3X660MW NORTH KARANPURA STPP

TECHNICAL SPECIFICATION

FOR

BONDED MINERAL (ROCK) WOOL MATTRESSES

SPECIFICATION NO. PE-TS-405-169-M032

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

	TITLE: TECHNICAL SPECIFICATION BONDED MINERAL (ROCK) WOOL MATTRESSES 3X660MW NORTH KARANPURA STPP	SPECIFICATION NO. PE-TS-405-169-M032
		REV. NO.: 00
		DATE: 05.11.2022
		SHEET 1 OF 1

CONTENTS

Form No. PEM-6666-0

	SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES	SPECIFICATION NO:PE-TS-405-169-M032
		SECTION : I
		REV. NO. 00
		DATE: 05.11.2022
		SHEET 1 OF 5

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 or both side, suitable for service temperatures up to 750 deg C.

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 rock 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 In case of any conflict between the above standards and this specification, the latter shall be final.

3.00.00 MANUFACTURE

3.01. 00 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. Nominal thickness shall be 25, 40, 50, 60, 70, 75 or 80 mm.

4.02.00 The method of measuring the dimensions i.e. length, width and thickness shall be as prescribed in IS: 3144. Tolerance on length and width shall be as per IS:8183. Tolerance on thickness shall be +6mm/-2mm.

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/m^3 unless otherwise specified. Tolerances on bulk density shall be +15 % and - 5% when tested as per method prescribed in IS: 3144.

	SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES	SPECIFICATION NO:PE-TS-405-169-M032
		SECTION : I
		REV. NO. 00
		DATE: 05.11.2022
		SHEET 2 OF 5

6.00.00 MATERIAL PROPERTIES

6.01.00 **SHOT CONTENT**:

The method for determination of shot content shall be as prescribed in IS: 3144. The maximum shot content shall be 5% by weight.

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: 8183 Latest when determined in accordance with the method prescribed in IS: 3346.

K' Value test (for minimum three mean temperatures i.e. 100°C, 200°C & 300°C) results to be provided to BHEL for acceptance in accordance with conditions given below: -

If 'K' Value test has been conducted against any BHEL order, on sample collected within 12 months prior to the date of present inspection, the related test results may be provided. Otherwise, the test will be carried out on samples identified and sealed by customer / BHEL authorized representative and related test results to be provided. The test will be carried out at govt. approved labs or test houses (at CBRI – Roorkee, IIT – Chennai, PIBCO R & D Centre - N. Delhi, NIRMA University, Ahmedabad) recognized by reputed customers.

6.03.00 **HEAT RESISTANCE**

When a sample of mattress is heated to the maximum recommended temperature of use (550 ^{o}C for 100 kg/m^3 density and 750 ^{o}C for 150 kg/m^3 density) as per method prescribed in IS:3144 (test for maximum recommended temp), the material shall not suffer visible deterioration of the fibrous structure, any fusion of fibers and shall not show any evidence of internal self-heating. Any colour change shall not be considered as visible deterioration in fibrous structure.

6.04.00 **OTHER TESTS**

The following tests are to be conducted as per IS:3144/IS:8183 and the acceptance norms shall be as per IS:8183.

a. Moisture content

b. Moisture Absorption

c. Incombustibility

d. Sulphur content

e. Recovery after Compression

f. Alkalinity

	SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES	SPECIFICATION NO:PE-TS-405-169-M032
		SECTION : I
		REV. NO. 00
		DATE: 05.11.2022
		SHEET 3 OF 5

g. Chloride Content

h. Fibre Diameter

i. Resistance to vibration

j. Resistance to jolting

7.00.00 PACKING AND MARKING

7.01.00 Stack of mattresses shall be packed in unfolded condition and sealed in polythene bags of at least 0.2mm thickness. Then the sealed bags shall be put inside the polythene lined HDPE or HDPP Woven netting bags and sealed by machine stitching.

To account for looseness in packing (if any) due to machine stitching, the bags shall be properly stacked and tightly fastened during transportation to avoid any possible damage due to relative movements. Sharp edges of wire netting shall be bent inwards to avoid damage to packing.

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 For easy identification of mattresses as per density & wire netting material, following colour codes for the HDPE bags is to be followed:

a) Yellow bags with marking as shown in Fig 1 (Page 5 of 5) for 150 kg/m3 with Galvanized steel wire netting

b) White bags with marking as shown in Fig 1 (Page 5 of 5) for 100 kg/m3 with Galvanized steel wire netting

c) Yellow bags with marking as shown in Fig 1 (Page 5 of 5) for 150 kg/m3 with SS wire netting

d) In case of both side SS/ GS wire meshing, additional marking “BOTH SIDE MESH” is to be provided.

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

a) Project Name
b) Vendor name:
c) Purchase Order No. and Date
d) Sl. No. of package/Batch No:
e) Size of mattresses (Thickness x Length x Width)
f) 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"

	SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES	SPECIFICATION NO:PE-TS-405-169-M032
		SECTION : I
		REV. NO. 00
		DATE: 05.11.2022
		SHEET 4 OF 5

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 material conforms 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.

8.02.00 The Quality Plan enclosed with this specification specifies minimum quality control requirement. During contract stage vendor shall furnish this Quality Plan duly signed & stamped for BHEL approval. Quality plan shall be approved by BHEL and customer. Inspection and testing shall be carried out as per Quality Plan by BHEL/ BHEL representative and customer (as applicable). In case inspection is by both BHEL and their customer, then the inspection can be carried out jointly or separately, which will be informed later. In case of the foreign bidder, inspection shall be carried out by reputed third party.

8.03.00 The charges for third party inspection (Lloyds, TUV or equivalent) for foreign bidders shall be included in the base price of the item by the bidder. This third party agency shall be approved by BHEL. Bidder to inform the same in the offer and mention the same in Quality Plan.

Note: There may be minor changes in quality plan depending on customer/consultant comments which will HAVE TO BE ACCOMMODATED BY VENDOR AT NO EXTRA COST.

9.00.00 DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT:

1. Quality plan duly signed and stamped.
2. Datasheet for Approval by BHEL/Customer.

Approval of Quality plan/ Data sheet shall be required for manufacturing clearance and the same shall be considered for delay analysis by BHEL.

	SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES	SPECIFICATION NO:PE-TS-405-169-M032
		SECTION : I
		REV. NO. 00
		DATE: 05.11.2022
		SHEET 5 OF 5

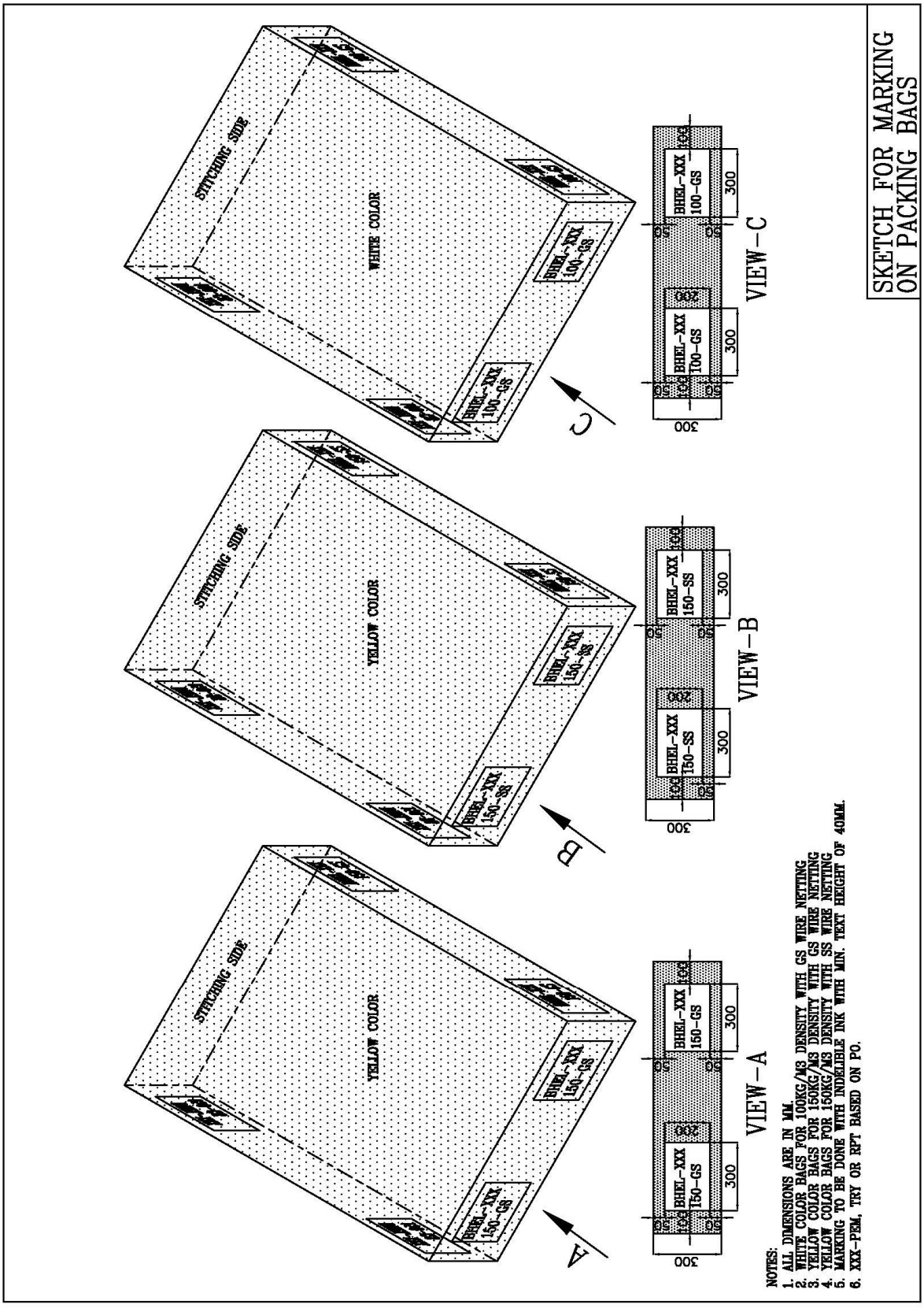

Fig 1: Sketch for marking on bags

STANDARD TECHNICAL DATA SHEET FOR LIGHT RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES

PROJECT: 3X660MW NORTH KARANPURA STPP

QP NO: PE-QP-405-169-M032

SPECIFICATION NO: PE-TS-405-169-M032

SL. No.	CHARACTERISITCS	ACCEPTANCE/PERMISSIBLE LIMIT		
1	MATERIAL	LRB Rock wool mattresses confirming to IS:8183/Latest.		
2	Bulk Density	100 Kg/m^3 & 150 Kg/m^3 with (+)15% & (-)5% tolerance.		
3	Mattresses Size	1640mm x 1220mm/1520mm x 1220mm		
4	Thickness	25,40,50,60,75mm (Thickness values as per BOM) Tolerance on thickness shall		
5	Service Temperature	Upto 400^0 C - 100 Kg/m3 Above 400^0 C - 150 Kg/m3		
6	Thermal Conductivity as per IS 8183/93 (Group 3/Group 4)	Mean Temp.	**100 Kg/m^3 (Group 3)** K value in mW/cm.°C (Max)	**150 Kg/m^3 (Group 4)** K value in mW/cm.°C (Max)
		100° C	0.52	0.52
		200° C	0.73	0.68
		300° C	0.95	0.93
7	Chloride content	0.01 % max.		
8	Shot content	Shot shall not exceed 5% maximum by weight.		
		Shot shall not be greater than 5mm in any dimension.		
9	Sulphur content	0.6% max		
10	Moisture Content (Weight gain by moisture absorption)	2 % max		
11	Incombustibility Test (loss of weight after test)	5% max		
12	Resistance to vibration	1 % max		
13	Resistance to jolting	3 % max		
14	Alkalinity	7-10 pH		
15	Recovery After Compression	90% minimum after compression to 75% of the original Thickness.		
16	Fibre Diameter	7.0 Micron max.		
17	SS wire netting (above 400 deg.C)	As per IS:6528 & 3150, Aperture 13mm & Wire Dia 0.56mm.(Wire Dia and single side/ Both sides wire netting as per BOM).		
18	SS Tieing/Stitching wire (above 400 deg.C)	Wire Dia 0.40mm As per IS:6528.		
19	GI wire netting (upto 400 deg.C)	As per IS:280 & 3150, Aperture 13mm & Dia 0.56mm.(Wire Dia and single side/ Both sides wire netting as per BOM).		
20	GI Tieing/Stitching wire (upto 400 deg.C)	Wire dia 0.40mm As per IS:280.		
21	Packing, Marking &other requirement	Stack of mattresses shall be packed in unfolded condition and sealed in polythene bags of at least 0.2mm thickness. Then the sealed bags shall be put inside the polythene lined HDPE or HDPP Woven netting bags and sealed by machine stitching. Packing to be duly marked with a caution note “Always store under covered shed and on raised platforms". For marking and other details Technical specification is to be referred.		

BIDDER/SUPPLIER	**BHEL**

Form No. PEM-6666-0

	TITLE:	SPECIFICATION NO. PE-TS-405-169-M032	
BHEL	**BILL OF MATERIAL** **3X660MW NORTH KARANPURA STPP** **BONDED MINERAL (R) WOOL MATTRESSES**	**REV. NO. 0**	**DATE: 05.11.2022**
		SHEET 1 OF 1	

DATA SHEET-A

R-MATTRESS B.O.M.

S.No	MATERIAL	DENSITY(Kg/m3)	THK(mm)	Quantity (m2)
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	150	25	**300**
			40	**8200**
			50	**7600**
			60	**10400**
			75	**38200**
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.	100	25	**11000**
			40	**10200**
			50	**17400**
			60	**11400**
			75	**14400**

NOTE:

1) Quantity tolerance shall be (+)0/ (-)15 m^2 for each density/thickness mattress.

बीएचईएल	**COMPLIANCE SHEET** **BONDED MINERAL (ROCK) WOOL MATTRESSES** **3X660MW NORTH KARANPURA STPP**	SPECIFICATION NO. PE-TS-405-169-M032 SECTION: II REV. NO.:00 DATE: 05.11.2022 SHEET 1 OF 1

I hereby comply/not comply (*) to all the requirements of this technical specification in totality.

*** In case the bidder does not comply to the technical specification, the deviations shall be explicitly listed in the technical deviation sheet of GCC. Deviations listed in technical deviation sheet shall only be considered.**

Name of Bidder / Authorized Representative :- _ _ _ _ _ _ _ _ _ _ _ _ _

Designation :- _ _ _ _ _ _ _ _ _ _ _ _ _

Signature :- _ _ _ _ _ _ _ _ _ _ _ _ _

Company Seal :- _ _ _ _ _ _ _ _ _ _ _ _ _

Date :- _ _ _ _ _ _ _ _ _ _ _ _ _ _

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE				
NAME	DESIGNATION	SIGNATURE	DATE	COMPANY SEAL

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN	SPEC. NO : PE-TS-405-169-M032	DATE: 05.11.2022
BHEL/Customer Approved Suppliers	CUSTOMER : M/s NTPC	QP NO.: PE-QP-405-169-M031	DATE: 05.11.2022
	PROJECT: 3X660MW NORTH KARANPURA STPP	PO NO.:	DATE:
	ITEM: THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES	SECTION: II	SHEET 1 OF 3

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9		**			10
					M	C/N				D	M	C	N	
1.0 MATERIAL														
1.1	CHEMICAL COMPOSITION (RAW MATERIAL)	CHEMICAL PROPERTIES	MA	CHEMICAL	ONE SAMPLE PER LOT	ONE SAMPLE PER LOT	MANUFACTURER STANDARD	MANUFACTURER STANDARD	TC	√	P	V	V	
1.2	GS WIRE	1.DIMENSIONS	MA	MEASUREMENT	IS 3150 Appendix A	IS 3150 Appendix A	IS 3150	IS 3150/ BHEL/CUSTOMER APPROVED DATA SHEET	IR	√	P	W #	V	#Witness shall be carried out at the stage of Clause 3.1.
		2.GAUGE DIAMETER	MA	MEASUREMENT			IS 280	IS 280/ BHEL/CUSTOMER APPROVED DATA SHEET	IR	√	P	W #	V	
		3. CHEMICAL	MA	LAB. TEST			IS 280	IS 7887	TC	√	P	V	V	
		4. COATING TEST	MA	LAB. TEST			IS 280	IS 4826	TC	√	P	V	V	
		5. TENSILE TEST	MA	LAB. TEST			IS 280	IS 280	TC	√	P	V	V	
		6. WRAPPING TEST	MA	LAB. TEST			IS 280	IS 280	TC	√	P	V	V	
		7. BEND TEST	MA	LAB. TEST			IS 280	IS 280	TC	√	P	V	V	
1.3	SS WIRE	1.DIMENSIONS	MA	MEASUREMENT	IS 6528	IS6528	IS 3150	IS 3150/ BHEL/CUSTOMER APPROVED DATA SHEET	IR	√	P	W #	V	#Witness shall be carried out at the stage of Clause 3.1.
		2.GAUGE DIAMETER	MA	MEASUREMENT	IS 3150	IS 3150	IS 6528	IS 6528/ BHEL/CUSTOMER APPROVED DATA SHEET	IR	√	P	W #	V	
		3.CHEMICAL ANALYSIS	MA	LAB. TEST	IS 6528	IS 6258	IS 6528	IS 6528	TC	√	P	V	V	
		4.TENSILE TEST	MA	LAB. TEST	IS 6528	IS6528	IS 6528	IS 6528	TC	√	P	V	V	
		5. REVERSE BEND TEST	MA	LAB. TEST	IS 6528	IS6528	IS 6528	IS 6528	TC	√	P	V	V	
		6. WRAPPING TEST	MA	LAB. TEST	IS 6528	IS6528	IS 6528	IS 6528	TC	√	P	V	V	
		7. TORSION TEST	MA	LAB. TEST	IS 6528	IS6528	IS 6528	IS 6528	TC	√	P	V	V	
2.0 IN-PROCESS INSPECTION														
2.1	FINISHED MATTRESS	DIMENSION & TOLERANCE	MA	MEASUREMENT	IS 8183	IS 8183	IS 3144	IS 8183/ BHEL/CUSTOMER APPROVED DATA SHEET	TC	√	P	V	V	

BIDDER/SUPPLIER	
Sign & Date	
Seal	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Lakhan Pal	Lakhan Pal	Checked by:	Ashish Panigrahi	Ashish Panigrahi
Reviewed by:	SANJAY KUMAR	Sanjay Kumar	Reviewed by:	HARISH KUMAR	Harish Kumar

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN	SPEC. NO : PE-TS-405-169-M032	DATE: 05.11.2022
BHEL/Customer Approved Suppliers	CUSTOMER : M/s NTPC	QP NO.: PE-QP-405-169-M031	DATE: 05.11.2022
	PROJECT: 3X660MW NORTH KARANPURA STPP	PO NO.:	DATE:
	ITEM: THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES	SECTION: II	SHEET 2 OF 3

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
3.0 FINAL INSPECTION														
3.1	BONDED MINERAL (ROCK) WOOL MATTRESSES (FINISHED PRODUCT)	1. DIMENSIONS	MA	MEASUREMENT	IS 8183	IS 8183	IS 3144	IS 8183/ BHEL/CUSTOMER APPROVED DATA SHEET	IR	√	P	W	V	
		2. APPEARENCE	MA	VISUAL	IS 8183	IS 8183	IS 3144	SHALL BE FREE FROM VOIDS, CRACKS	IR					
		3. BULK DENSITY	MA	LAB. TEST	IS 8183	IS 8183	IS 3144	IS 8183/ BHEL/CUSTOMER APPROVED DATA SHEET	TC	√	P	W	V	Routine tests
		4.SHOT CONTENT	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		5. SULPHUR CONTENT	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		6. ALKALINITY	MA	LAB. TEST	IS 8183	IS 8183	IS 8183		TC	√	P	W	V	
		7. CHLORIDE CONTENT	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		8. MOISTURE CONTENT	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		9.THERMAL CONDUCTIVITY (K VALUE)	CR	LAB. TEST	IS 8183	IS 8183	IS 3346	IS 8183/ BHEL/CUSTOMER APPROVED DATA SHEET	TC	√	P	W	V	Type test REFER NOTES 4 & 5
		10. HEAT RESISTANCE	MA	LAB. TEST	IS 8183	IS 8183	IS 3144	IS 8183/ BHEL/CUSTOMER APPROVED DATA SHEET	TC	√	P	W	V	Type tests REFER NOTE 6
		11.MOISTURE ABSORPTION	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		12. RECOVERY AFTER COMPRESSION	MA	LAB. TEST	IS 8183	IS 8183	IS 8183		TC	√	P	W	V	
		13. INCOMBUSTIBILITY	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		14.RESISTANCE TO VIBRATION	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		15. RESISTANCE TO JOLTING	MA	LAB. TEST	IS 8183	IS 8183	IS 3144		TC	√	P	W	V	
		16. FIBRE DIAMETER	MA	LAB. TEST	One for each density	One for each density	IS 3144		TC	√	P	W	V	
3.2	PACKING & MARKING	PACKING TYPE AND IDENTIFICATION MARKING	MA	VISUAL	RANDOM	RANDOM	BHEL/CUSTOMER APPROVED DATA SHEET/PACKING PROCEDURE	BHEL/CUSTOMER APPROVED DATA SHEET/ PACKING PROCEDURE	SOFT COPY OF PHOTO GRAPH	√	P	W	-	REFER NOTE 2

BIDDER/SUPPLIER	
Sign & Date	
Seal	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Lakhan Pal	Lakhan Pal	Checked by:	Ashish Panigrahi	Ashish Panigrahi
Reviewed by:	SANJAY KUMAR	Sanjay Kumar	Reviewed by:	HARISH KUMAR	Harish Kumar

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS BHEL/Customer Approved Suppliers	QUALITY PLAN	SPEC. NO : PE-TS-405-169-M032	DATE: 05.11.2022
	CUSTOMER : M/s NTPC	QP NO.: PE-QP-405-169-M031	DATE: 05.11.2022
	PROJECT: 3X660MW NORTH KARANPURA STPP	PO NO.:	DATE:
	ITEM: THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES	SECTION: II	SHEET 3 OF 3

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**		10
					M	C/N				D	M	C	N

NOTES:

1. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
2. Following to be noted for packing:
   a. Material shall be packed suitably in order to avoid damage during transit and also during storage at site in tropical climate conditions for a period of 15-18 months.
   b. Photographs of the packing (with LR No.) as per approved packing procedure (if applicable) just before dispatch.
3. BHEL reserves the right for conducting repeat test, if required.
4. If 'K' Value test has been conducted against any BHEL order, on samples collected within twelve (12) months prior to the date of present inspection, the related test results may be provided. Otherwise, the tests will be carriedout on samples identified and sealed by Customer/BHEL authorized representative and related test results to be provided. The tests will be carried out at govt. approved labs or test houses (at CBRI - Roorkee, IIT - Chennai or PIBCO R & D Centre, N. Delhi, NIRMA University, Ahmedabad) recognized by reputed customers. 'K' Value test will be carried out for at least three mean temperatures i.e.100 ^{0}C, 200 ^{0}C & 300 ^{0}C for each density.
5. Thermal conductivity type test reports shall be submitted to BHEL Engineering for review and approval.
6. Type tests (except thermal conductivity) shall be done once in 3 months in the presence of BHEL/BHEL AIA.
7. The latest revisions/year of issue of all the IS indicated in the QP shall be referred.

LEGENDS:

***D**: Records, identified with "Tick"(√) shall be essentially included by supplier in QA Documentation.
** **M**: Supplier/ Manufacturer/ Sub-Supplier
C: Main Supplier/BHEL/ Third Party Inspection agency
N: Customer
P: Perform
W: Witness
V: Verification
MA: Major Characteristic
MI: Minor Characteristic
CR: Critical Characteristic
IR: Inspection Report
TC: Test Certificate

BIDDER/SUPPLIER	
Sign & Date	
Seal	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	Lakhan Pal	Lakhan Pal	Checked by:	Ashish Panigrahi	Ashish Panigrahi
Reviewed by:	SANJAY KUMAR	Sanjay Kumar	Reviewed by:	HARISH KUMAR	Harish Kumar

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

1241186/2023/PS-PEM-MPL

Bharat Heavy Electricals Limited

(A Govt. Of India Undertaking)

PROJECT ENGINEERING MANAGEMENT

THERMAL INSUALTION-LRB (ROCKWOOL) MATTRESS/PIPESECTION for 3X660MW NORTH KARANPURA STPP

Price Variation Clause:

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

Current Price = 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.: 1.3.13.2 (REFRACTORY PRODUCTS) FOR MONTH OF ORDERING.
M1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.13.2 (REFRACTORY 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.: 1.3.14.4 – (MILD STEEL-LONG PRODUCTS) FOR MONTH OF ORDERING.
S1 = INDICES AS PER RBI BULLETIN TABLE 21 SL NO.: 1.3.14.4 – (MILD STEEL-LONG PRODUCTS) FOR 1 MONTH PRIOR TO DESPATCH
L0 = INDICES AS PER RBI BULLETIN TABLE 19 (CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR MONTH OF ORDERING.
L1 = INDICES AS PER RBI BULLETIN TABLE 19 (CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS) FOR 1 MONTH PRIOR TO DESPATCH

Total PVC shall be limited to ± 10% of Ex-Works Value.

Note: RBI Indices considered for refractory, Fuel &Power, Mild steel are as per base year 2011-12 and for Industrial worker as per base year 2016 of RBI Bulletin. The above PV Clause is subject to change based on latest RBI Bulletin.

1241186/2023/PS-PEM-MPL

	PRE - QUALIFYING REQUIREMENTS	DOCUMENT NO: PE-TS-405-000-M053
		REVISION NO: 00, DATE: 07.11.2022
		SHEET: 1 of 3

Standard document No.: PE-TS-999-000-M053

Enquiry No. (To be filled by PG):

Project: 3X660 MW NORTH KARANPURA STPP

Package: Thermal Insulation - Bonded Mineral (Rock) Wool Mattresses

CRITERIA FOR EVALUATION (TECHNICAL / ~~FINANCIAL~~):

1. Technical Pre-Qualifying Requirements:

1.1 The bidder (including cases as defined in clause no. 2.1 below) should have designed, in-house manufactured, tested, inspected and supplied thermal insulation - Bonded mineral (rock) wool mattresses for use in a power plant or for similar application.

Supply of material through requisite tie-up with specified manufacturing unit(s) shall also be acceptable. In such cases, tied up manufacturing unit(s) shall be binding for the contract and bidder shall meet PQR pertaining to all manufacturing units individually. Manufacturing units quoting through such tie-up shall not be eligible to quote separately or through any other tie-up.

Bidder to provide authorization letter from manufacturing units along with scope matrix in support of such Tie-up.

Manufacturing units, which have tie-up with parties quoting to BHEL, shall not be qualified for separately quoting to BHEL.

1.2 The item(s) mentioned in point 1.1 should have performed successfully in similar installations for atleast one year. To establish meeting this requirement, the bidder shall conform to any one of the following clauses:

(i) Execution of two purchase orders for different End-users with the item(s) performing successfully for one (1) year from date of commissioning to the date of bid submission as defined by BHEL-PEM in NIT. Different projects of a customer shall be considered as different End-users.

(ii) Minimum one (1) repeat contract from two (2) different Purchasers (i.e. 2 Nos of Purchase orders from each purchaser). A contract shall be considered as repeat, when the second contract is given by the same purchaser after lapse of minimum one (1) year from supply completion of first contract.

(iii) Execution of one (1) purchase order as per sl. no. (i) above from one End-user and one (1) repeat contract from another Purchaser as per sl. No. (ii) above.

(iv) Three (3) contracts from one (1) Purchaser. Second and third contract shall be after lapse of minimum one (1) & two (2) years respectively from supply completion of first contract.

PREPARED BY:	REVIEWED BY:	APPROVED BY:
NAME: LAKHAN PAL DESIGNATION: Dy. MGR. DEPT.: PS-PEM/ MPL	15/11/2022 NAME: SANJAY KUMAR DESIGNATION: SDGM DEPT.: PS-PEM/ MPL	15/11/2022 NAME: B.K. AGARWAL DESIGNATION: DH DEPT.: PS-PEM/ MPL

	PRE - QUALIFYING REQUIREMENTS	DOCUMENT NO: PE-TS-405-000-M053
		REVISION NO: 00 DATE: 07.11.2022
		SHEET: 2 of 3

1.3 The bidder to furnish the following documents, as applicable, in support of the above:

a) For point 1.2(i): Performance certificates from End-user (duly signed & dated) specifying that the product is performing successfully for one (1) year from date of commissioning along with correlated purchase order(s)

b) For point 1.2 (ii) & (iv): Purchase order(s), Material dispatch clearance certificate (MDCC)/ Material receipt certificate (MRC)/Lorry receipt (LR)/ Supply invoice

1.4 In addition to above, bidder or its tied up manufacturing units should have the following facilities:

a) In-house capability of manufacturing thermal insulation - Bonded mineral (rock) wool mattresses of minimum 200 MT per month.

b) In-house testing facilities for carrying out tests as per relevant standards & Quality plan. In case, the in-house testing facilities are not available, then bidder shall furnish undertaking that test(s) will be carried out from govt. approved lab or test house recognized by reputed customers.

Bidder to submit supporting documents (Certificate indicating capacity and details/ undertaking of manufacturing & testing facilities) for point (a) & (b) above.

1.5 To establish business continuity, bidder to submit minimum two (2) Purchase order for item(s) as specified in points 1.1 in last 3 (three) years prior to the date of bid submission defined by BHEL-PEM.

2.0 Bidder to also comply with general points mentioned below.

2.1 Offers of the JV companies/ Joint Bidders/ bidders having collaboration/ licensing agreement/ MOU/ Indian subsidiaries shall be evaluated as follows:

a) If bidder happens to be an Indian subsidiaries of foreign OEM, then the credentials of the foreign OEM can also be considered for meeting PQR.

b) If bidder happens to be the Joint Venture Company, then the credentials of any of JV partners can be also considered for meeting PQR.

c) If bidder happens to be the having valid collaboration agreement/ MOU/ licensing agreement with some other company, then the credentials of collaborator/ MOU partner/ licensing company can also be considered for meeting PQR.

Note: If bidder(s) qualifies on the basis of credentials of his principal/ JV partner/ Collaborator/ joint bidder etc., then the principal/ JV partner/ Collaborator/ MOU partner/ joint bidder shall be responsible for overall design vetting and warranty/ guarantee of the package. The scope

PREPARED BY:	REVIEWED BY:	APPROVED BY:
	15/11/2022	15/11/2022
NAME: LAKHAN PAL	NAME: SANJAY KUMAR	NAME: B.K. AGARWAL
DESIGNATION: Dy. MGR.	DESIGNATION: SDGM	DESIGNATION: DH
DEPT.: PS-PEM/ MPL	DEPT.: PS-PEM/ MPL	DEPT.: PS-PEM/ MPL

BHEL	**PRE - QUALIFYING REQUIREMENTS**	DOCUMENT NO: PE-TS-405-000-M053
		REVISION NO: 00, DATE: 07.11.2022
		SHEET: 3 of 3

matrix clearly defining their respective roles including design vetting, manufacturing of critical component, E&C etc. and warranty/ guarantee shall be submitted along with the offer.

2.2 Bidder to note that the arrangement of bidding (joint bid partners/ collaborator/ MOU partner/licensing company etc.) once offered to BHEL as a part of bidding documents cannot be changed till the execution of contract(s).

2.3 Consideration of offer shall be subject to customer's approval of bidders, if applicable.

2.4 Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.

2.5 Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

2.6 After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

2.7 Bidder to ensure that Third Party/customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document/ certificate issuing authority such as name & designation of issuing authority and its organization contact number and email-id etc. In case the same found not available, purchaser has right to reject such document from evaluation.

PREPARED BY:	REVIEWED BY:	APPROVED BY:
NAME: LAKHAN PAL **DESIGNATION:** Dy. MGR. **DEPT.:** PS-PEM/ MPL	15/11/2022 **NAME:** SANJAY KUMAR **DESIGNATION:** SDGM **DEPT.:** PS-PEM/ MPL	15/11/2022 **NAME**: B.K. AGARWAL **DESIGNATION:** DH **DEPT.:** PS-PEM/ MPL

ANNEXURE II TO RISK & COST

1. In case of delays (beyon d the maximu m late delive ry per iod as per LD cl ause) in supplie s, or if there be defective su pplies or no n-fulfilment o f any other terms and conditions of the Co ntract as en umerated subsequently in this clause, then, without prejudice to its right to recover any expenses, losses or damages to which the B uyer may b e put to in cur or sustain by rea son of th e Seller/ Contractor's d efault or b reach of Order/Contract or to suspend business dealings with the Seller/Contractor in terms of the Buyers' Guidelines for Suspension of Business Dealings as applicable from time to time, the Buyer shall also be entitled to cancel the Order/ Contract either in whol e or portion thereof without compensation to Seller. On t he occurrence of any of the acts/omission s mentioned below, the Buyer may if it so desi res, procure upon such terms and i n such manner as deemed appropriate, plant/equipment/ stores not so delivered or others of similar description where plant/ equipment/ stores exactly complying with particulars are not, in the opinion of the Buyer (wh ich shall be final), readily procurable, at the risk and cost of the Seller.

The Seller shall be liable to the Buyer for any excess co sts incurred thereof and the Seller shall continue the performance of the Order/Contract to the extent not cancelled under the provisions of this clause. The Seller shall on no account be entitled to any gain on such repurchases. If the Bidder doe s not agree to thi s Risk Purchase cl ause, BHEL reserves the right to reje ct the bid/offer of the Bidder. The ord er/contract may be cancelled in whole or p art thereof an d Risk & Co st Clause in lin e with term s and conditions of PO/Cont ract may be invoked by the Buyer in any of the following cases:

i. If the Seller/Contra ctor fails to deliver the good s or materials or any instalment thereof within the perio d(s) fixed for such delivery or the Seller's poor progress of the supply/services vis-à-vis delivery/execution timeline as stipulated in the contract, backlog attributable to the Seller including unexecuted portion of supply does not appear to be executable within balance period available;

ii. delivers g oods or mat erials not of the cont racted quality and failing to adhe re to the contra ct specifications/execution methodology;

iii. withdrawal from or repudiation/abandonment of the supply/services by the Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the order/Contract either in whole or in part or otherwise fails to perform the Order/Contract.

iv. Non supply by the Seller within scheduled completion/delivery period as per contract or as extended from time to time for reasons attributable to the Seller;

v. Termination of Contract on account of any other reason(s) attributable to the Seller.

vi. Assignment, transfer, sub-letting of Contract with out BHEL's written permission resulting in termination of Contract or part thereof by BHEL.

vii. If the Seller be an individual or a Sole Proprietorship, in the event of death or insanity of the Seller.

viii. If the Seller/Contractor being an individual or if a partnership firm thereof, shall at any time be a djudged insolvent or shall have a receivin g order for administration of his estate made against him or shall take a ny proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the order/Contract or enter into any arrangement or composition with his credi tors or suspend payment or if the firm dissolved under the Partnership Act;

ix. If the Seller/Co ntractor being a Company is wo und up voluntarily or by order of a Cou rt or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager

x. Non- Compliance to any contractual condition or any other default attributable to the Seller.

Such defaulting vendor/Seller shall not be eligible to participate in re-tendering conducted on account of risk purchase made due to fault of such vendor/Seller.

2. BHEL's right to go for Risk and Cost, Calculation of Risk and Cost amount & LD, recovery options to BHEL are given as under: -

2.1 BHEL reserves the right to terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor *after due notice of a period of 14 days' by BHEL* in any of the following cases:

i) If the Seller/Contractor fails to deliver the goods or materials or any instalment thereof within the period(s) fixed for such delivery or the Seller's poor progress of the supply/ services vis-a-vis delivery/execution timeline as stipulated in the Contract, backlog attributable to seller including unexecuted portion of supply does not appear to be executable within balance available period;

ii) Delivers goods or materials not of the contracted quality and failing to adhere to the contract specifications;

iii) Withdrawal from or repudiation/ abandonment of the supply/ services by Seller before completion as per contract or if the Seller refuses or is unable to supply goods or materials covered by the Order/Contract either in whole or in part or otherwise fails to perform the Order/Contract;

iv) Non-supply by the Seller within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the Seller;

v) Termination of Contract on account of any other reason (s) attributable to Seller.

vi) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.

vii) If the Seller be an individual or a sole proprietorship Firm, in the event of the death or insanity of the Seller;

viii) If the Seller/Contractor being an individual or if a firm on a partnership thereof, shall at any time, be adjudged insolvent or shall have a receiving order for administration of his estate made against him or shall take any proceeding for composition under any Insolvency Act for the time being in force or make any assignment of the Order/Contract or enter into any arrangement or composition with his creditors or suspend payment or if the firm dissolved under the Partnership Act;

ix) If the Seller/Contractor being a company is wound up voluntarily or by order of a Court or a Receiver, Liquidator or Manager on behalf of the debenture holders and creditors is appointed or circumstances shall have arisen which entitles the Court of debenture holder and creditors to appoint a receiver, liquidator or manager;

x) Non-compliance to any contractual condition or any other default attributable to Seller.

2.1.1 <u>Risk & Cost Amount against Balance Work</u>:

Risk & Cost amount against balance work shall be calculated as follows:

Risk & Cost Amount= [(A-B) + (A x H/100)]

Where,
A= Value of Balance scope of Work (*) as per rates of new contract
B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.
H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

2.1.2 Balance scope of work (in case of termination of contract):

Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work for calculating risk & cost amount.

Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose.

Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: In case portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work' for calculating Risk & Cost amount.

2.1.3 LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line NIT terms & conditions, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of LD against delay in executed work in case of termination of contract" is given below:

i. Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
ii. Let the value of executed work till the time of termination of contract = X
iii. Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y
iv. Delay in executed work attributable to contractor i.e. T2 = [1-(X/Y)] x T1
v. LD shall be calculated in line with LD clause (clause 16) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.2 Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor:

Without prejudice to the other means of recovery of such dues from the Seller recoveries from the Seller on whom risk
& cost has been invoked shall be made from the following:

a) Dues available in the form of Bills payable to seller, SD, BGs against the same contract.
b) Dues payable to seller against other contracts in the same Region/Unit/ Division of BHEL.
c) Dues payable to seller against other contracts in the different Region/Unit/ division of BHEL.

In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.