	<b>PRODUCT STANDARD</b> <b>HYDRO TURBINE ENGINEERING</b>	<b>HT 00270</b>
		<b>Rev. 01</b>
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<b><u>PURCHASE SPECIFICATION FOR</u></b> <b><u>THERMAL INSULATION (ELASTOMERIC FOAM BASED ON RUBBER)</u></b>		

### 1. **GENERAL:**

The thermal insulation along with cladding shall be provided on pipes for insulation against condensation and freezing protection of cooling water pipeline inside hydroelectric power house.

The cooling water pipes draw raw river water from tail race / penstock of the power house and pass it to the points of heat generation in the turbine and transformers. The hot water is then discharged to the tail race. The exposed cooling water pipe lines are to be insulated by suitable lagging.

Both tubular and sheet form of insulation may be used depending on pipe sizes and suitability for desired performance.

All the cooling water piping is of carbon steel/stainless steel. In addition to pipes, insulation shall be applicable for all pipe fittings, joints, valves etc.

### 2. **SCOPE:**

The scope will include supply and installation of the insulation material at site. Consumables like adhesives, sealing compounds, screws, tape, red oxide (for painting pipes & its accessories before installation) etc., shall also be supplied as per requirement.

Cladding: Plain aluminum sheet to be used shall be of minimum 0.5 mm thickness to physically protect lagging.


Adhesive: Should be suitable for application of offered material on pipes and must be fire resistant.

**Note:** Supplied quantity of insulation material should be adequate for requirement indicated in of **Input Data Sheet**. In case of any shortage observed during installation to fulfill requirement mentioned in **Input Data Sheet**, vendor shall supply the shortage quantity free of cost.

### 3. **MATERIAL & COMPLIANCE:**

The material of thermal insulation shall be "Elastomeric foam based on rubber" as per BS EN 14304 or equivalent with properties as mentioned in the **Table-I** in page-2.

Rev. No.	Date of Rev.	Remarks	<b>Approved</b>		
01	25.01.2018	Clause (6) modified.	J.S.Hanspal, AGM (HOD)-HTE		
			<b>Prepared</b>	<b>Checked</b>	<b>Date of issue</b>
			S K Prajapati Dy. Manager-HTE	A Mandal AGM-HTE	<b>(Rev 00)</b> 25.11.17
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<b><u>PURCHASE SPECIFICATION FOR</u></b> <b><u>THERMAL INSULATION (ELASTOMERIC FOAM BASED ON RUBBER)</u></b>		

**Table-I**

Property	Value/Range/Class
Temperature Range Max. service temperature Min. service temperature	(+) 105 Deg C (-) 50 Deg C
Thermal Conductivity at 0 Deg C Thermal Conductivity at (+) 20 Deg C Thermal Conductivity at (+) 40 Deg C	≤0.035 W/m K ≤0.037 W/m K ≤0.039 W/m K
Water vapour diffusion resistance	≥ 7000
Water absorption W <sub>p</sub> (max.)	0.1 kg/m <sup>2</sup> (As per BS EN 14304 Clause 4.3.4)
Fire performance	Class "0" (Ref. Standard BS 476-6/BS 476-7)
Reaction to fire	Self-extinguishing, should not drip, should not spread flames
Chemical Resistance to Ozone Building Materials Oil & chemicals	Very Good Very Good Very Good
Health aspects	Dust & fiber free, free of formaldehyde, Anti-microbial protection

**4. CONSTRUCTION:**


Material shall be flexible, resistant to flame and have closed cell structure so that no vapour barrier is required. Insulation finish should be neat and there should not be any visual defect. All edges shall be clean cut. Rough or jagged edges of the insulation are not permitted. All necessary tools required for installation shall be arranged by vendor. The insulation thickness shall be as given in **Input Data Sheet**.

**5. PACKING:**

The packing shall be suitable for long term storage at site.

**6. DOCUMENTS TO BE FURNISHED BY VENDOR**

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01	25.01.2018	Clause (6) modified.	J.S.Hanspal, AGM (HOD)-HTE		
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<b><u>PURCHASE SPECIFICATION FOR</u></b> <b><u>THERMAL INSULATION (ELASTOMERIC FOAM BASED ON RUBBER)</u></b>		

The vendor shall furnish the following documents:

**With offer:**

1. Calculation of thickness to be carried out as per ASTM C680& same to be furnished along with calculation for quantity offered.
2. BOM indicating thickness, size and quantity of insulation material for each item of our requirement indicated in Input Data Sheet.
3. Catalogue of material used depicting BS or EN or DIN or ASTM standards and all properties.
4. Installation process
5. Storage instruction & details of packing
6. Reference list of installation, where vendor has supplied the offered material.

**After placement of P.O.:**

- QA plan for approval by BHEL.
- One copy of installation manual.
- Box wise shipping list/packing list.
- Certificate of conformance of material (Insulation & cladding).

**7. WARRANTY**

The insulation & cladding shall be warranted for a period of 24 months from the date of installation.

**8. PROCUREMENT**

Insulation as well as cladding for all pipes shall be procured from the same vendor.  
In the offer, the vendor shall furnish item wise price.


**9. INSTALLATION AT SITE**

Installation of thermal insulation at site shall be in vendor's scope. Vendor to quote installation charges separately.

**Name of project:**

**Enquiry no.:**

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### CHECKLIST

(To be filled in by the vendor and submitted along with the offer)

S. No.	Description	Tick whichever applicable
1	Thickness of insulation shall be as per input data sheet	Yes/No
2	Thickness of cladding shall be as per clause 2 i.e. 0.5mm	Yes/No
3	Acceptance of material & compliance as per clause 3	Yes/No
4	Acceptance for construction shall be as per clause 4	Yes/No
5	Document/information submission shall be as per clause 6	Yes/No
6	Acceptance of warranty as per clause 7	Yes/No
7	Item wise price has been furnished in the offer	Yes/No
8	Packing shall be suitable for long term storage	Yes/No
9	Details of packing furnished in the offer	Yes/No
10	Offered quantity of insulation material is sufficient to cater requirement mentioned in Input Data Sheet	Yes/No
11	Installation shall be done by vendor	Yes/No
12	Vendor has quoted separately for installation	Yes/No
13	Reference list of installation, where vendor has supplied the offered material	Yes/No

Name of vendor \_\_\_\_\_  
Date \_\_\_\_\_

Authorized signature with stamp

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## HYDRO TURBINE ENGINEERING

Annexure -I to PRODUCT STANDARD: HT00270

PROJECT:.....

PI No.: .....

### INPUT DATA SHEET

**(Specific for a project, to be filled by indenter)**

Commissioning of project is scheduled likely in .....

Address of project site.....

### Quantities of Pipe, fittings & valves

Sl. No.	Pipe Size (NB)	Total Length *	No. of Elbow	No. of Reducer	No. of Tee	No. of Flange	No. of Valves	No. of NRV	No. of Flow-meter

Wind velocity to be considered: 0 m/s

The temp. of the intake water will be around ..... (These data to be obtained from

The relative humidity.....

customer by the indenter)

Note:

1. On the basis of above two data (temperature and relative humidity) thickness of insulation shall be calculated.
2. \* Above pipe lengths are approximate and a variation of  $\pm 10\%$  is possible depending on actual pipe routing at site.
3. Minimum thickness of insulation shall be as per table given below. Vendor to calculate thickness at his end also & if he proposes higher thickness; the same to be furnished in the offer. Calculation to be done as per ASTM C680 considering emissivity of cladding & wind velocity as zero m/s.

# Size (NB)	40-80	100-250	300-400	Above 400
Min. thickness of insulation (mm)	25 (See note:3)	30 (See note:3)	32 (See note:3)	35 (See note:3)

# for pipe, elbow, reducer, tee, flanges, valves & flow meter

Signature & stamp of indenter