SINGARENI COLLIERIES COMPANY LTD.
2 X 600 MW SINGARENI, ADILABAD TPP

CONSULTANT – NTPC LTD.

TECHNICAL SPECIFICATION FOR FIRE SEALING SYSTEM

SPECIFICATION NO: PE-TS-381-507-E016

REV:0

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

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TOTAL NO. OF SHEETS = 43
(INCLUDING COVER/ SEPARATOR SHEETS)

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

BIDDER'S STAMP & SIGNATURE

INSTRUCTIONS TO BIDDERS FOR PREPARING TECHNICAL OFFERS

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer :

    a. Unpriced Price Schedule (Annexure-I: BOQ, as enclosed with the specification).
    b. A copy of this sheet ("Instructions to Bidders for Preparing Technical Offer").
    c. A copy of previous sheet ("Contents").
    d. Technical deviations/ clarifications (if any).
    e. Duly filled Datasheet-B.
    f. Complete details of the system.
    g. Type Test Certicates.

2. No comments/ additions/ deletions shall be made by the bidder on the signed & stamped copy of the specification. Any such changes made by the bidder shall not be considered.

3. Confirmations/ comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/ covering letter of technical offer shall not be considered by BHEL.

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 item description/ quantities, notes etc. from those given in Annexure-I of specification [Bill Of Quantities] shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail).

BIDDER'S STAMP & SIGNATURE

PREAMBLE

1.0 The tender document contains two (2) volumes. The bidder shall meet the requirements of all the two volumes.

1.1 **Volume-I (CONDITIONS OF CONTRACT)**

This consists of four parts as below:-

Volume-IA	:	This part contains instructions to bidders for making bids to BHEL.
Volume-IB	:	This part contains general commercial conditions of the tender & includes provision that vendor is responsible for the quality of item supplied by their sub-vendors.
Volume-IC	:	This part contains special conditions of contract.
Volume-ID	:	This part contains commercial conditions for erection & commissioning site work, as applicable.

1.2 **Volume-II TECHNICAL SPECIFICATIONS**

Technical requirements are stipulated in Volume-II which comprises of :-

Volume-IIA	:	General Technical Conditions
Volume-IIB	:	Technical Specification including Drawings, if any.

1.2.1 **Volume-IIB**

This volume is sub-divided into following sections:-

Section-A	:	This section outlines the scope of enquiry.
Section-B	:	This section provides "Project Information".
Section-C	:	This section indicates technical requirements specific to the contract, not covered in Section-D.
Section-D	:	This section comprises of technical specifications of equipments complete with data sheet A.

Data Sheet - A specifies data and other requirements pertaining to the system.

Data Sheet - B Specifies data to be filled by the bidder (Data Sheet-B is contained in Volume-III).

Data Sheet - C Indicates data/documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

2.0 The requirements mentioned in Section-C / Data Sheets-A of section-D shall prevail and govern in case of conflict between the same and the corresponding requirements mentioned in the descriptive portion in Section-D.

SECTION – A

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 This specification covers the design, manufacture, inspection and testing at manufacturer's works, proper packing, delivery to site, handling and Erection & Commissioning of FIRE SEALING MATERIAL as mentioned in different sections of this specification for **2 X 600 MW SINGARENI, ADILABAD TPP.**

2.0 It is not the intent to specify herein all the details of design & manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation at site conditions.

3.0 The general terms and conditions, instructions to bidders and other attachment referred to elsewhere are hereby made part of the tender specification.

4.0 The bidder shall be responsible for and governed by all requirements stipulated hereinafter.

5.0 Deviations if any should be brought out very clearly on deviation sheet. Otherwise it will be presumed that the bidder's offer is in line with what has been stated/ asked for in this specification.

6.0 The documents shall be in English Language and MKS system of units.

SECTION – B

PROJECT INFORMATION

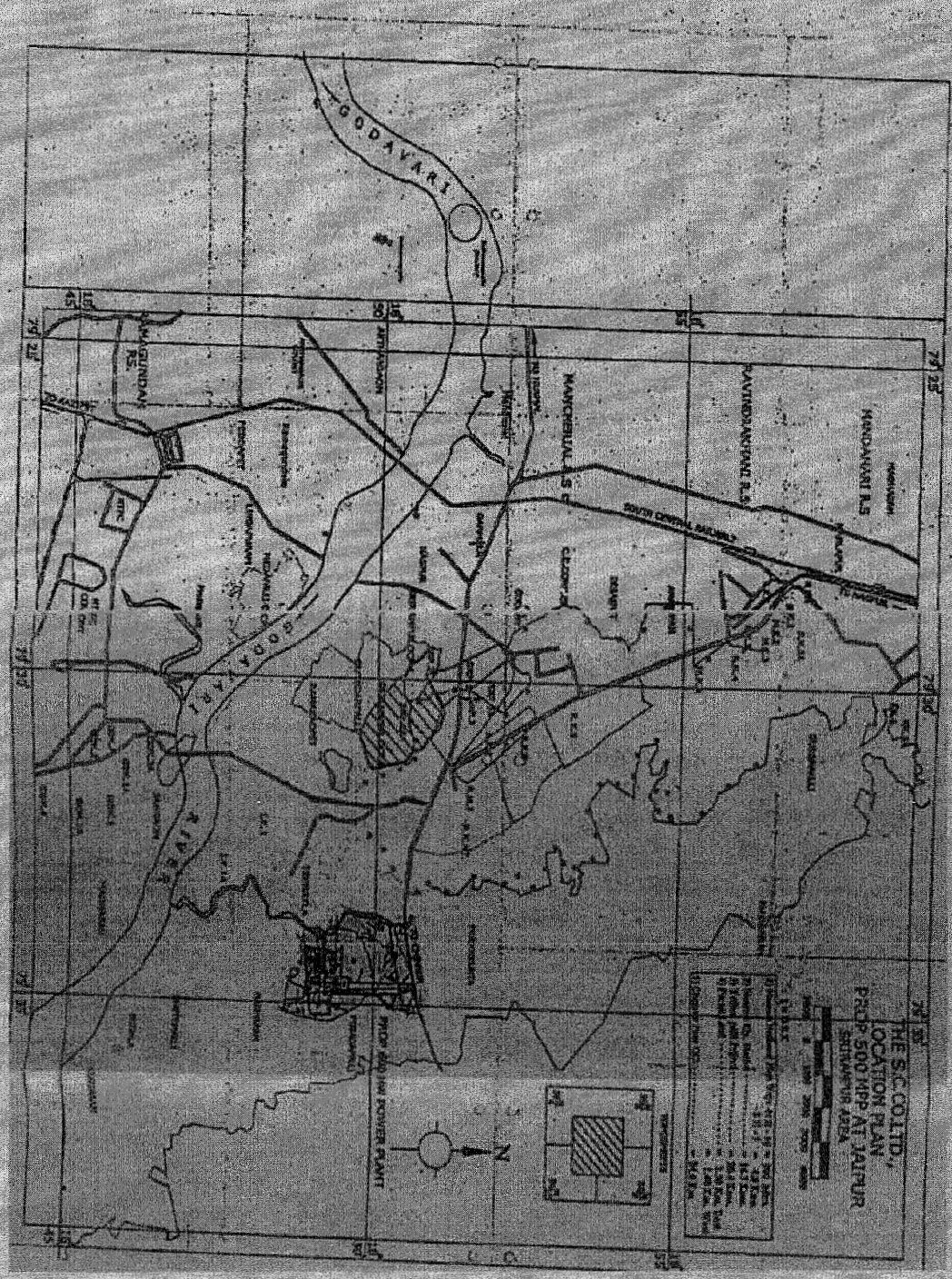
PROJECT INFORMATION

1.	Owner	SINGARENI COLLIERIES COMPANY LTD.(A GOVT. OF INDIA UNDERTAKING), HYDERABAD.
2.	Project	2X600 MW SINGARENI COLLIERIES COMPANY LTD., ADILABAD THERMAL POWER PLANT
3.	No of Units	2
4.	Consultant	NATIONAL THERMAL POWER CORPORATION LTD.
5.	Location	The site is located near Pegadapalli Village, Jaipur Mandal, District- Adilabad of Andhra Pradesh The latitude & longitude of site are 18° 48' 30" to 18° 50' 35" and 79° 34' 00" to 79° 35' 30" respectively. The site is 14 km from nearest town Mancherial and 4.6 km from State Highway. Distance from NH-16 is 500 M.
6.	District	Adilabad (Andhra Pradesh)
7.	Nearest Major Town	Mancherial
8.	Nearest Railway station	The nearest railway station is Mancherial railway station on Nagpur-Kazipet main rail line of South central Railway, located at a distance of about 14.6 kms.
9.	Nearest Airport	The nearest airport is Shamshabad Airport, Hyderabad located at a distance of 250 km.
10.	Vicinity Plan of the project	Refer Annexure-I (section-B)
11.	Meterological Data	Refer Annexure-II (section-B)

Annexure - I (Section - B)

CLAUSE NO.	PROJECT INFORMATION

VICINITY PLAN



SINGARENI THERMAL POWER PROJECT (2X600 MW) BOILER TURBINE GENERATOR PACKAGE	

Annexure-II (Section-B)

CLAUSE NO.	PROJECT INFORMATION

CLIMATOLOGICAL TABLE

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : रामगुंडम
STATION : Ramgundam

अक्षांश LAT 18°48' N देशांतर LONG 79°28' E समुद्र तल से ऊँचाई HEIGHT ABOVE M. S. L. 138 METRES

1951 से 1990 तक के आंकड़ों पर आधारित
BASED ON OBSERVATIONS FROM 1951 TO 1990

MONTH	STATION LEVEL PRESSURE (hPa)	MEAN DAY MAX (°C)	MEAN NIGHT MIN (°C)	MEAN DAILY MAX (°C)	MEAN DAILY MIN (°C)	MEAN HIGHEST IN THE MONTH (°C)	MEAN LOWEST IN THE MONTH (°C)	EXTREMES HIGHEST (°C)	EXTREMES DATE AND YEAR	EXTREMES LOWEST (°C)	EXTREMES DATE AND YEAR	HUMIDITY RELATIVE HUMIDITY (%)	HUMIDITY VAPOUR PRESSURE (hPa)	CLOUD AMOUNT ALL CLOUDS (Oktas)	CLOUD AMOUNT LOW CLOUDS (Oktas)	RAINFALL MONTHLY TOTAL (mm)	RAINFALL NO. OF RAINY DAYS	RAINFALL TOTAL IN WETTEST MONTH WITH YEAR (mm)	RAINFALL TOTAL IN DRIEST MONTH WITH YEAR (mm)	RAINFALL HEAVIEST FALL IN 24 HOURS (mm)	RAINFALL DATE AND YEAR	MEAN WIND SPEED (Km/h)
जनवरी JAN I	986.1	26.6	14.4	30.8	18.9	33.3	10.8	36.3	29 1974	6.4	10 1972	68	16.9	1.7	0.3	7.8	0.8	52.0	0.0	47.6	29 1979	4.5
	984.1	28.6	16.2									37	14.8	1.8	0.7			1968				
फरवरी FEB I	984.2	32.0	18.8	33.8	19.8	37.1	13.8	38.4	25 1980	8.4	02 1949	59	16.8	1.7	0.3	8.1	0.8	30.4	0.0	24.0	21 1982	5.0
	981.8	32.3	20.5									30	14.1	1.8	0.8			1975				
मार्च MAR I	984.4	36.8	20.2	37.5	22.3	40.8	17.8	42.8	27 1953	13.0	11 1978	33	15.3	1.7	0.4	12.0	1.0	71.0	0.0	38.2	05 1979	6.4
	980.5	38.2	21.8									25	14.1	1.8	1.0			1951				
अप्रैल APR I	981.0	39.5	26.1	40.2	28.2	42.8	21.3	42.8	29 1973	18.4	29 1971	33	22.5	2.5	0.7	16.7	1.1	96.8	0.0	67.0	24 1921	7.0
	980.2	39.5	28.5									25	16.8	3.2	1.7			1952				
मई MAY I	967.8	39.9	33.0	42.4	29.8	45.0	33.5	47.2	19 1948	23.4	01 1977	48	23.3	2.6	0.3	38.4	2.0	140.2	0.0	111.2	01 1977	7.0
	962.8	40.4	34.8									35	17.8	3.8	2.1			1977				
जून JUN I	961.4	30.0	31.3	37.6	27.3	43.8	32.4	47.2	05 1953	19.4	03 1973	63	25.7	5.5	3.3	171.3	6.5	369.2	0.0	140.7	28 1933	6.4
	961.3	38.8	32.4									43	24.7	6.7	5.8			1956				
जुलाई JUL I	965.4	27.0	24.2	32.5	24.8	38.0	22.0	41.0	06 1966	18.8	14 1973	79	26.0	6.8	3.8	309.2	13.2	520.8	164.0	150.7	23 1977	7.0
	966.8	30.7	25.4									86	28.0	6.5	5.9			1976	1970			
अगस्त AUG I	966.4	28.4	23.1	31.0	24.2	35.0	22.2	37.4	23 1965	19.6	21 1965	82	28.1	6.4	5.5	243.8	13.8	437.4	53.2	104.4	21 1960	5.5
	965.8	29.8	23.8									89	28.2	6.8	5.8			1953	1964			
सितम्बर SEP I	972.0	28.8	21.5	32.8	24.1	36.7	21.8	36.0	02 1968	17.5	20 1972	80	28.4	5.1	2.3	190.7	8.2	494.0	23.6	124.0	20 1905	4.8
	968.8	30.2	25.1									86	27.7	6.3	3.2			1966	1971			
अक्टूबर OCT I	993.3	26.7	22.0	33.1	22.3	36.5	19.3	38.4	11 1967	18.4	14 1972	78	25.3	3.1	1.2	84.5	4.4	536.8	0.0	135.8	24 1973	3.9
	992.8	30.4	23.4									82	25.2	3.5	2.1			1972				
नवम्बर NOV I	996.7	22.8	18.0	31.0	16.1	33.9	12.8	36.8	06 1977	9.0	30 1970	83	18.1	2.2	0.7	16.8	1.3	118.0	0.0	70.2	05 1961	3.5
	995.5	26.4	20.8									80	17.7	2.6	0.9			1962				
दिसम्बर DEC I	998.8	19.7	14.3	29.8	14.8	32.8	11.0	34.5	26 1976	7.8	16 1970	84	16.8	1.7	0.6	6.7	0.5	106.4	0.0	101.2	22 1966	3.2
	997.3	27.5	19.8									81	14.8	2.6	0.4			1962				
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN I	981.9	28.5	21.4	34.5	22.3	45.7	8.3	47.2		7.8		66	22.2	3.4	1.5	1107.8	50.9	1672.8	565.2	140.7		5.7
II	987.9	32.4	22.8									64	20.1	3.7	2.0			1973	1968			
वर्षों की संख्या NUMBER OF YEARS I	39	38	38	38	38	38	38	33		33		39	38	38	34	39	38	33	33	33		34
	38	38	38									39	38	38	34							

SINGARENI THERMAL POWER PROJECT
(2X600 MW)
BOILER TURBINE GENERATOR PACKAGE

SECTION – 'C'

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF ENQUIRY

1.1 This enquiry covers the supply of Fire Sealing System for cable openings through walls, floors (risers & below panels) and pipe sleeves as listed in enclosed Bill Of Quantities (BOQ) in accordance with Specific Technical Requirements (Section–C), General Technical Requirements of Fire sealing (Section – D), Data Sheet-A & schedules, annexures etc.

2.0 SCOPE OF WORK

2.1 The scope of work shall include system design, manufacturing, testing, packing, supply of Fire Sealing System as under:

1. Fire sealing material for:

a) Floor openings below panels in switchgear / control building
b) Floor openings for risers
c) Wall openings
d) Pipe sleeves

2.2 Erection & Commissioning

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 and 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 Life of the total assembly of fire sealing system shall be 40 years.

4.2 Fire seals for cable penetrations through walls/floors/pipe openings shall be suitable for **one hours rating**.

4.3 Fire sealing system offered shall be of the following types :

a) **Type-A** : Type A fire sealing system is either Silicone foam or equivalent foam system or using individual blocks for each cable along with suitable frame work rated for one hour. Type A is to be implemented at floor openings below C&I panels, control panels/Boards etc. in CER & CCR.

b) **Type-B** : Type B fire sealing system shall be out of any of the following system for one hour :
(i) Panel based sealing system
(ii) Powder / Mortar based sealing system
This will comprise rest of wall and floor crossings of cables/cable trays, opening below HT/LT Switchgears/board other than those covered under Type A.

4.4 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.

4.5 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 CODES & STANDARDS

5.1 The fire sealing system shall conform to the requirement of latest edition including amendments of BS:476 Part-20 Fire tests on Building materials and structures.

5.2 Fire penetration seal complying with any other international standards will also be considered if it ensures performance equivalent or superior to standard listed above.

5.3 The Bidder shall clearly indicate the standards adopted and furnish a copy of the English version of the latest editions of standards along with the bid, and shall clearly bring out the salient features for comparison.

5.4 The testing methods shall be in accordance with clause 9.0 and test sample shall be assembled as per clause 10.0.

6.0 APPLICATION OF FIRE SEALING SYSTEM 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 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 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 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) For all H.T., L.T., Relay and Control panels, Control desk, instrumentation panels, battery charger, 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 contractor.

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.

D)The contractor shall take adequate care to ensure that cables are not damaged in any manner during penetration system installation.

E) Wherever the floor/wall opening provided in the vicinity of penetration seals larger or smaller than that required for the cable fire penetration, these opening size can be reduced or increased in an approved manner by the contractor using the same materials as provided around the opening and of the same thickness. Generally the walls in the power station comprises of brickwork and the floors are made of RCC/steel work. The Contractor shall be paid for this work at the unit rates for the respective brickwork/ R.C.C.

F) The work to be carried out under this specification shall be done under the supervision of Project Manager's representative.

G) 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 the Project Manager and the same shall be subject to Project Manager's approval for acceptance.

H) The installation shall be carried out in neat workmen like manner by the skilled, experienced and competent workmen.

I) Installation work at site shall be properly coordinated with other services.

J) All materials being supplied or consumed during installation by the Contractor in the process of installation shall be of the best quality and according to relevant standards. All materials shall be inspected and approved by the Project Manager before the same is used for installation work. Also regarding inspection of work, the engineer shall have the right to inspect at any stage during installation, testing and commissioning.

K) The drilling and welding of building-steel or fixing supports etc. shall be carried out by contractor after taking prior approval of Project Manager.

L) Any work like chipping, breaking of existing structure like wall, floors, fabrications, any civil work etc. shall be done after taking prior approval of the Project Manager.

M) The following jobs are also in the scope of contractor's work:
a) Reasonable amount of drilling, cutting and welding surface preparation to fix the fire stops.
b) Supply of necessary cement, gravel, sand etc. required for grouting necessary supports.
c) All supporting arrangement.

7.0 FIRE PROOF SEALING SYSTEM:-

The material/ components used for fire-proof sealing system shall be provided to meet the following requirements:

a) Life expectancy should not be less than 40 years from the date of installation.
b) The penetration system shall be suitable for site condition at 50°C ambient temperature and relative humidity of 100%.
c) The penetration system shall be physically, chemically, thermally stable and shall be mechanically secure to the masonry/concrete/structural members. The system shall be mechanically robust and capable of giving satisfactory performance under vibrations encountered in power stations.
d) The penetration system shall be capable of withstanding mechanical loads, foot traffic drop loads, vibrations, wind pressure, etc.
e) The penetration system shall be completely gas and smoke tight.
f) Expansion co-efficient - very low, which is to be comparable with masonry concrete.
g) The penetration system shall retain integrity and perform satisfactorily even after remaining in water for long period.
h) Thermal conductivity shall be low.
i) The materials used in FPCP sealing system shall be non-toxic and harmless to the working personnel.
j) The penetration materials shall have no reaction with cable sheath/ galvanising/ painting of structural steel.
k) The penetration system of each wall/floor crossing shall be adequately designed/sized such that 20% addition of cables is possible at any later date without disturbance/wastage of material in the penetration system.
l) The penetration materials shall have anti-rodent and anti-termite properties.
m) The penetration materials shall have no shrinkage or cracking after the setting for the complete life of the power Plant.

n) Under normal load, short circuit and fire conditions, cables may be subjected to movement and vibration. The FPCP sealing system shall be designed to withstand and perform satisfactorily under these conditions.
o) The penetration system shall not affect the current carrying capacity of cables passing through it.
p) Asbestos shall not be used in the construction of fire penetration seal system.
q) The penetration system shall not emit any corrosive or toxic fumes or smoke on the unexposed face of the barrier.
r) Any wastage of the compound during the process of mixing for preparing the FPCP sealing compound shall be to Contractor's account.
s) For foam type of systems, only the foam shall form the penetration seal of specified rating, having the damming board removed after curing of the foam.
t) The fire rating shall not be less than one (1) hours and the system shall be stable after application of water jet in the exposed side in order to extinguish fire.
u) Should have shelf life of at least 12 months after the supply of materials.

9.0 TYPE TESTS & QUALITY PLAN

9.1 System offered shall be **type tested** at CBRI, Roorkee or by government approved Independent Agency or should have been witnessed by a client.

a) Following Type test reports as per the setup and procedures given in subsequent clauses for the Fire sealing system shall be submitted:

i) Accelerated aging test.

ii) Water absorption test

iii) Fire rating test

iv) Hose stream test

v) Vibration Test followed by fire rating test.

As per relevant standards suitable for 1 (one) hrs rating and carried out within last ten years from the date 11.11.2010. These reports should be for the tests conducted on similar materials to those offered/ proposed to be supplied under the contract and tests should have been either conducted at an independent laboratory or should have been witnessed by a client.

However, if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date 11.11.2010, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the Owner either at third party lab or in presence of BHEL/ CUSTOMER representative and submit the reports for approval. (conduction of type testing shall be on the material supplied under this contract, construction of sample may be witnessed

by BHEL/ CUSTOMER for which due notice shall be given), and reports shall be submitted for approval.

b) Type Test charges:

i) 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 as per S. No. C of price schedule.

ii) 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 indicated by the vendor at S. No. C of price schedule shall not be payable.

iii) 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, but under unforeseen circumstances (non availability of testing facilities), the type tests could not be conducted, the type test charges quoted by the bidder at S. No. C of price schedule shall be deducted from the supply payment.

9.2 Tests 9 (a) i), ii), iii) and iv) should have been carried out on same test sample subsequently One after the other without any touching up/repair/modifications in the same sequence and in accordance with the clause 11.0 The test sample shall be assembled as per clause 10.0. Further, Test indicated in clause 9 (a) v) above should have been carried out on a separate sample and as per the procedure indicated under clause 11.5.

9.3 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.

9.4 All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.

9.5 Test reports shall contain the following information:

1. Type of penetration material tested
2. Details of various components/ingredients used along with their catalogue.
3. Physical, chemical and mechanical properties of various components/ ingredients used.
4. Description of the various test assemblies tested.
5. Details of method of conditioning.
6. The observations as called for in BS:476 Part-20 and technical specification.

9.5 Bidder shall submit Quality Plan in format (*enclosed with Volume-II B of Technical specification*) which shall include various quality checks for the fire sealing system offered.

The same shall be subject to the approval of CUSTOMER/ BHEL without any commercial implications to BHEL.

9.6 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.

10.0 TEST SPECIMEN ASSEMBLY

10.1 The test specimen shall be assembled as per enclosed drawing and shall resemble typical floor crossing cable penetration system.

10.2 The test specimen shall be designed to seal an opening of adequate size in a concrete slab of 200 mm thickness. Two lengths of 300/600 mm wide ladder type cable tray shall be assembled with required layer of XLPE/PVC insulated, PVC sheathed unarmoured cables in touching formation. Type and number of cables in the cable tray shall be as per enclosed drawing. Cables shall be adequately clamped with tray at both the sides of the penetration as shown in the drawings. However, for penetration system with blocks which require staggered arrangement, cables can be clamped at an adequate distance from the penetration and the tray need not pass through the penetration seal.

10.3 The opening in the test specimen then shall be sealed with fire proof cable penetration sealing materials.

11.0 TEST PROCEDURES

11.1 ACCELERATED AGEING TEST

The test specimen assembled as per clause 8.01.00 with damming board removed shall be subjected to accelerated ageing test by storing in air furnace where the temperature of the inside air shall be maintained at 85 degree centigrade for 168 hours. The temperature controlled furnace should have 7 air changes per hour approx.

11.2 WATER ABSORPTION TEST

The test specimen shall be immersed in fresh clean water at a temperature of 20 deg. C + 2 deg C. The test specimen must be separated from the bottom and sides of the soak tank by at least 10 mm and it shall be covered by approximately 25 mm of water. At the end of the 24 hour soak period the specimen shall be removed from water and mopped up with a damp cloth.

11.3 FIRE RATING TEST

The test specimen after withstanding water absorption test shall be subjected to fire rating test as per BS: 476 part-20. Oil/Gas fired furnace shall be used for heating. The furnace shall have achieved standard time/temperature characteristics for fire tests as per BS:476

part-20. The pressure inside the furnace at the time of test shall be within 1.5 + 0.5 mm water gauge.Cables in the test specimen shall be anchored on the hot side to a structure independent of the barrier and its penetrations. This is to ensure that any differential movement between the penetration and the cable that could occur during a fire, is produced in the type tests and the reliability of the integrity of the penetration is checked. Cables shall be protruding between 1 to 2 metre, from the penetration face on the unexposed side and protruding into the furnace as far as it is practicable with a minimum length 750 mm. The ends of the cables shall be capped on the unexposed face to prevent gases and fumes to escape from the furnace during the fire.
The test specimen shall be subjected to fire test with surface exposed to controlled fire in the furnace confirming to time/temperature characteristics specified in BS:476(20). During the test the temperature of both the faces of the fire stop i.e. one which is exposed to fire and other unexposed shall be measured by calibrated thermo couples after regular interval of 5 minutes.
Atleast 3 thermo couples shall be provided for temperature measurement of each face.
The results at the end of the test shall be interpreted for failure criteria as under.

1. The system is deemed to have failed to maintain stability if there is a total collapse of the fire proof seal.
2. In case cracks are seen on the face of the fire stop or cracks through which the flame/ hot gas can pass the systems deemed to have failed to maintain integrity.
   The development of crack is characterised by appearance of black soot on cotton wool held near the penetration on the unexposed surface at a distance of about 100mm.
3. Failure shall be deemed to have occurred when the mean temperature of the unexposed surface of the specimen assembly increases by more than 140ÔC above the initial temperature or if the temperature of the unexposed surface is increased at any point by more than 180ÔC above the initial temperature.
   During the test the specimen shall meet all the three criteria simultaneously.

Temperature measurement on the unexposed side of penetration seal shall be measured by thermocouples at a distance of 25 mm from unexposed side of fire stop.

11.4 HOSE STREAM TEST

A hose stream test shall be conducted on the test specimen immediately following a fire resistance test on that assembly. The specimen must first be removed from the furnace since the hose stream is to be applied to the exposed face. This must be done quickly since it is the intention of the test that the stream be applied to the specimen whilst it is hot. The hose stream shall be long range narrow angle, (200 - 900 set at 300 included angle). High velocity water spray provided from a 28 mm hose discharging through an appropriate nozzle. The water pressure shall be 5 bar calculated at the base of the nozzle and the minimum flow rate shall be 4.7 litres/second. The stream shall be supplied perpendicularly to the exposed face of the test specimen with nozzle 3 m away from the

exposed face. Application shall be for minimum of two and a half minutes per 9 sq.m. of the test specimen including the barrier.

11.5 **VIBRATION TEST**

The test assembly is to comprise a single ladder rack penetration in 1 m x 1m high normal section of fire barrier which is securely supported. The penetration seal shall be formed in the middle of the barrier around 1 m length of 600 mm ladder rack. The tray shall be fully loaded with cables in touching formation. The penetration assembly shall be formed symmetrically through the fire barrier as in service. The penetration sealant material shall then be allowed to cure for atleast as long as the time required for conditioning to constant mass. A vibration test shall then be conducted on the sample as set out below. The vibration shall be of 100 Hz frequency and of 0.5 mm amplitude (1.0 mm peak to peak) and this shall be applied to one rail of the ladder rack or the centre of a cross member secured to the two rails at 250 mm from the centre line of the penetration. This vibration shall be applied to the sample for the minimum period of 3 hrs. Immediately following this vibration test the barrier/ penetration assembly shall be successfully subjected to a fire test in accordance with clause no. 11.3.

12.0 BILL OF QUANTITY

12.1 Bill of Quantities (BOQ) is given in Annexure-I in terms of area to be covered with fire sealing material for different types of wall/ floor penetrations.

12.2 Along with the bid, the bidder shall furnish 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.

13.0 DRAWINGS / DATA SHEETS

13.1 The following information shall be furnished with the bid:

a) Datasheet-B
b) Complete details of the system.
c) Typical drawings showing arrangement of various components and thickness etc.
d) Type test certificates
e) Signed and stamped copy of BOQ as detailed in clause 12.0 above.

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

a) Data Sheet-C
b) Typical drawings showing arrangement of various components and thickness etc.
c) Manufacturing Quality Plan.
d) Field Quality Plan.
e) Type test procedures, installation procedures, drawings.

f) Test reports, (Type, Batch, routine & acceptance)
g) Calculations for supply of material based on area to be provided with fire sealing.

13.3 The successful bidder shall be required to submit drgs/ docs. as per Annexure-II

13.4 Documentation distribution Schedule for Project shall be as per Annexure-III.

14.0 PRICES

14.1 Vendor shall be indicating the following unit price:.

a) Unit price for supply of material for each of the item listed in the BOQ.
b) Unit prices for Supervision of E&C.

14.2 Lot-I quantity shall be released along with LOI, which is approx. *70%* of ordered quantity/ contract value.

14.3 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.

14.4 Addition/deletion of quantity shall be applicable at the quoted unit price.

15.0 DELIVERY

The delivery shall be as per NIT (Notice Inviting Tender).

2 X 600 MW SINGARENI, ADILABAD TPP
BILL OF QUANTITIES/ PRICE SCHEDULE FOR FIRE SEALING SYSTEM
ANNEXURE-I

SL.NO.	ITEM CODE	DESCRIPTION	UNIT	ORDER QTY.	LOT 1 QTY	UNIT PRICE (EX-WORKS)	TOTAL PRICE (EX-WORKS)
A	MAIN ITEMS (SUPPLY)					(IN RUPEES)	(IN RUPEES)
1	507-26032-A	FSS-TYPE A FLOOR OPENINGS BELOW PANELS IN CCR ROOM (FLOOR THICKNESS 190MM APPROX)	SQM	255	180		
2	507-26037-A	FSS-TYPE B FLOOR OPENINGS BELOW PANELS (FLOOR THICKNESS 190MM APPROX)	SQM	875	615		
3	507-26034-A	FSS-TYPE B FLOOR OPENINGS (FLOOR THICKNESS 190MM APPROX)	SQM	140	100		
4	507-26040-A	FSS-TYPE B WALL OPENINGS (WALL THICKNESS 230MM APPROX)	SQM	85	60		
5	507-26046-A	FSS-TYPE B PIPE SLEEVES (200NB PIPES)	NOS.	160	115		
6	507-26013-A	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. (As applicable)	SET	1	1		

B	E&C	DESCRIPTION	UNIT	ORDER QTY.	LOT 1 QTY	UNIT PRICE	TOTAL PRICE
						(IN RUPEES)	(IN RUPEES)
1	507-26032-C	FSS-TYPE A FLOOR OPENINGS BELOW PANELS IN CCR ROOM (FLOOR THICKNESS 190MM APPROX)	SQM	255	180		
2	507-26037-C	FSS-TYPE B FLOOR OPENINGS BELOW PANELS (FLOOR THICKNESS 190MM APPROX)	SQM	875	615		
3	507-26034-C	FSS-TYPE B FLOOR OPENINGS (FLOOR THICKNESS 190MM APPROX)	SQM	140	100		
4	507-26040-C	FSS-TYPE B WALL OPENINGS (WALL THICKNESS 230MM APPROX)	SQM	85	60		
5	507-26046-C	FSS-TYPE B PIPE SLEEVES (200NB PIPES)	NOS.	160	115		

C	CIVIL WORKS			
		DESCRIPTION	UNIT	UNIT RATE WITHOUT TAXES & DUTIES IN Rs.
	a	ENLARGEMENT OF PENETRATION AREA IN	SQM	
	a1	BRICK WALL	SQM	
	a2	CONCRETE WALL	SQM	
	a3	FLOORS	SQM	
	b	REDUCTION OF PENETRATION AREA IN		
	b1	BRICK WALL	SQM	
	b2	CONCRETE WALL	SQM	
	b3	FLOORS	SQM	

D	TYPE TEST FOR TYPE-A FIRE SEALING SYSTEM (OPTIONAL)			
		TYPE TEST	UNIT	UNIT PRICE
	1	Accelerated aging test	LOT	
	2	Water absorption test	LOT	
	3	Fire rating test	LOT	
	4	Hose stream test	LOT	
	5	Vibration Test followed by fire rating test	LOT	

E	TYPE TEST FOR TYPE-B FIRE SEALING SYSTEM (OPTIONAL)			
		TYPE TEST	UNIT	UNIT PRICE
	1	Accelerated aging test	LOT	
	2	Water absorption test	LOT	
	3	Fire rating test	LOT	
	4	Hose stream test	LOT	
	5	Vibration Test followed by fire rating test	LOT	

Notes:-

1) The fire sealing area indicated under Column "Ordered Quantity" above shall be considered for ordering purposes. Bidder shall indicate the quantity of material required to be supplied per square metre, which shall be used for billing purposes of the supply portion after review and acceptance. However, the vendor shall supply the actual material necessary for meeting the specified area requirements as per type-tested arrangement without any commercial implication.
2) LOT 1 Quantity shall be released along with LOI, which is approximately 70% of the ordered Quantity/Contract value.
3) Quantity variation shall be limited to (-)30% to (+)30% of the contract value arrived at on the basis of the total ordered quantities. LOT 1 quantities shall be cleared for supply along with the LOI/ PO. However, supplies of quantities shall be made only after approval of drawings, datasheets, quality documentation and successful completion of type testing (if required).
4) Successful bidder is responsible for estimation of additional quantities based on site conditions and work progress. The estimates shall be used by BHEL as inputs for clearing further quantities. These activities shall be completed within the overall contractual period.
5) Total price quoted for items A and B above shall be used for price comparison purpose.
6) Unit prices for supply and installation shall be quoted in line with clause no. 8.3, Section D of specification.
7) Unit rates for civil works (item C above) shall be as per clause no. 8.3 (f) of Section-D of specification.
8) For Type Tests refer clause no. 9.0 of Section-C

ANNEXURE – II

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

Sl. No.	Drawings/Document Description	Drawings / Document Number	Submission date by vendor
1	Technical Data Sheet of Fire Sealing system TYPE-A	PE-V0-381-507-E041	Within two weeks of award of contract.
2	General Arrangement Drawings of Fire Sealing system TYPE-A	PE-V0-381-507-E042	Within two weeks of award of contract.
3	Type Test Reports of Fire Sealing System TYPE-A	PE-V0-381-507-E043	Within two weeks of award of contract.
4	Quality Plan for Fire Sealing System TYPE-A	PE-V0-381-507-E044	Within two weeks of award of contract.
5	Field Quality Plan for Fire Sealing System TYPE-A	PE-V0-381-507-E045	Within two weeks of award of contract.
6	Technical Data Sheet of Fire Sealing system TYPE-B	PE-V0-381-507-E046	Within two weeks of award of contract.
7	General Arrangement Drawings of Fire Sealing system TYPE-B	PE-V0-381-507-E047	Within two weeks of award of contract.
8	Type Test Reports of Fire Sealing System TYPE-B	PE-V0-381-507-E048	Within two weeks of award of contract.
9	Quality Plan for Fire Sealing System TYPE-B	PE-V0-381-507-E049	Within two weeks of award of contract.
10	Field Quality Plan for Fire Sealing System TYPE-B	PE-V0-381-507-E050	Within two weeks of award of contract.

ANNEXURE – III

(VENDOR DRAWING/DOCUMENT SCHEDULE)

S.NO.	DESCRIPTION	NOS.(HARD COPY)	SOFT COPY IN AUTOCAD & PDF	CD ROM
1.	All Drgs./docs.- First submission/resubmission	-	YES	-
2.	Final Drgs./docs. after approval for distribution purpose	10	YES	4
3.	As built drgs./docs.	10	YES	4
4.	Quality plan –submission/	-	YES	-
5	Quality plan- after approval for distribution purpose	10	YES	4
6.	Instruction Manual (Erection,/O&M), commissioning procedure, Data Books/Plant hands book/ CATALOGUES etc.			
6(a)	Draft copy	-	YES	-
6(b)	Final submission	10	YES	4
7.	Performance & Guarantee Test Report	10	YES	4

GENERAL TECHNICAL REQUIREMENTS

OF

FIRE STOP SYSTEM FOR CABLES

SPECIFICATION NO.

PES-507-26 REV. 02
DATE 3.11.93

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.

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

3.12 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.

3.13 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.

3.14 Welding

3.14.1 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.

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

3.14.3 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.

3.15 Surface Treatment

3.15.1 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.

3.15.2 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.

4.0 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.

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

5.1 The quality plan enclosed forms part of this specification.

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

a) Verification of test certificates for materials before desptach.

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.

1.3.2 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.

1.4 Anti-rodent test

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

1.4.2 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.

1.4.3 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.

1.5 Temperature rise test for cable in the fire stop

1.5.1 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.

1.5.2 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 ^{o}C.

1.5.3 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.

1.5.4 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.

7.6 Explosion Test

7.6.1 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.

7.6.2 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.

7.7 Structural Stability Test (Site Test)

7.7.1 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.

7.7.2 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.

8.0 PRICES

8.1 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.

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.

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

1.3 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.

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.

f) 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.

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 written 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 compltion of work the contractor shall remove all debris and take back all erection impliments, left-overs, surplus materials over and above the ordered quantity without any financial implications to either party.

11.0 <u>PERFORMANCE GUARANTEE</u>

11.1 Bidder shall guarantee that the system offered shall meet the requirement as indicated in this specification and as confirmed through various clauses 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.

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.

DATASHEET-A

1.0	Rating of fire stop	:	One (1) hour
2.0	Type of application	:	(√) Horizontal (√) Vertical (√) Below panels
3.0	Cable laying conditions	:	(√) Cables on cable trays (×) Unsupported cables
4.0	Suitability of fixing arrangement	:	(√) In masonry work (√) In concrete work
5.0	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
6.0	Type of system offered	:	Mortar based (√)
		:	Panel based (√)
7.0	Minimum Shelf life of most perishable material	:	12 Months (For TYPE-A material) 12 Months (For TYPE-B material)
8.0	Life expectancy of material	:	Greater than 40 Years.
9.0	Storage suitable for	:	Dry surface

INSTRUCTIONS TO BIDDER	1. This data sheet shall be read in conjunction with specification number PES-507-26 section – D volume- IIB. 2. Items which deviate from specification shall be marked with an asterisk(*) 3. This data sheet shall be submitted alongwith bid.

DATASHEET-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
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

INSTRUCTIONS TO VENDOR	1. This data sheet shall be filled up on the basis of finally agreed points of Data Sheet B, Bid clarifications & MOM with the bidder. 2. This data sheet shall be submitted by successful bidder after award of contract.

DATASHEET-C

1.0 GENERAL

1.1 Name of vendor :

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 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

j) 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
3.8	Shelf life of most perishable material	:	years
3.9	Life of total assembly	:	years

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 (Type, routine & acceptance)	:	YES / NO
d)	Bar chart	:	YES / NO
e)	Billing Schedule	:	YES / NO

			CUSTOMER	SINGARENI COLLIERIES COMPANY LIMITED		PROJECT TITLE	2X600 MW SINGARENI, ADILABAD TPP		SPECIFICATION NUMBER : PE-TS-381-507-E016			
		QUALITY PLAN	BIDDER/ VENDOR :			QUALITY PLAN NUMBER	PE-VO-381-507-E044		SPECIFICATION TITLE			TECHNICAL SPECIFICATION FOR FIRE SEALING SYSTEM
		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	
	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 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

Column11I- 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 approproate 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.