

**NTPC
2X660MW MOUDA STPP STAGE-II
(TG PACKAGE)**

**TECHNICAL SPECIFICATION
FOR
BONDED MINERAL (ROCK)
WOOL MATTRESSES**

SPECIFICATION NO: PE-TS-387-169-M032 (REV-00)



**BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA**

	TITLE: TECHNICAL SPECIFICATION BONDED MINERAL (ROCK) WOOL MATTRESSES 2X660MW MOUDA STPP	SPECIFICATION NO. PE-TS-387-169-M032
		REV. NO.: 0
		DATE: 17.11.2016
		SHEET 1 OF 1

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1.00.00 GENERAL

This specification covers the requirements of manufacture, physical & chemical properties, inspection & testing and packing for supply of bonded mineral (rock) wool mattresses having metallic hexagonal wire netting as facing on one side, suitable for service temperatures upto 750 deg C. In case of contradiction between Section-I and Data Sheet-A of Section-II, Data Sheet-A of Section-II will prevail.

2.00.00 CODES AND STANDARDS

2.01.00 INDIAN STANDARD

- 2.01.01 The manufacture, physical & chemical properties, inspection and testing of the bonded mineral wool mattresses shall conform to the latest editions of the following appropriate standards.
- 2.01.02 IS:8183 Specification for bonded mineral wool.
- 2.01.03 IS:3144 Methods of test for mineral wool thermal insulation materials.
- 2.01.04 IS:3346 Methods for the determination of thermal conductivity of thermal insulation materials (two slab, guarded hot plate method).

2.02.00 INTERNATIONAL STANDARD

- 2.02.01 For procurement as per ASTM: C 592-13 (Standard specification for Mineral fiber blanket insulation and blanket type pipe insulation, metal mesh covered-industrial type), requirement of ASTM shall be applicable in place of mentioned IS codes.
- 2.03.00 In case of any conflict between the above standards and this specification, the latter shall prevail and in case of any further conflict in the matter, the interpretation of the specification by the Purchaser's Engineer shall be final and binding.

3.00.00 MANUFACTURE

- 3.00.01 The mattresses shall be made from rock processed from a molten state into fibrous form with minimum organic thermosetting binder, and shall be machine felted, baked and metallic stitched / faced with metallic hexagonal wire netting on one or both sides (as specified in the BOM).
- 3.02.00 The metallic hexagonal wire netting shall be of Galvanized steel (made from wire conforming to IS: 280 medium coated to IS: 4826) / Stainless steel (made from wire to IS: 6528) having wire size and aperture conforming to IS: 3150, as specified in the BOM.
- 3.03.00 The mattress shall be continuously stitched / tied on to the wire netting with minimum 0.4 mm dia galvanized steel / stainless steel wire, as specified in the BOM. The spacing between the stitching /ties shall not be more than 250 mm along the width and 150 mm along the length.

4.00.00 DIMENSIONS AND DIMENSIONAL TOLERANCES

- 4.01.00 The length and width of the mattresses shall be 1520 mm x 1220 mm or 1640 mm x 1220 mm except for export orders where the length and width of the mattresses shall be 1520 mm x 1150 mm in order to make optimum use of the container. Nominal thickness shall be 25, 40, 50, 60 or 75 mm.

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4.02.00 The method of measuring the dimensions i.e. length, width and thickness shall be as prescribed in IS:3144. The following dimensional tolerances are applicable for the bonded mineral wool mattresses:

Length	+ 3% and - 2% of nominal length
Width	+ 3% and - 2% of nominal width
Thickness	+ 6 mm and - 2 mm for thickness not exceeding 40 mm
Thickness	+ 10 mm and - 2 mm for thickness over 40 mm

5.00.00 BULK DENSITY AND TOLERANCES ON DENSITY

5.01.00 The bulk density of the bonded mineral (rock) wool mattresses without the facings, shall be 150 / 100 kg/m³ unless otherwise specified. Tolerances on bulk density shall be +15 % and - 5% when tested as per method prescribed in IS: 3144.

5.02.00 The bulk density shall be calculated by dividing the actual weight of the mattress in kilograms by the volume in cubic meters arrived at as the product of the average actual length, average actual width and nominal / specified thickness (subject to the condition that the thickness is maintained within the specified tolerance limits).

6.00.00 MATERIAL PROPERTIES

6.01.00 SHOT CONTENT:

The shot content, when sieved through the 500 and 250 micron IS Sieves (Refer IS:460 for IS Sieve) shall not be more than 5% and 15% (by weight) respectively.

The method for determination of shot content shall be as prescribed in IS:3144. Any shot present in the materials shall not be greater than 5 mm in any dimension.

6.02.00 THERMAL CONDUCTIVITY

The thermal conductivity (k-value) of the bonded mineral wool mattresses shall not exceed the values given in IS:3183 when determined in accordance with the method prescribed in IS:3346.

The thermal conductivity (k-value) test will be carried out for minimum three mean temperatures i.e. 100 °C, 200 °C & 300 °C on samples identified and sealed by customer / BHEL Inspector once in twelve (12) months. The tests will be carried out at govt. approved labs (at CBRI-Roorkee, IIT-Chennai or PIBCO R & D Centre, N. Delhi).

6.03.00 HEAT RESISTANCE

When a sample of mattress is heated to the maximum recommended temperature of use (550 °C for 100 kg/m³ density and 750 °C for 150 kg/m³ density) as per method prescribed in IS:3144 (test for maximum recommended temp), the material shall not suffer any fusion of fibers and visible deterioration of the fibrous structure. Any colour change shall not be considered as deterioration of fibrous structure.

6.04.00 MOISTURE CONTENT

The bonded mineral (rock) wool mattress shall not contain more than 2% moisture when determined by the method prescribed in IS:3144.

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6.05.00 MOISTURE ABSORPTION

The mattress shall not gain in weight by more than 2% when tested by the method prescribed in IS:3144.

6.06.00 INCOMBUSTIBILITY

The material shall be rated as incombustible when tested by the method as prescribed in IS:3144. The loss in total weight when determined by this test shall not exceed 5%.

6.07.00 SULPHUR CONTENT

The material, after removal of the facing (wire netting), shall not contain more than 0.6% of sulphur when determined by the method as prescribed in IS:3144.

6.08.00 COMPRESSIBILITY AND RESILIENCE:

6.08.01 The objects of this test are firstly to ensure that the mattress applied at greater than nominal thickness shall be sufficiently compressible to be fitted as its nominal thickness and secondly that the mattress shall be sufficiently resilient to recover its nominal thickness after being subjected to compression.

6.08.02 The material shall be tested as stated in Annex A of IS:8183

When tested in accordance with the method, the recovery, after compression of 75% of the original thickness, shall not be less than 90% of the original thickness.

6.09.00 ALKALINITY

When tested as described in Annex B of IS:8183, the pH value of the solution of the material shall be between 7.0 and 10.0.

6.10.00 CHLORIDE CONTENT

The material shall not contain leachable chloride in excess of 0.01% when determined by the method prescribed in IS:3144.

6.11.00 FIBRE DIAMETER

The average fibre diameter of mineral (rock) wool shall not be more than 7 microns when determined by the method prescribed in IS:3144.

6.12.00 RESISTANCE TO VIBRATION

The mattress shall show not more than 1% height of settlement when tested by the method prescribed in IS 3144.

6.13.00 RESISTANCE TO JOLTING

The mattress shall show not more than 3% height of settlement when tested by the method prescribed in IS:3144.

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7.00.00 PACKING AND MARKING

7.01.00 Stack of mattresses shall be packed in Polythene lined HDPE bags and sealed / properly stitched to prevent moisture absorption during transit and storage.

In case of export orders stack of mattresses shall be packed in 0.2 mm thick Polythene all around and further shall be packed in HDPE Bags and sealed / properly stitched to prevent moisture absorption during transit and storage. For moisture absorption minimum four (4) packets of silica gel (25 grams each) shall be placed inside Polythene at different positions in each package. Silica gel shall be of indicating type conforming to IS:3401-1992 packed in cotton bags and shall not come into direct contact with the material inside the package.

7.02.00 Each bag of mattresses shall be serial numbered. Also, printed sheets indicating the nominal thickness, density and wire netting details (i.e. material and size) shall be placed below the wire netting.

7.03.00 Following details shall be legibly and indelibly marked on the packages.

- a) Project Name
- b) Purchase Order No.
- c) Sl. No. of package
- d) Size of mattresses (Thickness x Length x Width)
- e) Density of mattresses
- f) Wire netting material and size
- g) Weight of the package
- h) No. of mattresses in the package
- i) A caution note "Always store under covered shed and on raised platforms"

8.00.00 INSPECTION AND TESTING

8.01.00 Bonded mineral wool mattresses to be supplied under this specification shall be of tested quality and workmanship. Inspection and testing of thermal insulation materials shall be as per this specification / quality plan enclosed. Manufacturer shall conduct all tests and stage inspections as per the approved quality plan to ensure that the materials conform to the requirements of this specification and of applicable standards. All shop tests shall be conducted in the presence of BHEL's / BHEL's customer's representative, on the samples identified by him / them.

	TITLE:	SPECIFICATION NO. PE-TS-387-169-M 032
	TECHNICAL SPECIFICATION	SECTION: II
	BONDED MINERAL (ROCK) WOOL	REV. NO.: 00
	MATTRESS	DATE: 17.11.2016
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DATA SHEET-A
BILL OF MATERIAL (BOM)

S.No	MATERIAL	SPECIFICATION	DENSITY/ SIZE/ THICK	UNIT	QUANTITY (TO BE ORDERED - TWO UNITS)
1.	Bonded mineral (Rock) wool mattresses with one side GS wire netting of 13 mm x 0.56 mm size stitched with 0.4 mm GS wire.	PE-TS-387-169-M032	150 Kg/cub.m	Sq.M.	25 mm – 600 60 mm – 1500 75 mm – 1000
2.	Bonded mineral (Rock) wool mattresses with one side GS wire netting of 13 mm x 0.56 mm size stitched with 0.4 mm GS wire.)	PE-TS-387-169-M032	100 Kg/cub.m	Sq.M	25 mm – 2400 40 mm – 11300 50 mm – 8300 60 mm – 11500 75 mm – 12200

Signature

NTPC		MANUFACTURER'S NAME		STANDARD MANUFACTURING QUALITY PLAN				PROJECT : 2X660MW MOUDA STPP STAGE-II				
AS PER APPROVED VENDOR LIST		Manufacturing shall be done at approved manufacturing works		Item: LIGHTLY RESIN BONDED ROCKWOOL MATTRESSES (FOR POWER CYCLE PIPING & EQUIPMENTS)		QP No. PE-QP-387-169-M001 Rev.00		PACKAGE : THERMAL INSULATION				
								CONTRACT NO.; 387				
								CONTRACTOR : BHEL, PEM, NOIDA				
S.NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORM OF RECORD			REMARKS	
								D*	M	C		
1.	Bonded Mineral (Rock) wool mattresses (Finished Product)	Chemical composition (Raw material)	MA	Chemical	1 / Lot	Vendor standard	Vendor standard	Test Certificate	P	-	-	Ref. Note "A"
		Bulk density	MA	Lab. test	Sampling as per IS:8183	IS:3144 & Spec.	IS:8183 & Tech. Spec.	Test Certificate	P	W	V	
		Dimensions	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Shot content	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Thermal Conductivity	MA	-do-	-do-	IS:3346 & Spec	-do-	-do-	P	V	V	
		Heat Resistance	MA	-do-	-do-	IS:3144 & Spec	-do-	-do-	P	W	V	
		Moisture Content	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Moisture Absorption	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Recovery after compression	MA	-do-	-do-	IS:8183 & spec.	-do-	-do-	P	W	V	
		Resistance to vibration	MA	-do-	-do-	IS:3144 & Spec.	-do-	-do-	P	W	V	
		Resistance to jolting	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Fibre Diameter	MA	-do-	Sampling as per IS:3144	-do-	Tech. Spec.	-do-	P	W	V	
		Incombustibility	MA	-do-	Sampling as per IS:8183	-do-	IS:8183 & Tech. Spec.	-do-	P	W	V	
		Sulphur content	MA	-do-	-do-	-do-	-do-	-do-	P	W	V	
		Alkalinity	MA	-do-	-do-	IS:8183 & spec.	-do-	-do-	P	W	V	
		Chloride content	MA	-do-	-do-	IS:3144 & spec.	-do-	-do-	P	W	V	
		Appearance	MA	Visual	-do-	--	Shall be free from Voids, Cracks	Inspection Report	P	W	V	

	LEGEND:		FOR NTPC USE		DOC. NO. 9575-110-PE-QVM-Q-2345	
	* RECORDS, IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. ** M: MANUFACTURER / SUB-CONTRACTOR, C : CONTRACTOR/NOMINATED INSPECTION AGENCY, N: NTPC INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE "CHP" - NTPC SHALL IDENTIFY IN COL. "N".		REVIEWED BY		NAME & SIGN. OF APPROVING AUTHORITY & SEAL	

NTPC		MANUFACTURER'S NAME		STANDARD MANUFACTURING QUALITY PLAN				PROJECT : 2X660MW MOUDA STPP STAGE-II						
AS PER APPROVED VENDOR LIST		MANUFACTURING shall be done at approved manufacturing works		Item: LIGHTLY RESIN BONDED ROCKWOOL MATTRESSES (FOR POWER CYCLE PIPING & EQUIPMENTS)				QP No. PE-QP-387-169-M001 Rev.00				PACKAGE : THERMAL INSULATION		
				Date: 17.11.2016				CONTRACT NO.: 387						
				Page : 2 of 2				CONTRACTOR : BHEL, PEM, NOIDA						
S.NO.	COMPONENT & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORM OF RECORD		AGENCY**			REMARKS	
								D*	M	C	N			
2.	Hexagonal wire netting & stitching wire	i)	GS Wire	Dimension, Gauge dia, Coating test, Tensile test, Wrapping test, Bend test	MA	Physical	1 sample per lot	IS:4826, IS:3150, IS:280 & Tech. spec.	IS:4826, IS:3150, IS:280 & Tech. spec.	Test report	P	V	V	Ref. note "B"
	ii)	SS Wire	Dimension, Gauge dia, Chemical analysis, Tensile test, Wrapping test, Reverse Bend test	MA	Physical	1 sample per lot	IS:6528 & Tech. spec.	IS:6528 & Tech. spec.	Test report	P	V	V	Ref. note "B"	
														Visual
3.	Packing and marking	Packing type and identification marking	MA	Visual	Random	Tech. Spec.	Tech. Spec.	(Soft copy of photographs)	P	W	-	Photographs of packed material to be verified by BHEL before issuing MDCC.		

NOTES: A) 'K' Value test will be carried out on samples identified and sealed by customer / BHEL Inspector once in twelve (12) months irrespective of NTPC ongoing projects. The tests will be carried out at govt. approved labs (at CBRI - Roorkee, IIT - Chennai or PIBCO R & D Centre, N. Delhi).

B) Manufacturer's / supplier's compliance certificate will be furnished.

	LEGEND:		FOR NTPC USE		DOC. NO. 9575-110-PE-QVM-Q-2345	
	* RECORDS, IDENTIFIED WITH 'TICK' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. ** M: MANUFACTURER / SUB-CONTRACTOR, C: CONTRACTOR/NOMINATED INSPECTION AGENCY, N: NTPC INDICATE "P" PERFORM, "W" WITNESS AND "V" VERIFICATION AS APPROPRIATE "CHP" - NTPC SHALL IDENTIFY IN COL. "N".		REVIEWED BY		NAME & SIGN. OF APPROVING AUTHORITY & SEAL	

	COMPLIANCE SHEET BONDED MINERAL (ROCK) WOOL MATTRESSES 2X660MW MOUDA STPP	SPECIFICATION NO. PE-TS-387-169-M032
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A) Technical Details: Bidder to tick whichever is applicable.

1	Specific Technical requirements of Section - I	Accepted	Not Accepted
2	Datasheet-A of Section – II	Accepted	Not Accepted
3	Quality Plan of Section - II	Accepted	Not Accepted

B) Deviations to the technical specification are not acceptable. However, if there are any deviations due to unavoidable reasons then the same to be clearly specified in the schedule of deviation. In case of no deviations, schedule of deviations to be filled as NIL by bidder.

C) All reports, test certificates etc. to be submitted during contract shall be subject to BHEL / Customer review / approval.



Bharat Heavy Electricals Limited
(A Govt. Of India Undertaking)
PROJECT ENGINEERING MANAGEMENT

THERMAL INSULATION for 2X660 MW MOUDA STPP STAGE-II (TG)

PVC Clause:

Ex-works prices shall be variable as per PVC formula given below:

$$\text{Current Price} = \text{Order Price} * (0.15 + 0.4 * M1/M0 + 0.15 * F1/F0 + 0.05 * S1/S0 + 0.25 * L1/L0)$$

Where

M0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.9 (NON-METALLIC MINERAL PRODUCTS) FOR MONTH OF ORDERING.

M1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.9 (NON-METALLIC MINERAL PRODUCTS) FOR 1 MONTH PRIOR TO DESPATCH.

F0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.2 (FUEL & POWER) FOR MONTH OF ORDERING.

F1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.2 (FUEL & POWER) FOR 1 MONTH PRIOR TO DESPATCH

S0 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.10.1.2 -- (STEEL: LONG) FOR MONTH OF ORDERING.

S1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.10.1.2 -- (STEEL: LONG) FOR 1 MONTH PRIOR TO DESPATCH

L0 = INDICES AS PER RBI BULLETIN TABLE 19 (ALL INDIA CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR MONTH OF ORDERING.

L1 = INDICES AS PER RBI BULLETIN TABLE 19 (ALL INDIA CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR 1 MONTH PRIOR TO DESPATCH

Total PVC shall be limited to $\pm$ 10% of Ex-Works Value.

All other terms shall be as per BHEL GCC Rev-06 / NIT / project SCC.