

Bharat Heavy Electricals Limited

[A Government of India Undertaking]



Materials Management/Raw Materials

Tiruchirappalli - 620 014, INDIA

Fax : 0431 – 2520719

E mail : nshan@bheltry.co.in

Ref: NIT_20806

Dt: 28.07.2014

Ref : 1. NIT-20806

2. 2014_BHEL_259527_1

**CORRIGENDA-II TO OUR ENQUIRY Ref: 1901400348 Dt 19.12.2014
FOR THE SUPPLY OF NON ASBESTOS MATERIALS DUE ON 09.01.2015**

1. Revision in specification
2. The Enquiry Due date for Quotation is extended up to 12.01.2015.

**N. Shanmugasundaram
Purchase Officer/PSS
BHEL, Trichy 620014**



BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
HIGH PRESSURE BOILER PLANT
PURCHASE DEPARTMENT - FOSSIL BOILERS
THIRUCHIRAPALLI - 620014
TAMILNADU (INDIA)

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PHONE :2577419
GRAMS : BHARATELEC
FAX NO: 2520719
E-mail: cmuthuvel@bheltry.co.in
Web:

429-002/A


Enquiry No	Enquiry Date	Due Date for Quotation
1901400348 - 70	19.12.2014	12.01.2015
Please quote Enquiry No, Date and due date in all correspondences. This is only a request for quotation and not an order		

Item	Description	Unit	Quantity	Delivery Quantity	Schedule Date
10	220300010000 NON ASBESTOS COMPRESSED FIBRE JNTNG 1.5 TP-23294 NON ASBESTOS COMPRESSED FIBRE JNTNG 1.5 TP-23294 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
20	220300020000 GASKET-5MM TP-23292 GASKET-5MM TP-23292 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
30	220300030000 PACKING ROPE SQ.10MM - TP23299 PACKING ROPE SQ.10MM - TP23299 / REV 01 Dt.31.12.2014	KG	4000.000	4,000.00	31.01.15
40	220300040000 PACKING ROPE SQ.20MM - TP23299 PACKING ROPE SQ.20MM - TP23299 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
50	220300050000 PACKING ROPE SQ.12MM - TP23299 PACKING ROPE SQ.12MM - TP23299 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
60	220300060000 MILL BOARD 10 MM - TP 23296 MILL BOARD 10 MM - TP 23296 / REV 01 Dt.30.12.2014	KG	2000.000	2,000.00	31.01.15
70	220300070000 MILL BOARD 25 MM - TP 23296 MILL BOARD 25 MM - TP 23296 / REV 01 Dt.30.12.2014	KG	10000.000	10,000.00	31.01.15
80	220300080000 PACKING ROPE SQ.15MM - TP23299 PACKING ROPE SQ.15MM - TP23299 / REV 01 Dt.31.12.2014	KG	500.000	500.00	31.01.15
90	220300150000	KG	800.000	800.00	31.01.15

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of tenderers who have submitted their offer and who may like to be present for the tender opening. Late and delayed offers are liable to be rejected.

M. SHANMUGASUNDARAM
Purchase Officer
MM / MFG / Purchase / PSS
BHEL, TRICHY - 620 014.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**


MANAGER / PURCHASE
(FOSSIL BOILERS)
Yours faithfully,



BHARAT HEAVY ELECTRICALS LIMITED

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PHONE :2577419
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Web:

1901400348 / 19.12.2014

Gasket-3mm TP 23292
Gasket-3mm TP 23292 / REV 01
Dt.31.12.2014


100	220300160000 CARBON FIBRE/CERMC FIBRE GLAND PACKING-SQ 6mm TP-23299 CARBON FIBRE/CERMC FIBRE GLAND PACKING-SQ 6mm TP-23299 / REV 01 Dt.31.12.2014	KG	300.000	300.00	31.01.15
110	220300170000 CARBON/CERAMIC FIBRE GLAND PACKING-SQ 8mm TP 23299 / REV 01 Dt.31.12.2014	KG	500.000	500.00	31.01.15
120	220300180000 COMPRESSED FIBRE JOINTING SHEETS-1.5MM TP-23295	KG	200.000	200.00	31.01.15
130	220300190000 COMPRESSED FIBRE JOINTING SHEETS-3MM TP-23295 COMPRESSED FIBRE JOINTING SHEETS-3MM TP-23295	KG	700.000	700.00	31.03.15
140	220300200000 NONASBESTOS COMPRESSED FIBREJOINTING-2MM TP 23294 / REV 01 Dt.31.12.2014	KG	1100.000	1,100.00	31.01.15
150	220300250000 COMPRESSED FIBRE JOINTING-2MM TP 23295	KG	1000.000	1,000.00	31.01.15
160	220300300000 NON ASBESTOS COMPRESSED FIBRE JOINTINGS-2MM TP-23292 NON ASBESTOS COMPRESSED FIBRE JOINTINGS-2MM TP-23292 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
170	220300310000 COMPRESSED FIBRE JOINTING SHEET-1.0MM TP 23292 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
180	220300360000 COMPRESSED FIBRE JOINTING SHEET-1.50MM TP 23293 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
190	220300370000 COMPRESSED FIBRE JOINTING SHEET-2.00MM TP 23293 / REV 01	KG	200.000	200.00	31.01.15

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R. SHANMUGASUNDARAM
Purchase Officer
MM / MFG / Purchase / PSS
BHEL, TRICHY - 620 014.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**


MANAGER / PURCHASE
(FOSSIL BOILERS)
Yours faithfully,



BHARAT HEAVY ELECTRICALS LIMITED

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1901400348 / 19.12.2014

Dt.31.12.2014

200	220300400000 PACKING ROPE DIA-10MM TP-23299 PACKING ROPE DIA-10MM TP-23299 / REV 01 Dt.31.12.2014	KG	3500.000	3,500.00	31.01.15
210	220300450000 COMPRESSED FIBRE JOINTING SHEET-3.00MM TP: 23293 / REV 01 Dt.31.12.2014	KG	100.000	100.00	31.01.15
220	220300500000 CARBON FIBRE/CERAMIC FIBRE CLOTH-3MM TP-23297 CARBON FIBRE/CERAMIC FIBRE CLOTH-3MM TP-23297	KG	2000.000	2,000.00	31.01.15
230	220300600000 CARBON/SILICON FIBRE MILL BOARD-5MM TP-23296 CARBON/SILICON FIBRE MILL BOARD-5MM TP-23296 / REV 01 Dt.30.12.2014	KG	400.000	400.00	31.01.15
240	220300700000 NON ASBESTOS COMPRESSED FIBRE-1.5MM TP-23292 NON ASBESTOS COMPRESSED FIBRE-1.5MM TP-23292 / REV 01 Dt.31.12.2014	KG	200.000	200.00	31.01.15
250	220300800000 LUBRICATED AND GRAPHITED GLAND-SQ-8MM TP-23298	KG	100.000	100.00	31.01.15
260	220300900000 NONASBESTOS COMPRESSED FIBREJOINTING 3MM TP 23294 / REV 01 Dt.31.12.2014	KG	900.000	900.00	31.01.15

General Note:

Enquiry Terms And Conditions Are Enclosed.
samples should be submitted along with offer for our evaluation.
Offer without samples will not be considered for evaluation.


Enclosures:

"LD clause has to be confirmed without fail."

The offers should reach us 30 minutes before the time of opening of tenders.
The offers will be opened at 14.30 hrs on the due date of tender in the presence of
tenders who have submitted their offer and who may like to be present for the tender
opening.Late and delayed offers are liable to be rejected.

T. SHANMUGASUNDARAM
Purchase Officer
MM / MFG / Purchase / PSS
BHEL, TRICHY - 620 014.

Yours faithfully,
For **BHARAT HEAVY ELECTRICALS LIMITED**


MANAGER / PURCHASE
(FOSSIL BOILERS)
Yours faithfully,



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23292

Rev. No. 01

PAGE 1 OF 4

**NON ASBESTOS COMPRESSED FIBRE JOINTING SHEETS
(HIGH PRESSURE STEAM & WATER)**

1. SCOPE

This specification governs the quality of non-asbestos compressed fibre jointing sheets for high pressure steam and water.

2. APPLICATION:

The supplied material shall be suitable for use in steam turbines, boilers, thermal insulation, packing & sealing purposes at maximum operating pressures of 14.0 N/mm² and temperature of 625°C.

3. DIMENSIONS AND TOLERANCES:

- 3.1. Dimensions: the material should be supplied to the dimensions specified on the order.
- 3.2. Thickness: the thickness of the sheets shall preferably be selected from the following, 0.40, 0.50, 0.75, 1.00, 1.50, 2.00, 3.00, 5.00 mm
- 3.3. Tolerance: Maximum permissible deviation on the nominal thickness of the sheets shall be as

Nominal thickness (mm)		Permissible deviation from nominal thickness ± mm	Max. Deviation between points not more than 250 mm apart, ± mm
Above	Up to & including		
-	0.50	0.05	0.05
0.50	1.00	0.10	0.10
1.00	2.00	0.15	0.10
2.00	3.00	0.20	0.15
3.00	5.00	0.20	0.15

4. MATERIAL

The material used for manufacturing this Non Asbestos Compressed Fibre Jointing Sheets is glass, ceramic or carbon fibre based silicon or aramid fibre with suitable high temperature binder material.

Revisions 1. Requirement of withstanding Flue gas with 6% sulphur deleted			Approved: STANDARDS SECTION ITS&S HPBP. TIRUCHIRAPPALLI		
Rev. No. 01	Amd. No.	Reaffirmed	Prepared:	Issued:	Dt. of 1 st issue
Dt. 31.12.2014	Dt.	Dt.	STANDARDS	STANDARDS	21.02.2014



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23292

Rev. No. 01

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5. FREEDOM FROM DEFECTS

- The sheets shall have uniform texture, smooth on both sides and free from irregularities such as blisters tears and lumps.
- The sheets shall have square and evenly cut edges and they shall be smooth flat, free from cracks, as well as foreign mechanical inclusions.
- The carbon fibre / silicon fibre jointing sheets shall be of uniform thickness and suitable for easy shearing. The variations in thickness in one sheet should not exceed 10%.

6. TEST SAMPLE

Supplier shall supply a test sample to BHEL for acceptance before regular supplies.

7. PROPERTIES:

For Properties and Conditions refer TABLE-1 attached herewith.

Thickness(mm)	Material Code	**Weight/unit area(kg/m ²)
0.4	220300280000	-
0.5	220300290000	-
0.75	220300440000	-
1	220300310000	-
1.5	220300700000	2.85
2	220300300000	3.8
3	220300150000	5.7
5	220300020000	5.75

***weight indicated is approximate only. Vendor to provide actual weight per square meter.*

8. TYPE APPROVAL

Samples for the type approval shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory, to ensure continuous supply of good products.



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23292

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9. TEST CERTIFICATES.

Unless otherwise stated, three copies of the test certificate shall be supplied along with each consignment, giving the following information.

TP 23292-Rev No 01: Non-Asbestos Compressed Fibre Jointing Sheets for high pressure steam and water applications

BHEL Order No.
Manufacturer's /Supplier's Name
Trade mark , if any
Batch/ Lot No.
Date of manufacture
Quantity supplied
Test results of clause 3 and TABLE -1

10. PACKING AND MARKING

Unless otherwise stated, the material shall be supplied either flat or in rolls suitably packed to prevent damages during transit.

Manufacturer's name and grade shall be clearly marked on a piece of 300 x 300 mm cut from any position of the sheet.

Each package shall be legibly marked with following information,

TP 23292-Rev No 01: Non Asbestos Compressed Fibre Jointing Sheets for high pressure steam and water applications

BHEL Order No.
Manufacturer's /Supplier's Name
Trade mark , if any
Batch/ Lot No.
Date of manufacture
Quantity supplied



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23292

Rev. No. 01

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TABLE - 1

SI No	Characteristic	Requirement	Method of Test
1	Material (preferable. Better material meeting physical properties may be used. But must be certified in TC)	Glass, ceramic or Carbon fibre based silicon or aramid fibre with suitable high temp. Binder.	* FT-IR Analysis
2	Density/CC	1.57 to 2.20	ASTM D 792
3	Tensile Strength a) 0.4 to 1.0 mm thick b) Above 1 mm thick	18 N/mm ² minimum 24 N/mm ² minimum	ASTM F 152
4	Compressibility % (IS 2712 Appendix D)	6-14	ASTM F36
5	% Recovery (IS 2712 Appendix D)	40 .minimum	ASTM F36
6	Water Absorption - % increase in mass	10 max.	ASTM F 146
7	Loss of ignition at 580 °C ±25 °C.	30 % max	**Standard Method
8	Flexibility Test (after accelerated ageing)	No sign of cracking	**Standard Method
9	Stress relaxation – residual Stress	23 N/mm ² minimum	----

- *The FT-IR report shall contain the following.
a) Spectral Range b) Resolution c)Finger print
- ** Standard Methods along with applicable test and acceptance standard applied at test centres shall be declared in TC.
- The compressibility, tensile strength of the fibre shall not be sacrificed due to use of non-asbestos material. Vendor may guarantee the above and these properties shall be certified by Vendor on Test Certificate.



**PLANT PURCHASING
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TP 23293

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**NON ASBESTOS COMPRESSED FIBRE JOINTING SHEETS
(MEDIUM PRESSURE STEAM,WATER& OIL)**

1. SCOPE

This specification governs the quality of non-asbestos compressed fibre jointing sheets for medium pressure steam, water and oil.

2. APPLICATION:

The supplied material shall be suitable for use with steam, water and oil in steam turbines and boiler applications at maximum operating pressures of 7.0 N/mm² and temperature of 425°C.

3. DIMENSIONS AND TOLERANCES:

3.1. Dimensions: The material should be supplied to the dimensions specified on the order.

3.2. Thickness: The thickness of the sheets shall preferably be selected from the following,

0.40,0.50,0.75,1.00,1.50,2.00,3.00 mm

3.3. Tolerance: Maximum permissible deviation on the nominal thickness of the sheets shall be as

Nominal thickness (mm)		Permissible deviation from nominal thickness ± mm	Max. Deviation between points not more than 250 mm apart, ± mm
Above	Up to & including		
-	0.50	0.05	0.05
0.50	1.00	0.10	0.10
1.00	2.00	0.15	0.10
2.00	3.00	0.20	0.15

4. MATERIAL

The material used for manufacturing this Non Asbestos Compressed Fibre Jointing Sheets is glass, ceramic or carbon fibre based silicon or aramid fibre with suitable high temperature binder material.

Revisions 1. Requirement of withstanding Flue gas with 6% sulphur deleted			Approved: STANDARDS SECTION ITS&S HPBP, TIRUCHIRAPPALLI		
Rev. No. 01	Amd. No.	Reaffirmed	Prepared:	Issued:	Dt. of 1 st issue
Dt. 31.12.2014	Dt.	Dt.	STANDARDS	STANDARDS	21.02.2014



**PLANT PURCHASING
SPECIFICATION
HPBP TIRUCHIRAPPALLI**

TP 23293

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5. FREEDOM FROM DEFECTS

- The sheets shall have uniform texture, smooth on both sides and free from irregularities such as blisters tears and lumps.
- The sheets shall have square and evenly cut edges and they shall be smooth flat, free from cracks, as well as foreign mechanical inclusions.
- The carbon fibre / silicon fibre Non-Asbestos Compressed Fibre Jointing Sheets shall be of uniform thickness and suitable for easy shearing. The variations in thickness in one sheet should not exceed 10%.

5. TEST SAMPLE

Supplier shall supply a test sample to BHEL for acceptance before regular supplies.

6. PROPERTIES:

Properties and conditions refer TABLE-1 attached herewith.

Thickness(mm)	Material Code	**Weight/unit area(kg/m ²)
0.4	220300320000	-
0.5	220300330000	-
0.75	220300340000	-
1	220300350000	-
1.5	220300360000	-
2	220300370000	-
3	220300450000	-

***weight indicated is approximate only. Vendor to provide actual weight per square meter.*

8. TYPE APPROVAL:

Samples for the type approval shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory, to ensure continuous supply of good products.



**PLANT PURCHASING
SPECIFICATION
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TP 23293

Rev. No. 01

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9. TEST CERTIFICATES.

Unless otherwise stated, three copies of the test certificate shall be supplied along with each consignment, giving the following information.

TP 23293-Rev No 01: Non-asbestos Compressed Fibre Jointing Sheets for medium pressure steam, water and oil applications

BHEL Order No.
Manufacturer's /Supplier's Name
Trade mark , if any
Batch/ Lot No.
Date of manufacture
Quantity supplied
Test results of clause 3 and TABLE-1

10. PACKING AND MARKING

Unless otherwise stated, the material shall be supplied either flat or in rolls suitably packed to prevent damages during transit.

Manufacturer's name and grade shall be clearly marked on a piece of 300 x 300 mm cut from any position of the sheet.

Each package shall be legibly marked with following information,

TP 23293-Rev No 01: Non-Asbestos Compressed Fibre Jointing Sheets for medium pressure steam, water and oil applications

BHEL Order No.
Manufacturer's /Supplier's Name
Trade mark , if any
Batch/ Lot No.
Date of manufacture
Quantity supplied



**PLANT PURCHASING
SPECIFICATION
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TP 23293

Rev. No. 01

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TABLE 1

SI No	Characteristic	Requirement	Method of Test
1	Material (preferable. Better material meeting physical properties may be used. But must be certified in TC)	Glass, ceramic or Carbon fibre based silicon or aramid fibre with suitable high temp. Binder.	* FT-IR Analysis
2	Density/CC	1.57 to 2.20	ASTM D 792
3	Tensile Strength a) 0.4 to 1.0 mm thick b) Above 1 mm thick	9 N/mm ² minimum 12.8 N/mm ² minimum	ASTM F 152
4	Compressibility %	6-14	ASTM F36
5	Recovery %	40 minimum	ASTM F36
6	Water Absorption - % increase in mass	10 max.	ASTM F 146
7	Loss of ignition at 580 °C ± 25 °C.	30 % max	**Standard Method
8	Flexibility Test (after accelerated ageing)	No sign of crack	**Standard Method
9	Stress relaxation – residual Stress	17.5 N/mm ² minimum	----
10	Oil Ingress in thickness /mass for 5 hours at 150 ±2 °C	50% maximum	
11	Petrol Soaking a) Increase in thickness for 5 hours at 20 °C to 30°C b) Increase in mass for 5 hours at 20 °C to 30°C	50 % maximum 30 % maximum	

- *The FT-IR report shall contain the following.
a) Spectral Range b) Resolution c)Finger print
- ** Standard Methods along with applicable test and acceptance standard applied at test centres shall be declared in TC.
- The compressibility, tensile strength of the fibre shall not be sacrificed due to use of non-asbestos material. Vendor may guarantee the above and these properties shall be certified by Vendor on Test Certificate



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23294
Rev. No.01
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**NON ASBESTOS COMPRESSED FIBRE JOINTING SHEETS
(LOW PRESSURE STEAM AND WATER)**

1. SCOPE:

This specification covers the quality of Non asbestos compressed fibre jointing sheets for low pressure steam and water applications.

2. APPLICATION:

Suitable for use in boiler applications for thermal insulation, packing and sealing purposes up to a maximum operating pressure of 2.0 N/mm² and temperature of 350°C.

3. DIMENSIONS AND TOLERANCES:

3.1 Dimensions: The material shall be supplied to the dimensions specified on the order.

3.2 Thickness: The thickness of sheets shall preferably be selected from the following:
0.40, 0.50, 0.75, 1.00, 1.50, 2.00, 3.00 mm.

3.3 Tolerances: Maximum permissible deviation on nominal thickness of sheets shall be as follows:

Sl.No	Nominal Thickness (mm)		Permissible deviation from nominal thickness (±)mm	Max. deviation on thickness between points not more than 300mm apart (±) mm
	Above	Upto & Including		
1.	-	0.5	0.05	0.05
2.	0.5	1.0	0.10	0.10
3.	1.0	2.0	0.15	0.10
4.	2.0	3.0	0.20	0.15

4. MATERIAL:

The material used for manufacturing this Non Asbestos Compressed Fibre Jointing Sheets shall be glass, ceramic or carbon fibre based silicon or aramid fibre with suitable binder material meeting the temperature requirement as specified under application.

Revisions 1. Requirement of withstanding Flue gas with 6% sulphur deleted			Approved: STANDARDS SECTION ITS&S HPBP, TIRUCHIRAPPALLI		
Rev. No. 01	Amd. No.	Reaffirmed	Prepared:	Issued:	Dt. of 1 st issue
Dt. 31.12.2014	Dt.	Dt.	STANDARDS	STANDARDS	21.02.2014



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23294

Rev. No. 01

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5. FREEDOM FROM DEFECTS:

The supplied sheets shall be of uniform texture, smooth on both sides without any crack and free from irregularities.

The sheets shall have square and evenly cut edges and they shall be smooth flat, free from cracks, as well as foreign mechanical inclusions.

The carbon fibre / silicon fibre Non-Asbestos Compressed Fibre Jointing Sheets shall be of uniform thickness and suitable for easy shearing. The variations in thickness in one sheet should not exceed 10%.

6. TEST SAMPLE:

Supplier shall supply a test sample to BHEL for acceptance before regular supplies.

7. PROPERTIES:

For Properties and conditions refer TABLE-1 attached

Thickness(mm)	Material Code	**Weight/unit area(kg/m ²)
0.4	220300380000	-
0.5	220300390000	-
0.75	220300410000	-
1	220300420000	-
1.5	220300010000	2.9
2	220300200000	4.2
3	220300900000	6.3

***weight indicated is approximate only. Vendor to provide actual weight per square meter.*

8. TYPE APPROVAL:

Samples for type approval testing shall be accepted only from those manufacturers whose manufacturing and testing facilities are considered satisfactory, to ensure continuous supply of good product.



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23294

Rev. No. 01

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9. TEST CERTIFICATES:

Unless otherwise stated, three original copies of the test certificate shall be supplied along with each consignment, giving the following information.

TP 23294-Rev.No.:01 Non asbestos compressed fibre jointing sheets for low pressure steam and water applications.

BHEL Order No.

Manufacturer's/Supplier's Name.

Trade Mark, if any.

Batch/Lot No.

Quantity supplied.

Test results of Clauses 3 and TABLE-1.

10. PACKING AND MARKING:

Unless otherwise stated, the material shall be supplied either flat or in rolls suitably packed to prevent damages during transit.

Manufacturer's name and grade shall be clearly marked on one corner of each sheet.

Each package shall be legibly marked with the following information:

TP 23294-Rev. No.01: Non asbestos compressed fibre jointing sheets for Low pressure steam and water applications.

BHEL Order No.

Manufacturer's/Supplier's Name.

Trade Mark, if any.

Batch/Lot No.

Date of manufacture.

Quantity supplied



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23294

Rev. No. 01

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TABLE -1

Sl No	Characteristic	Requirement	Method of Test
1	Material of the fibre jointing	Glass, ceramic or carbon fibre based silicone or aramid fibre	*FT-IR Analysis
2	Density gm/CC	1.57 to 2.20	ASTM D 792
3	Tensile strength N/mm ²	6.7 min	ASTM F152
4	Compressibility %	6 to14	ASTM F 36
5	Recovery %	40 min	ASTM F 36
6	Loss on ignition at 580 °C ± 25 °C	30% max	**Standard Method
7	Flexibility Test (after accelerated ageing)	No sign of crack	**Standard Method
8	Dimensional tolerance	As per the Engg drawing	----

- *The FT-IR report shall contain the following.
 - a) Spectral Range
 - b) Resolution
 - c)Finger print
- ** Standard Methods along with applicable test and acceptance standard applied at test centres shall be declared in TC.
- The compressibility, tensile strength of the fibre shall not be sacrificed due to use of non-asbestos material. Vendor may guarantee the above and these properties shall be certified by Vendor on Test Certificate.



**PLANT PURCHASING
SPECIFICATION
HPBP-TIRUCHIRAPPALLI**

TP 23295
Rev. No. 00
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COMPRESSED NON ASBESTOS FIBRE JOINTING SHEETS (GASKETS)

1. Scope :

The specification governs the quality of oil resistant compressed non-asbestos fibre sheet manufactured from glass, ceramic or carbon fibre based silicone or aramid fibre of the highest grade, suitably bonded with heat resisting compound. The material is suitable for use with oil.

2. Application:

Used in the manufacturing of pole washers, slot liners, other parts of electrical machines, control gear and flange joints etc.

3. Preferred thicknesses (mm) : 0.25, 0.4, 0.5, 0.8, 1, 1.5, 2, 2.5 and 3.

4. Tolerance on thickness :

Thickness x Width x Length of the sheet shall be stated on the order.

The maximum permissible variation from nominal thickness and the maximum deviation on thickness between points not more than 300 mm apart shall be as given below:

Sl. No.	Thickness (mm)		Max. permissible variation from nominal thickness (\pm)mm	Max. deviation on thickness between points not more than 300mm apart (\pm) mm
	Over	Up to & Including		
1.	-	0.5	0.05	0.025
2.	0.5	1.0	0.08	0.05
3.	1.0	1.5	0.13	0.08
4.	1.5	-	0.18	0.10

5. Test Methods :

Unless otherwise specified, the test shall be conducted in accordance with the relevant methods as adopted for asbestos. (Refer IS: 2712)

6. Test samples :

Three sheets of ordered thickness and size 300 X 300 mm shall be supplied for testing and approval purposes.

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7. Finish :

The surface of the sheet shall be of uniform texture smooth on both sides, free from visible defects like blisters, loose fibres, wrinkles and dents. The sheets shall be free from foreign inclusions, which is detriment during use.

8. Physical properties:

For Properties refer TABLE – 1 attached

Thickness(mm)	Material Code	**Weight/unit area(kg/m ²)
0.25	220300430000	-
0.4	220300220000	-
0.5	220300230000	-
0.8	220300240000	-
1	220300270000	-
1.5	220300180000	2.85
2	220300250000	-
2.5	220300260000	-
3	220300190000	5.7

***weight indicated is approximate only. Vendor to provide actual weight per square meter.*

9. Chemical properties :

Sulphur content (Extractable): The total amount of sulphur content shall not exceed 50 ppm.

10. Mechanical properties :

- Tensile strength:

The average value of eight test results of fibre joining shall be not less than the maximum values as given below:

Sl. No.	Nominal Thickness(mm)		Tensile Strength Min	
	Over	Up to & including	Longitudinal N/mm ²	Transverse N/mm ²
1.	-	0.5	35	14
2.	0.5	1.2	45	16
3.	1.2	-	60	18

- Cutting and punching :

Shall be capable of being cut or punched without cracking or flaking.



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11. Test certificate:

Three numbers of original test certificates shall be supplied with each consignment, giving the following information:

TP 23295 Rev-00: Compressed Non Asbestos Fibre jointing Sheet.

BHEL Order No :

Batch/Lot No :

Test values obtained/ certificates for compliance for clause 8 and 10.

12. Packing and Marking :

The sheets shall be packed in wooden boxes suitably wrapped in water proof paper / canvas so as to protect them from moisture and mechanical damage.

Each package shall be marked with the following information.

TP 23295 Rev-00: Compressed Non Asbestos Fibre jointing Sheet.

BHEL Order No :

Manufacturers or supplier's name & grade Batch/Lot No:

Thickness, width and Length.

Net volume.



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TABLE -1

SI No	Characteristic	Requirement	Method of Test
1	Material of the fibre jointing	Glass, ceramic or carbon fibre based silicone or aramid fibre	*FT-IR Analysis
2	Density gm/CC	1.5 to 2.0	ASTM D 792
3	Tensile strength N/mm ²	10 min	ASTM F152
4	Compressibility %	6 to 15	ASTM F 36
5	% Recovery	50 min	ASTM F 36
6	Swelling Test in ASTM Oil No 3		
	1) % Thickness increase	25 max	ASTM F 146
	2) % Weight increase	20 max	ASTM F 146
7	Loss on ignition at 580 °C ± 25 °C	30% max	**Standard Method
8	Flexibility Test	No sign of crack	**Standard Method
9	Dimensional tolerance	As per the Engg drawing	----

- *The FT-IR report shall contain the following.
 - a) Spectral Range
 - b) Resolution
 - c) Finger print
- ** Standard Methods along with applicable test and acceptance standard applied at test centres shall be declared in TC.
- The compressibility, tensile strength of the fibre shall not be sacrificed due to use of non-asbestos material. Vendor may guarantee the above and these properties shall be certified by Vendor on Test Certificate.



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CARBON FIBRE / CERAMIC FIBRE MILL BOARD
(Thickness 5, 10 & 25 mm asbestos free)

1. SCOPE

This standard covers asbestos free carbon fibre / ceramic fibre mill board used as fire proof thermal insulating material.

2. MATERIAL

The material used for manufacturing this mill board is carbon fibre or ceramic fibre base with suitable high temperature binder.

The mill board shall have uniform texture, smooth on both sides and free from irregularities such as blisters tears and lumps.

The mill board shall have square and evenly cut edges and they shall be smooth flat, free from cracks, as well as foreign mechanical inclusions.

The mill board should withstand the required temperature of steam or the flue gases of coal fired boilers containing 6% sulphur.

3. APPLICATION

Asbestos free carbon fibre / ceramic fibre mill board used as fire proof thermal insulating material.

4. TECHNICAL REQUIREMENTS

Properties and conditions refer table 1.

The carbon fibre / ceramic fibre mill board shall be of uniform thickness and suitable for easy shearing. The variations in thickness in one sheet should not exceed 10%.

Tolerance on the size and thickness shall be as

On size : ± 10 mm

On thickness

Upto and including 2 mm : ± 0.2 mm

Above 2 mm : ± 0.3 mm

Revisions

Description changed from silicon fibre to ceramic fibre.

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Thickness of mill board	Material code	**Weight kg/sq.m
5	220300600000	4.875
10	220300060000	9.750
25	220300070000	24.375

***weight indicated is approximate only. Vendor to provide actual weight per meter length.*

5. DESIGNATION

Asbestos free carbon fibre / ceramicfibre mill board thickness 10 mm, according to this specification shall be designated on drawings as:

- i. Material specification column : 220300060000
- ii. Description column : Asbestos free carbon fibre / ceramicfibre
Mill-board 10 mm.
- iii. drawing number column : **TP 23296**

6. ORDERING DESCRIPTION

For placing indents, issuing enquiries and on purchase order, for 1 meter length and width, the ordering description given below shall be followed:

ASBESTOS FREE MILL BOARD 10 mm THICK, 1 m X 1 m,
As per BHEL STANDARD **TP 23296**

7. ADDITIONAL INFORMATION

- i. Copies of this standard shall be enclosed along with purchase order.

8. FINISH

The millboards shall have uniform texture, smooth on both sides and free from irregularities such as blisters, tears and lumps.

* The FT-IR report shall contain the following.

- A) Spectral Range
- B) Resolution
- C) Finger print

** Standard methods along with applicable tests and acceptance standard applied at test canters shall be declared in TC.



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TABLE 1

1	Material (preferable. Better material meeting physical properties may be used. But must be certified in TC)	Carbon fibre or ceramic fibre base with suitable high temp. Binder	* FT-IR Analysis
2	Density (g/cc)	0.75 to 1.2	ASTM D 792
3	Moisture at 105°C ± 5 °C	2 max	ASTM D 792
4	Loss on ignition at 580°C ±25°C after exposure for 30 minutes	20% max	**Standard Method
5	Continuous service temperature	1050 °C	-----
6	Maximum service temperature	1260 °C	-----
7	pH of water extract	7 to 8.5	**Standard Method
8	Chloride content of water extract ppm	200max	**Standard Method
9	Sulphur content of water extract ppm	50max	**Standard Method
10	Longitudinal tensile strength N/mm ²	10 (max)	ASTM F152
	Transverse tensile strength N/mm ²	9 (max)	ASTM F152
11	Shore hardness(A)	55 to 65	**Standard Method
12	Thermal conductivity (W/m °C)	0.17	**Standard Method
13	Linear shrinkage % (max)	3	**Standard Method
14	Dimensional tolerance	As per the Engg drawing	-----



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CARBON FIBRE/CERAMIC FIBRE CLOTH
(Thickness 3 mm asbestos free)

1. SCOPE

This standard covers asbestos free Carbon fibre/Ceramic fibre cloth.

2. MATERIAL

The material used for cloth is a Carbon fibre/Ceramic fibre free from asbestos. The cloth shall have uniform texture, smooth on both sides and free from irregularities such as blisters tears and lumps.

3. TECHNICAL REQUIREMENTS

Refer Table-2 for technical requirements.

The cloth shall be fire resistant, vermin-proof and capable of withstanding required temperature.

Recommended thickness of cloth for BHEL's use shall be 2, 3 or 5 mm.

The cloth shall be supplied in rolls of nominal width 1 m and length 25 to 40 m.

4. DESIGNATION

Asbestos free carbon fibre/ceramic fibre cloth, thickness 3 mm, according to this standard shall be designated on drawings as:

- i. Material specification column : 220300500000
- ii. Description column : Asbestos free Carbon fibre/Ceramic fibre cloth 3 mm.
- iii. Drawing number column : TP 23297

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5. ORDERING DESCRIPTION

For placing indents, issuing enquiries and on purchase order, the ordering description given below shall be followed:

ASBESTOS FREE, CARBON FIBRE / CERAMIC FIBRE CLOTH TWILL WOVEN 2 MM THICK, 1m X 25m, AS PER BHEL STANDARD **TP 23297**

6. Thickness and weight

Recommended thickness	Density dry condition (gm/cm ³)	Material code	**Weight (kg/m ²)
3 mm	0.7-1.2	220300500000	2.85

***weight indicated is approximate only. Vendor to provide actual weight per meter length.*

7. ADDITIONAL INFORMATION

- i. For procurement purpose, this standard shall be enclosed along with purchase order.



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TABLE-2

1	Material of cloth		Carbon fibre / Ceramic fibre	*FT-IR Analysis
2	Density gm/cm ³ (dry condition)	2mm thick	0.7 to 1.2	ASTM D 792
		3 mm thick	0.7 to 1.2	ASTM D 792
		5 mm thick	0.7 to 1.2	ASTM D 792
3	Chloride content max		50 ppm	** Standard method
4	Sulphur content max		50 ppm	** Standard method
5	Temperature resistance		1000 °C max	** Standard method
6	Loss on ignition at 580 °C ± 25 °C after exposure for 30 minutes.		25% max	** Standard method
7	Moisture content at 105 °C ± 5 °C		2.5% max	** Standard method
8	Thermal conductivity at 800°C (W/m°C)		0.17	** Standard method
9	Dimensional tolerance		As per Engg. drawing	-----

The supplier shall ensure that the tensile strength of the fibre and cloth shall not be sacrificed due to use of non-asbestos material. Vendor to guarantee the above and the strength properties shall be certified on Test Certificate.

* The FT-IR report shall contain the following.

- A) Spectral Range
- B) Resolution
- C) Finger print

** Standard methods along with applicable tests and acceptance standard applied at test centres shall be declared in TC.



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**LUBRICATED AND GRAPHITED GLAND
(Packing ropes/rings)**

1. SCOPE

This standard covers lubricated and graphited gland packing ropes/rings used for high pressure conditions.

2. APPLICATION

For leakage prevention and as lubricant in dampers, bowl mills and as to resist heat flow in boiler mountings, stop valves, steam expansion glands and soot blowers.

3. MATERIAL

The packing rope shall be made of asbestos free glass ply or carbon fibre ply or silicon or made of ceramic fibre.

The packing rope shall be plaited throughout from yarns reasonably uniform in appearance and thickness.

The surface of the packing rope/ring shall be smooth and it shall not have torn out threads.

The packing rope/ring shall be flexible enough to take up any shape.

4. TECHNICAL REQUIREMENTS

As per table 1.

5. DIMENSIONS

The preferred sizes of ropes/rings for our factory use are as follows:

SECTION	SIZE	MATL. CODE	**WEIGHT (Kg/m)
SQUARE	8 mm	220300800000	0.080

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Permissible deviations

For sizes up to and including 10 mm: ± 0.5 mm
For sizes above 10 mm: ± 1 mm
For permissible deviation on length of rope shall be ± 0.5 %

***weight indicated is approximate only. Vendor to provide actual weight per meter length.*

6. DESIGNATION

Lubricated and graphited packing ropes/rings of size 8 mm, square shall be designated on drawings as:

- i. Material specification column : 220300800000
- ii. Description column : PACKING ROPE SQ., 10 mm.
- iii. Drawing number column : **TP 23298**

7. ORDERING DESCRIPTION

For placing indents, issuing enquiries and on purchase order, the ordering description given below shall be followed:

LUBRICATED AND GRAPHITED PACKING ROPES/RING AS PER BOILER PLANT STANDARD TP 23298

8. ADDITIONAL INFORMATION

- i. These ropes shall be procured in coils of length 25 or 50 or 100 meters.
- ii. For procurement purpose, this standard shall be enclosed along with purchase order.



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9. FINISH

The packing rope/ring shall be smooth and it shall not have torn-out threads. The compressibility, tensile strength of fibre shall not be sacrificed due to use of non asbestos material. Vendor to guarantee the above and these properties shall be certified by vendor on test certificate.

* The FT-IR report shall contain the following.

- A) Spectral Range
- B) Resolution
- C) Finger print

** Standard methods along with applicable tests and acceptance standard applied at test centers shall be declared in TC.

TABLE 1

1	Material of the Rope/Ring	Glass ply or carbon fibres ply silicon or made of ceramic fibre.	*FT-IR Analysis
2	Density (gm/cc)	1.0 to 1.5	ASTM D 792
3	Chloride content max	50ppm	**Standard Method
4	Sulphur content max	50ppm	**Standard Method
5	Temperature resistance	600 °C min	**Standard Method
6	Continuous service temperature	540 °C	-----
7	Loss on ignition at 580 °C ±25 °C after exposure for 30 min by mass%	20 max	**Standard Method
8	Moisture content at 105°C ± 5°C % BY mass	2 max	**Standard Method
9	The lubricant shall be	Graphite powder	-----
10	The lubricant percentage (graphite >99%pure)	3% mass(max)	**Standard Method
11	The wire dia of the reinforcement	0.15 to 0.2	-----
12	Dimensional tolerance	As per the Engg drawing	-----
13	Corrosion Inhibitors, Zn/Mg based	3% Min	**Standard Method
14	Reinforcement wire	Inconel /SS	-----



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**CARBON FIBRE/CERAMIC FIBRE GLAND PACKINGS
(Excluding those for Corrosive Acid Services)**

1. SCOPE

1.1 This specification covers free carbon fibre /ceramic fibre gland packing.

2. APPLICATION

2.1 Suitable for flanged joints of ducts and fans for leakage prevention, valves , expansions provisions for refractory, thermal insulation, furnace joints, air heaters and doors in boiler

3. DIMENSIONS & SIZES :

Dimensions and sizes shall be as per table-1 of this standard.For technical parameters, refer to Table-2.

4. DESIGNATION :

Carbon Fibre / Ceramic Fibre gland packing of sizes 10 mm, square shape shall be designated as :

ON DRAWING :

1. Description column : Packing Rope SQ 10 mm
2. Drawing number column : **TP 23299**
3. Material code column : 220300400000

4.1 Ordering description

For placing indents, issuing enquiries and on purchase order, the ordering description given below shall be followed.

Gland Packing carbon fibre/ceramic fibre, 6 mm round.

5. SAMPLING AND ACCEPTANCE

5.1 The density of packing rope shall be 0.96 to 1.2 gm/cc and shall be determined in dry condition.

6. ADDITIONAL INFORMATION.

6.1 For procurement purpose, this standard shall be enclosed along with purchase order.

Revisions

1. Lubrication requirements specified in table-2 (Sl. No.9 & 10) deleted & Sl. No. re-numbered.

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TABLE-1

SHAPE	SIZE	MATERIAL CODE	**WEIGHT (KG) PER METRE LENGTH
Round	10	220300400000	0.08
Square	6	220300160000	0.03
	8	220300170000	0.06
	10	220300030000	0.09
	12	220300050000	0.14
	15	220300080000	0.22
	20	220300040000	0.38

** - Weight indicated is approximate only. Vendor to provide actual weight per meter length.



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Table-2 (Technical parameters)

1	Material of the Gland Packings	Glass ply or Carbon fibre ply Silicon or made of Ceramic fibre	*FT-IR Analysis
2	Density gm/cc (in Dry condition)	0.96 to 1.2	ASTM D 792
3	Chloride content max	50 ppm	**Standard Method
4	Sulphur content max	50 ppm	**Standard Method
5	Temperature resistance	600 °C Min	----
6	Continuous service temperature	540 °C	----
7	Loss on ignition at 580 °C ± 25 °C for 30 minutes by mass %	To be specified by the supplier	**Standard Method
8	Moisture content at 105 °C ± 5 °C % by mass	2 max	**Standard Method
9	The wire Dia of the reinforcement	0.15 to 0.2 mm	----
10	Dimensional tolerance	As per the Engg drawing	----
11	Corrosion Inhibitors,Zn/Mg based	3% min.	**Standard Method
12	Reinforcement wire	Inconel/SS	----

A.Finish: The Gland packing shall be smooth and it shall not have torn-out threads.

B .The compressibility, tensile strength of fiber shall not be sacrificed due to use of non-asbestos material. Vendor to guarantee the above and these properties shall be certified by Vendor on Test Certificate

* The FT-IR report shall contain the following.

a) Spectral Range b) Resolution c) Finger Print

** Standard methods along with applicable tests and acceptance standard applied at test centers shall be declared in TC.

Note: This specification is subject to revision based upon the actual tests performed on samples received from vendors.