days.

vii. It shall not show damage / deterioration when immersed in a lubricating oil for 3 days.

viii. The fire break material used in RB shall withstand an integrated gamma radiation dose of 100 Mega rads without affecting 30 min. fire rating.

ix. The firebreak system on curing shall be non-hygroscopic and retain its integrity and perform satisfactorily after prolonged exposure to water. This is applicable for outdoor use of firebreaks or where there is water logging.

x. The shelf life of all materials which form a part of supply of the fire break shall be indicated.

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1.0 **TESTS AT MANUFACTURER’S WORKS**

1.1 **General**

The tests at works shall include electrical, mechanical and hydraulic tests in accordance with the appropriate clauses of Statutory Regulation, relevant codes and standards and in addition any test called for by the Purchaser or his representative to ensure that the fire barrier system being supplied fulfills the requirements of the specification. The Contractor shall carry out all the shop tests and inspections specified in the following clauses in addition to those normally carried out by him.
For equipment not covered by any code or considered necessary by the Purchaser or his representative, multipart assemblies shall be fully erected and tested in the works prior to packing and dispatch to the site.

1.2 **Test on Cable Fire Breaks**

Testing shall be carried out as per NPCIL specification No. PP-E-1161 at site/manufacturer’s works. In case bidder desire to obtain copy of same for bidding, same shall be furnished on request.

1.2.1 **Test Sequence**

a. **Water Immersion Test**

For water immersion test, the above specimen shall be kept for 24 hrs. fully immersed in the fresh clear water at 500°C +/- 20°C. the specimen shall be removed from water bath and left for 8 hrs. at ambient temperature.

b. **Ageing Test**

Ageing test at 850°C +/- 50°C for 168 hrs. shall be carried out on the specimen to be tested after water immersion test.

c. **Flame Test**

The flame test shall be conducted as per NPCIL specification No. PP-E-1161. The flame shall be impinged on cables provided with fire break for 30 minutes.

1.3.1 The type test certificates shall be furnished by the Contractor for radiation withstand and ampacity derating test. Where type test certificate are not available actual test shall be conducted to prove radiation withstand capability based on approved test procedure.

1.3.2 **Acceptance Criterion**

On removal of flame after 30 minutes, the cables shall be allowed to burn on their own. When the flame extinguishes, the uncoated portion of the cables shall remain unchanged/unaffected.

1.4 **Acceptance Test on fire stops/breaks**

The manufacture shall furnish the list of tests to be conducted on each batch of materials for fire stop as well as each batch of materials for firebreak. The list of test and the test procedure shall be subject to purchaser’s approval.

1.5 All testing charges including type tests on fire breaks shall be borne by the contractor. The tests shall be performed on randomly selected samples by purchaser.
## TECHNICAL SPECIFICATION FOR FIRE BREAK MATERIAL
### SECTION CC-6
#### TESTS AT SITE

**REVISION-00**

1.0 The following checks shall be conducted at site on fire breaks to ensure good quality of workmanship/erection. These are however not intended to form a comprehensive commissioning check list as it shall be the CONTRACTOR's responsibility to draw up and carryout such a program after obtaining the PURCHASER's approval.

### 2.0 Checks for Fire Breaks

1. Check that fire break coating has been uniformly applied on the cable.
2. Check for length of coating as required for 1/2 hr. (30 minute) rating.
3. Check for thickness of coating at randomly selected locations.
4. Check for proper adhesion of coating to cable surface i.e peeling off/damage.

## TECHNICAL SPECIFICATION FOR FIRE BREAK MATERIAL
### SECTION CC-7
#### Special Tools and Tackles for Application

**REVISION-00**

1.0 The contractor shall arrange all the tools and tackles required for Application of fire breaks.

## TECHNICAL SPECIFICATION FOR FIRE BREAK MATERIAL
### SECTION CC-8
#### Quality Surveillance

**REVISION-00**

**QUALITY ASSURANCE PLAN FOR CABLE FIRE BREAKS**

Scope and Purpose: This document indicates the requirements expected from the contractor/manufacturer of the above material. Subsequent to the placement of Purchase Order, contractor/manufacturer shall submit “for purchaser’s approval a quality assurance plan and program in line with this document.”

## TECHNICAL SPECIFICATION FOR FIRE BREAK MATERIAL
### SECTION CC-9
#### Annexure-I

**REVISION-00**

**Information about site and work:**

1. Our site Rawatbhata Rajasthan site Unit 1&2 that is situated at Approx. 60 KM from Kota and 10KM from Rawatbhata in Rajasthan state.
2. Fire retardant paint to be applied at different location inside operating island i.e. Switchgear room, Turbine building, DG&MG room cable bridge between TB-2&RB-2, Reactor building, AFR etc.
3. Power cable circuit will remain in service and alive during execution of job; however cables are insulated for required voltage level as per national/international standards.
4. System Voltage level of power cable are 3.3 kV, 440 Volt AC and 250 Volt DC
5. Nearby switchgear panel will remain in service (i.e. Charged condition)
6. Power cables are installed since commissioning of Plant (Approx. 30-35 Year old).
7. Power cable tray are covered with GI Sheet cover and clamped at regular intervals on entire length.
8. Power cables are also coated with fire paint earlier; so new fire paint is to be done at uncoated portion as per requirement or on new power cables or portion from where old paint pill out.

9. Power cable /cable tray Hight will vary from 2 - 3 meter in switchgear room to 15 - 20 Meter on Cable Bridge between turbine and reactor building.

10. Working hour will be from 8:00Hrs to 16:00 Hrs, working beyond normal hour, Sunday, Holiday will require separate permission from competent authority.

11. Painting of some part of total quantity may be in radiation area where TLD and DRD will require for execution of work and remaining quantity will be in non-radiation area.

12. Application of fire paint is to be done as per approved plan only validly of this part should be one year, as entry in few areas required Plant Shutdown.

Mandatory requirement:-

1. CISF Entry pass is required for working at site operating island RRS 1&2 for which following are must;
   (i) Police verification of individual
   (ii) Photo Identity Card
   (iii) Valid Document for vehicle
   (iv) Industrial Safety and radiation training from NPCIL (free of cost).

2. **Insurance Policy**: Workmen compensation and third party liability policy for the period of working at RRS Unit 1&2 in the joint name of NPCIL &Your Company is required before start of work.

3. All industrial & radiological safety and security instruction to be followed and Hight pass will required for Hight job.

4. TLD to be deposited, whole Body counting will require after completion of work.

Scope of work:-

1. You have to submit the date wise work plan and procedure before starting the job for approval and same to be followed during execution.

2. Fire retardant paint of required thickness(1.5 mm to 2.0 mm) for 30 minute fire rating to be apply on power cable every 1 meter length after 6 meter on Horizontal portion of cable run and complete length on Vertical portion of cable run, 1 meter length at T joint in each direction.

3. Removal of cable tray cover/sheet and clamps before fire paint and reinstallation after work.

4. Housekeeping, cleaning of Floor, work area after job.

5. Removal of paint mark, if any from panel or nearby structure.

6. All tools, tackles, Brushes, pots, painting accessories required for this job will be arranged by contactor.

7. You have to arrange the transport arrangement for your deployed manpower.

8. Boarding and Lodging at site will be under the scope of bidder.

9. All Personnel protective equipments (i.e. Helmet, Safety belt, Hand gloves etc.) required for execution of work will be under the scope of bidder.

10. Scaffolding, Ladder for working at Hight will be provided by NPCIL (free of Cost). for which you have to raise requirement well in advance .

Payment of work:

1. Payment of completed and accepted job will be done for application part.

2. After complete application remaining item will be kept by purchaser in stock for future requirement and payment for application part will not be done for such un- applied quantity.