

BONGAIGAON– 3X250 MW FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION FOR RUBBER LINING FOR LIMESTONE SLURRY TANKS

CUSTOMER : NATIONAL THERMAL POWER CORPORATION LIMITED



NTPC:BONG:FGD:RUBBER LINING:TANKS-SPEC-016:REV-00

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1.0 PROJECT INFORMATION	
a) Owner	NTPC
b) Buyer	BHEL, Ranipet
c) Process / application	Wet Lime Stone FGD system
1.1 SITE CONDITIONS	
a) Ambient temperature (Guarantee)	27 Deg C
b) Ambient temperature (Design)	50 Deg C
c) Relative Humidity	60 %
1.2 LOCATION AND APPROACH	
Project location	
a) Place	Kumkuri near Salakati, Bongaigaon
b) District	Kokrajhar
c) State	Assam

2.0 INDENT OF SPECIFICATION

- 1 This Specification and the attached Data sheets defines the minimum requirements of Rubber Lining for Limestone slurry Tanks for use in the process of Flue Gas Desulphurization (FGD)
- 2 The Limestone slurry will be store in the limestone slurry tanks specific gravity, Dimension, thickness of rubber lining etc., for each Tanks are furnished in Table-1 and Table-2.
- 3 This specification covers the general design, selection of rubber materials, construction features, manufacture, shop inspection, testing at manufacturer's works (As per latest applicable statutes, regulation and safety codes in the locality where the lining are to be carried out) and delivery at site, surface preparation of lining surfaces, lining the surfaces to the satisfaction of the customer.
- 4 The rubber lining shall conform to the latest applicable Indian/British/American Standards. Nothing in this specification shall construed to relieve the contractor of the required statutory responsibility.
- 5 Compliance to this specification shall not relieve the vendor of the responsibility of furnishing Rubber lining materials of proper design, materials and workmanship to meet the specified requirements.
- 6 In case of deviation, it shall be listed in the vendor's proposal under separate section titled as " list of deviations/exceptions to the enquiry documents.

3.0 SCOPE OF SUPPLY

- 1 Design, manufacture, testing and supply of rubber lining material for the duty condition as specified in Table-1 and Table -2.
- 2 Erection and Commission. Delivery of material at BHEL Bongaigaon site, surface preparation for lining surfaces, lining the surface to the satisfaction of the customer shall be under bidder's scope, cost for Erection and Commission shall be included in the offer.
- 3 15 copies of Operation manuals containing all details of reference drawings and technical data shall be furnished by the Bidder.

4.0 SURFACE PREPARATION

- 1 The Tanks surface to be lined should be blasted to a bright grey metal finish (Sa 2½ requirement), free from rust, weld marks, oil and any other foreign matter. The blasting is carried out with the help of dry grit (copper sludge)/Sand under dry air pressure of 7 kg/cm² by Compressor. Surface roughness shall be 50-60 Microns.
- 2 After blast cleaning, blasted surface will be applied by surface protecting primer to prevent the corrosion. After 100% blasting of the particular Tank is completed,

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the surface is cleaned by appropriate solvent, so as to see that all the small dust particles are removed. Sharp corner shall be suitable rounded off. Surface should not have any sharp notch.

- 3 After this procedure suitable bonding agent and 3 to 4 coating of the specially formulated rubber adhesive should be applied for proper bonding of the Rubber Sheets to be lined.
- 4 Compressor and any other facilities required for grit \shot blasting shall be arranged by vendor. Any hoses provided in the compressed air line shall be tested with air before commencement of grit blasting job.
- 5 The grit\shot blasting machine shall be provided with safety valve (safe trip) as a protection against over pressure.
- 6 Any scaffolding provided by the vendor shall be of steel only.

5.0 RUBBER LINING

- 1 The lining shall completely cover the roof, sides and internals of Slurry Tanks , support angle, insert plates, openings, Man Hole / Inspection / Flange openings.etc.,
- 2 The rubber used for the lining shall be of natural rubber.
- 3 After Rubber sheet applied on the surface, rubber sheets should be systematically pressed to the metal surface by the help of mechanical tools like Rubber Rollers and metal thin rollers to remove the air between metal and rubber sheet. All rubber joints are properly overlapped by 25 to 35 mm wide tapered cut rubber sheet. All the joints will be covered by 75 mm X 1.5 - 1.7 mm thick rubber strip.
- 4 Vendor shall specify the shelf life of the rubber material being supplied and shall furnish the storage methods to be followed at site to ensure that the rubber material shall not be spoilt during storage.
- 5 Vendor shall submit the surface preparation and lining procedure to the purchaser for approval. The lining work shall start only after obtaining approval from Purchaser

6.0 INSPECTION AND TESTING OF RUBBER LINING

- | | | | |
|---|---------------------|---|--|
| 1 | Ageing Test | : | 70°C for 24 hrs. (IS : 3400 Pt.4)
Change in Tensile Strength: $\pm 5\%$
Elongation at break : $\pm 10\%$ |
| 2 | Abrasion Test | : | Wt. loss – Max. 25% |
| 3 | Tensile Strength | : | ≥ 2 MPa for 4 mm thk Rubber specimen. |
| 4 | Elongation at break | : | $\geq 400\%$ minimum for 4mm thk rubber specimen |
| 5 | Peeling strength | : | ≥ 3 N/mm |
| 6 | Hardness | : | 53 $\pm$ 5° Shore A |

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- 7 Spark Test : 1.5 KV/ mm
- 8 Lining shall be visually inspected to ensure free from poorly weed out fibers, entrapped air and exposed fires. Defects are to be repaired by sandblasting a generous area around the defected portion and applying a layer of rubber material.
- 9 Spark test shall be carried out at appropriate areas in the presence of Purchaser. Vendor should conduct test as per relevant standards.
- 10 After installation, the Rubber lining shall be subjected to testing at site as per relevant standards. If the performance is found not to meet the requirements as specified, the Rubber lining shall be rectified or replaced by the Vendor without any extra cost to the Purchaser.

6.1 FINISHING & INTERNAL TESTING

- 1 Rubber surface of all flanges and manhole of Equipment will be finished by the mechanical tools to get leakage free surface during commissioning.
- 2 After above finishing, 100% testing will be carried out for continuity by high frequency high voltage spark tester. If there is any puncture, they are checked and rectified as per the standard procedure of repair (Clause 6.1) as mentioned in procedure.

6.1 REPAIRING PROCEDURE

- 1 Faulty spots on the rubber lining are cut off down to be substrate and the seams of the remaining rubber are beveled.
- 2 Rubber sheet with a broad bevel cut is glued on the substrate laid bare.
- 3 On spots to be repaired of a diameter < 300 mm a second layer of Rubber sheet is glued covering the seams of the first layer.
- 4 Several spots to be repaired in a small area are jointly covered with a second layer of Rubber sheet.

7.0 PERFORMANCE GUARANTEE

- 1 Performance parameters to be guaranteed by the vendor and tolerances permitted shall be as indicated in the data sheet. Rubber lining or any portion thereof is liable for rejection, if it fails to give any of the guaranteed performance parameters. The lining should be guaranteed for faultless material and workmanship and also for a period of 24 months from the date of handing over. During Guarantee period any defects noticed due to faulty material and workmanship, shall be rectified by vendor free of cost.

8.0 PACKING

1. The part items of the Rubber lining should be identified by Tag numbers and should be packed as to minimize the possibility of damage during storage or transit. The packing

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should be suitable for tropical conditions. Vendor should specify the storage requirements for the Rubber lining materials.

2. The list of items identified as dispatchable units shall be furnished along with unit weight and the quantity for preparation of packing slip at BHEL end for dispatch to site and for easy identification, storage and erection at site.

9.0 DOCUMENTATION

9.1 DOCUMENTS TO BE ENCLOSED ALONG WITH THE OFFER

- 1 Write-up on technical features of rubber lining offered along with Catalogues, Resin composition, drawings etc.
- 2 Data sheets duly filled in for the Rubber lining material.
- 3 The erection sequence/Procedure of the Rubber lining. Detailed flow chart from start to finish of the lining to be furnished. Application procedure.
- 4 Man days required to complete the Rubber lining for each area is to be spelt from start to finish.
- 5 Vendor should clearly indicate the following:
 - Utility/Utilities from customer/purchaser required for Rubber lining at site.
 - Storage facility requirement for Rubber lining materials
- 6 Vendor should clearly indicate the price for Rubber lining of carbon steel construction per Square meters to enable to meet any additional lining areas.

9.2 DATA TO BE FURNISHED BY THE VENDOR AFTER RECEIPT OF PURCHASE ORDER

- 1 List of Drawing and documents to be submitted for review, approval and information with submission dates
- 2 Quality Assurance Plan to be submitted for approval.
- 3 Detailed dimensional General Arrangement drawing of the lining surfaces.
- 4 This drawing shall indicate all the design data and information about the material, scope of work and weight of the material supply, Packing procedure etc.
- 5 Installation, operation and maintenance manual.
- 6 Surface preparation and Lining procedures.
- 7 Catalogues, data sheets and drawings for Rubber lining.

Note:

The lining area indicated in Table 1 is only approximate. This area includes wall area and area of supports. During actual lining work at site, the area may be varying from the indicated area. In such case, BHEL clarifies that payment shall be made for lining work of the actual area based on justification and proof given by the vendor.

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Table -1

Dimension of Limestone Slurry Tanks

Sl.No.	Description	Rubber lining thickness (mm)	Tank Dimensions (meter)	Surface area of Tanks (m ²) (Shell, Base and Roof)	Number of Tanks	Total area (m ²) (including support)
1	Limestone Slurry Tanks	4	Dia : 11.5 Height : 12 .29	Shell = 444.01	Two (2)	1440
				Base = 103.87		
				Roof = 103.87		
2	Auxiliary Absorbent Tank	4	Dia : 16.5 Height : 10.173	Shell = 527.33	One (1)	1050
				Base = 213.2		
				Roof = 213.2		
3	Filtrate Water Tank	4	Dia : 10.0 Height : 9.06	Shell =284.63	One (1)	490
				Base = 78.54		
				Roof = 78.54		
4	Secondary Hydro cyclone Feed Tank	4	Dia : 16.0 Height : 13.6	Shell = 683.61	One (1)	1200
				Base = 201.3		
				Roof = 201.6		
5	Waste Water Tank	4	Dia : 10.0 Height : 9.775	Shell = 307.09	One (1)	520
				Base = 78.54		
				Roof = 78.54		
Total Surface area						4700

Note: Bidder should clearly indicate the price for Rubber lining of carbon steel construction per Square meters to enable to meet any additional lining areas.

Table-2 Process Parameters:

Sl. No.	Item	Auxiliary Absorber Tank	Limestone Slurry Tanks	Filtrate Tank & Secondary Hydro cyclone Tank	Waste water tank	Lime Feed Tank
1.	Maximum solid particle	200 mesh (75 micron)	150 mesh (104 micron)	325 mesh (43 micron)	200 mesh (75 micron)	325 mesh (43 micron)
2.	Distribution of above size particle, d20	25% (max)	20% (max)	70% (max)	2% (max)	<5% (max)
3.	Normal solid particle size, d50	325 mesh (43 micron)	325 mesh (43 micron)	500mesh (25 micron) to 1250 (10 micron)	325 mesh (43 micron) and fine particles	325 mesh (43 micron)
4.	Solid to be handled	Limestone Stone Slurry & Other Impurities				
5.	Specific gravity of Slurry	1.1	1.224	1.025	1.025	1.087
6.	PPM of heavier particle (Silica, Aluminum Oxide, Ferric Oxide and Columbium)	11800	23290	3200-3500	255	<40 ppm
7.	Hardness of Particle	5-7 (Mho scale)	5-7 (Mho scale)	5-7 (Mho scale)	5-7 (Mho scale)	5-7 (Mho scale)
8.	Concentration of Slurry	15 % by weight	30 % by weight	4 % by weight	4 % by weight	12 % by weight
9.	Specific gravity of Limestone	2.51 (Avg)	2.80	2.80	2.51 (Avg)	2.51 (Avg)
10.	Specific gravity of heaviest particles (Columbium and Iron oxide)	5.9	5.9	5.9	5.9	5.9
11.	Concentration of Chloride	20000 ppm	20000 ppm	20000 ppm	20000 ppm (max)	< 100 ppm
12.	Viscosity of Slurry	10-15 cp	20-30 cp	2-5 cp	10 cp	8-15 cp
13.	Maximum operating temperature of Slurry	60 deg C	60 deg C	45 deg C	50 deg C	45 deg C

