

VOLUME II

NTPC-SAIL POWER COMPANY (P) LIMITED

1 X 250 MW ROURKELA PP-II EXPANSION PROJECT

TECHNICAL SPECIFICATION

FOR

***FIRE SEALING SYSTEM
SUPPLY & INSTALLATION***

SPECIFICATION NO: *PE-TS-427-507-E016*

REVISION: 0



BHARAT HEAVY ELECTRICALS LIMITED

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

NOIDA, UP (INDIA) – 201301



TECHNICAL SPECIFICATION FOR
FIRE SEALING SYSTEM
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STANDARD TECHNICAL REQUIREMENTS



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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 specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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1.0 SCOPE OF ENQUIRY

- 2.1 This enquiry covers the Design, manufacturing, inspection & testing at manufacturer's works, proper packing, delivery to site, handling and erection & commissioning of **Fire Sealing System** for cable openings through floors & below panels conforming to this specification.
- 2.2 It is not the intent to specify herein all the details of design & manufacture of material. However, the material shall, conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.
- 2.3 Technical requirements of the **FIRE SEALING SYSTEM** are indicated in Datasheet-A and Section-II.
- 2.4 The stipulation of Data Sheet-A shall prevail in case of any conflict between the stipulations of Data Sheet-A & Section-II.

3.0 BILL OF QUANTITIES:

- 3.1 The bidder to quote for items as per 'BOQ-cum-Price Schedule' attached with NIT. The BOQ excludes civil works done in the opening and includes cross section area of cables and cable support materials within the area to be fire sealed.
- 3.2 Successful bidder shall submit calculations for supply of material based on area to be provided with fire sealing, cured density (based on type test certificate accepted by BHEL/CUSTOMER) & thickness as applicable for the project, wastage, space occupied by cables, etc. for approval during contract stage.

For the first lot cleared by BHEL, the calculations shall be made based on the average of the minimum & maximum cured density (wherever a range is specified for the cured density by the manufacturer) & minimum thickness. For subsequent lots cleared by BHEL, the calculation shall be based on the cured density & thickness as per accepted type test results, duly adjusting the quantities cleared in earlier lot.

4.0 DRAWINGS & DOCUMENTS TO BE SUBMITTED

- 4.1 The following information shall be furnished with the bid:
- Data Sheet-B
 - Type test certificates for fire sealing system (Type – A) as mentioned in section-II. Type test certificates should not be older than 10 June 2005.



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- c) Type test procedure
- d) Typical drawings showing arrangement of various components and thickness etc.
- e) Complete detail of the system

4.3 Following documents shall be submitted for specific project requirement after placement of order for BHEL & customer's approval:-

S. No	Document No.	Document title	Document type	First Submission	Re-submission
1.	Technical Data Sheet	PE-V0-427-507-E041A	Primary	Within 2 weeks of PO	Within 10 days after comments
2.	Installation Drawings	PE-V0-427-507-E042A	Primary	Within 2 weeks of PO	Within 10 days after comments
3.	Type test certificates	PE-V0-427-507-E043A	Primary	Within 2 weeks of PO	Within 10 days after comments
4.	Manufacturing Quality Plan	PE-V0-427-507-E905A	Primary	Within 2 weeks of PO	Within 10 days after comments
5.	Field Quality Plan	PE-V0-427-507-E906A	Secondary	Within 2 weeks of PO	Within 10 days after comments
6.	Bill of material for fire stop system	PE-V0-427-507-E044A	Secondary	Within 2 weeks of PO	Within 10 days after comments

4.4 Drawings/ documents shall be submitted through Document Management System (DMS).



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DATASHEET-A**1.0 REFERENCE CODES & STANDARDS**

The latest edition of following standards shall be applicable:

- a) ASTM-E-814: Standard test methods for fire test of Through-penetration fire stops.
- b) ASTM E-119: Standard test methods for Fire resistance rating and hose stream test
- c) IS-12458: Method of fire resistance test of fire stop
- d) UL-1479: Standard test methods for Fire resistance rating
- e) BS-476: Standard test methods for Fire resistance rating
- f) IEC-60332-3-23: Flammability test for fire retardant coating
- g) ASTMD-2863: Limiting oxygen index test for fire retardant coating
- h) IS: 6005- Pretreatment shall conform to the requirement of IS: 6005.
- i) IS: 2629- Galvanizing shall be done in accordance with IS: 2629.

2.0 Rating of fire stop : One (1) hours

3.0 Type of application : Below panels

5.0 Cable laying conditions : Cables on cable trays

6.0 Suitability of fixing arrangement : In masonry work/ In concrete work

7.0 Surface Treatment of Steel Material
(for frame work as applicable)

- a) Surface protection : Galvanization conforming to IS:2629
- b) Mass of Zinc : 460 g/m²

8.0 Type of fire stop system : 1) Fire stop system- Type A [Silicone Foam/
Equivalent Foam] (As per Sl. No. 2.2.1 (a) of Section-II)

9.0 Minimum shelf life : 12 months
of most perishable material

10.0 Life expectancy of material : Greater than 40 years

11.0 Packing suitable for : Storage on dry Surface



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DATASHEET-B/C**(Guaranteed technical Particulars to be submitted along with the bid)****1.0 GENERAL**

1.1 Name of vendor :

1.2 Address :

2.0 APPLICABLE STANDARDS

2.1 ASTM-E-814 & ASTM-E-119 For fire rating test and hose Stream test : YES / NO

2.2 IS-12458: Method of fire resistance test of fire stop : YES / NO

2.3 UL-1479: Standard test methods for Fire resistance rating : YES / NO

2.4 BS-476: Standard test methods for Fire resistance rating : YES / NO

2.5 IEC-60332-3-23: Flammability test for fire retardant coating : YES / NO

2.6 ASTMD-2863: Limiting oxygen index test for fire retardant coating : YES / NO

2.7 IS: 6005- Pretreatment shall conform to the requirement of IS: 6005 : YES / NO

2.8 IS: 2629- Galvanizing shall be done in accordance with IS: 2629 : YES / NO

3.0 TECHNICAL DETAILS

3.1 Type of system : 1) Fire stop system –Type A

3.2 Fire rating : 1) fire stop system

3.3 Pressure withstand capacity of
Fire stop : kg/mm²3.4 Weight of fire stop assembly
(without cables) : kg/mm²3.5 Shelf life of most perishable
Material : years

3.6 Life of total assembly : Years



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4.0 TYPE TEST

Whether Type Tests are applicable : YES/ NO

- a) If Type tests are applicable, the same shall be conducted as per clause 3.0, 4.0 and 5.0 of Section-II of this specification and as per relevant standards.
- b) If Type tests are not applicable, Type test reports of all the type tests as listed at clause no. 5.0 of section -II and relevant standards for fire sealing system materials shall be submitted.



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1.0 CODES AND STANDARDS

- 1.1 The material shall comply with all currently applicable safety codes and statutory regulations of India as well as of the locality where the material is to be installed.
- 1.2 The design, material, construction, manufacture, inspection, testing and performance of Fire Sealing System shall conform to the latest revision of relevant standards as per Data Sheet-A. Any other international standards will also be considered if it ensures performance equivalent or superior to standards listed.
- 1.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

2.0 TECHNICAL REQUIREMENTS

- 2.1 Fire sealing system shall be supplied as per technical particulars specified in Data Sheet – A and Section-II.

2.2 DESIGN REQUIREMENTS FOR FIRE STOP SYSTEM**2.2.1 FIRE STOP SYSTEM**

- a) **Type-A:** Silicon foam based or equivalent foam system or using individual blocks for each cable along with suitable frame work rated for ONE hour. This is to be implemented at floor openings below C&I panels, control panels/ boards etc. in CER & UCR/main control room.
- 2.2.2 The fire stop system, in case of fire, shall prevent spreading of fire in cables/systems beyond the fire stops.
- 2.2.3 Cables shall be generally laid in cable trays and fire stop system shall be designed in such a way that the basic supporting structure of cables is not disturbed.
- 2.2.4 The system shall be retrofit design, physically and chemically stable.
- 2.2.5 The system shall be mechanically secured to the masonry work/concrete work to resist dislocation.



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2.2.6 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. The system shall be suitable for ambient temperature of 50°C and relative humidity of 100%.

2.2.7 The system should be equally effective in horizontal & vertical formations.

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

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

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

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

2.2.12 Materials used for fire stop system shall meet the following requirements:

- a) Should 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 and painted steel material 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 and should be repellent to pest & termites.
- i) Should not produce any acid or alkali during gas generation.
- j) Should not produce suffocating/ corrosive gas.



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- k) Should have a very low Expansion co-efficient, which is to be comparable with masonry concrete.
- l) Should not be soluble and reactive to acid and alkali water.
- m) Should have a low thermal conductivity.
- n) The material in contact with the cables in the fire-proof sealing system shall be compatible with the material used for outer sheath of cables.
- o) For foam type systems, only the foam shall form the penetration seal of specified rating, having the damming board removed after curing of foam.

2.2.13 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, ASTM E-814, BS-476, UL-1479 and integrity & stability shall be maintained by the system after application of water jet on the exposed side in order to extinguish fire.

2.3 WELDING

- a) 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.
- b) All arc welding shall be carried out with low hydrogen content electrode.
- a) All welded connection 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.

2.4 SURFACE TREATMENT

2.4.1 Supply items:

Surface treatment of all material 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:



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- 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 free acid spots. The amount of zinc deposit shall not be less than the value specified in Data Sheet-A.

2.4.2 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.

3.0 QUALITY ASSURANCE REQUIREMENTS

- 3.1 At contract stage, the successful bidder shall submit the Quality Plan in attached BHEL format for BHEL/ ultimate customer's approval. In case bidder has reference Quality Plan agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of minor changes in Quality Plan during contract stage.
- 3.2 Stages of quality control shall include but not be limited to the following:
 - a) Verification of test certificates for materials before dispatch.
 - b) Visual inspection of materials before dispatch (as applicable).
 - c) Testing of materials before dispatch.
 - d) Inspection of packing before dispatch.
 - e) Quality checks during erection.
 - f) Inspection & testing of fire stops after erection.



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- 3.3 All materials shall be procured, manufactured, inspected and tested by vendor/ sub-vendor as per approved Quality Plan.
- 3.4 The supplier shall perform all tests necessary to ensure that the material and workmanship conform to the relevant standards and comply with the requirements of the specification.
- 3.5 In addition to meeting the type test requirements, material/ batch test certificates conducted at the premises of the bidder's principals for the supplies to be made for the project shall be submitted for BHEL/ CUSTOMER review and clearance.
- 3.6 All acceptance & routine tests as per relevant standards & specification shall be carried out. Charges for these shall be deemed to be included in the bid price.
- 3.7 Installation at site shall be as per parameters (i.e. minimum cured density & minimum thickness) achieved during type testing. In case type test waiver is given based on past type test certificates, installation shall be carried out as per the type test certificates accepted.
- 3.8 The successful bidder shall submit Field Quality Plan for storage, preservation, handling and erection work at site for fire-sealing system. The same shall subject to CUSTOMER/ BHEL approval without any commercial implications. Fire sealing shall be as per approved installation drawings.

4.0 TESTING**4.1 FIRE STOP SYSTEM**

- 4.1.1 The system offered shall comply with the following type tests and test reports shall be submitted along with offer:

- Accelerated aging test
- Water absorption test
- Fire rating test
- Hose stream test
- Vibration test followed by fire rating test

Tests at Sl. No. a), b), c) & d) should have been carried out on the same test sample, subsequently one after the other without any touching up / modification/ repair in the same sequence and in accordance with clause 5.

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



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4.1.3 Test reports shall contain the following information: -

- a) Type of penetration material tested.
- b) Details of various components/ ingredients used along with their catalogue.
- c) Physical, chemical and mechanical properties of various components/ ingredients used.
- d) Description of the various test assemblies tested.
- e) Details of method of conditioning.
- f) The observations as called for in BS 476 part-20 & technical specification.

4.2 Test details are listed under clause 5.0.

4.3 System offered shall be **type tested** at CBRI, Roorkee or by government approved Independent agency.

- a) The bidder shall furnish the reports of all the type tests for fire sealing system materials. These reports should be for the tests conducted on identical materials to those offered/ proposed to be supplied under the contract and shall not be older than 10.06.05.
- b) 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, then all such tests under the contract shall be conducted free of cost to the owner, and reports shall be submitted for approval. No charges shall be paid under this contract.

4.4 Type Test charges:

- a) In case type test certificates are available with vendor & acceptable to BHEL/ CUSTOMER and still vendor being asked to conduct type testing and type tests successfully conducted, the type test charges shall be payable to vendor at actual against Original money receipt of CBRI Roorkee/ Govt approved lab.
- b) In case type test certificates are not available with the vendor or available with the vendor but not acceptable to BHEL/ CUSTOMER and vendor being asked to carry out type testing, and type testing successfully conducted, the type test charges by the vendor shall not be payable.

4.5 BHEL/ CUSTOMER reserve the right to witness type testing on any one lot for the project without any commercial implications.

5 TEST DETAILS



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5.1 FIRE STOP SYSTEM**5.1.1 Accelerated aging test:**

The fire stop system specimen shall be subjected to accelerated ageing test for 168 hours. During the test, the system/ components shall be placed in air furnace where the temperature of inside air shall be maintained at 85 deg. C. The specimen shall be taken out of the furnace after 168 hours for water absorption test. The temperature controlled furnace should have 7 air changes per hour appx.

In case the mechanical properties before and after the accelerate 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.

5.1.2 Water absorption test:

The test specimen shall be immersed in fresh clean water at a temperature of 20 ± 2 deg. C for a period of minimum 24 hrs. At the end of 24 hour soak period, the specimen shall be removed from water and mopped with a damp cloth. The specimen shall thereafter be subjected to the live fire test as per clause 5.1.3 below.

5.1.3 Fire rating test: shall be done as per ASTM E 814/BS:476/UL:1479/IS:12458.**5.1.4 Hose stream test:** Test shall be conducted on the test specimen immediately after fire resistance test as per ASTM E 119**5.1.5 Vibration test:** The test specimen shall be subjected to vibration of 100Hz frequency and 0.5 mm amplitude for a minimum period of 3 hours.**6.0 APPLICATION OF FIRE SEALING SYSTEM SHALL BE AS UNDER:****6.1. FIRE SEALING SYSTEM**

- a) The various openings below Control Equipment room 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 Contractor. The necessary steel section for fabrication of frames shall be supplied by the Contractor without any extra cost. Any, civil works required to be done in the openings shall be



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carried out by the Contractor. 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 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) For all relay and control panels, Control desk, instrumentation panels and other miscellaneous panels, fire stops should be provided below base plate. The non-inflammable type sealing material shall be supplied by the contractor.

7.0 PRICES

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

- a) Design, manufacture, testing at works, packing, supply, transportation to site, handling at site of the fire stop system materials.
- 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 floor openings below panel.
- e) Consumables like enamels, cold zinc paint, electrodes for welding etc.
- f) Minor civil works like chipping/breaking of floors and masonry work for reducing/closing of openings on floor including supply of materials like cement, sand, bricks etc. as required. Any work as described above to the extent of 200 mm on all sides of openings on 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 all site fabrication such as cutting, bending and drilling equipment.



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- h) Provision of welding sets.
- i) Provision of special tools and tackles for erection.
- j) Provision of all testing equipment and conducting the specified test after erection at site.
- k) Wherever the floor opening provided in the vicinity of penetration seals larger or smaller than that required for cable fire penetration, these opening size can be reduced or increased in an approved manner by the bidder using the same materials as provided around the opening and of the same thickness.

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

8.0 MEASUREMENT & WASTAGES

8.1 Quantity measurement: For all payment purpose, measurement shall be made on the basis of the execution drawings/physical measurements. Physical measurements shall be made by vendor in the presence of Site Engineer.

8.2 Wastage Allowance: No wastage allowance is permissible. All wastages shall be to the account of vendor.

9.0 ADDITIONAL POINTS OF CONSIDERATION

9.1 Bidder shall be deemed to have confirmed to the specification in toto.

9.2 All work shall be carried out in accordance with the agreed field quality plan and approved drawings. The field quality plan shall additionally specify the fire sealing material thickness, minimum cured density and other related parameters achieved in the approved type tests for the contract. The work shall be done to the satisfaction of purchaser and acceptance of the work shall be subject to the purchaser's approval.

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

9.4 The installation work at site shall be properly coordinated with other services.

9.5 All materials, equipment, instrument, hardware, tools, consumables, fasteners, accessories whether specifically mentioned or not in offer required for complete installation and testing in



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all respect and to the satisfaction of Engineers will be in the scope of vendor and no extra payment will be made for the same.

- 9.6 All materials being supplied or consumed during erection by the vendor in the process of erection work shall be of best quality and according to the relevant standard. 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.
- 9.7 Any drilling and welding on building structural steel for fixing supports etc. will not be done without the prior written approval of Engineer.
- 9.8 Any work like chipping, or breaking of existing structure like floors, fabrication 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 re-erected promptly to comply with requirement at no extra cost.
- 9.9 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.

10.0 PERFORMANCE GUARANTEE

Bidder shall guarantee that the system offered shall meet the requirements as indicated in this specification and as confirmed through various clauses of datasheets. 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.

11.0 PACKING & STORAGE

All material/ components of fire stop shall be supplied in proper packing to avoid contamination of material due to dust/ moisture and temperature during transit & storage. All packing shall be of durable quality and date of expiry & date of manufacture shall be printed on it. Space shall be provided by BHEL. Packing containers shall be suitable for storing on dry surface.

FORMAT FOR QUALITY PLAN

			QUALITY PLAN			CUSTOMER				PROJECT TITLE				SPECIFICATION : NUMBER :			
						BIDDER/				QUALITY PLAN				SPECIFICATION			
						VENDOR				NUMBER				TITLE			
			SHEET 1 OF 1			SYSTEM			ITEM :FIRE STOP 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					
									P	W	V						
1	2	3	4	5	6	7	8	9	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			BIDDER'S/VENDORS COMPANY SEAL								
			NAME														
			SIGNATURE														
			DATE														

ANNEXURE-1

INSTRUCTIONS FOR 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 shets, 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
Column11-	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 bgy BHEL and all tests as per relevent 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 presserved till despatch. Wherever this is not possible, the identification mark shall be transferred to the components in the presence of BHEL QS Engineer unless other wise 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 compiled with.
7. Inspection reports, log sheets, test reports/certificate. etc. shall be furnished to BHEL at the appropoate 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.