

OWNER : RRVUNL

2 X 660 MW SURATGARH STPP

CONSULTANT – TCE Ltd.

**TECHNICAL SPECIFICATION FOR
FIRE SEALING SYSTEM**

SPECIFICATION NO: PE-TS-392-507-E016

REV:0



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA - 201301**



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
FIRE SEALING SYSTEM
SUPPLY & INSTALLATION**

SPECIFICATION NO. PE-TS- 392-507-E016

VOLUME II

SECTION ---

REVISION 0

DATE: 28.03.2017

SHEET 1 OF 1

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	TOTAL NO. OF SHEETS (INCLUDING COVER/ SEPARATOR SHEETS)	= 28

IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN TOTO & THAT THERE ARE NO TECHNICAL DEVIATIONS.

BIDDER'S STAMP & SIGNATURE

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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1.0 SCOPE OF ENQUIRY

- 1.1 This enquiry covers the supply and installation of fire sealing material for cable opening through walls & floors (below panels & risers), pipe sleeves & fire protection coating on installed cables as listed in Bill Of Quantities in accordance with specific technical requirements section - I, section - D and data sheet - A.

2.0 SCOPE OF WORK

- 2.1 The scope of work shall include design, manufacturing, and testing, packing, supply to site, E&C, handling & installation of:

1. Fire sealing material :

- a) Floor openings below panels
- b) Floor openings
- c) Wall openings
- d) Pipe sleeves opening

2. Fire protection coating on cables

3.0 GENERAL

- 3.1 Bidder shall confirm compliance to the specification in totality. Any deviation from this specification shall be brought out in Schedule of Deviations enclosed. In the absence of duly filled in 'Schedule of Deviations', it shall be construed that the bid conforms to the specification.
- 3.2 Purchaser reserves the right to increase / decrease the quantity as finally required for the project. Unit rates quoted by the bidder shall be applicable for adjustment purposes for the same.
- 3.3 The bid is liable to be rejected in case complete documentation required to be the part of the bid is not furnished.

4.0 SPECIFIC TECHNICAL REQUIREMENTS

- 4.1 Cables / cable tray openings in walls and floors or through pipe sleeves from one area to another or one elevation to another, between the units and within the same unit, shall be sealed by a fire-proof sealing system. The fireproof sealing system (FPSS) shall effectively prevent the spread of fire from the flaming to the non-flaming side, in the event of a fire.

The FPSS shall conform to the following requirements:

(a) FPSS shall have a fire rating of two hours.

(b) The FPSS shall be subjected to fire endurance test, hose stream test, temperature measurement of non-flaming side as per ASTM-E119. 'Standard method of fire tests of building construction and materials'.

(c) The FPSS will also conform to the in-combustibility test carried out in accordance with IS: 3144-1992.

(d) Under fire condition, the FPSS material shall not emit smoke or any corrosive or toxic fumes.

(e) FPSS shall have minimum life of 25 years.

- 4.2 Fire sealing system offered shall be out of any of the following system

- a) Panel based sealing system
- b) Powder/ mortar based sealing system



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- 4.3 In addition to the installation of the fire sealing system materials, any additional work required for the installation (e.g. preparation of the area where fire seal is intended to be applied, enlargement/ reduction of the total opening area, etc.) is included in their scope of work. However, payment towards the civil works (enlargement/ reduction) of penetration area shall be as per clause 8.1(f) & 8.3 (f) of section-D.
- 4.4 Bidder shall indicate price for tool and accessories required for addition or removal of cables after the seal is made. This shall include special tools; compound injection guns, spray guns, etc. (As applicable) in price schedule.
- 5.0 **FIRE PROTECTION COATING TO BE APPLIED ON INSTALLED CABLES: -**
- 5.1 Fire break shall be provided by applying a suitable fire-resistant coating on cables for the required length to meet the fire rating of 30 minutes.
- 5.2 Fire break shall be provided at an interval of 15 metres in the straight portion of each of the cable tray above ground, at intervals of 30 metres in cable trenches and at 5M for all vertical trays. All cable inter section and tee offs shall be provided with firebreaks.
- 5.3 When pipe sleeves are provided for cables from outdoor areas to indoor areas, the pipe opening at the outdoor side shall be sealed by fire proof sealing material, which is also continuously waterproof. The indoor side of the pipe opening shall also be sealed by continuous fire proof sealing materials. The duct banks in outdoor areas also need to be sealed by fire proof sealing material and water proof seals to prevent the ingress of water.
- 5.4 The fire protection coating shall have the following properties/ composition:
- (i) Asbestos free, non-volatile, not eatable by vermin, harmless and non-irritant to skin of human.
 - (ii) Not affecting the current carrying capacity of the cables and the properties of the installed cables.
- 6.0 **APPLICATION OF FIRE SEALING SYSTEM & FIRE PROTECTIVE COATING ON CABLES WITH FIRE RESISTANCE COMPOUND SHALL BE AS UNDER:**
- A) The various openings in the cable vault, vertical/horizontal raceways of cables penetrating walls/floors and the bottom of Electrical Switchgears and panels in Control Equipment room/MCCs/ Distribution Boards/Cabinets/Panels shall be provided with fire stop systems. Cables passing through the openings at various locations are laid on various tiers of the cable trays/racks in the bunch formation. In case, for the purpose of installation of seal system, steel frames are required to be fabricated and fixed in the openings, the fabrication of frame and fixing of the same shall have to be done by the Bidder. The necessary steel section for fabrication of frames shall be supplied by the Bidder without any extra cost. Any, civil works required to be done in the openings shall be carried out by the Bidder. Bidder shall also include one set of tools and accessories required for addition or removal of cables after the seal is made. This shall include special tools, compound injection guns, spray guns, etc.
- B) All openings in the floor and wall for cable access shall be sealed after installation of the cable system with non-inflammable materials, as follows:
- i) Fire stop/Penetration seal shall be installed in the cable spreaders and cable raceways.
 - ii) Similarly in the trenches fire stop/penetration seals shall be provided at suitable interval to avoid spread of fire.



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iii) For all H.T., L.T., D.C. Dist. boards and other miscellaneous panels, fire stops should be provided below base plate. The non-inflammable type sealing material shall be supplied by the Bidder.

C) Except for inside an enclosure wherever the cable enters or leave the conduit, the conduit end shall be sealed by suitable sealing compound, having fire withstand capability.

7.0 TESTS ON FIRE PROOF SEALING SYSTEM AND FIRE BREAK SYSTEM

7.1 Type test reports for following tests on fireproof sealing system suitable for 2 hours shall be submitted :

- a) Accelerated ageing test
- b) Water absorption test
- c) Vibration test
- d) Fire rating test
- e) Hose stream test

Type test reports for following tests on fire breaks (fire-resistant coating on cables) suitable for 30 minutes shall be submitted :

- a) Flammability test as per IEC-60332-3-23 (CAT-B)
- b) Limiting oxygen Index test as per ASTM D-2863
- c) Ampacity test for fire breaks

7.2 System offered shall be of type tested at CBRI, Roorkee or by government approved independent agency.

7.3 Bidder shall furnish the latest type test reports of type tests (mentioned in clause 7.1) conducted on the system offered.

7.4 In case bidder is not able to submit report of type test(s) conducted, or in case type test report(s) are not found to be meeting the specification/ relevant standard requirements, the Bidder shall conduct all such tests under this contract at no additional cost to BHEL either at third party lab or in presence of BHEL/Customer representative and submit the reports for approval.

7.5 Routine and acceptance tests shall be carried out on FPSS and fire break (fire-resistant coating on cables) material. All acceptance & routine tests as per relevant standards & specification shall be deemed to be included in the bid price.

7.6 Type test certificate for water proof test shall be submitted.

8.0 DRAWINGS / DATA SHEETS

8.1 The following information shall be furnished with the bid:

- a) Data Sheet - B
- b) Complete details of the system
- c) Technical details of water proofing material/ water proofing properties of fire sealing material used for pipe sleeves
- d) Typical drawings showing arrangement of various components and thicknesses etc.
- e) Type test certificates
- f) Signed and stamped copy of BOQ
- g) Signed and stamped copy of Content sheet
- h) Signed and stamped copy of Compliance sheet

8.2 The following information shall be furnished after award of contract, for BHEL / Customer approval.

- a) Data Sheet - C
- b) Typical drawings showing arrangement of various components and thicknesses etc.



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- c) Calculations for supply of material based on area to be provided with fire sealing (BOM)
- d) Manufacturing Quality Plan
- e) Field Quality Plan
- f) Type test reports

9.0 CODES & STANDARDS

- 9.1 Latest revision of relevant standards / codes shall be applicable.
- 9.2 The testing methods shall be in accordance with the international standards (such as ASTM-E-814, ASTM-E-119, UL-1479, BS: 476, IEC-332-3 and ASTM-D-2863, IEC-331, ANSI-IEEE-383, IEEE-634, IS: 3144 latest)

10.0 QUALITY PLAN

- 10.1 Successful bidder shall submit Quality Plan after award of contract, which shall include various quality checks for the fire sealing system offered. The same shall be subject to the approval of BHEL/Customer without any commercial implication.
- 10.2 The successful bidder shall submit Field Quality Plan for storage, preservation, handling and erection work at site for fire-sealing system. The same shall be subject to CUSTOMER/ BHEL approval without any commercial implications.

11.0 BILL OF QUANTITY

- 11.1 The floor openings below panels, floor openings, wall openings, pipe sleeves and cables to be provided with fire sealing system are indicated in the BOQ cum price schedule. Bidder to quote accordingly for fire sealing system. The successful bidder shall furnish at contract stage, bill of quantities of fire sealing materials for each of the items with calculations and data justifying the same. The agreed quantities will be only for billing purposes and bidder is responsible for supplying the quantities to complete the fire sealing work meeting the specification requirements, without any price implications.

12.0 PRICES

- 12.1 Bidder shall indicate the following unit price:

- a) Unit price for supply of material for each of the item listed in the BOQ.
- b) Unit prices for installation of fire sealing material for each item listed in BOQ.
- c) Unit rates for civil works in line with clause no. 8.3, Section D of specification.

Unit prices quoted shall adhere to the requirement given under clause 8.3 section-D of this specification.

- 12.2 Lot-I quantity shall be released along with LOI, which is approx. 70% of ordered quantity.
- 12.3 Additional quantity shall be released by BHEL progressively as per site requirement. The quantity variation shall be limited to (-) 30% to (+) 30% of the contract value arrived at on the basis of the total order of quantities.
- 12.4 Addition/deletion of quantity shall be applicable at the quoted unit price.

13.0 DELIVERY

Delivery shall be as per NIT (Notice Inviting Tender)

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ANNEXURE – I

**LIST OF DRAWINGS / DOCUMENTS
(REQUIRED TO BE FURNISHED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT)**

Sl. No.	Drawings/Document Description	Drawings / Document Number
1	Technical Data sheet	PE-V0-392-507-E041
2	General arrangement drawings	PE-V0-392-507-E042
3	Quality plan	PE-V0-392-507-E043
4	Type test reports	PE-V0-392-507-E044
5	Field quality plan	PE-V0-392-507-E045

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DATA SHEET - A

- | | | | |
|------|---|---|--|
| 1.0 | Rating of fire proof sealing system | : | Two (2) hours |
| 2.0 | Rating of Fire break (fire resistant coating on cables) | : | 30 minutes |
| 3.0 | Type of application | : | (√) Horizontal
(√) Vertical
(√) Below panels |
| 4.0 | Cable laying conditions | : | (√) Cables on cable trays
(×) Unsupported cables |
| 5.0 | Suitability of fixing arrangement | : | (√) In masonry work
(√) In concrete work |
| 6.0 | Surface Treatment of Steel
Material (for frame work as applicable) | | |
| | a) Surface protection | : | Galvanization conforming to
IS: 2629 |
| | b) Mass of Zinc | : | 460 g/m ² |
| 7.0 | Type of system offered
(Bidder to offer any one of the mentioned system) | : | (i) Panel based sealing system OR
(ii) Powder / Mortar based sealing system |
| 8.0 | Minimum Shelf life of most perishable material | : | 12 Months |
| 9.0 | Life expectancy of material | : | Greater than 25 Years. |
| 10.0 | Packing suitable for | : | Storage on dry surface by BHEL site |

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DATA SHEET - B

1.0 GENERAL

1.1 Name of bidder :

1.2 Address :

2.0 APPLICABLE STANDARDS

2.1 Applicable standard for fire rating test and hose Stream test :

3.0 TECHNICAL DETAILS

3.1 Type of fire sealing system :

3.2 Make :

3.3 Fire rating :

3.4 Whether fire retardant coating req. as part of system to meet rating : YES / NO

3.5 If answer to 3.4 is 'YES'

a) Material of coating :

b) Length of coating :

c) Thickness of coating

i) On cable :

ii) On panel :

d) Physical Properties

i) Density :

ii) Viscosity

3.6 Pressure withstand capacity of Fire stop : kg/mm^2

3.7 Weight of fire stop assembly (without cables) : kg/mm^2

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3.8 Shelf life of most perishable material : years

3.9 Life of total assembly : years

4.0 DOCUMENTATION

The following shall be furnished for each contract

a) Complete details of the system : YES / NO

b) All relevant drawings : YES / NO

c) All test certificates (Type, routine & acceptance) : YES / NO

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DATA SHEET - C

1.0 Fire Proof Sealing System/Fire stops

- 1.1 Manufacturers name :
- Type of FPSS provided :
- 1.2 Duration for which the FPSS will retain its guaranteed properties (Life expectancy) : Years
- 1.3 Minimum shelf life of the materials used in the fire stops : Months
- 1.4 Applicable standard :
- 1.5 Performance tests
- 1.5.1 Whether type test certificates for the following tests enclosed
- Fire rating test : Yes / No
 - Hose stream test : Yes / No

2.0 Fire Breaks

- 2.1 Manufacturers name :
- 2.2 Applicable standard :
- 2.3 Duration for which the fire breaks will retain its guaranteed properties (Life expectancy) : Years
- 2.4 Minimum shelf life of the materials used in the fire stops : Months
- 2.5 Type test certificates of the following tests enclosed
- Ampacity test : Yes / No
 - Flame test : Yes / No
 - Water Proof test : Yes / No

3.0 TECHNICAL DETAILS

3.1 Physical Properties

- i) Density :
- ii) Viscosity :

- 3.2 Pressure withstand capacity of : kg/mm²

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Fire stop

3.3 Weight of fire stop assembly : kg/mm²
(without cables)

4.0 DOCUMENTATION

The following are furnished for purchaser's approval

- a) Complete details of the system : YES / NO
- b) All relevant drawings : YES / NO
- c) All Test certificates : YES / NO
(Type, routine & acceptance)



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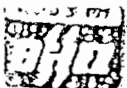
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FIRE STOP SYSTEM FOR CABLES

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GENERAL TECHNICAL REQUIREMENTS

OF

FIRE STOP SYSTEM FOR CABLES

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FIRE STOP SYSTEM FOR CABLES

1.0 GENERAL

This specification covers the requirements which are applicable in general to fire stop system of cable penetrations through floors and walls.

2.0 STANDARDS

The latest editions of following standards shall be applicable :

- a) ASTM-E-814 Standard test methods for fire tests of Through-Penetration fire stops

3.0 DESIGN REQUIREMENTS

3.1 The fire stop system, in case of fire, shall prevent spreading of fire in cables / systems beyond the fire stops.

3.2 The cables shall be generally laid in cable trays/cable racks/conduits and fire stop system shall be designed in a way such that the basic supporting structure of cables is not disturbed.

3.3 The system shall be of retrofit design, physically and chemically stable.

3.4 Through penetration cable openings on floors and walls shall be divided into modules. Each module shall have spare capacity to accommodate additional cables in future. The fire stop system shall be designed to accept additional cables without impairing fire stop capability and without disturbance / wastage of material in the nearby modules. Addition of cables should cause minimum disturbance/ wastage of material in the affected module.

3.5 The system shall be mechanically secured to the masonry work/concrete work to resist dislocation.

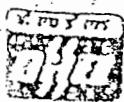
3.6 The system shall remain unaffected due to any vibrations or expansion in cables. The system must also remain unaffected due to adverse temperature and humidity variations in the atmosphere. Temperature and humidity conditions shall be specified in the project information for the respective projects.

3.7 The system should be equally effective in horizontal and vertical formations.

3.8 The system should not affect the current carrying capacity of cables passing through the fire stop.

3.9 The system should provide firm grip on the outer surface of the cable in the event of fire.

3.10 The system shall be capable of withstanding mechanical loads, foot traffic, drop loads and wind pressure etc.



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1.11 The fire stop system shall be completely gas & smoke tight.

1.12 The materials/components used for fire stop system shall meet the following requirements :

- a) Shall not get affected over a period of time due to humidity, moisture, Ozone and variation in ambient temperature.
- b) Should not contain volatile solvents after the setting period of system.
- c) Should be able to withstand stresses due to expansion/vibrations.
- d) Should be free from shrinkage and cracking and should maintain smoke and gas tightness during fire.
- e) Should not react with cable sheaths, galvanized & painted steel materials etc.
- f) Should be easy to apply/install using conventional methods.
- g) Should be non-toxic and harmless to the working personnel.
- h) Should have anti-rodent properties.
- i) Should have shelf life of atleast 18 months after the supply of materials.

1.13 The system shall have a fire resistance rating of duration as per Data Sheet A. Fire resistance rating shall be in accordance with ASTM E-119 and integrity and stability shall be maintained by the system after application of water jet on the exposed side in order to extinguish fire.

1.14 Welding.

1.14.1 All welded connections if applicable shall be made by electric arc welding. All welding work shall be carried out by qualified and experienced welders and adequately protecting the already laid cables.

1.14.2 All arc welding shall be carried out with low hydrogen content electrode.

1.14.3 All welded joints shall be allowed to cool down gradually to atmospheric temperature before putting any load on them. No artificial cooling should be adopted to cool welded joints.



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1.15 Surface Treatment

1.15.1 Supply Items

Surface treatment of all materials supplied shall be done as applicable in an approved manner and as per the specific requirements given in the Data Sheet A. Surface treatment shall include following steps :

- a) Pretreatment : Pretreatment shall conform to the requirements of IS:6005. The clean and dry pretreated surface shall be given a coat of red oxide primer paint and shall be left for natural drying.
- b) Galvanizing : Articles shall be hot dip galvanized after pretreatment. The galvanizing shall be done in accordance with IS:2629. The galvanizing shall be uniform, clean, smooth, continuous and free from acid spots. The amount of zinc deposit shall not be less than the value specified in Data Sheet A.

1.15.2 After erection :

- a) GALVANIZED ITEMS shall be given a surface treatment only at the welded joints and at the places where the galvanization has been damaged. Welded joints shall be applied with two coats of cold zinc paint whereas damaged portions of galvanizing shall be applied with single coat of zinc paint.
- b) In addition to the above, the vendor shall ensure after completion of fire stop system that the final finish of all surfaces of materials is in good condition and wherever needed a touch up of cold zinc paint shall be given.
- c) The final finish of all erected materials shall be uniform, clean, smooth and free from spots.

1.0 PACKING & STORAGE

All materials/components of fire stops shall be supplied in proper packing to avoid contamination of materials due to dust/moisture. All packing shall be of durable quality. Packing containers shall be suitable for storing on wet surface. However, the materials shall be generally stored on wooden racks inside enclosed area and the responsibility of proper storage of materials shall be of the vendor.

1.0 QUALITY ASSURANCE AND QUALITY CONTROL

The quality plan enclosed forms part of this specification.



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5.2 Stages of quality control shall include but not be limited to the following :

- a) Verification of test certificates for materials before despatch.
- b) Visual inspection of materials before despatch.
- c) Testing of materials before despatch as applicable.
- d) Inspection of packing before despatch.
- e) Quality checks during erection
- f) Inspection & testing of fire stops after erection.

6.0 TESTING

6.1 The system offered shall comply with the following type tests and the test reports shall be submitted along with offer.

- a) Fire rating test
- b) Hose stream test
- c) Accelerated aging test followed by fire test
- d) Anti rodent test
- e) Temperature rise test for cables in fire stop.
- f) Explosion Test (optional, refer Data Sheet A)

6.2 System shall be subjected to structural stability test, which shall be conducted at site.

6.3 The test details have been covered in clause 7.0

7.0 TEST DETAILS

7.1 Fire rating test

Fire rating test shall be done as per ASTM E 119

7.2 Hose Stream Test

Hose stream test shall be done as per ASTM E 119

7.3 Accelerated Aging test

7.3.1 The fire stop system shall be subjected to accelerated aging. The system/components shall be stored for 400 hours in air furnace where the temperature of the inside air shall be maintained at 100 °C. The aged specimen then shall be immersed in water for a period of minimum 24 hours. The specimen shall thereafter be subjected to the live fire test as per cl. 7.1 above.



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13.2 In case the mechanical properties before and after the accelerated aging do not indicate substantial change, the system shall be deemed to have passed the accelerated aging test. Similarly, the variation in the form of the system/component at the end of the test shall not indicate permanent deformation which is likely to affect the sealing properties of the system.

14 Anti-rodent test

14.1 This test shall be carried out to ascertain the anti-rodent properties of the components of the fire stop system.

14.2 This test shall be carried out at approved test station dealing with the tests on pharmaceutical products. The complete fire stop assembly shall be subjected to attack of insects and vermin such as rats for about 20 days.

14.3 At the end of the test the condition of the surface of fire stop shall be compared with the surface condition before commencement of the test. The fire stop shall be deemed to have passed this test in case no marks of gnawing are seen on the surface.

15 Temperature rise test for cable in the fire stop

15.1 This test shall be carried out to ascertain whether due to inadequate dissipation of heat at the location of fire stop the temp. of cable conductor or outer sheath in contact with the fire stop rises beyond the acceptable limits due to which whether any derating is required for cables.

15.2 Fire stop system shall be erected with at least 10 armoured power cables. While laying the cable through fire stop assembly, thermocouples shall be placed on the outer surface of cable in contact with the fire stop system. The location shall be selected where there is possibility of inadequate dissipation of heat from cables to the atmosphere due to fire stop system components. Two thermocouples shall also be located on the two surfaces of the firestop system. Similarly thermo-couples shall also be placed on the outer surface of cables where there is contact of free air without any obstruction so as to enable adequate natural cooling. Ambient temperature at test location should not be less than 40 °C.

15.3 Rated current of the cable (after adjusting for ambient conditions), guaranteed by the cable manufacturer as free air rating shall be injected through the cable one by one. Measurement of temperatures at the location where thermocouples are provided shall be recorded. Test shall continue till stable temperatures on all surfaces are achieved.

15.4 In case the temp. of outer surface of the cable in contact or inside the fire stop system does not exceed 60°C, it is inferred that no derating of cable is required for cable when used in conjunction with the particular fire stop system.



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1.5 Explosion Test

1.6.1 Following method shall be adopted :

- a) The explosion test shall be carried out in an explosion apparatus having approximately 1 metre cube volume and capable of withstanding maximum pressure of about 100-bars. Acetylene-Air mixture is exploded in the apparatus chamber in order to obtain different dynamic pressures.
- b) The fire-stop system is subjected to the dynamic pressure produced inside the explosion chamber. The pressure is increased to the guaranteed explosion pressure, which shall not be less than 16 bars.
- c) Pressure shall be registered with suitable instrument like Diso Wheel pressure metre or Light Beam recorder during the test.

1.6.2 The explosion test shall be deemed to have been passed if the system maintains stability and is not found leaking when subjected to explosion pressure as mentioned above.

1.7 Structural Stability Test (Site Test)

1.7.1 For structural stability test i.e. to check the mechanical strength and workmanship of fire stop system, following test shall be conducted by the vendor at site before the start of erection work.

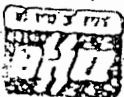
- a) The vendor shall construct a fire stop specimen on a floor slab having a horizontal opening of 500x500x225mm (LxBxH). The test opening shall not be provided with any cables or penetration items. The specimen shall be constructed using same materials and techniques as are intended to be used in actual service.
- b) A standard steel weight of 1 kg shall be dropped repeatedly twice at the middle of opening from a vertical height of 2 metres.

1.7.2 The fire stop system shall be deemed to have failed if the drop test results in dislocation or collapse or cracking of the fire stop system.

3.0 PRICES

3.1 Unit prices listed out in this clause shall be applicable for payment to the vendor for activities covered under this specification. The unit price shall be inclusive of :

- a) Design, manufacture, testing at works, packing, supply, transportation to site, handling and storage at site of the fire stop system materials.



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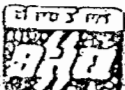
- b) Visual inspection & Transportation of materials from Vendor's/ Owner's storage yard to work site, handling, testing including supply and installation of all associated materials and consumables, carrying out of all associated minor civil works and furnishing of all skilled /unskilled labour and supervisory staff.
- c) Provision of fasteners like nuts, bolts, washers, spring washers, rawl plugs, anchoring bolts and lugs etc.
- d) Provision of all sealing compounds for wall and floor openings.
- e) Consumables like enamels, cold zinc paint, electrodes for welding etc.
- f) Minor civil works like chipping/ breaking of floors/walls and masonry work for reducing/ closing of openings on floors/ walls including supply of materials like cement, sand, brick etc. as required. Any work as described above to the extent of 200 mm on all sides of openings on walls and floors for the purpose of fitting the actual fire stop assembly shall be deemed to have been included in the unit prices of fire stop assembly.
- g) Provision of all facilities/equipment for site fabrication such as cutting, bending and drilling equipment.
- h) Provision of welding sets.
- i) Provision of all special tools and tackles for erection.
- j) Provision of all testing equipment, & conducting the specified test after erection at site.

Requirement of Quality Plan and Field Quality Plan shall be considered in the quoted prices.

Unit Prices

Following unit prices shall be applicable for the purpose of payment :

- a) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF HORIZONTAL FIRE STOP BELOW EQUIPMENT shall be applicable for the cutout area to be measured in square metres. Coating of cable, if considered, shall be provided on one side of the fire stop i.e. below the equipment.
- b) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF HORIZONTAL FIRE STOP AT FLOOR CROSSINGS IN CABLE SHAFTS shall be applicable for the cutout area to be measured in square metres. Coating of cable, if considered, shall be provided on both sides of the fire stop.



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- c) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF VERTICAL FIRE STOP AT WALLS FOR HORIZONTAL RACEWAYS shall be applicable for the cutout area to be measured in square metres. Coating of cable, if considered, shall be provided on both sides of the fire stop. Unit rate shall also be applicable for the part of the Fire Stop Walls other than doors, provided for the segregation of various units.
- d) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF VERTICAL FIRE STOP IN TRENCHES shall be applicable for the cross section area of the trench measured in square metres. Coating of cable, if considered, shall be provided on both sides of the fire stop.
- e) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF FIRE DOORS shall be applicable for the area of the door and its assembly to be measured in square metres.
- f) Unit rate of ~~SUPPLY AND INSTALLATION~~ OF FIRE BARRIER PARTITION WALLS shall be applicable for the area of the fire barrier wall constructed and measured in square metres.
- l) Unit rate for CIVIL WORKS such as chipping/ breaking of floors/ walls and masonry work for closing/ reducing of openings on floors/ walls including supply of cement, sand, brick etc. over and above the limits described in cl. 8.1(f) above shall be applicable for the area measured in square metres of such construction.

9.0 MEASUREMENT & WASTAGES

9.1 Quantity Measurement

9.1.1 For all payment purposes, measurement shall be made on the basis of the execution drawings/physical measurements. Physical measurements shall be made by the vendor in the presence of the Engineer.

9.2 Wastage Allowance

9.2.1 No wastage allowance is permissible. All wastages shall be to the account of vendor.

10.0 ADDITIONAL POINTS OF CONSIDERATION

10.1 The work to be carried out under this specification shall be done under the supervision of purchaser's/owner's representative.

10.2 The materials and components offered for fire stop system shall be complete in all respects. Any materials and components not specifically stated but which are necessary for the erection of the systems are to be included. All such equipment/accessories shall be supplied free of cost.

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- 10.3 All work shall be carried out in accordance with the agreed quality plan and approved drawings. The work shall be done to the satisfaction of purchaser and acceptance of the work shall be subject to the purchaser's approval.
- 10.4 Bidder shall be deemed to have confirmed to the specification in toto.
- 10.5 The installation work shall be carried out in a neat workman like manner by skilled, experienced and competent workmen.
- 10.6 Installation work at site shall be properly coordinated with other services.
- 10.7 All materials, equipment, instrument, hardware, tools, consumables, fasteners, accessories whether specifically mentioned or not in the offer but required for complete installation and testing in all respects and to the satisfaction of Engineers will be in the scope of vendor and no extra payment will be made for the same.
- 10.8 All materials being supplied or consumed during erection by the vendor in the process of erection work shall be of the best quality and according to the relevant standards. All materials shall be got inspected and got approved by the Engineer before the same is used for erection. Also, purchaser reserves the right to carry out inspection of installation work at any stage during erection, testing and commissioning.
- 10.9 Any drilling and welding on building structural steel for fixing supports etc. will not be done without the prior approval of Engineer.
- 10.10 Any work like chipping, or breaking of existing structure like walls, floors, fabrications etc. shall be done after taking prior approval of Engineer.
 - a) After installation of fire stops through a structure, the vendor shall repair / refabricate the affected portion of structure.
 - b) Any wrong erection shall be removed and reerected promptly to comply with the requirements at no extra cost.
- 10.12 After completion of work the contractor shall remove all debris and take back all erection implements, left-overs, surplus materials over and above the ordered quantity without any financial implications to either party.

PERFORMANCE GUARANTEE

Bidder shall guarantee that the system offered shall meet the requirement as indicated in this specification and as confirmed through various changes of Data Sheets. If it is proved that the system doesn't conform to performance guarantee, the bidder should be ready to replace the faulty components / equipment without any loss or extra cost to the purchaser.



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12.0 DOCUMENTATION

12.1 The following information shall be furnished in requisite copies for distribution as per respective contract requirements :

- a) Complete details of the system.
- b) Typical drawings showing arrangement of various components and thicknesses etc.
- c) All test certificates (Type, routine & acceptance)
- d) Contract drawings for all fire stops.

12.2 The following information shall be furnished within two weeks of award of contract, for purchaser's approval.

- a) Bar Chart covering all activities including activities at site.
- b) Billing Schedule.

	QUALITY PLAN SHEET 1 OF 1		CUSTOMER	RRVUNL	PROJECT TITLE	2X660 MW SURATGARH STPS	SPECIFICATION : PE-TS-392-507-E016				
			BIDDER/	:	QUALITY PLAN	PE-VO-392-507-E044	SPECIFICATION	TECHNICAL SPECIFICATION FOR FIRE SEALING SYSTEM			
			VENDOR		NUMBER		TITLE				
			SYSTEM		ITEM : FIRE SEALING MATERIAL		SECTION	VOLUME III			
SL. NO.	COMPONENT/OPERATION	CHARACTERISTICS CHECK	CAT.	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY	REMARKS	
1	2	3	4	5	6	7	8	9	P	W	V
										10	11
LEGEND : P : PERFORMER W: WITNESSER V: VERIFIER 1- BHEL 2-VENDOR 3- SUB VENDOR CHP: CUSTOMER HOLD POINT WHICH WILL BE DECIDED AT CONTRACT STAGE.											
BHEL			PARTICULARS		BIDDER/VENDOR						
			NAME								
			SIGNATURE								
			DATE								
BIDDER'S/VENDORS COMPANY SEAL											

INSTRUCTIONS FOR FILLING QUALITY PLAN

The Quality Plan shall include all the Quality Control Measures and Checks adopted by the Vendor to ensure that the material/component/assembly/services supplied by him meet/will meet the requirements as per specifications and good practices. They shall include all stages of operation such as materials, processes, manufacture, assembly, packing and despatch. The following guide lines may be noted:

- | | |
|------------|--|
| Column 1- | Serial Number |
| Column 2- | Component/Operation- The component and/or operation being checked shall be given here. |
| Column 3- | Characteristics check- The characteristics being checked shall be given here, e.g., chemical composition, mechanical properties, leak tightness, surface defects etc.. |
| Column 4- | Category -'CR' stands for critical characteristic - affecting safety of equipment and personnel
'MA' stands for major Characteristic - affecting safety of equipment and personnel
'MI' stands for minor characteristic - affecting appearance etc. |
| Column 5- | Type/Method of check e.g. chemical analysis tensile testing, hydraulic test, visual examination radiography etc. |
| Column 6- | Extent of check, such as, 100, 10, 1 percent etc. |
| Column 7- | Reference Documents - Documents, such as technical specification, drawings, standard specifications (IS, BS ETC.) procedure, etc. according to which check is done. |
| Column 8- | Acceptance Norms - Standards etc. according to which acceptability or otherwise of the characteristics being checked is decided. |
| Column 9- | Format of Record - Formats, log sheets, reports, etc. in which the observations are recorded. Standard log sheets, reports, formats etc. of the Vendors shall be numbered and such reference numbers shall be included here. |
| Column 10- | Agency - The agency which performs the test/instruction shall be written in sub-column 'W'
The agency which verifies test certificates/inspection records and carries out audit check of the components/operation shall be written in sub-column 'V' |
| | The agencies are codified as 1,2 & 3 |
| | '1' stands for (BHEL) |
| | '1' * means the operation shall be cleared by BHEL before the start of the next operation. |
| | '2' Stands for Vendor |
| | '3' stands for sub-Vendor of the Vendor and so on. |
| Example : | |
| Entry | '3' in column 'P' means test./inspection to be performed by sub-Vendor's QC |
| Entry | '2' in column 'W' means test./inspection to be witnessed by Vendor's QC |
| Entry | '1' in column 'V' means verification shall be done by BHEL and next stage to be started only after the hold point is cleared by BHEL |
| Column 11- | Remarks - Any special remarks shall be given here. |

NOTES :

1. In absence of correlation with the test certificate(s) (e.g. material identification) samples shall be drawn by BHEL and all tests as per relevant specifications shall be carried out in their presence or in recognized Government Laboratory.
2. When materials and components are initially identified and stamped by BHEL QS engineer, the identification marks shall be preserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless otherwise agreed.
3. For castings and forgings integral test specimens shall be provided, When this is not possible for casting, they shall be poured in the presence of BHEL QS Engineer unless otherwise, if witnessing of test by BHEL is called for.
4. When welders qualified by reputed inspection agencies or statutory bodies are not available, qualification tests shall be conducted in the presence of BHEL QS Engineer.
5. This Quality Plan is liable to be modified as per the requirements of approved drawings and changes in technical specifications/drawings. If there are contradictions in respect of column 7 & 8 between this Quality Plan and the approved drawings specifications, the latter shall prevail.
6. Wherever inspection by BHELs Purchaser/Third Party/Statutory authorities are mandatory, this shall be complied with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropriate stages or at the time of final inspection, as required.
8. This Quality Plan is also applicable to spares, if any, under scope of supply of Vendor.
9. The quality plan shall be submitted in minimum 4 copies with a soft copy of the same or in line with contract requirements.