PURCHASE-BOI DEPARTMENT
BHARAT HEAVY ELECTRICALS LIMITED,
HEAVY ELECTRICAL EQUIPMENT PLANT,
RANIPUR, HARIDWAR – 249 403 (UTTARAKHAND), INDIA

BHEL Ref. No.: **B/4066/2020/1403/V1**

Tender Enquiry for the requirement of Thermal Insulation of TIP for Udangudi U-1&2 project

Bids are invited from the bidders for providing the complete design, supply of material and application of **Thermal Insulation of Turbine Integral Piping for 2 x 660 MW Udangudi Unit-1&2 project** as per detailed specifications. All tender documents uploaded along with this tender enquiry are as mentioned below.

LIST OF TENDER DOCUMENTS

S.No.	Document Name & No.	Total Pages
1.	PQR (PRE-QUALIFICATION REQUIREMENT) (Annexure-A)	**02**
2.	TECHNICAL SPECIFICATION & DOCUMENTS comprising of following: **a)** **ST29005 Rev. 04** (Technical Specification for Thermal Insulation for TIP) **b)** Doc. No. **412114W6000 Rev. 00** (Thermal Insulation Schedule for TIP) **c)** Doc. No. **412114W6001 Rev. 00** (Bill of Materials for Thermal Insulation of TIP)	**43**
3.	ADDITIONAL TERMS & CONDITIONS FOR TENDER (Annexure-B) (In addition to General terms and conditions on GeM 4.0, Version 1.9 Dtd. 31.03.2023 or latest version as applicable)	**04**
4.	QUALITY PLAN No. **QA/BE/QP/316/UDAN, Rev. 00**	**02**
5.	PBG FORMAT AND LIST OF BHEL CONSORTIUM BANK	**03**

For and on behalf of BHEL, Hardwar

Dy. Manager (PPX-BOI)

PRE-QUALIFICATION REQUIREMENTS

BHEL Ref. No. B/4066/2020/1403/V1

Bidders are required to meet the Pre-qualification requirements (PQR) for the supply of **Thermal Insulation of TIP required for 2 x 660 MW Udangudi project** as per criteria stipulated below:

Sl. No.	Pre-Qualification Requirements	Bidder's confirmation
1.	Vendor should have an experience in Design, Supply & Application of Thermal Insulation (Non Spray Type) of Hot Pipes (as per ASTM C 680/IS 14164 or equivalent standards) of at least two (2) successfully commissioned Steam turbine power plant of 200 MW or above, which should not be older than 7 years as on the date of enquiry.	
2.	Vendor should furnish the following documents satisfying criteria in clause 1 above: a. Vendor to submit Un-Priced Purchase Order copies (mentioned at clause 1) along with all relevant technical documents including parameters (outer dia of pipe, insulation thickness, fluid temperature, cold face temperature, ambient temperature, wind velocity and emissivity of cladding) for any of the mentioned project against clause 1. b. Vendor to furnish k-value at different mean temperatures (100^0C, 150^0C, 200^0C, 250^0C and 300^0C etc.). Vendor to submit at least 04 Nos. thickness calculations for mentioned different mean temperatures (as per ASTM C-680/IS: 14164 or any other internationally accepted standard). c. Vendor to furnish customer certificate/ work completion certificate for any of executed project mentioning that vendor has designed, supplied and applied Thermal Insulation of Piping and is working successfully at _____ (Name of Site) and rating _____MW. Signed customer certificate should contain details of signing authority such as Name, designation, contact number, email address etc. d. An experienced Indian JV (Joint venture)/ subsidiary company or company having a collaboration can also submit the offer. In such case valid technical collaboration or licensing agreement with quailed vendor who meets the requirement stipulated at clause 1, 2(a), 2(b) and 2(c) of Principle Company with whom JV / technical collaboration / licensing agreement is done needs to be submitted. The Indian bidder shall design supply and apply as per qualified vendor with whom JV / subsidiary / licensing agreement has been done. Indian bidder to confirm.	
3.	BHEL reserves the right to verify the information submitted by vendor. Submission of false / incorrect information shall lead to rejection of vendor's offer and shall be taken seriously by BHEL.	
4.	BHEL reserves the right to ask for more pertinent information/documents/ clarifications. Vendor shall provide this information to BHEL in a timely manner so that project schedule doesn't hamper.	

Signature of bidder

5.	All the documents furnished to BHEL shall be in English language only. If the documents are not in English, then they must be accompanied with duly certified English translations of the same.	

Note:

1. All documents should be self-certified by vendor.
2. BHEL would consider the offers and open the Price bids/conduct RA of only those bidders, who fulfill the Pre-Qualification requirement (PQR) and technical requirement of tender.
3. Please refer the below Checklist format of PQR for Thermal Insulation of TIP. All the bidders are required to check the submission of proper & complete documents as mentioned in above criteria of PQR in order to save redundancy of time in seeking the clarification of PQR documents:

PQR Sl. No	**PQR Topic.**	**Comments**	**Checks**
1	Experience (>=200MW)	Successful experience of 2 Nos. TPP of 200MW & above.	Yes / No
		Order received and executed within 7 years of date of tender enquiry.	Yes / No
2a	Supporting documents	As below	-
	Purchase Orders	2 Nos. POs for 200MW and above TPP.	Yes / No
		Submitted POs are of within 7 years from date of tender enquiry.	Yes / No
	BOM /BOQ	BOQ having quantity of material used. **For any of project**	Yes / No
		BOM / Thickness schedule. **For any of project**	Yes / No
	Site condition data	Site condition data. **For any of project**	Yes / No
2b	K value	K-value certificate for different density (100 & 150 Kg/m3 etc.)	Yes / No
	Sample calc	04 Nos. Sample calculations for which thickness schedule provided.	Yes / No
2c	Work completion certificate	Work completion certificate. **For any of project**	Yes / No
2d	JV & NDA	Joint venture document & Non-disclosure agreement **if applicable.**	Yes / No

Signature of bidder

BASED ON :
BHEL EXPERIENCE

SPECIFICATION FOR THERMAL INSULATION

FOR T.G.INTEGRAL PIPING SYSTEM

				NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
हस्ताक्षर एवं दिनांक SIGN & DATE					
			अनुवादक TRANSLATED BY	-	-
QAX	S.S. CHAUHAN		निर्माणकर्ता WORKED BY	S.K.GUPTA	12.11.03
TSX	KISHAN LAL	27.11.03	जांचकर्ता CHECKED BY	S.K.GUPTA	12.11.03
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	V.K.GUPTA	12.11.03
			स्वीकृति APPROVED : (B.K. BHALLA) AGM (STE)		ST 8.20
सामग्री सूची संख्या INVENTORY NO. P-5788	REV.NO. 04 Dt. 04.02.05		निर्माण PREPARED : STE	जारी ISSUED : STE (TL)	दिनांक DATE : 1-6-89

1.0 INTRODUCTION

In a thermal power station, thermal insulation of all piping carrying hot fluids is essential for heat economy and protection of operating personnel. In any pipe which is at a temperature higher than its surroundings will loose heat and the amount of heat lost will depend upon the temperature of the fluid conveyed and the thermal conductivity of the piping material. The heat lost through bare pipes increases with:

(a) Increase in the temperature of fluid conveyed.

(b) Air velocity of the surroundings.

Providing proper and adequate insulation on to the facilities and equipments controls heat transfer and maintain the required skin temperatue. The use of high quality insulation can return 20% or more per year on the investment.

2.0 SCOPE

This specifications covers the design, technical requirements and essential particulars for the supply, application & finishing of the thermal insulation complete with all auxiliary materials for the integral piping systems for thermal power stations. Thermal insulation will be applied over integral steam piping having a rated operated temperature of above 60°c for the protection of the operating person & for energy conservation.

2.1 The scope of supply shall be defined in data sheet of the project.

(a) The description of the components to be insulated.
(b) Maximum continuous operating temperature of the components.
(c) Design ambient temperature.
(d) Type of insulation ordered.
(e) Cold face temperature of the insulation above ambient.
(f) Other instruction and notes concerning the design, manufacture and supply of Insulation.

2.2 Attachment, devices & accessories shall form the part of the scope of supply.

2.3 Application of the insulation shall be done at site after consultation with or at the request of the chief of the erection group of BHEL at site.

2.4 In case the requirements specified in the data sheet for a particular project are different than what is given in this specification, the data sheet requirements shall be considered as final and binding for that project.

2.5 The pipe lengths given in data of the insulation schedule are inclusive of the equivalent length of tees/stub and reducer. The vertical / near vertical runs of piping are included in the pipe length given in the data of insulation schedule. Additional supporting arrangements are required for insulation on vertical / near vertical piping. The bidder should include the charges for these supporting arrangements in the contract cost based on his experience. No breakup of vertical and horizontal runs are to be furnished to the bidder.

2.6 Data furnished for the items to be insulated is based on pipe erection drawings. No physical measurement of insulation work will be done. The conversion factors for the valve and fittings will be taken from IS:14164.

3.0 DESIGN AND PERFORMANCE REQUIREMENTS

3.1 For the design of the insulation shall be assumed that the surface temperature of the equipment is taken equal to the temperature of the steam. Heat loss at the surface of insulation shall not exceed 180 Kcal / m^2h unless specified in data sheet.

3.2 In principal all the equipments operating above 60^0C shall be insulated. However the contractor shall be guided by BHEL regarding the scope as per clause No.2.

3.3 If the ambient temperature is not specified in the data sheet, the same shall be assumed as 40^0C.

3.4 Insulation thickness shall be completed based on the design parameters given in data sheet of the project. The thickness given in insulation schedule shall be reviewed by the bidder.

3.5 Insulation shall be supplied in thickness 25, 40, 50, 65 and 75mm. Higher thickness shall be made up in multiple layers from them. The breakup of thickness of multiple layers is given under the column insulation thickness in the insulation schedule.

4.0 MATERIALS

4.1 INSULATING MATERIALS

The insulating materials and protective covering shall be new and fresh, incombustible , non-hygroscopic and shall be guaranteed to withstand continuously and without deterioration the maximum temperature to which they will be subjected under the specified application. The insulation material and any component of the finished insulation job shall not react chemically by itself or in combination with water or moisture to form the substances which are more actively corrosive to the applied surfaces than water or moisture alone. The material shall not offer substance to fungus or vermin and must not pose a health hazard. The bidder shall submit with the bid the details of application of protective coatings or other methods he proposes to use for corrosion protection of insulated surface.

The material of insulation used for mattress shall be bonded mineral (rock) as per IS8183.

If Preformed pipe section are used, it shall be as per IS9842.

4.2 SHEATHING MATERIAL

The sheathing material for all insulated piping & equipment shall be aluminium sheet confirming to IS 737. Unless otherwise specified in Data sheet, the thickness of aluminium sheathing to be used shall be as follows:

a)Pipes of 450 mm (18 inch.) and above; over outside diameter of insulation :- 1.219 mm (18 SWG).

b)Pipes of 150 mm (6inch)and above; over outside diameter of insulation :- 0.914 mm (20 SWG).

c)Pipes less than 150 mm (6inch); over outside diameter of insulation :- 0.711 mm (22SWG)

4.3 BINDING & LACING WIRE

Binding & lacing wire shall be 20 SWG galvanized steel wire. Where interface temperature is 400°C or more, the binding wire shall be 20 SWG stainless steel wire.

4.4 STRAPS & BANDS

All straps & bands shall be galvanized steel. For securing aluminium sheathing material, stainless steel or anodized aluminium bands shall be used. Bands shall be 20 mm wide & 0.6 mm thick.

4.5 SCREWS

Screws shall be of self tapping type &shall be cadmium/zinc plated.

5.0 APPLICATION OF INSULATION

5.1 GENERAL

The application of thermal insulation is highly skilled job contrary to the general belief. Badly fitted/laid insulation can lead to greater heat loss or surface

temperature than that estimated & also to constant maintenance. Ample provision shall be made for maximum possible thermal movement & the insulation shall be applied in a manner which will avoid breaking or telescoping due to alternate periods of expansion & contraction. A single layer of insulation shall not be more than 75 mm thick.

The following are some of the points to be considered in the application of insulation

a) Surfaces must be clean,dry,& free from grease,loose scale, moisture etc. before application of insulation.

b) Insulation thickness on flanges & valves should be equal to that of the adjacent/associated pipes.

c) Where contamination by chemicals or oil spillage is possible, it is important that precaution be taken to avoid contamination of insulation.

d)Pipe hangers & supports and any penetrations should be covered in such a way that moisture cannot penetrate.

e) The bare insulation must be stored in a proper place (indoor) to avoid contamination which will lead to change in weight & thermal conductivity values.

f) Rigid sections should have staggered joints where more than one layer is involved & they must be held in close contact with pipe & fitting face by means of wire or bands.

5.2 PIPING :-

5.2.1 For insulation of piping with preformed pipe sections the same shall be applied over the pipe and finally insulation shall be held in position with 15 mm wide aluminium band at not greater than 400 mm spacing.

5.2.2 For insulation of piping with mattresses having backing GI wire or SS wire netting, the required lengths & shapes are cut from the blankets & wrapped on the piping with edges pulled together tightly at the longitudinal joint and secured by lacing wire & this joint shall be at lower side.

If the interface temperature is 400°C or more the wire netting shall be from 20 SWG stainless steel wire and having hexagonal opening of 25 mm size. Otherwise each layer of mattress shall have GI wire netting from 20 SWG &having hexagonal opening of 25 mm size. The ends of all wire loops shall be firmly twisted together with pliers, bent over & carefully pressed into the surface of the insulation.

Preformed insulation & mattress insulation on vertical or near vertical piping must be supported in position by means of metal rings & at intervals as per enclosed sketches.

GI band/Aluminium bands are to be used for tightly securing the different layers of insulation.

5.2.3 Piping bends shall be insulated to the same specification as adjacent straight piping and should form a smooth external surface. Where preformed material is used, it

should be cut lobster back finish and wired or strapped into position.

5.2.4 All insulation shall be protected by an outer covering of aluminium sheathing. All insulation sheathing joints shall be sealed and made effectively weather & waterproof. All flat surfaces shall be adequately sloped to prevent pools of water collecting. The sheathing shall be protected internally with two coats of anti corrosive paint as per IS 158. The jackets shall be installed with the longitudinal lap joint at 45° below the horizontal for horizontal pipes and the joints sealed with sealing compound.

Arrangements for securing the metal finish over the insulation shall ensure that direct metal contact between the insulated surface and outer metal cladding is avoided. 4 mm thick asbestos board packing shall be used as interfaces to thermally isolate the metal covering from supporting arrangements. There shall be over lapping of 50 mm on both longitudinal & circumferential joints. The screws shall be provided at not greater than 150 mm spacing. Sealing compound is to be applied at all sheathing joints. The overlapping in outer casing should always be at the bottom for horizontal piping so that no rain water enters into the insulation through the joints & the lapping must be done so that water will have a natural drainage. In case of vertical & inclined piping, circumferential overlapping is made such that no rain water enters into the insulation through the joints by proper lapping sequence.

5.2.5 All joints in the insulation shall be staggered. For multiple layers of insulation the different layers shall be applied so that the butt joints of one layer do not coincide with those of the other layer.

6.0 VALVES & FLANGES INSULATION

The insulation on all valves & flanged joints shall be enclosed in a removable jacketing so that it may be removed without disturbing the concerned equipment or piping. The thickness of insulation shall be same as that of the pipe line in which these valves and fittings are located. A typical arrangements shown in drawing at sheet no 15.

7.0 GENERAL INSTRUCTIONS FOR ERECTION OF INSULATION

a) Persons doing the actual job can alter the method of fixing of sheet metal as and when necessary, only after consulting the concerned field engineer.

b) Care shall be taken to see that the flexible insulation mattresses are not unduly compressed.

c) The day to day insulation works are covered by sheathing or with suitable protective materials to prevent the rain water entry.

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d) The indicated insulation thickness are minimum requirements which should be maintained, and are based on LRB mattresses. If the bidder desires to use pipe section or combination of pipe section & LRB mattresses, the same should be done after prior approval of design engineer.

e) Where junctions between bodies of different diameter occur and difference of insulation thickness is specified, the greater thickness is to be continued for a length equal to one diameter of the smaller body and then smoothly tapered to the required smaller thickness over a length equal to two diameters of the smaller body.

f) Once the insulation is laid walking on the insulated pipe should be avoided. Suitable scaffoldings are to be used. Similarly slinging of pipes over the insulation should be avoided.

g)The layers** of wool mattresses to be adopted, to obtain the specified insulation thickness, are as per table below unless otherwise specified

Thickness of insulation(mm)	Ist layer	IInd layer	IIIrd layer	IVth layer
80	40	40	- -	- -
100	50	50	- -	- -
110	65	50	- -	- -
120	75	50	- -	- -
130	65	40	25	- -
140	75	65	- -	- -
150	75	75	- -	- -
200	75	75	50	- -

**If the mattress thickness combination are indicated in the insulation schedule, the above instruction is to be ignored. The necessary guide lines of fixing arrangement for pipe section & mattresses are given in the drawings at sheet nos 10 & 11.

h) Insulation Fixing Arrangements:-
Typical fixing arrangements for insulation of pipes & pipe fittings are shown vide drawings listed below;
i)Fixing arrangement pipe section and lightly bonded mattresses/ mattresses at sheet nos. 10,12 & 13.

ii) Fixing arrangements for lightly banded mattress at sheet nos 11,12 & 13.
iii) Lugs at sheet no 14.
iv) Flats at sheet no. 15.
v) Fixing of insulation on valves at sheet no. 16.
vi) Insulation of tee at sheet no. 17.
vii) Insulation of elbow at sheet no. 18.
viii) Pipe clamp carbon steel at sheet no. 19.
ix) Pipe clamp alloy steel at sheet no. 20.

8.0 PROTECTION OF MATERIALS DURING STORAGE

The supplier shall protect the insulation materials from weather at all times from delivery to finish. Decking & covering tarpaulins alone are not adequate for any length of time & shall not be allowed except in extreme emergencies and only for short periods. Stacking of insulating materials directly on ground shall not be done.

9.0 GUARANTEES

The supplier shall guarantee that if the specified maximum surface temperatures are exceeded on actual measurement, the supplier shall either replace the insulation with a superior material or provide additional insulation thickness at the BHEL'S/ site engineers discretion at no extra cost to the BHEL.

The supplier shall also guarantee the quality of the materials used & workmanship for a period of 18 months from the date of commissioning. Any defects arising from faulty materials or workmanship during this period shall be rectified by the supplier at no extra cost to BHEL.

10.0 INSPECTION & TESTING

10.1 Thermal insulating material :-

Supplier shall arrange for carrying out all the tests for establishing thermal conductivity values, physical & chemical properties as required by relevant IS & or BS codes and standards. The tests shall be done on representative samples drawn from each lot of insulation material to be supplied under this specification & prior intimation shall be given so that BHEL can depute their representative to witness any or all the tests. For thermal conductivity values, test certificates from independent authorized testing agency (subject to BHEL'S approval) shall be furnished to BHEL for approval.

10.2 Other materials :-

For other materials i.e. cladding sheet, wire netting, binding wires, stitching & lacing wires etc., manufacturers correlated test certificates as per relevant codes & standards shall be furnished. In case correlating test certificates are not available, the supplier shall arrange to carry out necessary tests in presence of BHEL'S representative.

All test certificates shall be furnished & written approval shall be taken from BHEL before commencement of the supply of material.

11.0 DOCUMENTS TO BE SUBMITTED

Two copies of the following pre-approval documents shall be submitted by the bidder along with the offer :-

(i) Thermal conductivity values of the insulating materials at various mean temperatures not older than 2 years for densities 100, 120 & 150 Kg / m^3 from government approved lab for information.

(ii) Manufacturer's descriptive and illustrative literature for insulating materials offered with complete properties as per relevant standards.

(iii) Quality plan duly signed on BHEL format for approval.

(iv) Total bill of material of each item, giving the material specification, density / size / thickness, quantity and the wastage allowance considered shall be indicated in Data Sheet / Insulation schedule alongwith its thickness calculation.

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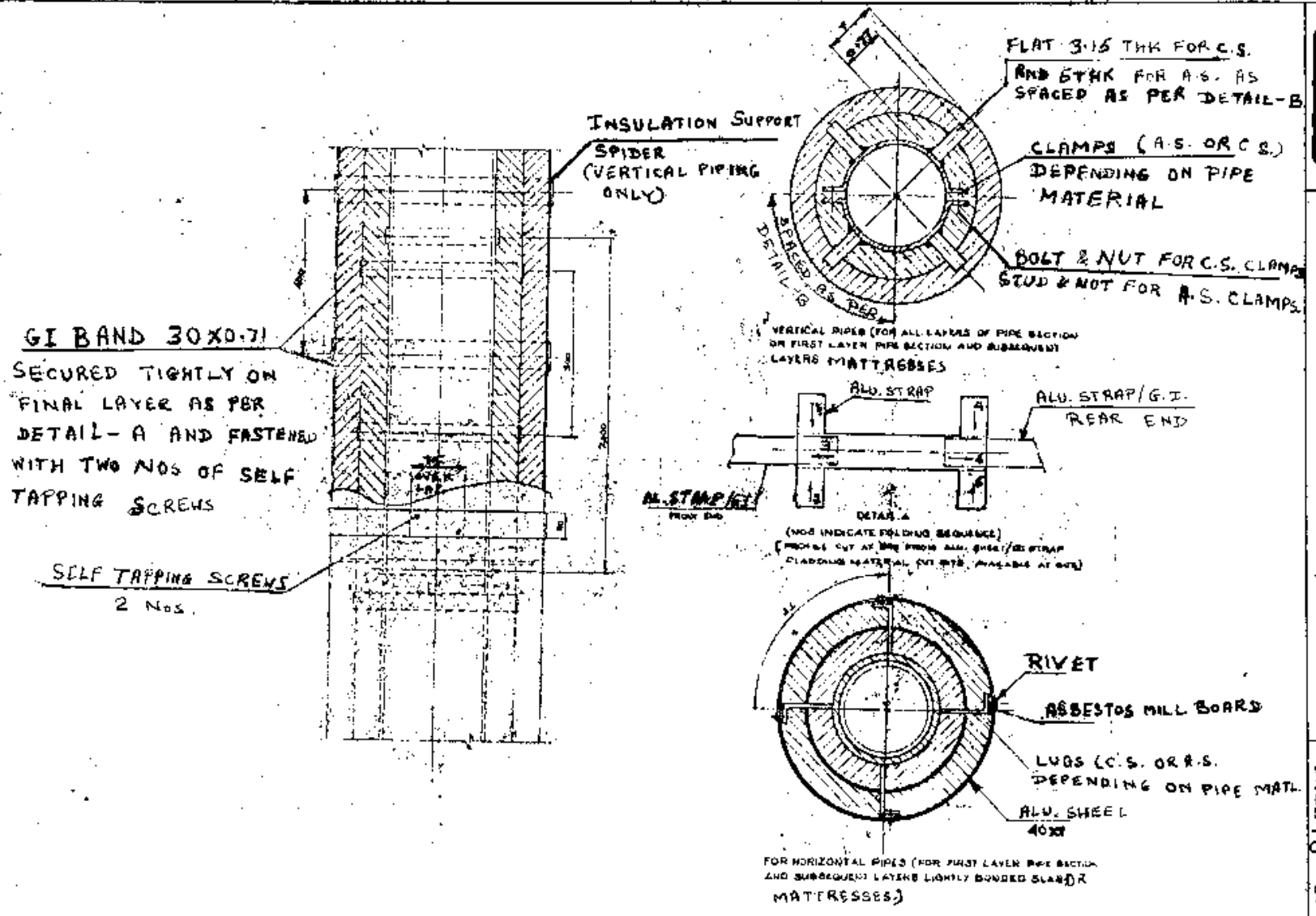

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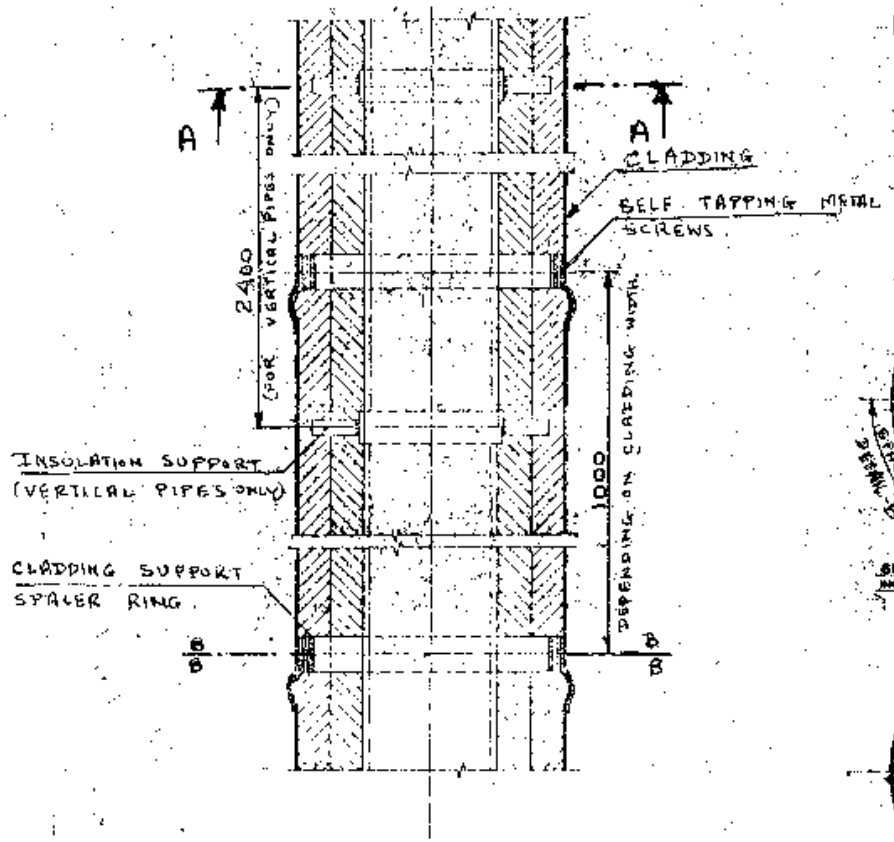

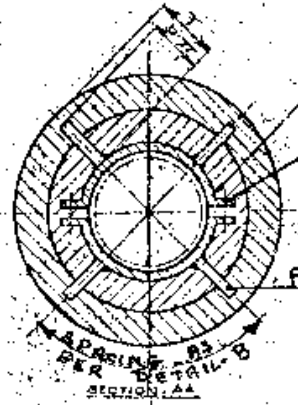

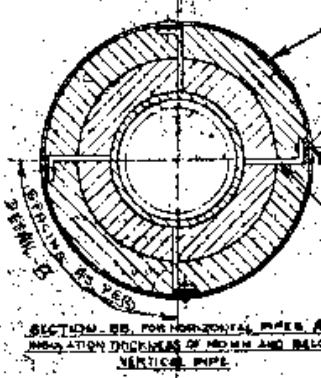

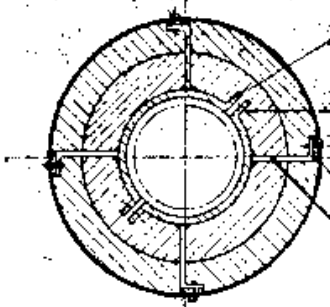

SECTION - BB
FOR VERTICAL PIPES WITH INSULATION THICKNESS 161 MM AND ABOVE.

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NOTES ON ERECTION :-

A. (ONLY PIPE SECTION)

1.Fix support spider on vertical pipes. Bottom most spider at tangent point of bend/tee.
2.Commence insulation of all layers except last layers of insulation, from support spider level in vertical pipes.
3.Fit each layer of insulation and secure with 30 x 0.71 GI bands at spacing as shown. Secure it tightly by cutting the alu. sheet as per detail-A.
4.Secure last layer of insulation and fasten it at a GI band 30 x0.71 (as detail-A).
5.Fix cladding sheet and apply sealant.
6.For horizontal pipes use GI bands 30 x0.71 and secure it as per detail-A.

B. FIRST LAYER PIPE SECTION AND SUBSEQUENT LAYERS LRB MATTRESSES OR MATTRESSES.

1.For horizontal pipes secure tightly the first layer of pipe section using 30 x 0.71 GI bands and as per detail-A.
2.Insert lugs for horizontal pipes and secure it tightly using alu. sheet 40 x1 as per detail-A.
3.Fit in asbestos mill board and rivet.
4.Insert the LRB mattresses or mattresses with field cut slots from edge in felt and wire netting to clear lugs.
5.Fix cladding sheet and apply sealant.
6.For fixing of insulation in vertical pipes follow the same as the one for pipe section.

C. GENERAL

a) After proper folding (as per detail-A) the ends are to be properly fastened by using two nos. self tapping screws per band.
b) Lugs/flats are issued in standard length running meters. They are to be cut at site depending on insulation thickness.

D. NOTES ON APPLICATION

1.Fix insulation support spiders on vertical pipes. Bottom most spider at tangent point of bend/tee at bottom.
2.Fix cladding support spacer ring at specified intervals by using aluminium strap tightly (as per detail-A).
3. Commence insulation on all layers of insulation except last layer from support spider level in vertical pipes.
4. Insert insulation at support spacer rings locations with field cut slots from edge in felt and wire netting to clean lugs/projection.
5. Stitch wire netting together at all edges and field cuts.

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6. Adjacent layers of insulation to be disposed to result in 50 mm overlap.
7. Fit last layer of insulation.
8. All gaps in insulation to be filled with cuttings & finished.
9. Provide and fix cladding with sealing compound.
10. Lugs and flats are issued for standard height. It has to be cut at site depending on insulation thickness (refer insulation schedule for the thickness of insulation).
11. This is applicable for LRB mattresses or mattresses (both for horizontal and vertical piping).

DETAIL-B

OUTER DIA. OF PIPE	NO.OFF
Upto 219	4
273 to 406	6
Above 406	8

E. Inspection at site during and after application of insulation shall be carried out as stipulated in the enclosed field quality plan.

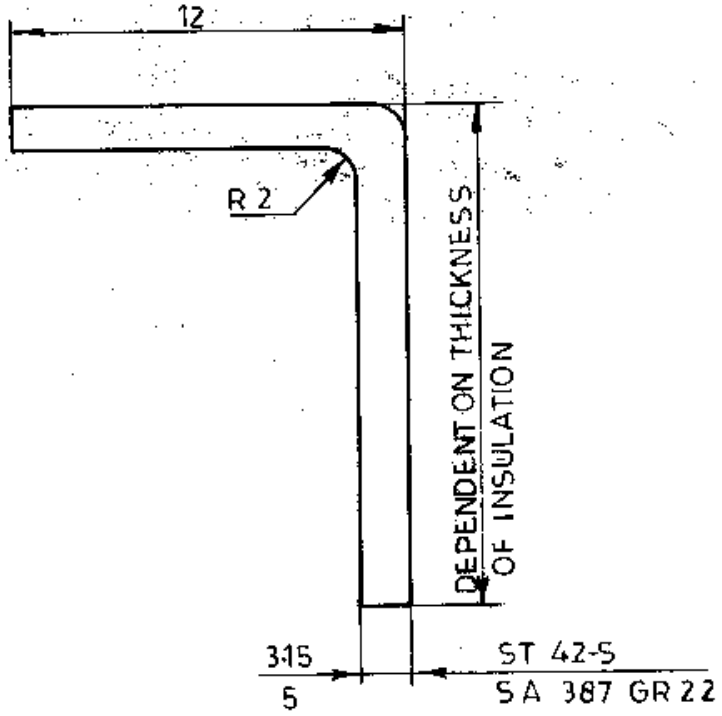
F. CROSS REFERRED STANDARDS :-

IS:737

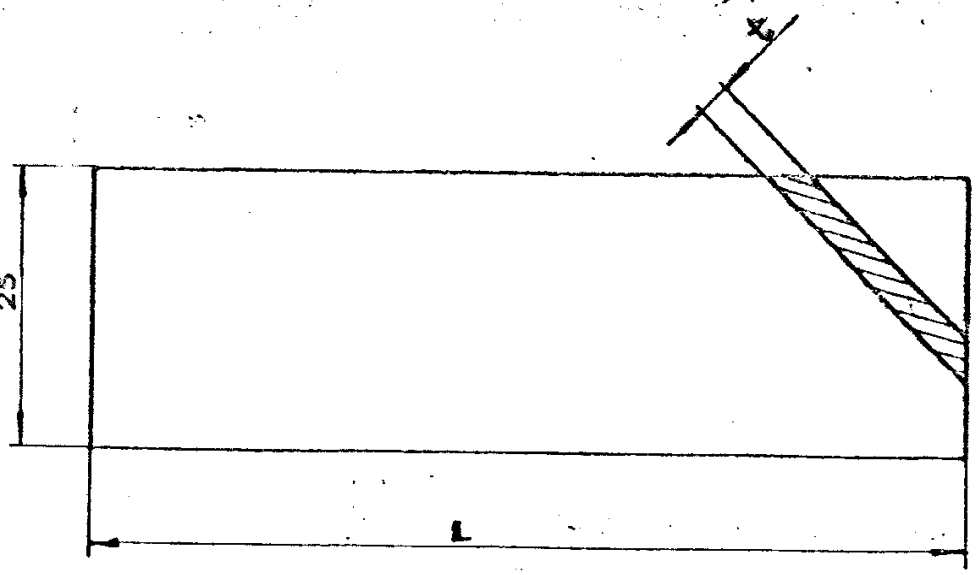
IS:8183

IS:9842

IS:14164



LUGS



NOTE :-

1. 'L' = 0.7 x INSULATION THICKNESS
2. 't' = 3.15 THK FOR CARBON STEEL (VAR.01)
   5 THK FOR ALLOY STEEL (VAR.02)

VARIANT NO.	DESCRIPTION	STD	MATL CODE	A/C	UNIT	UNIT WT
			MATL SPEC			QTY.
02	PLATE-5mm Thk.		IS 962 255 / SA 387 GR22			1
01	PLATE-3/5mm-Thk		ST 42-S			1

FLAT

INVENTORY No. P.57888

SIGN & DATE 27/6/80

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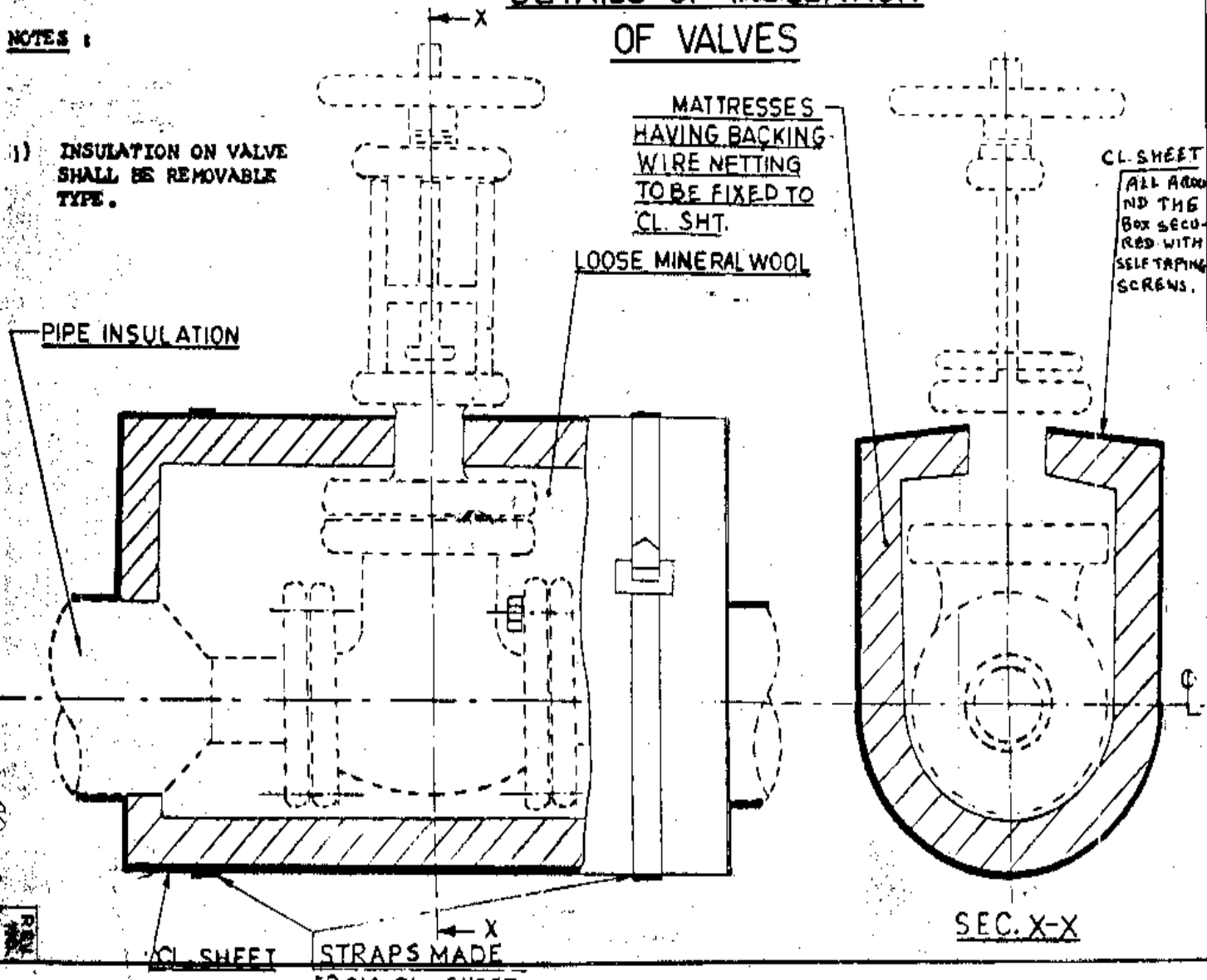
DETAILS OF INSULATION OF VALVES

NOTES :

1) **INSULATION ON VALVE SHALL BE REMOVABLE TYPE.**



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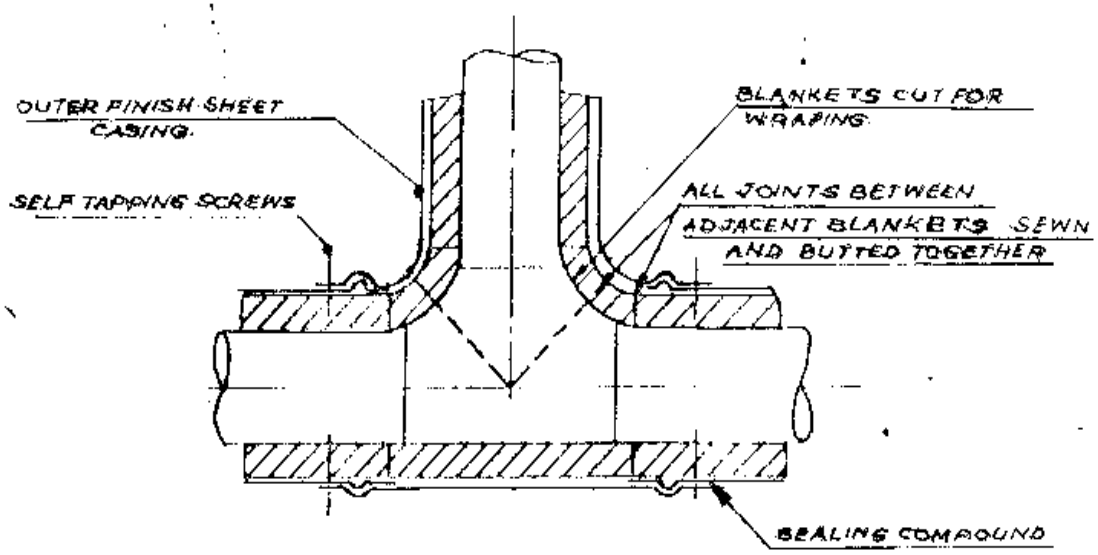
P-5788	22/6/89				

WORKED BY:- Rajan

CHECKED BY:-

REV. NO. 04

FIXING OF INSULATION ON TEES



TEE INSULATION
(WITH MATTRESS INSULATION)

PRODUCT STANDARD

STEAM TURBINE ENGINEERING

ST 29005

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FORM

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P-5788	22-14/89				

REV. NO. 04

WORKED BY:- Rajan

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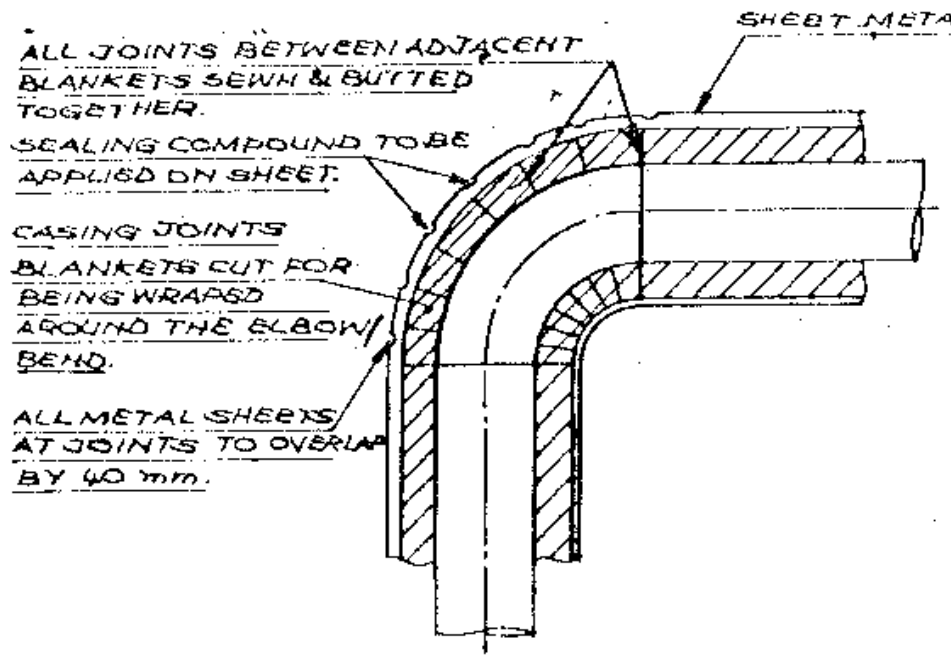
FIXING OF INSULATION ON BENDS / ELBOWS



WITH MATTRESS

PRODUCT STANDARD

STEAM TURBINE ENGINEERING

ST 29005

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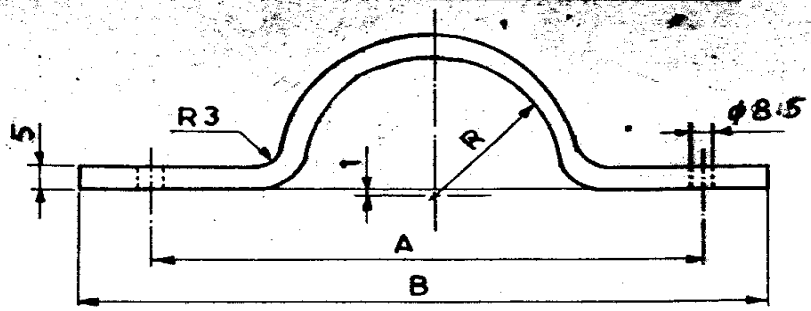
FORM

PIPE CLAMPS (CARBON STEEL)



VAR.	A	B	R	NB	DESCRIPTION	MATL SPCN.	UNIT WT.
01	76	91	30	50	PL. 5X50X120	ST 42-S/IS226	0.240
02	88	103	37	65	PL. 5X50X142		0.280
03	104	119	44	80	PL 5X50X166		0.320
04	129	144	57	100	PL. 5X50X210		0.45
05	183	198	84	150	PL. 5X50X288		0.570
06	234	249	110	200	PL. 5X50X371		0.730
07	288	303	137	250	PL. 5X50X455		0.900
08	339	354	162	300	PL. 5X50X 534		1.050
09	371	386	178	350	PL. 5X50X 584		1.150
10	421	436	203	400	PL 5X50X 663		1.300
11	473	488	229	450	PL. 5X50X746		1.400
12	523	538	254	500	PL 5X50X 820		1.620
13	123	138	54	100	PL 5X50X200		0.400
14	174	189	80	150	PL 5X50X 282		0.550
15	579	594	280	550	PL 5X50X910		1.800
16	156	171	70	125	PL 5X50X248	ST 42-S/IS226	0.480

SUPERSEDES INVENTORY No.

SIGN & DATE

INVENTORY NO. P-5788

SIGN & DATE 2/4/89

REV. NO. 04

WORKED BY:— Rajan

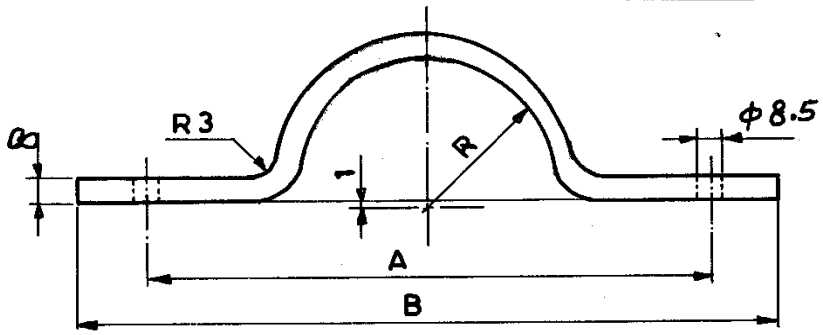
CHECKED BY:— [signature]

FORM

PRODUCT STANDARD
STEAM TURBINE ENGINEERING

ST 29005
PAGE 20 OF 23

PIPE CLAMPS (ALLOY STEEL)



VAR.	A	B	R	NB	DESCRIPTION	MATL. SPCN.	UNIT WT.
01	76	91	30	50	PL. 8 X 50 X 125	13 Cr M044	0 400
02	88	103	37	65	PL 8X50X 150	↑	0 480
03	183	198	84	150	PL 8X50 X 295		0 920
04	234	249	110	200	PL 8X50X 380		1 200
05	288	303	137	250	PL 8X50X 460		1 450
06	371	306	178	350	PL. 8X50X 590		1 850
07	421	436	203	400	PL. 8X50X 670		2 100
08	473	488	229	450	PL. 8X50X 752		2 400
09	523	538	254	500	PL. 8X50X 824		2 600
10	626	644	305	600	PL. 8X50 X 990		3 000
11	123	138	54	100	PL. 8X50 X 200		0 630
12	129	144	57	100	PL. 8X50 X 210		0 660
13	174	189	80	150	PL. 8X50 X 282		0 900
14	339	354	162	300	PL. 8X50X 540		1 700
15	365	380	175	350	PL. 8X50X 580		1 820
16	569	584	280	550	PL. 8X50X910		2 860
17	104	119	44	80	PL. 8X50X166		0 520
18	156	171	70	125	PL. 8X50X 248	↓	0 78
19	730	745	356	700	PL. 8X50 X 1150	13 Cr Mo 44	3 610

SIGN & DATE

SUPERSEDES INVENTORY No.

SIGN & DATE 27/6/89

INVENTORY NO. P-57888

REV. NO. 04

WORKED BY :- Rajan

CHECKED BY :-

FIELD QUALITY PLAN :

SL NO	COMPONENT/ OPERATION	CHARACTERISTIC CHECKED	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
01	STORAGE AND HANDLING	Damage in transit and handling	MA	Visual	100%	Specif. & IS 10556	Specif. & IS 10556	Log Sheet	No breakage and damage of insulating materials. No distortion or tearing off the packing.
		Storage location	MA	-do-	-do-	-do-	-do-	-do-	Stacked under covered shed.
		Storage space and surroundings.	MA	-do-	-do-	-do-	-do	-do	Free from damp, oil, fume and sulphur bearing gases.
		Stacking height	MA	-do-	-do-	-do-	-do-	-do-	2 M. for pipe sections and 3 M. for mattresses.
		Platform	MA	-do-	-do-	-do-	-do-	-do-	Concrete or wooden.

Contd. on page 22

WORKED BY :— Rajan

CHECKED BY :— S Chandra

REV. NO. 04

FIELD QUALITY PLAN :-

SL NO	COMPONENT/ OPERATION	CHARACTERISTIC CHECKED	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
02	APLLICATION	Surface cleanliness	MA	Visual	Random	Specification	Specification	Log Sheet	Surface shall be from dirt, rust, scale, oil etc. and dried.
		Insulation material appearence.	MA	-do-	-do-	-do-	-do-	-do-	Material shall be uniform and free from cracks, voide etc.
		Binding wires/ Bands spacing	MA	-do-	-do-	Appd. drg & specif.	Appd. drg & specif.	-do-	
		Wire netting dimensions and location.	MA	-do-	-do-	-do-	-do-	-do-	
		Wire ends	MA	-do-	-do-	-do-	-do-	-do-	Wire ends shall be twisted and bent inside.
		Supports arrangements & spacing	MA	-do-	-do-	-do-	-do-	-do-	
		Expansion joints spacing.	MA	-do-	-do-	-do-	-do-	-do-	
		Insulation thickness test	MA	Physical	10%	IS 7413 & Specf.	IS 7413 & Specf.	-do-	
		Uniformity of thickness	MA	-do-	-do-	-do-	-do-	-do-	
		Bulk density test	MA	-do-	-do-	-do-	-do-	-do-	

Contd. on page 23

WORKED BY :- Rajan

REV. NO. 04

CHECKED BY :- [illegible]

FIELD QUALITY PLAN

SL NO	COMPONENT/ OPERATION	CHARACTERISTIC CHECKED	CAT	TYPE/ METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	REMARKS
03	FINISHING	Cladding material thickness	MA	Visual	Random	Appd. Drg & Specif.	Appd. Drg & Specif.	Log Sheet	
		ST Screws	MA	-do-	-do-	-do-	-do-	-do-	
		Grooving/ overlapping	MA	-do-	-do-	-do-	-do-	-do-	
		Joints Sealing	MA	-do-	-do-	-do-	-do-	-do-	
		Appearance	MA	-do-	-do-	-do-	-do-	-do-	Surfaces shall be uniform & free from cracks, dents etc.
04	PERFORMANCE TESTING This shall be conducted after commissioning the plant.	Ambient temperat.	MA	Physical	10%	Specif.	Specif.	Log sheet	Shall be measured at a distance of 1 M from the insulation surface
		Ambient air velocity	MA	-do-	-do-	-do-	-do-	-do-	-do-
		Cold face temperature	MA	-do-	-do-	-do-	-do-	-do-	Shall be measured at insulation cladding surface. This shall not be more than the specified value at the specified design conditions.

WORKED BY:- Rajan

REV. NO. 04

CHECKED BY:-

	THERMAL INSULATION SCHEDULE FOR TURBINE INTEGRAL PIPING TURBINE LAYOUT GROUP	BHEL DOC. NO. 412114W6000
		REV. – 0 / DATE: 08.07.2020
		MATERIAL CODE: W90313146098

Project		SPEC DOC. NO.
2X660MW UDANGUDI TPP		ST29005 Rev_04

Specifications are as below:

1. **DESIGN PARAMETERS:**

Sl No	Description	Value
1	COLD FACE TEMPERATURE	60 DEG C
2	AMBIENT TEMPERATURE	40 DEG C
3	EMISSIVITY OF AL. SHEET	0.2
4	WIND VELOCITY	0.5 M/S
5	DESIGN HEAT LOSS AT CLADDING SURFACE	IS14164 (LATEST EDITION OR EQUIVALENT)

2. MATERIALS:

Sl No	Description	Value
6	INSULATION MATERIAL	LIGHTLY RESIN BONDED ROCKWOOL AS PER IS: 8183.
7	DENSITY	1. 100 KG/M^3 FOR HOT FACE TEMP. UPTO 400°C 2. 150 KG/M^3 FOR HOT FACE TEMP. ABOVE 400°C
8	CLADDING MATERIAL	ALUMINIUM SHEET AS PER IS: 737

3. SPECIAL INSTRUCTIONS:

- ENTIRE INSULATION MATERIAL SHALL BE ASBESTOS FREE.

Prepared by	Approved by
Rajeev kumar Dy Manager- TL 08.07.2020	ANUJ JAIN Digitally signed by ANUJ JAIN DN: cn=ANUJ JAIN, o=BHEL, ou=HEEP, email=anuj.jain@bhel.in, c=IN Date: 2020.07.08 13:30:21 +05'30' Anuj Jain DGM- TL

Bill of Materials for Thermal Insulation of TIP
Turbine Drainage System

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
1	MAG10BR100	CAP	498	114.3	-							1		
2		CAP	498	323.9	-							1		
3		ELBOW	498	1219	-	1								
4		FLANGE	498	285	-				1					
5		WELDOLET	498	1219	-								2	
6		TUBE/PIPE	498	114.3	0.5									
7		TUBE/PIPE	498	168.3	0.5									
8		TUBE/PIPE	498	1219	5.5									
9	MAG10BR101	ELBOW	80	323.9	-	1								
10		FLANGE	80	485	-				2					
11		TEE	80	323.8	-		1							
12		TUBE/PIPE	80	323.9	5.0									
13	MAG10BR102	TUBE/PIPE	498	323.9	2.5									
14	MAG10BR110	CAP	498	323.8	-							1		
15		CAP	498	114.3	-							1		
16		ELBOW	498	1219	-	1								
17		FLANGE	498	285	-				1					
18		WELDOLET	498	1219	-								2	
19		TUBE/PIPE	498	168.3	0.5									
20		TUBE/PIPE	498	114.3	0.5									
21		TUBE/PIPE	498	323.9	6.0									
22	MAG10BR111	ELBOW	80	323.9	-	1								
23		FLANGE	80	485					2					
24		TEE	80	323.8			1							
25		TUBE/PIPE	80	323.9	8.0									
26	MAG10BR112	TUBE/PIPE	499	323.9	2.5									
27	MAL01BR001	ELBOW	617	323.8	-	1								
28		CAP	617	323.8	-							1		
29		TUBE/PIPE	617	323.8	2.0									
30		WELDOLET	617	323.8	-								8	

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
31	MAL02BR001	ELBOW	617	323.8	-	1								
32		CAP	617	323.8	-							1		
33		TUBE/PIPE	617	323.8	1.8									
34		WELDOLET	617	323.8	-								6	
35	MAL03BR001	ELBOW	617	323.8	-	1								
36		CAP	617	323.8								1		
37		TUBE/PIPE	617	323.8	4.5									
38		WELDOLET	617	323.8	-								7	
39	MAL04BR001	ELBOW	617	323.8	-	2								
40		CAP	617	323.8	-							1		
41		TUBE/PIPE	617	323.8	3.0									
42		WELDOLET	617	323.8	-								12	
43	MAL11BR001	TEE	601	60.3	-		2							
44		CAP	601	60.3	-							1		
45		BEND	601	60.3	-						7			
46		VALVE	601	60.3	-					2				
47		TUBE/PIPE	601	60.3	15.0									
48		TUBE/PIPE	601	73	0.5									
49	MAL12BR001	TEE	601	60.3	-		2							
50		CAP	601	60.3	-							1		
51		BEND	601	60.3	-						12			
52		TUBE/PIPE	601	60.3	14.0									
53		TUBE/PIPE	601	73	0.5									
54		VALVE	601	60.3	-					2				
55	MAL14BR001	VALVE	587	48.3	-					2				
56		TEE	587	48.3	-		2							
57		CAP	587	48.3	-							1		
58		BEND	587	48.3	-						8			
59		ELBOW	587	48.3	-	2								
60		TUBE/PIPE	587	48.3	22.5									
61		TUBE/PIPE	587	60.3	0.5									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
62	MAL19BR001	CAP	601	60.3	-							1		
63		TEE	601	60.3	-		2							
64		VALVE	601	60.3	-					2				
65		BEND	601	60.3	-						10			
66		TUBE/PIPE	601	73	0.5									
67		TUBE/PIPE	601	60.3	15.0									
68	MAL20BR001	CAP	570	60.3	-							1		
69		TEE	570	60.3	-		2							
70		BEND	570	60.3	-						4			
71		TUBE/PIPE	570	73	0.5									
72		TUBE/PIPE	570	60.3	16.0									
73		VALVE	570	60.3	-					2				
74	MAL22BR001	ELBOW	541	48.3	-	2								
75		REDUCER	541	60.3				1						
76		TUBE/PIPE	541	48.3	2.5					3				
77	MAL22BR002	ELBOW	541	48.3	-	2								
78		TUBE/PIPE	541	48.3	2.0					3				
79	MAL22BR003	CAP	541	60.3	-							1		
80		VALVE	541	60.3	-					2				
81		TEE	541	60.3	-		3							
82		BEND	541	60.3	-						8			
83		TUBE/PIPE	541	60.3	15.0									
84		TUBE/PIPE	541	73	0.5									
85	MAL23BR001 MAL23BR002	BEND	601	60.3	-						13			
86		BEND	601	33.4	-						3			
87		CAP	601	60.3	-							1		
88		TEE	601	60.3	-		2							
89		VALVE	601	60.3	-					2				
90		TUBE/PIPE	601	33.4	2.0									
91		TUBE/PIPE	601	73	0.5									
92		TUBE/PIPE	601	60.3	20.0									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
93		ELBOW	601	60.3		2								
94		VALVE	601	33.4	-					3				
95	MAL24BR001	BEND	601	60.3	-						9			
96		CAP	601	60.3	-							1		
97		TEE	601	60.3	-		2							
98		TUBE/PIPE	601	73	0.5									
99		VALVE	601	60.3	-					2				
100		TUBE/PIPE	601	60.3	28.0									
101	MAL24BR002	BEND	601	33.4	-						2			
102		TUBE/PIPE	601	33.4	1.0									
103		VALVE	601	33.4	-					3				
104	MAL25BR001	BEND	442	48.3	-						12			
105		VALVE	442	48.3	-					2				
106		CAP	442	48.3	-							1		
107		TEE	442	48.3	-		1							
108		TUBE/PIPE	442	60.3	0.5									
109		TUBE/PIPE	442	48.3	15.0									
110	MAL26BR001	ELBOW	601	60.3		15								
111		CAP	601	60.3								1		
112		TEE	601	60.3			2							
113		TUBE/PIPE	601	73	0.5									
114		TUBE/PIPE	601	60.3	19.0									
115		VALVE	601	60.3						2				
116	MAL26BR00-	BEND	601	33.4	-						2			
117		TUBE/PIPE	601	33.4	2.0									
118		VALVE	601	33.4	-					3				
119	MAL27BR001	BEND	601	60.3							12			
120		CAP	601	60.3								1		
121		ELBOW	601	60.3		1								
122		TEE	601	60.3			2							
123		TUBE/PIPE	601	60.3	21.0									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
124		TUBE/PIPE	601	73	0.5									
125		VALVE	601	60.3						2				
126		BEND	601	33.4	-						2			
127	MAL27BR002	TUBE/PIPE	601	33.4	1.5									
128		VALVE	601	33.4	-					3				
129		BEND	601	33.4	-						2			
130	MAL31BR001	TUBE/PIPE	601	33.4	10.5									
131		ELBOW	601	33.4	-	4								
132	MAL31BR002	TUBE/PIPE	601	33.4	3.0									
133		ELBOW	601	33.4	-	2								
134		BEND	601	60.3							6			
135		CAP	601	60.3								1		
136		REDUCER	601	60.3				1						
137	MAL31BR003	TEE	601	60.3			3							
138		VALVE	601	60.3						2				
139		TUBE/PIPE	601	60.3	10.5									
140		TUBE/PIPE	601	73	0.5									
141		CAP	432	60.3								1		
142		ELBO	432	60.3		5								
143	MAL41BR001	TEE	432	60.3			3							
144		VALVE	432	60.3						2				
145		TUBE/PIPE	432	73	0.5									
146		TUBE/PIPE	432	60.3	9.0									
147		BEND	432	48.3	-						1			
148	MAL41BR002	TUBE/PIPE	432	48.3	11.5									
149		ELBO	432	48.3	-	5								
150		CAP	496	60.3								1		
151		TEE	496	60.3			1							
152		BEND	496	60.3							2			
153	MAL45BR001	VALVE	496	60.3						2				
154		ELBOW	496	60.3		2								

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
155		TUBE/PIPE	496	60.3	11.0									
156		TUBE/PIPE	496	73	0.5									
157	MAL47BR001	CAP	408	60.3								1		
158		ELBOW	408	60.3		4								
159		VALVE	408	60.3						2				
160		TEE	408	60.3			1							
161		TUBE/PIPE	408	60.3	5.5									
162		TUBE/PIPE	408	73	0.5									
163	MAL51BR001	CAP	277	60.3								1		
164		VALVE	277	60.3						2				
165		TEE	277	60.3			2							
166		ELBOW	277	60.3		5								
167		TUBE/PIPE	277	60.3	3.0									
168		TUBE/PIPE	277	73	0.5									
169	MAL51BR003	TUBE/PIPE	277	33.4	8.5									
170		BEND	277	33.4	-						4			
171	MAL51BR004	BEND	277	33.4	-						7			
172		TUBE/PIPE	277	33.4	13.0									
173		TEE	277	33.4	-		1							
174	MAL54BR001	BEND	148	60.3							9			
175		CAP	148	60.3								1		
176		ELBOW	148	60.3		1								
177		TEE	148	60.3			1							
178		VALVE	148	60.3						2				
179		TUBE/PIPE	148	60.3	34.0									
180		TUBE/PIPE	148	73	0.5									
181	MAL55BR001	BEND	220	60.3							10			
182		CAP	220	60.3								1		
183		ELBOW	220	60.3		1								
184		TEE	220	60.3			1							
185		VALVE	220	60.3						2				

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
186		TUBE/PIPE	220	60.3	31.0									
187		TUBE/PIPE	220	73	0.5									
188	MAL65BR001	BEND	382	60.3							4			
189		CAP	382	60.3								1		
190		TEE	382	60.3			2							
191		ELBOW	382	60.3		3								
192		TUBE/PIPE	382	60.3	18.0									
193		VALVE	382	60.3						2				
194	MAL81BR001	BEND	585	33.4							8			
195		CAP	585	33.4								1		
196		VALVE	585	33.4						2				
197		TEE	585	33.4			3							
198		TUBE/PIPE	585	33.4	16.0									
199		TUBE/PIPE	585	48.3	0.5									
200	MAL81BR002	TUBE/PIPE	585	33.4	5.5									
201		BEND	585	33.4	-						7			
202	MAL81BR003	BEND	585	33.4	-						8			
203		TUBE/PIPE	585	33.4	11.5									
204		INST	585	33.4	-					3				

Bill of Materials for Thermal Insulation of TIP
Seal Steam System

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
1	LBC41BR001	ELBOW	480	168.3		5								
2		VALVE	480	168.3						1				
3		TUBE/PIPE	480	273.1	9									
4	LBC41BR002	TUBE/PIPE	382	273.1	1									
5		ELBO	382	273.1		2								
6	MAM10BR001	BEND	549	48.3							9			
7		TUBE/PIPE	549	48.3	16.5									
8	MAM10BR002	BEND	549	48.3							9			
9		TUBE/PIPE	549	48.3	15									
10	MAM10BR003	BEND	549	48.3							10			
11		TUBE/PIPE	549	48.3	26									
12	MAM10BR004	BEND	549	48.3							5			
13		TUBE/PIPE	549	48.3	6									
14	MAM10BR005	BEND	549	26.7							11			
15		TUBE/PIPE	549	26.7	20									
16	MAM10BR008	BEND	549	60.3							6			
17		CAP	549	60.3								1		
18		TEE	549	60.3			2							
19		TUBE/PIPE	549	60.3	7.5									
20	MAM10BR010	BEND	549	60.3							7			
21		CAP	549	60.3								1		
22		TEE	549	60.3			2							
23		TUBE/PIPE	549	60.3	13.5									
24	MAM20BR002	BEND	277	33.4							5			
25		TUBE/PIPE	277	33.4	4									
26	MAM20BR003	BEND	277	33.4							5			
27		TUBE/PIPE	277	33.4	3.6									
28	MAM20BR004	BEND	432	48.3							7			
29		WELDOLET	432	48.3									1	
30		TUBE/PIPE	432	48.3	9.7									
31	MAM20BR001	CAP	432	88.9								1		
32		ELBOW	432	88.9		3								
33		BEND	432	33.4			2							
34		BEND	432	48.3			1							
35		TUBE/PIPE	432	33.4	0.5									
36		TUBE/PIPE	432	48.3	0.5									
37		TUBE/PIPE	432	88.9	8.2									
38	MAM20BR006	BEND	549	48.3							9			
39		WELDOLET	549	48.3									1	
40		TUBE/PIPE	549	48.3	7.5									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
41	MAM20BR007	BEND	549	48.3							2			
42		ELBOW	549	48.3		7								
43		WELDOLET	549	48.3									1	
44		TUBE/PIPE	549	48.3	8									
45	MAM20BR010	CAP	549	114.3								1		
46		ELBOW	549	114.3		1								
47		BEND	549	114.3							1			
48		TEE	549	114.3			4							
49		TUBE/PIPE	549	114.3	8.5									
50	MAM20BR009	BEND	585	48.3							1			
51		ELBOW	585	48.3		9								
52		WELDOLET	585	48.3									1	
53		TUBE/PIPE	585	48.3	8.8									
54	MAM20BR008	BEND	585	48.3							9			
55		WELDOLET	585	48.3									1	
56		TUBE/PIPE	585	48.3	10									
57	MAM30BR001	BEND	585	42.2							9			
58		TUBE/PIPE	585	42.2	14									
59	MAM30BR002	BEND	585	42.2							15			
60		TUBE/PIPE	585	42.2	28									
61	MAM30BR003	BEND	585	42.2							17			
62		TUBE/PIPE	585	42.2	43									
63	MAM30BR004	BEND	585	42.2							1			
64		TUBE/PIPE	585	42.2	4.5									
65	MAM30BR008	CAP	585	60.3								1		
66		BEND	585	60.3		4								
67		TEE	585	60.3			2							
68		TUBE/PIPE	585	60.3	8									
69	MAM30BR010	CAP	585	60.3								1		
70		BEND	585	60.3							4			
71		TEE	585	60.3			2							
72		ELBOW	585	60.3		2								
73		TUBE/PIPE	585	60.3	14									
75	MAM40BR001	BEND	585	42.2							5			
78		TUBE/PIPE	585	42.2	7.6									
80	MAM40BR002	BEND	585	42.2							11			
83		TUBE/PIPE	585	42.2	16									
85	MAM40BR003	BEND	585	42.2							8			
88		TUBE/PIPE	585	42.2	14									
90	MAM40BR004	BEND	585	42.2							11			
93		TUBE/PIPE	585	42.2	13									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
94		CAP	585	88.9								1		
97	MAM40BR005	ELBOW	585	88.9		2								
98		TUBE/PIPE	585	88.9	5.5									
99		ELBOW	335	88.9		2								
100		TEE	335	88.9			1							
101	MAW10BR001	TUBE/PIPE	335	88.9	1									
102		VALVE	335	88.9						1				
103		VALVE	335	273						1				
104		VALVE	320	273						1				
105		ELBOW	320	273		2								
106	MAW10BR002	BEND	320	273							3			
107		TEE	320	273			1							
108		TUBE/PIPE	320	273	2									
109		VALVE	335	88.9						2				
110		ELBOW	335	88.9		1								
111	MAW10BR003	BEND	335	88.9							3			
112		REDUCER	335	88.9				1						
113		TUBE/PIPE	335	88.9	1									
114		VALVE	320	273						1				
115	MAW10BR004	BEND	320	273							4			
116		TUBE/PIPE	320	273	1.5									
117		REDUCER	470	323.8				1						
118		ELBOW	470	273		3								
119	MAW20BR001	FLANGE	470	273					2					
120		TEE	470	273			2							
121		TUBE/PIPE	470	273	4									
122		BEND	470	323.8							5			
123		WELDOLET	470	323.8									1	
124	MAW20BR002	REDUCER	470	323.8				1						
125		TEE	470	323.8			3							
126		TUBE/PIPE	470	323.8	4									
127		ELBOW	360	273		2								
128	MAW20BR003	FLANGE	360	273					2					
129		TEE	360	273			5							
130		TUBE/PIPE	360	273	13.5									
131		FLANGE	360	88.9					2					
132	MAW20BR004	WELDOLET	360	88.9									1	
133		BEND	360	88.9							1			
134		TUBE/PIPE	360	88.9	0.5									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
135		VALVE	360	21.3					2					
136		TUBE/PIPE	360	21.3	0.5									
137		TUBE/PIPE	360	33.4	1									
138		TUBE/PIPE	360	88.9	4.5									
139	MAW20BR005	WELDOLET	360	88.9									2	
140		ELBOW	360	88.9		2								
141		CAP	360	88.9								1		
142		BEND	360	88.9							4			
143		REDUCER	360	33.4				2						
144		TUBE/PIPE	470	114.3	6									
145	MAW21BR001	FLANGE	470	141.3					2					
146		ELBOW	470	114.3		5								
147		TUBE/PIPE	470	114.3	7.5									
148	MAW21BR002	FLANGE	470	141.3					2					
149		ELBOW	470	114.3		5								
150		TUBE/PIPE	470	168.3	6.5									
151	MAW21BR003	TEE	470	168.3			1							
152		REDUCER	470	168.3				1						
153		BEND	470	168.3							3			
154		TUBE/PIPE	470	168.3	8									
155	MAW22BR001	TEE	470	168.3			1							
156		REDUCER	470	168.3				1						
157		ELBOW	470	168.3		4								
158		TUBE/PIPE	470	114.3	5.5									
159	MAW22BR002	BEND	470	114.3							1			
160		FLANGE	470	141.3					2					
161		ELBOW	470	114.3		4								
162		TUBE/PIPE	470	114.3	4.5									
163	MAW22BR003	FLANGE	470	141.3					2					
164		ELBOW	470	114.3		4								
165		BEND	470	114.3							1			
166		TUBE/PIPE	470	114.3	5.5									
167	MAW23BR001	FLANGE	470	141.3					2					
168		ELBOW	470	114.3		4								
169		TUBE/PIPE	470	114.3	6									
170	MAW23BR002	FLANGE	470	141.3					2					
171		ELBOW	470	114.3		3								

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
172	MAW23BR003	TUBE/PIPE	470	219	5									
173		TUBE/PIPE	470	168.3	8.5									
174		TEE	470	168.3			1							
175		REDUCER	470	168.3				1						
176		ELBOW	470	168.3		5								
177	MAW24BR001	TUBE/PIPE	470	141.3	5									
178		REDUCER	470	141.3				1						
179		ELBOW	470	141.3		2								
180	MAW24BR002	TUBE/PIPE	470	141.3	4									
181		ELBOW	470	141.3		2								
182		REDUCER	470	141.3				1						
183	MAW24BR003	TEE	470	168.3			1							
184		TUBE/PIPE	470	168.3	8									
185		REDUCER	470	168.3				1						
186		ELBOW	470	168.3					5					
187	MAW24BR004	TUBE/PIPE	470	114.3	3									
188		ELBOW	470	114.3		2								
189		FLANGE	470	141.3					2					
190	MAW24BR005	TUBE/PIPE	470	114.3	2.5									
191		ELBOW	470	114.3		2								
192		FLANGE	470	141.3					2					
193	MAW25BR001	BEND	360	114.3							6			
194		TUBE/PIPE	360	114.3	11.5									
195		FLANGE	360	141.3				2						
196		ELBOW	360	114.3		4								
197	MAW26BR001	TUBE/PIPE	360	114.3	10.5									
198		FLANGE	360	114.3					2					
199		ELBOW	360	114.3		4								
200		BEND	360	114.3							5			
201	MAW27BR001	BEND	360	114.3							3			
202		ELBOW	360	114.3		6								
203		FLANGE	360	114.3					2					
204		TUBE/PIPE	360	114.3	12									
205	MAW28BR001	BEND	360	114.3							8			
206		ELBOW	360	114.3		3								
207		FLANGE	360	114.3					2					
208		TUBE/PIPE	360	114.3	10									
209	MAW50BR003	ELBOW	585	457.2		1								
210		TUBE/PIPE	585	457.2	1		1						1	
211		VALVE	585	457.2						1				

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
212	MAW50BR002	VALVE	585	457.2						1				
213		TUBE/PIPE	585	457.2	13									
214		TEE	585	457.2			1							
215		ELBOW	585	457.2		9								
216	MAW50BR004	VALVE	585	457.2						1				
217		TUBE/PIPE	585	457.2	1									
218		ELBOW	585	457.2		4								
219	MAW50BR005	BEND	585	168.3		1								
220		FLANGE	585	168.3					2					
221		WELDOLET	585	168.3									1	
222		TUBE/PIPE	585	168.3	1									
223	MAW50BR006	ELBOW	585	457.2		2								
224		REDUCER	585	457.2				1						
225		TEE	585	457.2			1							
226		VALVE	585	457.2						1				
227		TUBE/PIPE	585	457.2	3									
228		TUBE/PIPE	585	406.4	0.5									
229	MAW60BR002	TUBE/PIPE	442	114.3	0.5									
230		TUBE/PIPE	442	48.3	0.5									
231		CAP	442	141.3								1		
232	MAW60BR004	TUBE/PIPE	510	168.3	5.5									
233		TEE	510	168.3			2							
234		CAP	510	168.3								1		
235		BEND	510	168.3							1			
236		ELBOW	510	168.3		2								
237	MAW60BR005	TUBE/PIPE	510	114.3	4.5									
238		ELBOW	510	114.3		4								
239		BEND	510	114.3							1			
240	MAW60BR006	TUBE/PIPE	510	114.3	4.5									
241		ELBOW	510	114.3		2								
242		BEND	510	114.3							1			
243	MAW60BR007	TUBE/PIPE	442	219.1	2									
244		TUBE/PIPE	510	219.1	15.5									
245		TEE	510	219.1			2							
246		WELDOLET	510	219.1									2	
247		BEND	510	219.1							3			
248		ELBOW	510	219.1		6								
249		CAP	510	219.1				1						

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
250	MAW60BR009	TUBE/PIPE	510	168.3	3									
251		TEE	510	168.3			2							
252		BEND	510	168.3							1			
253		ELBOW	510	168.3		2								
254		CAP	510	168.3								1		
256	MAW60BR010	TUBE/PIPE	510	114.3	5.5									
257		BEND	510	114.3							1			
258		ELBOW	510	114.3		5								
259	MAW60BR011	TUBE/PIPE	510	114.3	5.5									
260		BEND	510	114.3							1			
261		ELBOW	510	114.3		5								
262	MAW80BR001	VALVE	320	323.8						2				
263		TUBE/PIPE	320	323.8	53									
264		TUBE/PIPE	320	141.3	0.5									
265		TEE	320	323.8			3							
266		REDUCER	320	323.8				1						
267		FLANGE	320	141.3					1					
268		ELBOW	320	323.8		10								
269	MAW80BR002	TUBE/PIPE	320	273.1	4									
270		TEE	320	273.1			2							
271		REDUCER	320	273.1							1			
272		ELBOW	320	273.1		2								
273	MAW80BR003	TUBE/PIPE	320	219.1	3									
274		TEE	320	219.1			2							
275		CAP	320	219.1								1		
276	MAW80BR004	TUBE/PIPE	320	273	6									
277		TUBE/PIPE	320	60.3	0.5									
278		FLANGE	320	60.3					2					
279		ELBOW	320	273		5								
280	MAW80BR005	TUBE/PIPE	320	33.4	2.5									
281		TEE	320	33.4			1							
282		REDUCER	320	33.4				2						
283		BEND	320	33.4							6			
284		ELBOW	320	33.4		1								
285	MAW80BR006	TUBE/PIPE	320	33.4	3.5									
286		TEE	320	33.4			1							
287		REDUCER	320	33.4				2						
288		ELBOW	320	33.4		5								

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
289	MAW80BR008	VALVE	320	168.3						1				
290		TUBE/PIPE	320	168.3	8									
291		TEE	320	168.3			1							
292		FLANGE	320	168.3					2					
293		REDUCER	320	219.1				1						
294		CAP	320	168.3								1		
295		ELBOW	320	168.3		5								
296	MAW80BR009	VALVE	320	168.3						1				
297		TUBE/PIPE	320	168.3	1									
298		FLANGE	320	168.3					2					
299		REDUCER	320	219.1				1						
300		CAP	320	168.3								1		
301		ELBOW	320	168.3		2								
302	MAW80BR012	TUBE/PIPE	320	33.4	0.5									
303		VALVE	320	219.1						1				
304		ELBOW	320	219.1		2								
305		FLANGE	320	219.1					2					
306		TUBE/PIPE	320	219.1	2.5									
307	MAW80BR013	TUBE/PIPE	320	33.4	0.5									
308		ELBOW	320	219.1		5								
309		TEE	320	219.1			1							
310		FLANGE	320	219.1					2					
311		VALVE	320	219.1						1				
312		TUBE/PIPE	320	219.1	9.5									
313	MAW80BR020	TUBE/PIPE	320	33.4	11									
314		BEND	320	33.4							6			
315	MAW80BR021	TUBE/PIPE	320	33.4	12									
316		BEND	320	33.4							6			
317	MAW81BR001	ELBOW	320	114.3		2								
318		BEND	320	114.3							1			
319		TUBE/PIPE	320	114.3	4									
320	MAW81BR002	ELBOW	320	114.3		3								
321		TUBE/PIPE	320	114.3	4.5									
322	MAW81BR003	VALVE	320	168.3						1				
323		BEND	320	168.3							1			
324		TUBE/PIPE	320	168.3	7.5									
325		TEE	320	168.3			1							
326		REDUCER	320	168.3				1						
327		ELBOW	320	168.3		2								
328		FLANGE	320	168.3					2					

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
329		ELBOW	320	114.3		3								
330	MAW82BR001	BEND	320	114.3							1			
331		TUBE/PIPE	320	114.3	4									
332	MAW82BR002	ELBOW	320	114.3		4								
333		TUBE/PIPE	320	114.3	4									
334		ELBOW	320	168.3		4								
335		TUBE/PIPE	320	168.3	7.5									
336		REDUCER	320	168.3				1						
337	MAW82BR003	FLANGE	320	168.3					2					
338		BEND	320	168.3							1			
339		TEE	320	168.3			1							
340		VALVE	320	168.3						1				
341		FLANGE	320	114.3					2					
342		BEND	320	114.3							1			
343	MAW83BR001	ELBOW	320	114.3		6								
344		TUBE/PIPE	320	114.3	12.5									
345		TUBE/PIPE	320	141.3	2									
346		VALVE	320	114.3						1				
347		FLANGE	320	141.3					2					
348		TUBE/PIPE	320	141.3	10.5									
349	MAW84BR001	REDUCER	320	141.3				1						
350		VALVE	320	141.3						1				
351		ELBOW	320	141.3		5								
352	MAW84BR002	BEND	320	141.3							2			
353		TUBE/PIPE	320	141.3	2.5									
354		ELBOW	190	88.9		5								
355		FLANGE	190	88.9					2					
356	MAW85BR001	VALVE	190	88.9						1				
357		TUBE/PIPE	190	88.9	6									
358		TUBE/PIPE	190	114.3	2									
359		ELBOW	190	88.9		7								
360		FLANGE	190	88.9					2					
361	MAW86BR001	TUBE/PIPE	190	88.9	6									
362		TUBE/PIPE	190	114.3	2									
363		VALVE	190	88.9						1				
364		ELBOW	190	88.9		7								
365		FLANGE	190	88.9					2					
366	MAW87BR001	VALVE	190	88.9						1				
367		TUBE/PIPE	190	114.3	2									
368		TUBE/PIPE	190	88.9	6									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (M)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	CAP	WELDOLET	Insulation Thickness (mm) To be filled by vendor
369	MAW88BR001	ELBOW	190	88.9		7								
370		FLANGE	190	88.9					2					
371		VALVE	190	88.9						1				
372		TUBE/PIPE	190	88.9	6.5									
373		TUBE/PIPE	190	88.9	6.5									

Sl No	TAG No of the Line	TYPE	Operating Temperature (deg C)	Pipe OD (mm)	Length (m)	ELBOW	TEE	REDUCER	FLANGE	VALVE	BEND	OLET	Insulation Thickness (mm) To be filled by vendor
1	MAA14BR001	TUBE/PIPE	593	219.1	12								
3		WELDOLET	593	219.1	-							1	
4		BEND	593	219.1	-						6		
5	MAA14BR002	TUBE/PIPE	593	219.1	13								
6		BEND	593	219.1	-						6		
7		WELDOLET	593	219.1	-							7	
8	MAA14BR003	TUBE/PIPE	570	219.1	11								
9		REDUCER	570	219.1	-			1					
10		ELBOW	570	219.1	-	5							
11	MAA14BR004	TUBE/PIPE	570	219.1	19								
12		ELBOW	570	219.1	-	9							
13		REDUCER	570	219.1	-			1					
14	MAA14BR005	TUBE	570	168.3	3								
15		ELBOW	570	168.3	-	2							
16		VALVE	570	33.4	-					2			
17		WELDOLET	570	168.3	-							1	
18		REDUCER	570	33.4	-			1					
19		TUBE	570	33.4	1								
20	MAA14BR006	ELBOW	570	168.3	-	2							
21		TUBE/PIPE	570	168.3	3								
22		WELDOLET	570	168.3	-							1	

General Notes for Seal Steam, Turbine Drainage & Overload Piping System:

1. This BOM may vary by +/- 3%.

2. Components are not included in pipe length and are to be considered separately for Thermal Insulation as per the above table.This supercedes Clause 2.5 of ST29005 in this regard.

3. This BOM consists of total 19 (Nineteen) pages. Turbine Drainage System = 7 Pages, Seal Steam System = 10 Pages & Overload Piping System = 2 Page.

SPECIAL INSTRUCTIONS:

Checklist for Vendors

Sl No	BHEL REQUIREMENTS	VENDOR's CHECKPOINT (To be filled by Vendor) [YES/NO]
1	***Vendor has indicated insulation thicknesses for all items covered in this document.***	
2	***Vendor has considered design criteria as per doc no 412114W6000 , ST29005 REV_04 & Annexure-1 (Customer Spec.).***	
3	***Vendor has furnished Sample Calculations for min 10 different cases.***	
4	***Vendor has furnished k-values of insulation mattresses at different mean temperatures ranging from 100-300 ^{0}C.***	
5	***Vendor has furnished BOM containing breakup of quantity of mattresses (in m^{2}) & Aluminium (in kg, for 18,20 & 22 SWG separately) in their standard format along with Wt in Kg.***	

PREPARED BY: RAJEEV KUMAR (Dy. Mgr-TL)

ANUJ JAIN
Digitally signed by ANUJ JAIN
DN: cn=ANUJ JAIN, o=BHEL, ou=HEEP, email=anuj.jain@bhel.in, c=IN
Date: 2020.07.08 13:25:18 +05'30'

APPROVED BY: Sh ANUJ JAIN (DGM-TL)

ADDITIONAL TERMS & CONDITIONS OF TENDER **(Annexure-B)**

THERMAL INSULATION OF TIP FOR 2 x 660 MW UDANGUDI UNIT-1&2 PROJECT

BHEL ref. no. B/4066/2020/1403/V1

<table>
<tr><th>Sl. No.</th><th>Terms</th><th>Description</th><th>Bidder's confirmation</th></tr>
<tr><td>1.</td><td>Technical Requirement</td><td>a) Please quote your valuable offer as per BHEL Specification & Documents i.e. Technical Specification No. ST29005 Rev. 04, Doc. No. 412114W6000 Rev. 0 and 412114W6001 Rev 0.
b) Please furnish Insulation thickness table duly filled, signed & stamped strictly in BHEL format, along with sample calculations (at least 10 different cases), variation of k-values with mean temperatures and complete BOQ for the materials required. All these documents should necessarily be a part of the technical offer submitted by the bidder.
c) Please fill all fields in the checklist of Doc. No. 412114W6001 and ensure that all requirements as per the checklist are met at the time of offer submission.</td><td></td></tr>
<tr><td rowspan="2">2.</td><td rowspan="2">Evaluation Criteria</td><td>Evaluation will be done on Total Landed Cost to BHEL upto Udangudi project site basis (i.e. material cost and application cost taken together for each unit).
Total Landed Cost to BHEL includes Material cost, Application cost, Packing & Freight charges, GST etc.</td><td></td></tr>
<tr><td>'Price Bid to RA' shall be processed on GeM portal as per GeM terms & conditions (GeM 4.0) of only those bidders who meet the PQR and techno-commercial requirement of tender.</td><td></td></tr>
<tr><td>3.</td><td>Basis of quotation</td><td>Kindly confirm that Prices for material portion have been quoted on <u>Ex-Works Freight prepaid upto Project site</u> basis inclusive of GST (i.e. including all taxes, duties, duties, local levies, transportation/freight, packing, forwarding charges etc.).</td><td></td></tr>
<tr><td>4.</td><td>Transit insurance</td><td>Transit insurance would be arranged by BHEL. Please send your offer keeping this in view.</td><td></td></tr>
<tr><td>5.</td><td>Scope of Enquiry</td><td>Kindly note the scope/requirement covered in this tender enquiry as detailed below:
<table>
<tr><th>Sl. No.</th><th>Material Code and Item Description</th><th>Qty.</th><th>Project</th><th>Delivery Requirement</th></tr>
<tr><td>1.</td><td>Material Code: W90313146098
<u>SUPPLY AND APPLICATION</u> OF THERMAL INSULATION OF TIP
As per Doc. Nos. 412114W6000 Rev. 0 & 412114W6001 Rev. 0
SPEC: ST29005 REV: 04</td><td>02 Sets</td><td>2 x 660 MW Udangudi Unit-1&2</td><td>Unit-1: Nov23
Unit-2: Jan-24
However, material will be dispatched on <u>On Intimation</u> basis to Project site.</td></tr>
</table></td><td></td></tr>
<tr><td>6.</td><td>Delivery Schedule/ Period</td><td><u>Material Supply</u>: Delivery date would be 10 weeks from the date of intimation from BHEL 'or' actual site requirement, whichever is later. Latest site requirement for the above material for Udangudi U-1&2 project are mentioned above in clause 5 of Scope of Enquiry.
The delivery/dispatch period (of 10 weeks) is inclusive of the time for submission of BOM/technical documents (15 days) by the vendor, approval of BOM/technical documents by BHEL (15 days) and for review of test certificate/ Inspection report for issuance of dispatch clearance by BHEL. Any delay shall be on respective account.
In case, bidders are not able to meet delivery of 10 weeks, such bidders required to quote their best possible delivery from the date of intimation.
<u>Application of Insulation</u>: Manpower with complete tool and tackles shall reach project site within 15 days of intimation of BHEL. Please confirm.</td><td></td></tr>
<tr><td>7.</td><td>Application of Insulation</td><td>Application of TIP Insulation is required by supplier's representative at 2 x 660 MW Udangudi project site.
Bidder to quote the lump sum charges for application (irrespective of man days and inclusive of all factors i.e. food, boarding, lodging, travel etc.) including applicable GST as per defined separate GeM cataloge for application portion. Kindly confirm.</td><td></td></tr>
</table>

8.	**Quality Requirement & Inspection**	a) Kindly confirm to follow and submit the endorsed copy (sign & stamp) of BHEL Standard Quality plan no. QA/BE/QP/316/UDAN, Rev. 00 (enclosed with enquiry) along with your offer. b) Inspection shall be done by BHEL nominated third party inspection agency (Intertek/ TUV) as per approved Quality Plan. Kindly confirm. The charges of TPI will be borne by BHEL. However, co-ordination with Third Party Inspection agency would be the sole responsibility of the supplier. At least 07 days prior notice should be given to BHEL TPIA to arrange inspection.	
9.	**Engineering Document approval**	In case of order, supplier to submit Bill of Material (BOM)/ required technical documents for approval from BHEL within 15 days of placement of Purchase Order or Intimation from BHEL, whichever is later. BHEL will provide approval of the same within 15 days of receipt of documents/BOM, if complete & correct as per agreements before placement of Purchase order. The delay due to late submission shall be to supplier's account whereas delay in approval of documents shall be BHEL's account. In case of delay on account of BHEL, delivery shall be re-scheduled accordingly.	
10.	**Liquidated Damages (LD)**	Liquidated Damages shall be applicable LOT-WISE as per clause no. 15 (iii) of General terms and conditions on GeM 4.0 (Version 1.9 Dtd. 31.03.2023 or latest version as applicable). Date of GR/LR shall be treated as date of delivery for LD purpose. *Kindly confirm.*	
11.	**Guarantee/ Warranty Clause**	Supplier shall guarantee the quality of material used & workmanship for a period of **24 months from the date of supply or 18 Months from the date of commissioning (completion date), whichever is later**. Any defect arising from faulty material or workmanship during this period shall be rectified by the supplier at no extra cost. Supplier shall also guarantee that if the specified maximum surface temperature is exceeded on actual measurement, the supplier shall either replace the insulation with a superior material or provide additional insulation thickness at the BHEL' s / site engineers discretion at no extra cost to BHEL.	
12.	**Payment terms**	**Material Portion:** 100% payment of supply portion shall be released (Unit/Lot-wise) as per below after receipt of material at site (i.e. On issue of Delivery CRAC i.e. consignee receipt-cum-acceptance certificate) alongwith submission of PBG @ 5% of the Order value. *Kindly confirm.* **Negotiable documents for Supply payment are as under:** • Material receipt certificate/ CRAC issued by BHEL. • Original Guarantee certificate. • Original Invoice • Original Packing list • Copy of Consignee GR • Copy of MDCC issued by BHEL. • Original Bank Guarantee (PBG) as per below clause no. 13. *Please ensure to send the Original GR (Consignor copy) alongwith above original negotiation documents to BHEL Haridwar for End customer billing purpose.* **Application portion**:	

Type of Bidder	**Payment Terms (Number of Days)**
Micro & Small Enterprises (MSEs)	45 days
Medium Enterprises	60 days
Non MSME	90 days

		100% payment of application portion shall be released after receipt of work completion certificate (Commissioning CRAC) issued by Consignee/BHEL site. *Kindly confirm.*	
13.	**PBG clause**	Vendor has to submit **Performance Bank Guarantee** (PBG) for **5% of the Order/Contract value** (Unit/Lot-wise) to BHEL. PBG should be valid for entire Guarantee/Warranty period. PBG should be in BHEL format and from one of the BHEL consortium banks, which are available at https://hwr.bhel.com. PBG would be submitted before processing of payment of material portion. Performance shall be covered under Guarantee/ Warranty period. *The requirement of PBG for entire Guarantee/Warranty period is mandatory and non-acceptance of the PBG may lead to rejection of your offer.*	
14.	**MDCC clause**	Material shall be dispatched only after issue of Material dispatch clearance certificate (MDCC) by BHEL/Customer. All Test certificates (TCs) & Inspection Reports should be submitted by supplier to BHEL at least 07 days in advance for review and issuance of MDCC. Any delay on submission/approval shall be on respective account. Material should be dispatched within 07 days of issue of MDCC by BHEL.	
15.	**Packing Instructions**	Each Package of each shipment shall be clearly marked with the following identification: • Project name: 2 x 660 MW Udangudi STPP • Address of Consignee • BHEL PO and Item description • Package no. viz 1/1, 1/2 etc.	

16.	**Conflict of interest**	A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Procuring Entity's interests. The bidder found to have a conflict of interest shall be disqualified. A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if: a) they have controlling partner(s) in common; or b) they receive or have received any direct or indirect subsidy/ financial stake from any of them; or c) they have the same legal representative/agent for purposes of this bid; or d) they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder, or e) Bidder participates in more than one bid in this bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid; or f) In cases of agents quoting in offshore procurements, on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorise only one agent/dealer. There can be only one bid from the following: 1. The principal manufacturer directly or through one Indian agent on his behalf; and 2. Indian/foreign agent on behalf of only one principal, or g) A Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid, or h) In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/similar line of business.	
17.	**Risk Purchase Clause**	In case of abnormal delays (beyond the maximum late delivery period as per LD clause) in supplies / defective supplies or non-fulfillment of any other terms and conditions given in Purchase Order, BHEL may cancel the Purchase Order in full or part thereof, and may also make the purchase of such material from elsewhere / alternative source at the risk and cost of the supplier. BHEL will take all reasonable steps to get the material from alternate source at optimum cost. If bidder does not agree to the above Risk Purchase Clause, BHEL reserves the right to reject the offer. In case for compelling reasons BHEL accepts the offer without acceptance of this clause by the bidder and in the eventuality of Risk Purchase, appropriate action will be taken as per BHEL extant rules. This will be without prejudice to any other right of BHEL under the contract or under General Law.	
18.	**Regarding ITC based evaluation bid**	Kindly note that this bid/tender has been availed with 100% ITC (Input tax credit) based evaluation. Bidders shall have to enter their Prices inclusive of all taxes including GST during participation in bid on GeM portal and also bidders to add/input the applicable GST amount in percentage separately as per provision made by GeM in the system. Kindly confirm your compliance to the above and submit your offer on GeM portal accordingly.	

19.	**Confirmation to General terms & conditions of GeM**	**This ADDITIONAL TERMS & CONDITIONS OF TENDER should be read and complied in conjunction with GENERAL TERMS AND CONDITIONS of GeM (GeM 4.0 Version 1.9 Dtd. 31.03.2023 or latest version as applicable) governed for this bid.** Please confirm the acceptance to above General terms & conditions of GeM applicable for this tender.	

Kindly ensure to submit the below documents/enclosures along with Part-1 bid:

a. Signed & Stamped copy (each page) of GeM tender bid.

b. Signed & Stamped copy (each page) of duly filled Additional terms & conditions of tender (Annexure-B).

c. Copy/Replica of Price schedule (without prices) mentioning ''Quoted' in place of price alongwith your techno-commercial (Part-1) offer.

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
BHEL	VENDOR'S NAME AND ADDRESS	ITEM	THERMAL INSULATION FOR TURBINE INTEGRAL PIPING	QP. NO.:	QA/BE/QP/316/UDAN		
				REV. NO.:	00		
		DRG. NO.:	412114W6000 & 412114W6001				
		REV. NO.:	AS PER DRWAING				
		SPEC. NO.:	ST 29005				
		REV. NO.:	04	Page **1** of **2**			

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**D**	**10**			**11**
1.0	Material												
1..0	Bonded mineral / Rockwell mattresses												
1.1	Routine tests												
1.1.1		Chemical Composition	Major	Chemical	1 Sample/lot	Vendor's Std	Vendor's Std	TC	√	P	-	-	
1.1.2		Bulk Density	Major	Physical	Sample As Per IS 8183	IS 3144	IS 8183	TC	√	P	W	-	
1.1.3		Recovery After Compression	Major	Physical	-do-	IS 8183	IS 8183	TC	√	P	W	-	
1.1.4		Shot Content	Major	Chemical	-do-	IS 3144	IS 8183	TC	√	P	W	-	
1.1.5		Moisture Content and Moisture Absorption	Major	Physical	-do-	IS 3144	IS 8183	TC	√	P	W	-	
1.1.6		Incombustibility	Major	Thermal	-do-	IS 3144	IS 8183	TC	√	P	W	-	
1.1.7		Thermal Conductivity or K - Value	Major	Thermal	Sample As Per IS 3144	IS 3346	IS 8183	TC	√	P	W	-	Refer Note:1
1.1.8		Sulphur Content	Major	Chemical	Sample As Per IS 8183	IS 3144	IS 8183	TC	√	P	W	-	
1.1.9		Dimensional check	Major	Measurement	-do-	IS 3144	IS 8183	IR	√	P	W	-	
1.1.10		Fibre Diameter	Major	Measurement	-do-	IS 3144	IS 8183	IR	√	P	W	-	
1.1.11		Resistance to Vibration	Major	Physical	-do-	IS 3144	IS 8183	TC	√	P	V	-	
1.1.12		Heat Resistance	Major	Physical	-do-	IS 3144	IS 8183	TC	√	P	V	-	
1.1.13		Alkalinity	Major	Chemical	-do-	IS 3144	IS 8183	TC	√	P	V	-	
1.1.14		Corrosive Attack / Chloride Content	Major	Chemical	-do-	IS 3144	IS 8183	TC	√	P	V	-	
2.0	Sheathing Material-Aluminium Sheet (Gr.19000)												
2.1		Chemical Composition	Major	Analysis	Sample As Per IS 737	IS 737	IS 737	TC	√	P	V	-	
2.2		Tensile Test & Elongation	Major	Physical	-do-	IS 737	IS 737	TC	√	P	V	-	
2.3		Bend test	Major	Physical	-do-	IS 737	IS 737	TC	√	P	V	-	
2.4		Gauging / Thickness	Major	Measurement	-do-	ST 29005	ST 29005 / Appd BOM	IR	√	P	V	-	
3.0	Galvanised Steel / Stainless Steel Wire for Netting, Binding, Stitching & Lacing												
3.1		Chemical Composition	Major	Analysis	Sample As Per IS 6528 / IS 280	IS 6528/IS 280	IS 6528 / IS 280	TC	√	P	V	-	

		LEGEND:	FOR CUSTOMER USE	
MANUFACTURER/SUBCONTRACTOR		RECORDS IDENTIFIED WITH (√) 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER TC: TEST CERTIFICATE, IR INSPECTION REPORT, COC CERTIFICATE OF CONFORMANCE INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER	APPROVED BY	Digitally signed by Manindra Kumar Date: 2020.07.31 09:10:56 +05'30'

MANUFACTURER'S NAME AND ADDRESS			STANDARD QUALITY PLAN			TO BE FILLED BY BHEL	TO BE FILLED BY BHEL
BHEL	VENDOR'S NAME AND ADDRESS	ITEM	THERMAL INSULATION FOR TURBINE INTEGRAL PIPING	QP. NO.:	QA/BE/QP/316/UDAN		
				REV. NO.:	00		
		DRG. NO.:	412114W6000 & 412114W6001				
		REV. NO.:	AS PER DRWAING				
		SPEC. NO.:	ST 29005				
		REV. NO.:	04		Page **2** of **2**		

SL. NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS		AGENCY			REMARKS
										M	B	N	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**D**	**10**			**11**
3.2		Dimensions (Size of netting & Dia / Gauge of Wire)	Major	Measurement	-do-	ST 29005	ST 29005 / Appd BOM	IR	√	P	V	-	
3.3		Tensile Test & Elongation	Major	Physical	-do-	IS 6528/ IS 280	IS 6528 / IS 280	TC	√	P	V	-	
3.4		Wrapping Test	Major	Physical	-do-	IS 6528/ IS 280	IS 6528 / IS 280	TC	√	P	V	-	
3.5		Bend Test	Major	Physical	-do-	IS 6528 / IS 280	IS 6528 / IS 280	TC	√	P	V	-	
3.6		Mass of Coating for GI Wire	Major	Measurement	-do-	IS 280	IS 280	TC	√	P	V	-	
4.0	Straps, Bands & Screws												
4.1		Dimensional	Major	Measurement	--	ST 29005	ST 29005	COC	-	P	-	-	
4.2		Visual	Major	Physical	--	ST 29005	ST 29005	COC	-	P	-	-	
5.0	Packing / Marking & Storage												
5.1		Identification (Batch no., Thickness, Density) & Marking	Major	Visual	100%	ST 29005	ST 29005	IR	-	P	-	-	
5.2		Packing & Despatch	Major	Visual	100%	ST 29005	ST 29005	IR	-	P	-	-	

NOTE: 1. Thermal Conductivity or 'K' Value test report on the samples identified and tested in last one year shall be reviewed by BHEL / BHEL nominated inspection agency. However, samples for Thermal Conductivity or 'K' Value test shall be identified by BHEL / BHEL nominated inspection agency from each lot and test shall be conducted at (BHEL agreed lab) CBRI Roorkee / IIT Chennai / PIBCO, NEW DELHI / M/s ISOLLOYD ENGINEERING TECHNOLOGIES LIMITED, BADDI. The test report of the same shall be submitted to BHEL for review and acceptance.

NOTE: 2 BHEL reserves the right for conducting repeat test, if required.

MANUFACTURER/SUBCONTRACTOR		LEGEND: RECORDS IDENTIFIED WITH (√) 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUBCONTRACTOR B: BHEL / NOM. INSPECTION AGENCY N: CUSTOMER TC: TEST CERTIFICATE, IR INSPECTION REPORT, COC CERTIFICATE OF CONFORMANCE INDICATE 'P' PERFORM 'W' WITNESS AND 'V' VERIFICATION ALL 'W' INDICATED IN COLUMN 'N' SHALL BE 'CHP' OF CUSTOMER	FOR CUSTOMER USE	APPROVED BY Digitally signed by Manindra Kumar Date: 2020.07.31 09:11:12 +05'30'

BANK GUARANTEE BOND

WAM 28

(Paragraph 4.9.6 of – Works Accounts Manual)

1. In consideration of the Bharat Heavy Electricals Limited, Siri Fort, New Delhi through HEEP Hardwar Division (hereinafter called 'the Company') having agreed to exempt_____(hereafter called 'the said Contractor' which term includes 'Suppliers' for the purpose of this Bond) from the demand under the terms and conditions of an Agreement dt. _____ made between _____ and _____ for (hereafter called 'the said Agreement') of Security Deposit for the due fulfillment by the said Contractor of the terms and conditions contained in the said Agreement, on production of a Bank Guarantee for Rs. _____ (Rupees _____ only) we, _____

(Indicate the name of the Bank)

(hereinafter referred to as 'the Bank') at the request of _____

_____

Contractor(s) do hereby undertake to pay to the Company an amount not exceeding Rs. _____ against any loss or damage caused to or suffered or would be caused to or suffered by the Company by reason of any breach by the said Contractor(s) of any of the terms and conditions contained in the said Agreement.

2. We, _____ do hereby undertake

(indicate the name of the Bank)

to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Company stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Company by reason of breach by the said Contractor(s), of any of the terms or conditions contained in the said Agreement or by reason of the contractor(s), failure to perform the said Agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____ .

3. We undertake to pay to the Company any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this bond shall be valid discharge of our liability for payment thereunder and the Contractor(s) shall have no claim against us for making such payment.

4. We _____ further agree that the Guarantee
(Indicate the name of the bank)
herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the duce of the Company under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till _____ Office / Department / Division of Bharat Heavy Electricals Limited certifies that the terms and conditions of the said Agreement have been fully and property carried out by the said contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____, we shall be discharged from all the liability under this guarantee there after.

5. We, _____, further agree with the company that
(Indicate the name of the bank)
the Company shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Agreement or to extend time to performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the company against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the company or any indulgence by the company to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s)

7. We_____ lastly undertake not to revoke
(Indicate the name of the bank)
this guarantee during its currency except with the pervious consent of the Company in writing.

Dated the_____ day of _____

For _____
(Indicate the name of the Bank)

List of Consortium Banks * (wef 22.03.2016)

	Nationalised Banks		Nationalised Banks
1	Allahabad bank	19	Vijaya Bank
2	Andhra bank		**Public Sector Banks**
3	Bank of Baroda	20	IDBI
4	Canara Bank		**Foreign banks**
5	Corporation bank	21	CITI Bank N.A
6	Central bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Limited
8	Indian Oversea Bank	24	Standard Chartered Bank
9	Oriental bank of Commerce	25	J P Morgan
10	Punjab National Bank		
11	Punjab & Sindh Bank		**Private banks**
12	State Bank of India	26	Axis Bank
13	State Bank of Hyderabad	27	The Federal Bank Limited
14	Syndicate Bank	28	HDFC
15	State Bank of Travancore	29	Kotak Mahindra Bank
16	UCO Bank	30	ICICI
17	Union Bank of India	31	Indusind Bank
18	United Bank of India	32	Yes Bank