

**RAICHUR POWER CORPORATION LTD  
2X800 MW YERAMARUS STPP**

**TECHNICAL SPECIFICATION  
FOR  
INSULATING MATS**

**BHEL DOCUMENT NO. : PE-TS-362-507-E018, REV-0**

**VOLUME II B**



**BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECT ENGINEERING MANAGEMENT  
NOIDA – 201301**



TECHNICAL SPECIFICATION  
FOR  
INSULATING MATS

SPECIFICATION NO. PE-TS-362-507-E018

VOLUME II B

REVISION 0

DATE: 13.08.2015

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**IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION IN  
TOTAL, & THAT THERE ARE NO TECHNICAL DEVIATIONS.**

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BIDDER'S STAMP & SIGNATURE  
(REFER INSTRUCTION NO.1 OF 'INSTRUCTION TO BIDDERS')



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**INSTRUCTION TO BIDDERS FOR PREPARING TECHNICAL OFFERS**

1. Two signed and stamped copies of the following shall be furnished by all bidders as technical offer.
  - a. Unpriced Price schedule with bidder's signature and company stamp.
  - b. A copy of this sheet ("Instruction to Bidders for Preparing technical Offer"), with bidder's signature and company stamp.
  - c. A copy of previous sheet ("contents"), with bidder's signature and company stamp.
2. No comments/additions/deletions shall be made by the bidder on the signed & stamped copy of the specification. Any such changes made by the bidder shall not be considered.
3. Confirmations/comments (if any) regarding delivery schedules shall be furnished as part of the commercial offer. Any reference elsewhere/covering letter of technical offer shall not be considered by BHEL.
4. Any comments/clarifications on technical/inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall not be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the material description/quantities, notes etc. from those given in Annexure of specification shall not be considered (i.e., technical description, quantities, notes etc. as per specification shall prevail.)

-----  
(BIDDER'S STAMP & SIGNATURE)



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**PREAMBLE**

1. The Tender documents contain Two (2) volumes. The bidder shall meet the requirements of all two volumes.
  - 1.1 VOLUME - I CONDITIONS OF CONTRACT

This consists of four parts as below: -

Volume – IA This part contains Instructions to bidders for making bids to BHEL.

Volume – IB This part contains General Commercial Conditions of the Tender & includes provision that vender shall be responsible for the quality of item supplied by their sub-vendors.

Volume – IC This part contains Special Conditions of Contract.

Volume – ID This part contains Commercial Conditions for Erection & Commissioning site work, as applicable.
  - 1.2 VOLUME – II TECHNICAL SPECIFICATIONS

Technical requirements are stipulated in Volume – II, which comprises of: -

Volume – IIA General Technical Conditions.

Volume – IIB Technical Specification including Drawings, if any.
  - 1.3 VOLUME – IIB

This volume is sub-divided in to following sections:-

Section – A This section outlines the Intent of Specification

Section – B This section provides “Project Information”.

Section – C This section indicates Technical Requirements specific to Contract, not covered in Section – D

Section – D This section comprises of Technical specification of equipments complete with Data Sheets A & C.

Data sheet – A: - Specific data and other requirements pertaining to the equipments.

Data Sheet-C: Not Applicable



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**SECTION A**

**SCOPE OF ENQUIRY**



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**SCOPE OF ENQUIRY**

- 1.0 This specification covers design, manufacture, assembly, inspection & testing at manufacturer's works & CPRI, proper packing, delivery to site of **Protective Insulating Mats** as mentioned in different sections of this specification, complete with all accessories for efficient and trouble-free operation of 2 X 800MW YERAMARUS STPP.
- 2.0 It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to bidder's guarantee.
- 3.0 The general terms and conditions, instruction to bidders and other attachment referred to elsewhere are hereby made part of the Technical Specification.
- 4.0 The Bidder shall be responsible for and governed by all requirements stipulated hereinafter.
- 5.0 Bidder shall confirm total compliance to the specification without any deviations from the technical / quality assurance requirements stipulated.
- 6.0 The documents shall be in English language and MKS system of units.
- 7.0 At Contract Stage [By successful bidder for BHEL/ CUSTOMER approval]:
  - 1) Quality Assurance Plan.
  - 2) Technical Datasheet
  - 3) Copies of test certificates for testing done under the contract.



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**SECTION B**

**PROJECT INFORMATION**

		<b>RAICHUR POWER CORPORATION LTD</b>			
		TITLE		SHEET 1	
		<b>PROJECT INFORMATION</b>			
1.0	Owner	:	Raichur Power Corporation Ltd 22/23, Sudarshan Complex, IInd floor, Sheshadri Road, Bangalore-560 009 Karnataka, India		
2.0	Consultant	:	M/s Evonik Energy Services (I) Pvt. Ltd.,A-29, Sector 16 Noida-201301(UP), India		
3.0	Project Title	:	2x800 MW Yermarus Thermal Power Station		
4.0	Location	:	Yermarus Raichur Dist Karnataka State, INDIA It is situated at about 8 Kms from Raichur on the Raichur-Hyderabad State Highway-13 and 12 kms away from Bank of river Krishna and about 5 kms from Raichur Thermal Power Station		
5.0	Nearest Railway	:	Chicksugur Railway Station which is about 2 kms from site.		
6.0	Nearest Airport	:	Hyderabad around 200 kms		
7.0	Nearest Port	:	Chennai around at about 470 kms from site.		
8.0	Latitude and Longitude	:	Latitude – 16° 16' 55.9"N Longitude – 77° 20' 38.6"E		
9.0	Elevation above mean sea level	:	350-375 meters		
10.0	<u>Climatic Conditions</u>				
	(a) <u>Ambient Temperature</u>				
	i. maximum temperature	:	45° C		
	ii. minimum temperature	:	6° C		

**PROJECT INFORMATION**

iii. Design Temperature : 50° C Ambient  
for all Electrical/  
Mechanical  
Equipment

(b) Relative Humidity

i. Maximum during monsoon : 85%

ii. Minimum : 20%

iii. Average : 65%

(c) Rainfall

Annual average rain : 720 mm

Max. for one day : 115 mm

Max. intensity : 38 mm/hr

Period : June to September

(d) Wind Speed

i. Prevailing wind direction : West, South-East, North-West,  
South-West

ii. Maximum mean wind speed : 15.9 Kms / hr  
(4.42 m/s)

iii. Average : 9.61 Km/hr  
(2.67 m/s)

11.0 Wind Load

Calculations for wind effect shall be in accordance with IS:875- (Part-3) latest revision taking into account the following :

(a) Basic wind speed of 39 m/sec as given in Fig.1 of the code.

(b) Factor K1 shall be taken as 1.06

(c) Terrain category shall be 2 and corresponding values shall be taken for K2

(d) Factor K3 shall be taken as 1.0

12.0 Wind Loading for Stack

(a) For wind pressure as per clause 11.0 above

(b) For RC stacks as per IS: 4998

	<b>RAICHUR POWER CORPORATION LTD</b>	
	TITLE	SHEET 3
	<b>PROJECT INFORMATION</b>	

- 13.0 Seismic data (as per IS:1893 latest issue)
- (a) Zone : Zone III (as per IS:1893- latest )
  - (b) Importance factor (I) : 1.75
- 14.0 Auxiliary power supply : Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following supply system.
- (a) For motors rated above 1500 kW : 11000V, 3 phase, 3 wire, 50Hz medium earthed AC
  - (b) For motors rated 175KW and above and below 1499KW. : 3300V, 3 phase, 3 wire, 50Hz medium earthed AC
  - (c) For motor rated 174 kW and below : 415, 3 phase, 3 wire solidly earthed AC
  - (d) For motor control centre : 415V, 3 phase, 3 wire solidly earthed AC
  - (e) DC. motor starters, DC solenoids, DC alarm, control and protections : 220 V DC, 2 wire, unearthed DC
  - (f) AC control & protective devices : 110 V 1 phase, 50Hz, 2 wire AC supply. The single-phase 110V AC supply shall be derived by Contractor by providing 415V/110V control transformers of adequate rating with MCCB /MCB on both the primary and secondary sides.
  - (g) Uninterrupted power supply : 240 V, 1 phase, 50Hz, 2 wire AC supply from UPS system for I&C (including indicator recorders) and UCMS only

**PROJECT INFORMATION**

- (h) AC solenoids, indicators/recorders, space heaters (for motors rated 30KW and above) : 240V 1 phase, 2 wire, 50Hz AC system with effectively earthed neutral. The power supply shall be derived by CONTRACTOR by providing 415V/ 240V transformer of adequate rating with MCCB/MCB on primary/secondary sides.
- (i) Winding heating of motors below 30kW : 24 V 1 phase,50Hz, AC with one point earthed. This shall be derived by CONTRACTOR by providing 415V 3 phase, 3 wire, AC supply through an adequately rated step-down transformer of adequate rating with MCCB / MCB on primary/secondary sides.
- (j) Solid state controls (including solenoid valves) : 24 V DC, 2 wire, supply from Battery chargers for instrumentation system only.
- (k) Lighting fixtures : 240 V, 1 phase, 2 wire, 50Hz system.
- (l) Lighting fixtures and space heaters in panels : 240 V, 1 phase, 2 wire, 50Hz system.
- (m) Construction supply : 415 V, 3 phase, 4 wire, 50 Hz AC supply with neutral lead solidly earthed.
- (n) The above voltages may vary as follows :
 

All devices shall be suitable for continuous operation over the entire range of voltage and frequency indicated below without any change in their performance.

  - i. AC supply : Voltage variation  $\pm 10\%$   
Frequency variation  $\pm 5\%$   
Combined voltage & frequency variation  $\pm 10\%$
  - ii. DC supply : Voltage variation +10%  
-20%



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**2 X 800 MW YERAMARUS STPP**

**BOQ CUM PRICE SCHEDULE FOR INSULATING MATS**

(TECH. SPEC. NO. - PE-TS-362-507-E018)

SL. No.	Item Description	Total Quantity (SQ. MTRS.)	Unit Price Ex-Works (Rs.)	Total Price Ex-Works (Rs.)
1	CLASS- A, UPTO 3.3 kV LEVEL <b>[CATEGORY III AS PER AMENDMENT NO. 2 MARCH 2010 OF IS 15652:2006]</b>	1650		
2	CLASS- B, ABOVE 3.3 & UPTO 11kV SWITCHGEAR <b>[CATEGORY III AS PER AMENDMENT NO. 2 MARCH 2010 OF IS 15652:2006]</b>	160		

**NOTE :**

1	Insulating mats shall be manufactured and tested in accordance with latest version of IS:15652.
2	Mats shall be supplied in units of 1x1 meters. The thickness of CLASS-A shall be 2mm (+/-10% Tolerance) while thickness of CLASS- B insulating mats shall be 2.5 mm (+/-10% Tolerance). Mats shall be light blue in colour.
3	Bidder to comply the requirements of enclosed Quality plan no. PED-507-00-Q-008, <b>R-2</b> . Materials consumed during testing shall be to bidder's account.
4	Insulating mats to be supplied shall be BIS marked.
5	Type tests shall be conducted on one sample/lot of each type of insulating mats for the project. Sample shall be drawn by BHEL representative out of entire lot offered for inspection by vendor. However type testing shall be applicable for each lot of each type for the project. Type test shall be conducted at CPRI. The cost of testing of each lot shall be to bidder's account.
6	BHEL reserves the right to witness the testing for which due notice shall be given by the Vendor.



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**ANNEXURE - I**

**DOCUMENT / DRG. DISTRIBUTION SCHEDULE**

SL. NO.	DESCRIPTION	DRG/DOC. NO.	REMARKS
1	TECHNICAL DATA SHEET	PE-V0-362-507-E620	
2	QUALITY PLAN	PE-V0-362-507-E621	
3	TYPE TEST REPORTS FOR TEST CONDUCTED AS PER QUALITY PLAN	PE-V0-362-507-E622	

(REQUIRED DOCUMENTS TO BE FURNISHED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT)

## TECHNICAL DATA SHEET OF INSULATING MATS

S.NO.	Technical Parameters	TYPE OF INSULATING MAT	
		Class- A, Category-III	Class- B, Category-III
1.	Applicable standard	IS:15652-2006 with latest amendments	
2.	Dimension		
2.1	Width	1000 mm ( $\pm 20$ mm tolerance)	
2.2	Length	1000 mm ( $\pm 20$ mm tolerance)	
2.3	Thickness	2mm ( $\pm 10\%$ tolerance)	2.5mm ( $\pm 10\%$ tolerance)
3.	Color	Light Blue (No metallic derivatives shall be used)	
4.	Marking	Class, Category, Thickness, Manufacturer's Identity, Lot No., Roll No. shall be marked on Insulating Mats.	
5.	BIS Certification Mark	Yes	
6.	Type Tests on Insulating Mats		
6.1	Physical Properties		
6.1.1	Tensile Strength	15N/mm <sup>2</sup> (min.)	
6.1.2	Elongation at Break	250% (min.)	
6.2	Dielectric Properties		
6.2.1	Insulation Resistance with Water	10,00,000M $\Omega$ with 500V Megger or 100,000M $\Omega$ with 5000V Megger	
6.2.2	Leakage Current	10 mA (max.)	
6.2.3	AC Dielectric Strength (rms)	30 KV (min.)	45 KV (min.)
6.2.4	AC Proof Voltage (rms)	10 KV for 3 minutes	22 KV for 3 minutes
6.3	Ageing Properties		
6.3.1	Tensile Strength & Elongation	Not less than 75% of the corresponding values obtained for unaged test pieces from same lot when subject to ageing test as per IS 15652	
6.4	Thermal Properties		
6.4.1	Flame Retardant	5 seconds (max.) after removal of blue flame	
6.4.2	Low Temperature Resistant	Mats of all classes shall not show any visible break or cracks when folded after placing for 1 hour at a temperature of $-10 \pm 3$ Deg C; These shall also pass AC proof voltage test.	
6.5	Acid, Alkali, Diesel & Transformer Oil Resistance	Value of tensile strength & Elongation at break shall not be less than 80% of the corresponding values obtained in tests carried out on samples from same batch without conditioning when subject to testing as per IS 15652.	



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VOLUME NO. : II-B

SECTION : B

REV NO. : 0 DATE : 13-08-2015

SHEET : 1 OF 5

STANDARD QUALITY PLAN

VENDOR'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN							DOC NO.: PED-507-00-Q-008, R-02				
		CUSTOMER: PROJECT: PRODUCT: Insulating Mats				BHEL P.O. NO.: P.O. DATE: BHEL SPEC:			REV NO: 2		DATE:		
SL. NO.	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
<b>1.0 RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>													
01	Synthetic Resin	Appearance, Bulk density, Particle Porosity, Sieve analysis	-	Physical & Chemical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
02	Lubricants	Appearance, Melting Point	-	Physical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
03	Filler	Appearance, Bulk density, DOP absorption, Sieve analysis	-	Physical & Chemical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
04	Fire Retardant Chemicals	Appearance, Bulk density, DOP absorption	-	Physical & Chemical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
05	Plasticizer	Appearance, Flash Point, Thermal Stability, Specific gravity	-	Physical & Chemical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
06	Titanium Dioxide	Appearance, Bulk density, Particle Porosity	-	Physical & Chemical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	
07	Heat Stabilizer	Appearance, Thermal Stability	-	Physical	As per vendor's QAP sampling plan	Manufacturer's Standard/ IS Specification	Manufacturer's Standard/ IS Specification	QC Record		2	2	1	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL/ CUSTOMER FOR BHEL NOMINATED INSEPTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT/CHARACTERISTIC UNDER P,W & V COLUMNS * FOR ITEMS MARKED V (TICK) IN COLUMN 'D'. TEST CERTIFICATES	PREPARED BY	CHECKED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS			<b>MANUFACTURING QUALITY PLAN</b>						DOC NO.:PED-507-00-Q-008, R-02			
			CUSTOMER:			BHEL P.O. NO.:			REV NO: 2		DATE:	
			PROJECT:			P.O. DATE:						
PRODUCT: Insulating Mats			BHEL SPEC:									
SL. NO.	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
									P	W	V	

2.0 IN PROCESS CONTROL / INSPECTION													
01	Visual	Mat shall be free on both surfaces from harmful physical irregularities such as pin holes, cracks, blisters, cuts, conductive foreign matter, creases, pinch marks, voids (entrapped air) and prominent ripples.	Each class	Visual	Each Jumbo Roll	IS 15652	IS 15652	QC records		2	2	1	
02	Thickness	As specified	Each class	Physical	Each Jumbo Roll	Approved Data Sheet	Approved Data Sheet	QC records		2	2	1	
03	Width	As specified	Each class	Physical	Each Jumbo Roll	Approved Data Sheet	Approved Data Sheet	QC records		2	2	1	

3.0 FINAL ASSEMBLY, INSPECTION & TESTING													
3.1 TYPE TEST													
01	Visual	Compared with std. sample	Each class	Physical	One sample/Lot for each type	IS: 15652	IS: 15652	Test reports		2	1	1	Product will be tested at CPRI as per IS:15652 and shall be witnessed by BHEL/ BHEL's Customer.
02	Thickness	As Specified	Each class	Physical	One sample/Lot for each type	Approved data sheet	Approved data sheet	Test reports		2	1	1	
03	Width	As Specified	Each class	Physical	One sample/Lot for each type	Approved data sheet	Approved data sheet	Test reports		2	1	1	

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VENDOR'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN							DOC NO.:PED-507-00-Q-008, R-02				
		CUSTOMER: PROJECT: PRODUCT: Insulating Mats			BHEL P.O. NO.: P.O. DATE: BHEL SPEC:				REV NO: 2		DATE:		
SL. NO.	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
04	Tensile Strength	15 N/mm2 (min).	Each class	Physical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	Product will be tested at CPRI as per IS:15652 and shall be witnessed by BHEL/ BHEL'S Customer.
05	Elongation	250% (min)	Each class	Physical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
06	Insulation Resistance with water	1000000 MΩ with 500V Megger OR 100000 MΩ with 5000V Megger	Each class	Electrical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
07	Leakage Current	10 mA (max)	Each class	Electrical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
08	AC-Di-electric strength	2.00mm-30 kV(min) 2.5mm-45 kV (min)	Each class	Electrical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
09	AC-proof Voltage	2.00mm-10kV 2.5mm-22kV For 3 minutes duration.	Each class	Electrical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
10	Ageing Properties	Not less than 75% of corresponding values obtained for unaged test pieces from the same lot.	Each class	Physical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
11	Flame retardance	5 Second (max.) after removal of blue flame	Each class	Physical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
12	Low temperature resistance	Shall not show any visible break or crack when folded	Each class	Physical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	
13	Acid, Alkalis, diesel and transformer oil resistance	Not less than 80% of corresponding values obtained in tests carried out on samples from same batch without conditioning.	Each class	Chemical	One sample/Lot for each type	Approved data sheet/IS 15652	Approved data sheet/IS 15652	Test reports		2	1	1	

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	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP

VENDOR'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN							DOC NO.: PED-507-00-Q-008, R-02				
		CUSTOMER:			BHEL P.O. NO.:				REV NO: 2		DATE:		
PROJECT:		PRODUCT: Insulating Mats			P.O. DATE:		BHEL SPEC:						
SL. NO.	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
									P	W	V		
<b>3.2 SAMPLING &amp; ROUTINE TESTS</b>													
01	All sampling and routine tests shall be done as per IS: 15652:2006 at vendor's works.		Each class	Physical/ Electrical/ Chemical/ Visual	As per IS 15652	As per IS 15652	As per IS 15652	QC Records		2	1	1	
02	Color		Each Class	Visual	100%	As per approved data sheet	As per approved data sheet	QC Records		2	1	1	
<b>4.0 MARKING &amp; PACKING</b>													
01	Marking	Class, Category, Thickness, Manufacturer's Identity, Lot No., Roll No. & BIS Mark	Each Class	Visual	Random	IS 15652	IS 15652	QC Records		2	1	1	
02	Packing	Gunny/Jute material (in accordance with IS 15652)	-	Visual	100%	IS 15652	IS 15652	QC Records		2	2	1	
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