# FRAMEWORK AGREEMENT

**TECHNICAL SPECIFICATION**

**FOR**

**BONDED MINERAL (ROCK) WOOL MATTRESSES**

**SPECIFICATION NO. PE-TS-020-169-M032**

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

# CONTENTS

| | | |
|---|---|---|
| BHEL | SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES FRAMEWORK AGREEMENT | SPECIFICATION NO:PE-TS-020-169-MO32<br>SECTION : I<br>REV. NO. 00<br>DATE: 24.03.2017<br>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 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.

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/m$^3$ 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:8183 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 $^{o}$C, 200 $^{o}$C & 300 $^{o}$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 $^{o}$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 any fusion of fibers and visible deterioration of the fibrous structure. Any color 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.

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 **INCOMBUSTIBLITY**

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.

## 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 For easy identification of mattresses as per density & wire netting material,

following color 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 (Single side/Double side)
b) White bags with marking as shown in Fig 1 (Page 5 of 5) for 100 kg/m3 with Galvanized steel wire netting (Single side/Double side)
c) Yellow bags with marking as shown in Fig 1 (Page 5 of 5) for 150 kg/m3 with SS wire netting (Single side/Double side)

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

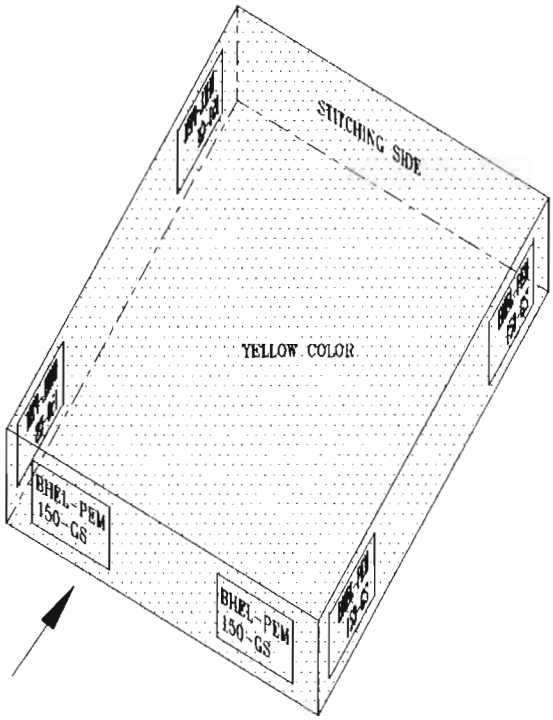
a) Project Name
b) Purchase Order No.
c) Sl. No. of package
d) Size of mattresses (Thickness x Length x Width)
e) Density of mattresses
f) Wire netting material and size
g) Weight of the package
h) No. of mattresses in the package
i) A caution note "Always store under covered shed and on raised platforms"

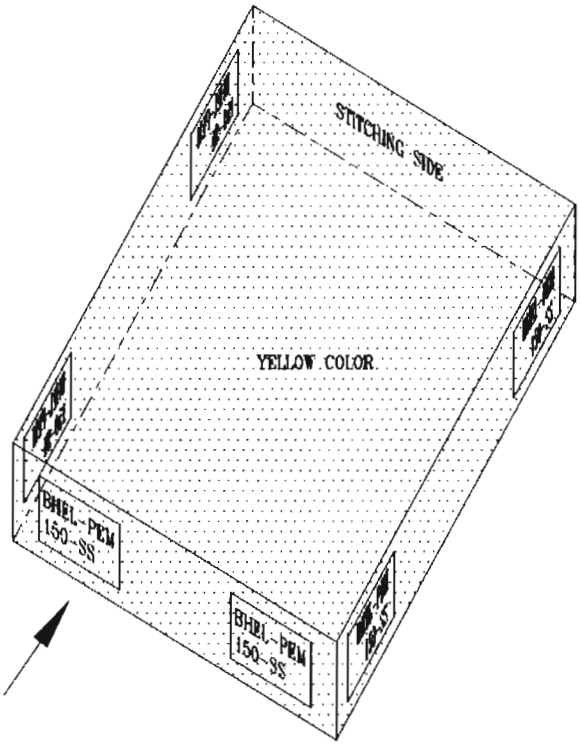
## 8.00.00 INSPECTION AND TESTING

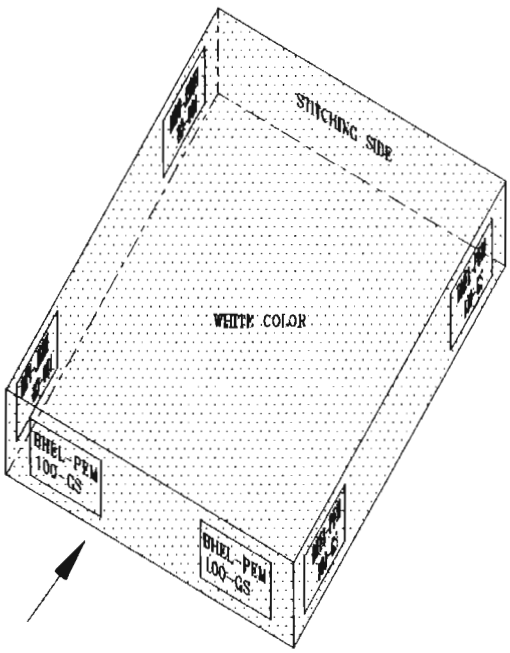
8.01.00 Bonded mineral wool mattresses to be supplied under this specification shall be of tested quality and workmanship. Inspection and testing of thermal insulation materials shall be as per this specification / quality plan enclosed. Manufacturer shall conduct all tests and stage inspections as per 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.

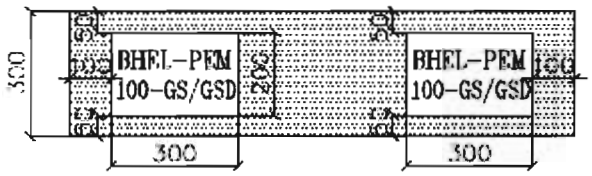
8.02.00 All reports, test certificates etc. to be submitted during contract shall be subject to BHEL / Customer review / approval.

| | SPECIFIC TECHNICAL REQUIREMENT FOR BONDED MINERAL (ROCK) WOOL MATTRESSES FRAMEWORK AGREEMENT | SPECIFICATION NO:PE-TS-020-169-MO32 |
|---|---|---|
| | | SECTION : I |
| | | REV. NO. 00 |
| | | DATE: 24.03.2017 |
| | | SHEET 5 OF 5 |




TYPICAL VIEW

Note:

a) Yellow bags with marking for 150 kg/m3 with GS wire netting (GS-Single side/GSD-Double side)
b) White bags with marking for 100 kg/m3 with GS wire netting (GS-Single side/GSD-Double side)
c) Yellow bags with marking for 150 kg/m3 with SS wire netting (SS-Single side/SSD-Double side)

| | TITLE: | | SPEC. NO. PE-TS-020-169-M032 | |
|---|---|---|---|---|
| | TECHNICAL SPECIFICATION | | SECTION: II | |
| | BONDED MINERAL (ROCK) WOOL MATTRESS | | REV. NO.: 00 | |
| | FRAMEWORK AGREEMENT | | DATE: 24.03.2017 | |
| | | | SHEET 1 OF 1 | |
| | DATA SHEET-A | | | |
| | BILL OF MATERIAL (BOM) | | | |
| S.NO. | | | | |
| 1 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & one side GS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm GS wire. | 25MM | 2850 | |
| | | 40MM | 19750 | |
| | | 50MM | 36750 | |
| | | 60MM | 24350 | |
| | | 75MM | 126800 | |
| 2 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & one side SS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm SS wire. | 75MM | 22850 | |
| 3 | Bonded mineral (Rock) wool mattresses with 100Kg/M³ density & one side GS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm GS wire. | 25MM | 26750 | |
| | | 40MM | 70950 | |
| | | 50MM | 63150 | |
| | | 60MM | 40350 | |
| | | 75MM | 77000 | |
| 4 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & both side GS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm GS wire. | 25MM | 0 | |
| | | 40MM | 50 | |
| | | 50MM | 50 | |
| | | 60MM | 50 | |
| | | 75MM | 600 | |
| 5 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & both side SS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm SS wire. | 75MM | 3700 | |
| 6 | Bonded mineral (Rock) wool mattresses with 100Kg/M³ density & both side GS wire netting of 13 mm x0.56 mm size stitched with 0.4 mm GS wire. | 25MM | 1350 | |
| | | 40MM | 2600 | |
| | | 50MM | 1350 | |
| | | 60MM | 3200 | |
| | | 75MM | 4750 | |
| 7 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & one side GS wire netting of 13 mm x0.71 mm size stitched with 0.4 mm GS wire. | 25MM | 600 | |
| | | 40MM | 3050 | |
| | | 50MM | 27450 | |
| | | 60MM | 69200 | |
| | | 75MM | 170000 | |
| 8 | Bonded mineral (Rock) wool mattresses with 150Kg/M³ density & one side SS wire netting of 13 mm x0.71 mm size stitched with 0.4 mm SS wire. | 75MM | 46800 | |
| 9 | Bonded mineral (Rock) wool mattresses with 100Kg/M³ density & one side GS wire netting of 13 mm x0.71 mm size stitched with 0.4 mm GS wire. | 25MM | 14950 | |
| | | 40MM | 42550 | |
| | | 50MM | 68350 | |
| | | 60MM | 66800 | |
| | | 75MM | 109000 | |

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| बी एच ई एल BHEL | **QUALITY PLAN** | CUSTOMER: | PROJECT: **FRAMEWORK AGREEMENT** | SPEC. NO : **PE-SS-020-169-M032** |
| | | VENDOR : | QP NO. **PE-QP-020-169-M031** REV. **00** DT: **24.03.2017** | SPEC. TITLE : **THERMAL INSULATION** |
| | SHEET 2 OF 2 | SYSTEM | ITEM: **THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES** | CONTRACTOR : **BHEL, PEM, NOIDA** |

| S.NO. | COMPONENT/ OPERATION | CHARACTERISTICS CHECKED | CATE GORY | TYPE OF CHECK | EXTENT OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY P | AGENCY W | AGENCY V | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2.** | **Hexagonal wire netting & stitching wire** | | | | | | | | | | | |
| i) | GS Wire | Dimensional, 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 | 3 | - | 2 | Ref. note "D" |
| | | Appearance | MA | Visual | Random | Tech. Spec. | Shall be bright & free from defects | Inspection Report | 3 | - | 2 | Ref. note "D" |
| ii) | SS Wire | Dimensional, 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 | 3 | - | 2 | Ref. note "D" |
| | | Appearance | MA | Visual | Random | Tech. Spec. | Shall be bright & free from defects | Inspection Report | 3 | - | 2 | Ref. note "D" |
| **3.** | **Packing and marking** | Packing type and identification marking | MA | Visual | Random | Tech. Spec. | Tech. Spec. | (Soft copy of photographs) | 3 | 2 | - | 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 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) These type tests to be carried out once in 3 months.

C) These type tests to be carried out once in 3 months.

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

LEGEND

| | | | |
|---|---|---|---|
| MA | MAJOR CHARACTERISTIC | 1 | CUSTOMER |
| P | PERFORM | 2 | BHEL |
| W | WITNESS | 3 | VENDOR OR SUBVENDOR |
| V | VERIFICATION | | |

| BHEL | PARTICULARS | BIDDER/VENDOR | |
|---|---|---|---|
| LAKHAN PAL | NAME | | |
| | SIGNATURE | | |
| 24/03/2017 | DATE | | BIDDERS/VENDORS COMPANY SEAL |

| | | | | |
|---|---|---|---|---|
| बी एच ई एल BHEL | **QUALITY PLAN** | CUSTOMER: | PROJECT: **FRAMEWORK AGREEMENT** | SPEC. NO : **PE-SS-020-169-M032** |
| | | VENDOR : | QP NO. **PE-QP-020-169-M031** REV. **00** DT: **24.03.2017** | SPEC. TITLE : **THERMAL INSULATION** |
| | SHEET 1 OF 2 | SYSTEM | ITEM: **THERMAL INSULATION – RESIN BONDED MINERAL (ROCK) WOOL MATTRESSES** | CONTRACTOR : **BHEL, PEM, NOIDA** |

| S.NO. | COMPONENT/ OPERATION | CHARACTERISTICS CHECKED | CATE GORY | TYPE OF CHECK | EXTENT OF CHECK | REFERENCE DOCUMENT | ACCEPTANCE NORMS | FORMAT OF RECORD | AGENCY P | AGENCY W | AGENCY V | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | **Bonded Mineral (Rock) wool mattresses** | Chemical composition | MA | Chemical | 1 / Lot | Vendor std. | Vendor std. | Test Certificate | 3 | - | - | |
| | | Bulk density | MA | Lab. Test | Sampling as per IS: 8183 | IS: 3144 & spec | IS: 8183 & spec | -do- | 3 | 2 | - | |
| | | Dimensions | MA | Physical | -do- | -do- | -do- | -do- | 3 | 2 | - | |
| | | Shot content | MA | Lab. Test | -do- | -do- | -do- | -do- | 3 | 2 | - | |
| | | Chloride content | MA | Chemical | -do- | -do- | -do- | -do- | 3 | 2 | - | |
| | | Thermal Conductivity | MA | Lab. Test | -do- | IS: 3346 & spec | -do- | -do- | 3 | - | 2 | Ref. Note "A" |
| | | Heat Resistance | MA | Physical | -do- | IS: 3144 & spec | -do- | -do- | 3 | 2 | - | Ref. Note "C" |
| | | Moisture Content | MA | -do- | -do- | -do- | -do- | -do- | 3 | 2 | - | Ref. Note "C" |
| | | Moisture Absorption | MA | -do- | -do- | -do- | -do- | -do- | 3 | 2 | - | Ref. Note "B" |
| | | Recovery after compression | MA | -do- | -do- | IS: 8183 & spec | -do- | -do- | 3 | 2 | - | Ref. Note "C" |
| | | Resistance to vibration | MA | -do- | -do- | IS: 3144 & spec | -do- | -do- | 3 | 2 | - | Ref. Note "B" |
| | | Resistance to jolting | MA | -do- | -do- | -do- | -do- | -do- | 3 | 2 | - | Ref. Note "B" |
| | | Fibre diameter | MA | -do- | Sampling as per IS: 3144 | -do- | Tech. spec | -do- | 3 | 2 | - | Ref. Note "B" |
| | | Incombustibility | MA | -do- | Sampling as per IS: 8183 | -do- | IS: 8183 & Tech. spec | -do- | 3 | 2 | - | Ref. Note "B" |
| | | Sulphur Content | MA | Chemical | -do- | -do- | -do- | -do- | 3 | 2 | - | Ref. Note "C" |
| | | Alkalinity | MA | Chemical | -do- | IS: 8183 & spec | -do- | -do- | 3 | 2 | - | Ref. Note "C" |
| | | Appearance | MA | Visual | -do- | ---- | To be free from Voids, Cracks | Inspection Report | 3 | 2 | - | |

| **BHEL** | PARTICULARS | BIDDER/VENDOR | |
|---|---|---|---|
| LAKHAN PAL | NAME | | |
| | SIGNATURE | | |
| 24/03/2017 | DATE | | BIDDERS/VENDORS COMPANY SEAL |

| | COMPLIANCE SHEET<br>BONDED MINERAL (ROCK) WOOL MATTRESSES<br>FRAMEWORK AGREEMENT | SPECIFICATION NO: PE-TS-020-100-M032<br>SECTION: II<br>REV. NO.: 00<br>DATE: 24.3.2017<br>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 |