

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

3. PAINTING OF DAMAGED AREAS

Areas where paint has deteriorated badly by erosion and areas where the paint film has lost its adhesion property and where the steel has got rusted appreciably - these areas are to be repainted as per the following procedure:

SL NO	SURFACE LOCATION	SURFACE PREPARATION	PRIMER, INTERMEDIATE & FINISH
1	Paint damaged Components falling under FGD Sl no.01,02,03,04,05,06, 07,08,09,11,12,13,18 19,21,22,24,25,26,27,28,30,31,32,34,36, 37,39,40,47& 48 of FGD.	Hand/ Power Tool cleaning to Bare metal to minimum 6 inches peripheral area adjoining to damaged area	Primer: Epoxy Zinc rich primer to IS 14589, DFT-70µ (If Metal surface exposed) followed by intermediate & finish coat as per respective scheme If primer is intact- Intermediate & finish as per respective scheme
2	Paint damaged components failing under other Sl nos of FGD & Gates & Dampers	Power Tool Cleaning to Bare metal	Primer and Finish : As given in respective scheme

GENERAL NOTES

- No painting is required for Galvanized, non-ferrous & stainless steel items, except as indicated above.
- Machined items are to be applied with coat of temporary rust preventive oil
- PGMAs covered in sub-supplier (ie., Purchased) items viz., Agitator and other sub-delivery components etc., are not indicated in the above list. However, the Painting Schedule for all items supplied by all sub-suppliers and BOI under the scope of BHEL shall be same as for main equipment covered in this document.
- In sub-assy, wherever plates / sheets of thickness less than or equal to 5mm and rods are used - Power Tool or Hand Tool Cleaning to SSPC - SP 3 / SP 2 shall be followed and painting shall be as per SI no:05 of GAD.
- Ground shade/colour of finish paints and identification tag/band for equipments, fans, piping, pipe services, supporting structures and other components is followed as per NTPC doc no: QS-01-DIV-W-4 at site.
- All components covered under different PGMAs are to be painted. In case any component is left out, the same shall deemed to be included under the relevant section.
- All threaded and other surfaces of foundation bolts and its materials, insulation pins, Anchor channels, Sleeves shall be coated with temporary rust preventive fluid and during execution of civil works; the dried film of coating shall be removed using organic solvents.
- Painting requirement for all electrical equipment shall be as per the details identified in specification for the respective equipment.
- All steel structures shall be provided with painting as given in the specification. Further, painting system shall also meet the requirements of corrosivity category C3 (durability high) as per ISO 12944.
- Finish coat to be applied after an interval of min 10 hrs and within 6 months (after completion of intermediate coat).
- Bottom of base plate including below zero level portion marked in Supporting Columns of structures which will be embedded in concrete, those surfaces shall be prepared by manual cleaning to ST3 and provided with primer coat of chlorinated rubber based zinc phosphate primer of min. 50 µm DFT.

784074/2022/PS-PEM-MAX

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

PAINING SCHEME- DETAILS OF PROCUREMENT & APPLICATION PROCESSES

SL NO	TYPE OF PAINT	SPECIFICATION OF PAINT	NO OF PACK	VOLUME OF SOLIDS (% Min)	MODE OF APPLICATION	MIN. OVER COATING INTERVAL (hours)	SHADE
01	Epoxy Zinc phosphate primer	IS 13238	2	40	Spray	24	Grey
02	Zinc Ethyl silicate primer (% Zn on dry film= 80 (min))	IS 14946	2	60	Airless Spray only	24	Grey
03	Epoxy High solid-Polyamide cured Epoxy based MIO pigmented intermediate coat	--	2	80	Airless Spray only	16	Brown
04	Epoxy based finish paint	IS 14209	2	62	Airless Spray only	16	Corresponding shade no
05	Aliphatic isocyanate acrylic polyurethane paint	IS 13213	2	55	Spray	16	Corresponding shade no
06	Heat resistant aluminium paint	IS 13183 Grade II	1	--	Brush/ Spray	24	--
07	Synthetic Enamel undercoat	IS 2932	1	40	Brush/ Spray	12	--
08	Long oil alkyd Synthetic enamel finish paint	IS 2932	1	35	Brush/ Spray	12	Corresponding shade no
09	Red oxide Zinc phosphate primer	IS 12744	1	--	Brush/ spray	12	--

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

PGMA DETAILS

SNO	PGMA	PGMA DESCRIPTION	PGMA DETAILS
01	FW 212	Slurry recirculation pump system	RC Pumps incl Shaft seal Common Base Plate Coupling and Guard Gear Box Expansion Bellow Anchor Bolts & Fasteners Special Tools
02	FW 219	Absorber system base	Absorber tank bottom plate
03	FW 220	Absorber system structures	Absorber tank structure Absorber tower structure Spray headers structure
04	FW 221	Absorber system casing bottom	Absorber tank wall casing- bottom
05	FW 222	Absorber system casing top	Absorber Tank wall casing –Top Mist Eliminator supports Spray pipe supports Internal Beam Shim plates in Absorber area Internal Struts
06	FW 223	Absorber system accessories	Nozzles and flanges Inspection doors & Man holes Viewing ports Antifoam dosing equipment Suction strainers- FRP
07	FW 226	Emergency Quench water tank	Base Plate & its supports Roof, Shell
08	FW 227	Emergency Quench System	Emergency Quenching Spray Pipe Nozzle for Emergency Pipe Fasteners Gaskets
09	FW 230	Air oxidation System	Oxidation Blowers Common Base Plate Coupling and Guard Anchor Bolts & Fasteners Expansion Bellow Suction & Discharge Silencers Acoustic Enclosure Water Injection cooling system

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

Pipe, Valves & Instruments
Special Tools

SNO	PGMA	PGMA DESCRIPTION	PGMA DETAILS
10	FW 244	Oxidation air distribution System	Pipe & Fittings Flanges
11	FW 251	Expansion joint between bypass	Pipe Hanger, Bottom Elbow, Bottom sliding supports Expansion joints Seal Plates & Fasteners
12	FW 252	Expansion joint between scrubbers	Fabric & its fixing fasteners Sleeves & Flanges Gaskets
13	FW 255	Ducts between bypass duct inlet & booster fan	Plates & Stiffeners Guide Vanes
14	FW 256	Ducts between Booster fan & Absorber	Plates & Stiffeners Guide Vanes
15	FW 257	Ducts between Absorber & stack	Plates & Stiffeners Guide Vanes
16	FW 260	Duct structure between bypass duct & Booster fan	Duct Supports Gusset Plate Divider plate Internal Struts Support bearings
17	FW 261 FW 262	Duct structure between booster fan & absorber & Absorber and Stack	Duct Supports Gusset Plate Divider plate Internal Struts Support bearings
18	FW 292	Structures for Elevator	Columns Seal Plate Bracings Enclosure (Purlin & sheeting)
19	FW 293	Elevator and accessories	Base Frame Buffer Spring Mast Section Cage Control Panel & AC Mandatory Spares

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

SNO	PGMA	PGMA DESCRIPTION	PGMA DETAILS
20	FW 310	Structures for booster fan handling	Columns Beams Bracings Seal plate
21	FW 610 FW 722	Galleries & railings for Scrubbers, Tank	Stairs Handrail Step treads Floor grills Ladders Foundation bolts Fasteners
22	FW 701	Slurry pumps & accessories	Slurry Pumps incl Shaft seal Common Base Plate Coupling and Guard Belt & Pulley Expansion Bellow Anchor Bolts & Fasteners Motor & accessories Sump Pumps incl Shaft seal Common Base Plate Coupling and Guard Belt & Pulley Anchor Bolts & Fasteners Motor & accessories
23	FW 710	Monorail for hoist& cranes	Insert Plate Stiffener plate Monorail beam
24	FW 721	Agitator support	Channels & Beams
25	FW 730	Limestone silo structures	Columns Beams Bracings Seal plate Angles, channels

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

PGMA DETAILS								
SNO	PGMA	PGMA DESCRIPTION	PGMA	PRIMER	FINISH	DFT (µm min.)	DFT (µm min.)	TOTAL DFT IN (µm min.)
26	FW 731	Limestone silo		Base plate & its supports Shell, Roof				
27	FW 723 FW 724 FW 725	Air cannon Bag filter Nozzles & flanges		Bag filter Air cannon bin activator Nozzles & Flanges				
28	FW 733	Limestone silo approach platforms		Stairs Handrail Step treads Floor grills Ladders Foundation bolts Fasteners				
29	FW 734	Limestone mill		Wet ball mill Hydro cyclone- Mill area Mill circuit pump Mill separator tank with Agitator				
30	FW 742	Lime stone slurry storage tank		Base plate & its supports Shell, Roof				
31	FW 743	Auxiliary Absorber tank		Base plate & its supports Shell, Roof				
32	FW 744	Filtrate tank		Base plate & its supports Shell, Roof				
33	FW 745	Wastage water tank		Base plate & its supports Shell, Roof				
34	FW 747	Hydro cyclone waste water tank		Base plate & its supports Shell, Roof				
35	FW 748 FW 785 FW 786	Process Water tank Belt filter washing tank Primary Hydro cyclone feed tank		Base plate & its supports Shell, Roof				
36	FW 751 FW 752	Process water pipe accessories Cooling water pipe accessories		CS/FRP Pipes & Fittings Sight Glass R Orifice Gaskets & Fasteners				
37	FW 753	Slurry pipe accessories		CSRL/FRP Pipes & Fittings Strainer (Cone) Expansion Joint-Rubber R Orifice Gaskets & Fasteners				

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

SNO	PGMA	PGMA DESCRIPTION	PGMA DETAILS
38	FW 754	Service air pipe accessories	GI Pipes & Fittings Flexible Hose Expansion Joint (Metallic) Hose connector R Orifice Gaskets & Fasteners
39	FW 755	Instrument air pipe accessories	SS Pipes & Fittings Strainer(Y Type) Gaskets & Fasteners
40	FW 815 to FW 851	Valves and fittings	Globe valves Ball Valves Butterfly Valves Diaphragm Valves Gate Valves CheckValves Pinch Valves Knife Gate Valves Control Valves Relief Valves
41	FW 761 FW 765	Structures for Pipe racks	Bracings Columns
42	FW 280 FW 281 FW 282 FW 283 FW 740 FW 760 FW 763	Foundation material for duct structure Foundation material for absorber Foundation material for Tanks Foundation material for Pipe racks Foundation material for Elevator Foundation material for RC pump shed	Foundation bolts Template
43	FW 766	Platforms for Pipe rack	Stairs Handrail Step treads Floor grills Ladders Foundation bolts Fasteners
44	FW 768 FW 769	Trestle for Main & sub Pipe racks	Truss Beams, Supports for all Pipes
45	FW 779	Supports for cable tray	Double Sup Channel & Base plates Single Sup Channel & Base plates

No	SURFACE LOCATION	PGMA	SURFACE PREPARATION	PRIMER		FINISH		TOTAL DFT IN (µm min.)
				PAINT	DFT (µm min.)	PAINT	DFT (µm min.)	

46	FW 996			Cantilever Arm Fasteners & clamps Brackets				
SNO	PGMA		Tools	Erection , commissioning, special tools				
47	FW 798		PGMA DESCRIPTION Air receivers	Instrument Air receivers Any Instruments/Valves				PGMA DETAILS
48	FW 800		Clarified water tank	Base plate & its supports Shell, Roof				
49	FW 802		Neutralization tank & accessories	Base plate & its supports Shell, Roof				
50	FW 988 FW 997 FW 999		Commissioning spares & Mandatory spares	Startup & commissioning spares Mandatory spares				



TITLE:

PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS

SPECIFICATION No: PE-TS-434-571-18000-A003

SECTION-I, SUB-SECTION-C3

REV. 01

DATE: DEC 2021

SHEET : 1 OF 1

TECHNICAL SPECIFICATION OF AGITATORS (ELECTRICAL PORTION)



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
 FOR
 AGITATOR**
3X800 MW PVUNL PATRATU TPP PHASE-1

SPECIFICATION NO.
 VOLUME NO. : **II-B**
 SECTION :
 REV NO. **00** : DATE : 09.01.2020
 SHEET : 2 OF 3

1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER:

- a) Services and equipment as per “Electrical Scope between BHEL and Vendor”.
- b) Any item/work either supply of equipment or erection material which have not been specifically mentioned but are necessary to complete the work for trouble free and efficient operation of the plant shall be deemed to be included within the scope of this specification. The same shall be provided by the bidder without any extra charge.
- c) Supply of mandatory spares as specified in the specifications of mechanical equipments.
- d) Electrical load requirement for **AGITATOR**.
- e) All equipment shall be suitable for the power supply fault levels and other climatic conditions mentioned in the enclosed project information.
- f) Bidder to furnish list of makes for each equipment at contract stage, which shall be subject to customer/BHEL approval without any commercial and delivery implications to BHEL
- g) Various drawings, data sheets as per required format, Quality plans, calculations, test reports, test certificates, operation and maintenance manuals etc shall be furnished as specified at contract stage. All documents shall be subject to customer/BHEL approval without any commercial implication to BHEL.
- h) Motor shall meet minimum requirement of motor specification.
- i) Vendor to clearly indicate equipment locations and local routing lengths in their cable listing furnished to BHEL.
- j) Cable BOQ worked out based on routing of cable listing provided by the vendor for “ both end equipment in vendor’s scope”shall be binding to the vendor with +10 % margin to take care of slight variation in routing length & wastages.

2.0 EQUIPMENT & SERVICES TO BE PROVIDED BY PURCHASER FOR ELECTRICAL & TERMINAL POINTS:

Refer “Electrical Scope between BHEL and Vendor”.

3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

- 3.1 The electrical specification without any deviation from the technical/quality assurance requirements stipulated shall be deemed to be complied by the bidder in case bidder furnishes the overall compliance of package technical specification in the form of



TITLE :
**ELECTRICAL EQUIPMENT SPECIFICATION
 FOR
 AGITATOR
 3X800 MW PVUNL PATRATU TPP PHASE-1**

SPECIFICATION NO.
VOLUME NO. : II-B
SECTION :
REV NO. 00 : DATE : 09.01.2020
SHEET : 3 OF 3

compliance certificate/No deviation certificate.

3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

4.0 List of enclosures :

- a) Electrical scope between BHEL & vendor
- b) Customer (NTPC) specification for Motors
- c) Customer (NTPC) specification for cable lugs and glands
- d) Quality plan for motors & NTPC quality assurance
- e) Datasheet A & C (Annexure- I)
- f) -Void-
- g) Electrical Load data format (Annexure –III)
- h) BHEL cable listing format (Annexure –IV)

REV: 0 DATE: 09.01.2020

STANDARD ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (FOR EPC PROJECTS)
PACKAGE: AGITATOR (Supply Package)

PROJECT: 3X800 MW PATRATU TPS

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&C</u>	<u>REMARKS</u>
1	415 V MCC	BHEL	BHEL	415 V AC (3 PHASE 4 WIRE) supply shall be provided by BHEL based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station (for motors)	BHEL	BHEL	Located near the motors.
3	Power cables, control cables and screened control cables	BHEL	BHEL	Incoming cable from BHEL supplied MCC will be informed by BHEL. Vendor shall provide lugs & glands accordingly.
4	Cable trays, accessories & cable trays supporting system	BHEL	BHEL	
5	Cable glands and lugs for equipments supplied by Vendor	Vendor	BHEL	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power and control cables.
6	Conduit and conduit accessories for cabling between equipments supplied by vendor	BHEL	BHEL	
7	Equipment grounding & lightning protection	BHEL	BHEL	
8	Below grade grounding	BHEL	BHEL	
9	LT Motors with base plate and foundation hardware	Vendor	BHEL	Makes shall be subject to BHEL approval at contract stage.
10	Mandatory spares	Vendor	-	Vendor to quote as per specification.
11	Recommended O & M spares	Vendor	-	As per specification
12	Any other equipment/material/service required for completeness of system but not specified above (to ensure trouble free and efficient operation of the system).	Vendor	BHEL	
13	Electrical equipment GA drawing	Vendor	-	For necessary interface review.

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL after award of contract.
2. All QPs shall be subject to approval of BHEL after award of contract without any commercial implication.



SUB-SECTION – B-07

MOTORS

**EPC PACKAGE FOR
PATRATU SUPER THERMAL POWER STATION EXPANSION
PHASE –I (3X 800MW)**

**TECHNICAL SPECIFICATION
SECTION – VI, PART-B
BID DOC NO. : CS-9585-001-2**

CLAUSE NO.	TECHNICAL REQUIREMENTS																																				
	<p style="text-align: center;">MOTORS</p> <p>1.00.00 GENERAL REQUIREMENTS</p> <p>1.01.00 For the purpose of design of equipment/systems, an ambient temperature of 50 deg. Centigrade and relative humidity of 95% (at 40 deg C) shall be considered. The equipment shall operate in a highly polluted environment.</p> <p>1.02.00 All equipment shall be suitable for rated frequency of 50 Hz with a variation of +3% & -5%, and 10% combined variation of voltage and frequency unless specifically brought out in the specification.</p> <p>1.03.00 Contractor shall provide fully compatible electrical system, equipment, accessories and services.</p> <p>1.04.00 All the equipment, material and systems shall, in general, conform to the latest edition of relevant National and international Codes & Standards, especially the Indian Statutory Regulations.</p> <p>1.05.00 Paint shade shall be as per RAL 5012 (Blue) for indoor and outdoor equipment.</p> <p>1.06.00 The responsibility of coordination with electrical agencies and obtaining all necessary clearances for contractors equipment and systems shall be under the contractor scope.</p> <p>1.07.00 Degree of Protection</p> <p>Degree of protection for various enclosures as per IEC60034-05 shall be as follows:-</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 5%;">i)</td> <td style="width: 45%;">Indoor motors</td> <td style="width: 10%;">-</td> <td style="width: 40%;">IP 54</td> </tr> <tr> <td>ii)</td> <td>Outdoor motors</td> <td>-</td> <td>IP 55</td> </tr> <tr> <td>iii)</td> <td>Cable box-indoor area</td> <td>-</td> <td>IP 54</td> </tr> <tr> <td>iv)</td> <td>Cable box-Outdoor area</td> <td>-</td> <td>IP 55</td> </tr> </table> <p>2.00.00 CODES AND STANDARDS</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 5%;">1)</td> <td style="width: 45%;">Three phase induction motors</td> <td style="width: 10%;">:</td> <td style="width: 40%;">IS/IEC:60034</td> </tr> <tr> <td>2)</td> <td>Single phase AC motors</td> <td>:</td> <td>IS/IEC:60034</td> </tr> <tr> <td>3)</td> <td>Crane duty motors</td> <td>:</td> <td>IS:3177, IS/IEC:60034</td> </tr> <tr> <td>4)</td> <td>DC motors/generators</td> <td>:</td> <td>IS/IEC:60034</td> </tr> <tr> <td>5)</td> <td>Energy Efficient motors</td> <td>:</td> <td>IS 12615, IEC: 60034-30</td> </tr> </table>	i)	Indoor motors	-	IP 54	ii)	Outdoor motors	-	IP 55	iii)	Cable box-indoor area	-	IP 54	iv)	Cable box-Outdoor area	-	IP 55	1)	Three phase induction motors	:	IS/IEC:60034	2)	Single phase AC motors	:	IS/IEC:60034	3)	Crane duty motors	:	IS:3177, IS/IEC:60034	4)	DC motors/generators	:	IS/IEC:60034	5)	Energy Efficient motors	:	IS 12615, IEC: 60034-30
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<p style="text-align: center;">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</p>	<p style="text-align: center;">SUB-SECTION-B-07 MOTORS</p>	<p style="text-align: center;">PAGE 1 OF 10</p>																																		

CLAUSE NO.	TECHNICAL REQUIREMENTS		
3.00.00	TYPE		
3.01.00	<p>AC Motors:</p> <p>a) Squirrel cage induction motor suitable for direct-on-line starting.</p> <p>b) Continuous duty LT motors upto 200 KW Output rating (at 50 deg.C ambient temperature), shall be Premium Efficiency class-IE3, conforming to IS 12615, or IEC:60034-30.</p> <p>c) Crane duty motors shall be squirrel cage Induction motor as per the requirement.</p> <p>d) Motor operating through variable frequency drives shall be suitable for inverter duty. Also these motors shall comply the requirements stipulated in IEC: 60034-18-41 and IEC: 60034-18-42 as applicable.</p>		
3.02.00	DC Motors	Shunt wound	
4.00.00	RATING		
5.00.00	<p>(a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.</p> <p>(b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.</p> <p>(c) For BFP motors, starting MVA shall be restricted to meet requirements indicated in B-0.</p> <p>TEMPERATURE RISE</p> <p>Air cooled motors</p> <p>70 deg. C by resistance method for both thermal class 130(B) & 155(F) insulation.</p> <p>Water cooled</p> <p>80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) & 155(F) insulation.</p>		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 2 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	41 deg.C over inlet cooling water maximum temperature of 39 deg.C for thermal class 90 (Y) wet wound Boiler circulation pump motor.		
6.00.00	OPERATIONAL REQUIREMENTS		
6.01.00	Starting Time		
6.01.01	For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.		
6.01.02	For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.		
6.01.03	For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.		
6.01.04	Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.		
6.02.00	Torque Requirements		
6.02.01	Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.		
6.02.02	Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.		
6.03.00	<p>Starting voltage requirement</p> <p>(a) Up to 85% of rated voltage for ratings below 110 KW</p> <p>(b) Up to 80% of rated voltage for ratings from 110 KW to 200 KW</p> <p>(c) Up to 85% of rated voltage for ratings from 201 KW to 1000 KW</p> <p>(d) Up to 80% of rated voltage for ratings from 1001 KW to 4000 KW</p> <p>(e) Up to 75 % of rated voltage for ratings above 4000KW</p> <p>Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.</p>		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 3 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.00.00	DESIGN AND CONSTRUCTIONAL FEATURES		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors, space heater terminals inside the main terminal box may be acceptable.		
7.02.00	<p>All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACW) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). The method of movement of primary and secondary coolant shall be self-circulated by fan or pump directly mounted on the rotor of the main motor as per IEC 60034-6. However VFD driven motors can be offered with forced cooling type with machine mounted fan or pump driven by separate electric motor. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS: 2148 as detailed below</p> <p>(a) Fuel oil area : Group – IIB</p> <p>(b) Hydrogen generation : Group - IIC or (Group-I, Div-II as per plant area NEC) or (Class-1, Group-B, Div-II as per NEMA / IEC60034)</p>		
7.03.00	<p>Winding and Insulation</p> <p>(a) Type : Non-hygroscopic, oil resistant, flame resistant</p> <p>(b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature.</p> <p>(c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e. resin poor method. The lightning Impulse & intertern insulation surge withstand level shall be as per IEC-60034 part-15.</p> <p>However winding insulation for wet wound Boiler circulation pump motor shall be thermal class 90 (Y) or better.</p> <p>(d) 240VAC, 415V AC & 220V DC motors : Thermal Class (B) or better</p>		
7.04.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.		
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</p>	<p align="center">SUB-SECTION-B-07 MOTORS</p>	<p align="center">PAGE 4 OF 10</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.		
7.06.00	Noise level for all the motors shall be limited to 85dB (A) except for BFP motor for which the maximum limit shall be 90 dB(A). Vibration shall be limited within the limits prescribed in IS/IEC 60034-14. Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.		
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.		
7.08.00	Motor body shall have two earthing points on opposite sides.		
7.09.00	11 KV motors shall be offered with Separable Insulated Connector (SIC) as per IEEE 386. The offered SIC terminations shall be provided with protective cover and trifurcating sleeves. SIC termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Suitable termination kit shall be provided for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non-magnetic material for single core cables) shall be provided.		
7.11.00	The spacing between gland plate & center of terminal stud shall be as per Table-I.		
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.		
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.		
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.		
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.		
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</p>	<p align="center">SUB-SECTION-B-07 MOTORS</p>	<p align="center">PAGE 5 OF 10</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS															
8.00.00	<p>The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.</p> <table border="0"> <tr> <td data-bbox="423 304 941 336">(a) 50 kW to 110 kW</td> <td data-bbox="966 304 982 336">:</td> <td data-bbox="1047 304 1112 336">11.0</td> </tr> <tr> <td data-bbox="423 367 941 399">(b) From 110 KW & upto 200 KW</td> <td data-bbox="966 367 982 399">:</td> <td data-bbox="1047 367 1096 399">9.0</td> </tr> <tr> <td data-bbox="423 430 941 462">(c) Above 200 KW & upto 1000KW</td> <td data-bbox="966 430 982 462">:</td> <td data-bbox="1047 430 1112 462">10.0</td> </tr> <tr> <td data-bbox="423 493 941 525">(d) From 1001KW & upto 4000KW</td> <td data-bbox="966 493 982 525">:</td> <td data-bbox="1047 493 1096 525">9.0</td> </tr> <tr> <td data-bbox="423 556 941 588">(e) Above 4000KW</td> <td data-bbox="966 556 982 588">:</td> <td data-bbox="1047 556 1144 588">6 to 6.5</td> </tr> </table>	(a) 50 kW to 110 kW	:	11.0	(b) From 110 KW & upto 200 KW	:	9.0	(c) Above 200 KW & upto 1000KW	:	10.0	(d) From 1001KW & upto 4000KW	:	9.0	(e) Above 4000KW	:	6 to 6.5
(a) 50 kW to 110 kW	:	11.0														
(b) From 110 KW & upto 200 KW	:	9.0														
(c) Above 200 KW & upto 1000KW	:	10.0														
(d) From 1001KW & upto 4000KW	:	9.0														
(e) Above 4000KW	:	6 to 6.5														
9.00.00	CW motor shall be designed with minimum power factor of 0.8 at design duty point.															
10.00.00	TYPE TEST															
10.01.00	HT MOTORS															
10.01.01	<p>The contractor shall carry out the type tests as listed in this specification on the equipment to be supplied under this contract. The bidder shall indicate the charges for each of these type tests separately in the relevant schedule of Section - VII- (BPS) and the same shall be considered for the evaluation of the bids. The type tests charges shall be paid only for the test(s) actually conducted successfully under this contract and upon certification by the employer's engineer.</p>															
10.01.02	<p>The type tests shall be carried out in presence of the employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out.</p>															
10.01.03	<p>In case the contractor has conducted such specified type test(s) within last ten years as on the date of bid opening, he may submit during detailed engineering the type test reports to the employer for waiver of conductance of such test(s). These reports should be for the tests conducted on the equipment similar to those proposed to be supplied under this contract and test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. The employer reserves the right to waive conducting of any or all the specified type test(s) under this contract. In case type tests are waived, the type test charges shall not be payable to the contractor.</p>															
10.01.04	<p>Further the Contractor shall only submit the reports of the type tests as listed in "LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED "and carried out within last ten years from the date of bid opening. These reports should be for</p>															
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW</p>	<p align="center">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</p>	<p align="center">SUB-SECTION-B-07 MOTORS</p>	<p align="center">PAGE 6 OF 10</p>													

CLAUSE NO.	TECHNICAL REQUIREMENTS		
10.01.05	<p>the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client. However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.</p> <p>LIST OF TYPE TESTS TO BE CONDUCTED</p> <p>The following type tests shall be conducted on each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) No load saturation and loss curves upto approximately 115% of rated voltage (b) Measurement of noise at no load. (c) Momentary excess torque test (subject to test bed constraint). (d) Full load test (subject to test bed constraint) (e) Temperature rise test at rated conditions. During heat run test, bearing temp., winding temp., coolant flow and its temp. shall also be measured. In case the temperature rise test is carried at load other than rated load, specific approval for the test method and procedure is required to be obtained. Wherever ETD's are provided, the temperature shall be measured by ETD's also for the record purpose. 		
10.01.06	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of HT motor</p> <ul style="list-style-type: none"> (a) Degree of protection test for the enclosure followed by IR, HV and no load run test. (b) Terminal box-fault level withstand test for each type of terminal box of HT motors only. (c) Lightning Impulse withstand test on the sample coil shall be as per clause no. 4.3 IEC-60034, part-15 (d) Surge-withstand test on interturn insulation shall be as per clause no. 4.2 of IEC 60034, part-15 		
<p align="center">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)</p>	<p align="center">TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2</p>	<p align="center">SUB-SECTION-B-07 MOTORS</p>	<p align="center">PAGE 7 OF 10</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
10.02.00	LT Motors		
10.02.01	LT Motors supplied shall be of type tested design. During detailed engineering, the contractor shall submit for employer's approval the reports of all the type tests as listed in this specification and carried out within last <i>ten</i> years from the date of bid opening. These reports should be for the test conducted on the equipment similar to those proposed to be supplied under this contract and the test(s) should have been either conducted at an independent laboratory or should have been witnessed by a client.		
10.02.02	However if the contractor is not able to submit report of the type test(s) conducted within last ten years from the date of bid opening, or in the case of type test report(s) are not found to be meeting the specification requirements, the contractor shall conduct all such tests under this contract at no additional cost to the employer either at third party lab or in presence of client/ employer's representative and submit the reports for approval.		
10.02.03	<p>LIST OF TESTS FOR WHICH REPORTS HAVE TO BE SUBMITTED</p> <p>The following type test reports shall be submitted for each type and rating of LT motor of above 50 KW only</p> <ol style="list-style-type: none"> 1. Measurement of resistance of windings of stator and wound rotor. 2. No load test at rated voltage to determine input current power and speed 3. Open circuit voltage ratio of wound rotor motors (in case of Slip ring motors) 4. Full load test to determine efficiency power factor and slip. 5. Temperature rise test. 6. Momentary excess torque test. 7. High voltage test. 8. Test for vibration severity of motor. 9. Test for noise levels of motor(Shall be limited as per clause no 7.06.00 of this section) 10. Test for degree of protection and 11. Over speed test. 		
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 8 OF 10

CLAUSE NO.	TECHNICAL REQUIREMENTS		
12.	Type test reports for motors located in fuel oil area having flame proof enclosures as per IS 2148 / IEC 60079-1		
10.03.00	All acceptance and routine tests as per the specification and relevant standards shall be carried out. Charges for these shall be deemed to be included in the equipment price.		
10.04.00	The type test reports once approved for any projects shall be treated as reference. For subsequent projects of NTPC, an endorsement sheet will be furnished by the manufacturer confirming similarity and "No design Change". Minor changes if any shall be highlighted on the endorsement sheet.		
TABLE - I			
DIMENSIONS OF TERMINAL BOXES FOR LV MOTORS			
Motor MCR in KW	Minimum distance between centre of stud and gland plate in mm		
UP to 3 KW	As per manufacturer's practice.		
Above 3 KW - upto 7 KW	85		
Above 7 KW - upto 13 KW	115		
Above 13 KW - upto 24 KW	167		
Above 24 KW - upto 37 KW	196		
Above 37 KW - upto 55 KW	249		
Above 55 KW - upto 90 KW	277		
Above 90 KW - upto 125 KW	331		
Above 125 KW-upto 200 KW	203		
For HT motors the distance between gland plate and the terminal studs shall not be less than 500 mm.			
PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE:			
NOTE: Minimum inter-phase and phase-earth air clearances for LT motors with lugs installed shall be as follows:			
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 9 OF 10

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CLAUSE NO.	TECHNICAL REQUIREMENTS		
	Motor MCR in KW	Clearance	
	UP to 110 KW	10mm	
	Above 110 KW and upto 150 KW	12.5mm	
	Above 150 KW	19mm	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X 800MW)	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO. : CS-9585-001-2	SUB-SECTION-B-07 MOTORS	PAGE 10 OF 10

Cable glands


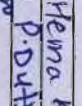

Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.

Cable lugs/ferrules

Cable lugs/ferrules for power cables shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs and ferrules for control cables shall be tinned copper type. The cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipments. Cable lugs and ferrule shall conform to DIN standards


		STANDARD QUALITY PLAN		SPEC. NO. :	
MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		CUSTOMER :		QP NO.: PED-506-00-Q-006, REV.02	
		PROJECT:		DATE: 27.02.2020	
		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:	
				SHEET 1 OF 2	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	C/N				D	M	C	N	
1.0	ASSEMBLY	1 WORKMANSHIP 2 DIMENSIONS 3 CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/COLOUR CODE	MA	VISUAL	100%	-	MFG. SPEC	MFG. SPEC.	-DO-	P	-	-	-	NOTE -1
2.0	PAINTING	1 SHADE	MA	VISUAL	SAMPLE	-	MFG. SPEC/ APPROVED DATASHEET	SAME AS COL.7	LOG BOOK	P	-	-	-	NOTE -1 & NOTE-2
3.0	TESTS	1 ROUTINE TEST INCLUDING SPECIAL TEST 2 OVERALL DIMENSIONS & ORIENTATION	MA	-DO- MEASUREMENT & VISUAL	100% 100%	100%	IS-326 / IS-1261/ APPROVED DATA SHEET	SAME AS COL.7 APPROVED DRG/DATA SHEET	TEST/ INSPN REPORT	P	P	W	W	NOTE -1 & NOTE-2

ENGINEERING		BHEL		QUALITY	
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:		Hema K.			KUNAL KANHT

BIDDER/ SUPPLIER	
Sign & Date	Seal

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

		MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO.		DATE: 27.02.2020	
		CUSTOMER :		PROJECT:		ITEM: AC ELECT. MOTORS UPTO 55KW (LV (415V))		SYSTEM:	
QIP NO. : PED-508-00-Q-006, REV.02		PO NO.:		FORMAT OF RECORD		AGENCY		SHEET 2 OF 2	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY			(#) APPLICABLE FOR EXPORT JOBS	
					M	C/N				M	C	N		
1	2	3 NAMEPLATE DETAILS	MA	VISUAL	100%	100%	IS-325 / IS-12815 / APPROVED DATA SHEET	SAME AS COL.7	TEST/INSPN REPORT	D	M	C	N	
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL	100%	100%	AS PER MFG. STANDARD / APPROVED PACKING DRAWING (#)	AS PER MFG. STANDARD / APPROVED PACKING DRAWING (#)	INSPC. REPORT		P	W	W	

NOTES:

- 1 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL/CUSTOMER SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES. THE SAMPLING PLAN SHALL BE MUTUALLY AGREED UPON
- 2 FOR EXHAUST/VENTILATION FAN MOTORS OF RATING UPTO 1.5KW, ONLY ROUTINE TEST CERTIFICATES SHALL BE FURNISHED FOR SCRUTINY.
- 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED
- 4 BHEL RESERVES THE RIGHT TO PERFORM REPEAT TEST, IF REQUIRED
- 5 AFTER PACKING AND PRIOR TO ISSUE MDCC, PHOTOGRAPHS OF ITEMS TO BE DESPATCHED SHALL BE SENT TO BHEL FOR REVIEW.
- 6 IN CASE, ANY CHANGES IN QP COMMENTED BY CUSTOMER AT CONTRACT STAGE SHALL BE CARRIED OUT BY BIDDER WITHOUT ANY IMPLICATION TO BHEL/CUSTOMER.

LEGENDS:

- * RECORDS IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
- ** M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, C: CUSTOMER, P: PERFORM, W: WITNESS, V: VERIFICATION, AS APPROPRIATE
- MA: MAJOR, MI: MINOR, CR: CRITICAL
- D: DOCUMENT

ENGINEERING		BHEL		QUALITY	
Sign & Date	Name	Checked by:	Sign & Date	Name	
<i>[Signature]</i>	Hema K.	<i>[Signature]</i>	<i>[Signature]</i>	Kunal	
Prepared by:		Reviewed by:			
<i>[Signature]</i>		<i>[Signature]</i>			
Reviewed by:					
<i>[Signature]</i>					

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
<i>[Signature]</i>			
Approved by:			

STANDARD QUALITY PLAN		SPEC. NO.	
CUSTOMER :		QP NO.: PED-506-00-Q-0017, REV.04	
PROJECT :		DATE: 27.02.2020	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SECTION: II	
SYSTEM:		SHEET 1 OF 9	

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	CN				D	M	C	N	
1.0	RAW MATERIAL & BROUGHT OUT CONTROL													
1.1	SHEET STEEL PLATES, SECTION EYE BOLTS	1 SURFACE CONDITION	MA	VISUAL	100%		MANUFACTURERS DRG./SPEC	FREE FROM BLANKS, CRACKS, WAVERNESS ETC	LOG BOOK	P				
1.2	HARDWARES	2 DIMENSIONS 3 PROOF LOAD TEST (EYE BOLT) 1 SURFACE CONDITION	MA	MECH TEST VISUAL	100%		MANUFACTURERS DRG./SPEC	FREE FROM CRACKS, UN-EVENNESS ETC	DOC-TEST REPORT	P				PROPERTY CLASS MARKING SHALL BE CHECKED BY THE VENDOR
1.3	CASTINGS	1 SURFACE CONDITION 2 CHEM. & PHY. PROP 3 DIMENSIONS	MA	VISUAL CHEM & MECH TEST MEASUREMENT	100%		MANUFACTURERS DRG./SPEC	FREE FROM CRACKS, BLOW HOLES ETC	LOG BOOK	P				HEAT NO SHALL BE VERIFIED
1.4	PAINT & VARNISH	1 GAZE SHADE, SPLIT LIFE & TYPE	MA	VISUAL	100% CONTINUOUS		MANUFACTURERS DRG./SPEC	MANUFACTURERS DRG./SPEC	LOG BOOK	P				

ENGINEERING				BHEL				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name	Reviewed by:	Sign & Date	Name
	<i>[Signature]</i>	Heena K.		<i>[Signature]</i>	P. Dutta		<i>[Signature]</i>		<i>[Signature]</i>		

BIDDER/ SUPPLIER	
Sign & Date	Seal

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



MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN		SPEC. NO.	
CUSTOMER:		QP NO.: PEQ-506-09-0-007 .REV-04	
PROJECT:		DATE: 27.02.2020	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SECTION: II	
SYSTEM:		SHEET 2 OF 9	

SI No.	Component & Operations Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
				M	C/N				D	M	C	N	
15	SHAFT (FORGED OR ROLLED)	MA	VISUAL	100%	-	MANUFACTURER'S DRG./ SPEC	FREE FROM VISUAL DEFECTS MANUFACTURER'S DRG./ STD	DO-	P	-	-	-	VENDOR'S APPROVAL IDENTIFICATION SHALL BE MAINTAINED
16	SPACE HEATERS, CONNEX-IONS, TERMINAL BOXES, CABLES & CABLE LUGS, CARBON BRUSH TEMP DETECTORS, RTD. RTDS	MA	CHEM & PHYSICAL TESTS	100%	-	MANUFACTURER'S DRG./ SPEC	MANUFACTURER'S DRG./ STD	DO-	PV	-	-	-	FOR DIA OF 55 MM & ABOVE
		MA	CHEM & PHYSICAL TESTS	100%	-	ASTM-A388	MANUFACTURER'S DRG./ STD	DO-	PV	-	-	-	
		MA	MEASUREMENT	100%	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG./ STD	DO-	PV	-	-	-	
		MA	UL TRASONIC TEST	100%	-	MANUFACTURER'S DRG./ STD	NO PHYS. DAMAGE AND ELECTRICAL DISCONTINUITY MANUFACTURER'S DRG./ STD	DO-	PV	-	-	-	
MA	1 MAKE & RATING	MA	VISUAL	100%	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG./ STD	DO-	PV	-	-	-	
MA	2 PHYSICAL CONDI.	MA	DO-	100%	-	MANUFACTURER'S DRG./ STD	DO-	DO-	PV	-	-	-	
MA	3 DIMENSIONS (W/REVERSE APPLICABLE)	MA	MEASUREMENT	SAMPLE	-	MANUFACTURER'S DRG./ STD	MANUFACTURER'S DRG./ STD	DO-	DO-	PV	-	-	
MA	4 PERFORMANCE/ CALIBRATION	MA	TEST	100%	-	DO-	DO-	TEST REPORT	DO-	PV	-	-	

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Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:					

Sign & Date	Seal
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Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

 MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		STANDARD QUALITY PLAN		SPEC. NO.	DATE: 27.02.2020
		CUSTOMER :	PROJECT:	SYSTEM:	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SECTION: II		PO NO.:	SHEET 3 OF 9

Sl No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY					
					M	C/N				D	M	C	N		
17	OTHER INSULATING MATERIALS LIKE SLEEVES, BINDINGS CORDS PAPERS, PRESS BOARDS ETC	1 SURFACE COND ETC	MA	VISUAL	100%		MANUFACTURERS STD	NO VISUAL DEFECTS	TEST REPORT						
18	SHEET STAMPING (PUNCHED)	1 SURFACE COND	MA	VISUAL	100%		MANUFACTURERS DRG	NO VISUAL DEFECTS (FREE FROM BURS)	LOGBOOK						
19	CONDUCTORS	1 SURFACE FINISH	MA	VISUAL	100%		MANUFACTURERS DRG / STD	FREE FROM DEFECTS	LOGBOOK						

* MOTOR MANUFACTURERS TO CONDUCT VISUAL CHECK FOR SURFACE FINISH ON RANDOM BASIS 10% SAMPLE AT HIS WORKS AND MAINTAIN RECORD FOR VERIFICATION BY BHEL CUSTOMER

ENGINEERING				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Reviewed by:	
	<i>[Signature]</i>	Hema K. Dutta		<i>[Signature]</i>	K. Srinivas		

SIGNATURE		SEAL	
Sign & Date		Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No.	Sign & Date	Name	Seal



MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN	SPEC. NO.	DATE: 27.02.2020
CUSTOMER :	QP NO.: PED-566-00-Q-007, REV. 04	
PROJECT :	PO NO.:	
ITEM: AC ELECT. MOTORS 65 KW & ABOVE (LV (415V))	SYSTEM:	SECTION: II
		SHEET 4 OF 9

Sl.No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Or check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	CN				D	M	C	N	
1				MEASUREMENT	DO.		DO.	DO.	Log Book					
10	BEARINGS	1 MAKE & TYPE 2 DIMENSIONS 3 SURFACE FINISH	MA	VISUAL	100%		MANUFACTURERS DRG / APPROVED DATASHEET	MANUFACTURERS DRG / APPROVED DATASHEET	DO.					
11	SLIP RING (WHEREVER APPLICABLE)	1 SURFACE COND. 2 DIMENSIONS 3 TEMP WITH STRAND CAPACITY 4 HVIR	MA	VISUAL	100%		APPROVED DATASHEET	APPROVED DATASHEET / BEARING MANUF'S CATALOGUES	DO.					
12	OIL SEALS & GASKETS	1 MATERIAL OF GASKET 2 SURFACE COND 3 DIMENSIONS	MA	VISUAL	100%		MANUFACTURERS DRG / APPROVED DATASHEET	MANUFACTURERS DRG / SPECS	DO.					

ENGINEERING			QUALITY		
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	<i>[Signature]</i>	Hema K. P. Dutta	Reviewed by:	<i>[Signature]</i>	K. N. S. Rao

Sign & Date	Seal
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Doc No.	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN		SPEC. NO.	DATE: 27.02.2020
CUSTOMER :		QP NO.: PED.908.00.2.007, REV.04	
PROJECT:		PO NO.:	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (L.V. (415V))		SYSTEM:	SECTION: II
			SHEET 5 OF 9

Sl No	Component & Operations	Characteristics	Class	Type of Check	Quantum of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	C/N				D	M	C	N	
2.0	IN PROCESS			VISUAL			GOOD FINISH	LOG BOOK						
2.1	STATOR FRAME WELDING (IN CASE OF FABRICATED STATOR)	1 WORKMANSHIP & CLEANNESS 2 DIMENSIONS	MA	MEASUREMENT			MANUFACTURERS DRG	LOG BOOK						
2.2	MACHINING	1 FINISH 2 DIMENSIONS	MA	VISUAL			MANUFACTURERS DRG	LOG BOOK						
2.3	PAINING	1 SURFACE PREPARATION 2 PAINT THICKNESS (BOTH PRIMER & FINISH COAT) 3 SHADE 4 ADHESION	MA	MEASUREMENT BY RUCOMETER VISUAL CROSS CUTTING & TAPE TEST			MANUFACTURERS STD / APPROVED DATASHEET	LOG BOOK						

ENGINEERING		QUALITY	
Prepared by:	Sign & Date	Checked by:	Sign & Date
Reviewed by:	Name	Reviewed by:	Name

Handwritten signatures and dates in the Engineering and Quality sections.

Sign & Date	Seal
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Doc No.	Sign & Date	Name	Seal
	Reviewed by		
	Approved by		

FOR CUSTOMER REVIEW & APPROVAL

BHEL		STANDARD QUALITY PLAN	
CUSTOMER :		SPEC. NO.	
PROJECT :		QP NO. : PED-506-99-4-007, REV.04	
ITEM: AC ELECT, MOTORS 55 KW & ABOVE (LV (415V))		DATE: 27.02.2020	
SYSTEM :		PO NO. :	
SECTION: II		SHEET 6 OF 9	

Sl.No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	Q/N				D	M	C	N	
2.4	SHEET STACKING	1 COMPLETENESS 2 COMPRESSION 3 TIGHTENING	MA	MEASUREMENT MEASUREMENT	SAMPLE	100%	MANUFACTURERS STD	MANUFACTURERS STD	LOG BOOK		P	-	-	
2.5	WINDING	1 COMPLETENESS 2 CLEANLINESS 3 RLV/IR 4 RESISTANCE 5 INTERTURN INSULATION	CR	VISUAL	100%	100%	MANUFACTURERS STD/APPROVED DATASHEET	MANUFACTURERS STD/APPROVED DATASHEET	LOG BOOK		P	-	-	
2.6	IMPREGNATION	1 VISCOSITY 2 TEMP PRESSURE VACUUM 3 NO. OF DIPS	MA	PHY. TEST PROCESS CHECK	AT STARTING CONTINUOUS	CONTINUOUS	MANUFACTURERS STANDARD MANUFACTURERS STANDARD	MANUFERS STANDARD MANUFACTURERS STANDARD	LOG BOOK LOG BOOK		P P	- -	V	THREE DIPS TO BE GIVEN

ENGINEERING				QUALITY			
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name	Seal	
Reviewed by:	<i>[Signature]</i>	Hema K.	Reviewed by:	<i>[Signature]</i>	<i>[Signature]</i>		

02/15/2020
P. D. H. H.

भारतीय विद्युत निगम BHEL		STANDARD QUALITY PLAN		SPEC. NO	
MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS		CUSTOMER :		QP NO.: PED-506-00-Q-007, REV 04	
		PROJECT:		DATE: 27.02.2020	
		ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		PO NO.:	
		SYSTEM:		SECTION: II	
				SHEET 7 OF 9	

Sl No.	Component & Operators	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY				
					M	C/N				D	M	C	N	
1														
27	COMPLETE STATOR ASSEMBLY	4 DURATION 1 COMPACTNESS & CLEARNESS 1 COMPLETENESS 2 SOUNDNESS	MA MA CR CR	DO VISUAL DO MALLETT TEST & UT	CONTINUOUS 100% DO 100%	CONTINUOUS 100% DO 100%	DO- DO- DO- DO- DO-	DO- DO- DO- DO- DO-	LOG BOOK LOG BOOK LOG BOOK LOG BOOK LOG BOOK	✓ ✓ ✓ ✓ ✓	P P P P P	V V V V V	- - - - -	- - - - -
28	BRAZING/COMPRESSION JOINT	3 HV 1 RESIDUAL UNBALANCE 2 SOUNDNESS GF DIE CASTING	MA CR CR CR	ELECT TEST DYN BALANCE ELECT (GROWLER TEST)	100% DO 100% 100%	100% DO 100% 100%	DO- MANUFACTURER'S SPEC/ ISO 1940 MANUFACTURER'S SPEC	DO- MANUFACTURER'S DWG MANUFACTURER'S SPEC	LOG BOOK LOG BOOK LOG BOOK	✓ ✓ ✓	P P P	V V V	- - -	- - -
29	COMPLETE ROTOR ASSEMBLY	1 ALIGNMENT 2 WORKMANSHIP 3 AXIAL PLAY 4 DIMENSIONS 5 CORRECTNESS COMPLETENESS TERMINATIONS/ MARKING/ COLOUR CODE 6 RTD, RTD & SPACE HEATER MOUNTING	MA MA MA MA MA MA	MEAS VISUAL MEAS DO VISUAL	DO DO DO DO 100%	DO DO DO DO 100%	DO- DO- DO- DO- MANUFACTURER'S SPEC	DO- DO- DO- DO- MANUFACTURER'S SPEC	LOG BOOK LOG BOOK LOG BOOK LOG BOOK LOG BOOK	✓ ✓ ✓ ✓ ✓	P P P P P	V V V V V	- - - - -	- - - - -
210	ASSEMBLY		MA	VISUAL	100%	100%	MANUFACTURER'S SPEC	MANUFACTURER'S SPEC	LOG BOOK	✓	P	V	-	-

ENGINEERING		QUALITY	
Prepared by:	Sign & Date	Checked by:	Sign & Date
Reviewed by:	Name	Reviewed by:	Name
BHEL		BIDDER/ SUPPLIER	
Sign & Date		Seal	
FOR CUSTOMER REVIEW & APPROVAL			
Doc No:	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			



MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS

STANDARD QUALITY PLAN		SPEC NO	DATE: 27.02.2020
CUSTOMER :		QP NO.: PED-206-00-Q-007, REV:04	
PROJECT:		PO NO.:	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SYSTEM:	
		SECTION: II	SHEET 3 OF 9

Sl.No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY			
					M	C/N				D	M	C	N
3.0	TESTS	1.TYPICAL TESTS INCLUDING SPECIAL TESTS 2.ROUTINE TESTS INCLUDING SPECIAL TEST	MA	ELECT TEST	100%	100%	IS-325/IS-12615/APPROVED DATASHEET	IS-325/IS-12615/APPROVED DATASHEET	TEST REPORT	P	W	W	NOTE - 1
		3.VIBRATION & NOISE LEVEL	MA	DO	100%	100%	IS-12075 / IEC 60034-14 & IS-12065	IS-12075 / IEC 60034-14 & IS-12065	DO	P	VW	VW	NOTE - 2
		4.OVERALL DIMENSIONS AND ORIENTATION	MA	MEASUREMENT & VISUAL	100%	100%	APPROVED DRG/DATA SHEET	APPROVED DRG/DATA SHEET &	TEST/INSPC REPORT	P	W	W	NOTE - 1
		5.DEGREE OF PROTECTION	MA	ELECT & MECH TEST	100%	100%	IEC 60034-5/IS-12815	APPROVED DATASHEET	TC	P	V	V	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		6. MEASUREMENT OF RESISTANCE OF PTD & BTD	MA	DO	100%	100%	IS-325/IS-12615/IEC 60034 PART-1 / IS-12802	IS-325/IS-12615/IEC 60034 PART-1 / IS-12802	DO	P	VW	VW	NOTE - 2
		7. MEASUREMENT OF RESISTANCE IN OF SPACE HEATER	MA	DO	100%	100%	IS-325/IS-12615/IEC 60034 PART-1	IS-325/IS-12615/IEC 60034 PART-1	DO	P	VW	VW	NOTE - 2
		8. NAME PLATE DETAILS	MA	VISUAL	100%	100%	IS-325/IS-12615 & DATA SHEET	IS-325/IS-12615 & DATA SHEET	TEST/INSPC REPORT	P	V	V	NOTE - 2
		9.EXPLOSION FLAME PROOF (RESISTIVE SPECIFIED)	MA	EXPLOSION FLAME PROOF TEST	100%	100%	IS-2149 / IEC 60079-1	IS-2149 / IEC 60079-1	TC	P	V	V	TC FROM AN INDEPENDENT LABORATORY, REFER NOTE-3
		10. PAINT SHADE, THICKNESS & FINISH	MA	VISUAL & MEASUREMENT BY EXKOMETER	100%	100%	APPROVED DATASHEET	APPROVED DATASHEET	TC	P	V	V	SAMPLEING PLAN TO BE DECIDED BY INSPECTION AGENCY

ENGINEERING		QUALITY	
Prepared by:	Sign & Date	Checked by:	Sign & Date
Reviewed by:	Name	Reviewed by:	Name

BHEEL		BIDDER/ SUPPLIER	
Sign & Date	Seal	Sign & Date	Seal

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

BHEL		MANUFACTURER/ BIDDER SUPPLIER NAME & ADDRESS	
STANDARD QUALITY PLAN		SPEC. NO.	
CUSTOMER :		QP NO.: PED-506-06-Q-001, REV-04	
PROJECT:		DATE: 27.02.2020	
ITEM: AC ELECT. MOTORS 55 KW & ABOVE (LV (415V))		SYSTEM:	
SYSTEM:		PO NO.:	
SECTION: II		SHEET 9 OF 9	

Sl. No.	Component & Operations	Characteristics	Class	Type of Check	Quantum Of check		Reference Document	Acceptance NORMS	FORMAT OF RECORD	AGENCY						
					M	CM				D	M	P	W	N		
1	2	3	4	5			7	8	9							
4.0	PACKING	SURFACE FINISH & COMPLETENESS	MA	VISUAL			AS PER MANUFACT. STANDARD / APPROVED CROSS SECTION DRAWING	AS PER MANUFACT. STANDARD / APPROVED CROSS SECTION DRAWING	INSPC REPORT							IF APPLICABLE, REFER SEAWORTHY PACKING ALSO.

NOTES:

- 1 DEPENDS UPON THE SIZE AND CRITICALITY, WITNESSING BY BHEL SHALL BE DECIDED.
- 2 ROUTINE TESTS ON 100% MOTORS SHALL BE DONE BY THE VENDOR. HOWEVER, BHEL/CUSTOMER SHALL WITNESS ROUTINE TESTS ON RANDOM SAMPLES.
- 3 IN CASE TEST CERTIFICATES FOR THESE TESTS ON SIMILAR TYPE, SIZE AND DESIGN OF MOTOR FROM INDEPENDENT LABORATORY ARE AVAILABLE, THESE TEST MAY NOT BE REPEATED.
- 4 BHEL RESERVES THE RIGHT TO PERFORM REPEAT TEST, IF REQUIRED.
- 5 AFTER PACKING AND PRIOR TO ISSUE MDCC, PHOTOGRAPHS OF ITEMS TO BE DESPATCHED SHALL BE SENT TO BHEL PURCHASE GROUP FOR REVIEW.
- 6 IN CASE ANY CHANGES IN DP COMMENTED BY CUSTOMER AT CONTRACT STAGE SHALL BE CARRIED OUT BY BIDDER WITHOUT ANY IMPLICATION TO BHEL/CUSTOMER.

LEGENDS:

- * RECORDS, IDENTIFIED WITH TICK(✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
- ** M. SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, B. MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, C. CUSTOMER, P. PERFORM, W. WITNESS, V. VERIFICATION, AS APPROPRIATE.
- MA. MAJOR, MI. MINOR, CR. CRITICAL.
- D. DOCUMENT.

ENGINEERING		BHEL		QUALITY	
Prepared by:	Sign & Date	Name	Checked by:	Sign & Date	Name
Reviewed by:	<i>[Signature]</i>	<i>[Name]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Name]</i>

BIDDER/ SUPPLIER	
Sign & Date	Seal

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



MOTOR

TESTS/CHECKS TEMS/COMPONENTS	Visual	Dimensional	Make/Type/Rating /General Physical Inspection	Mech/Chem. Properties	NDT /DP/MPI/UT	Metallography	Electrical Characteristics	Welding/Brazing(WPS/PQR)	Heat Treatment
Plates for stator frame, end shield, spider etc.	Y	Y	Y	Y	Y				Y
Shaft	Y	Y	Y	Y	Y	Y			Y
Magnetic Material	Y	Y	Y	Y			Y		
Rotor Copper/Aluminium	Y	Y	Y	Y			Y		Y
Stator copper	Y	Y	Y	Y			Y		Y
SC Ring	Y	Y	Y	Y	Y		Y	Y	Y
Insulating Material	Y		Y	Y			Y		
Tubes, for Cooler	Y	Y	Y	Y	Y				Y
Sleeve Bearing	Y	Y	Y	Y	Y				Y
Stator/Rotor, Exciter Coils	Y	Y	Y				Y	Y	
Castings, stator frame, terminal box and bearing housing etc.	Y	Y	Y	Y	Y			Y	
Fabrication & machining of stator, rotor, terminal box	Y	Y			Y			Y	Y
Wound stator	Y	Y					Y	Y	
Wound Exciter	Y	Y					Y	Y	
Rotor complete	Y	Y					Y		
Exciter, Stator, Rotor, Terminal Box assembly	Y	Y					Y		
Accessories, RTD, BTD,CT, Space heater, antifriction bearing, gaskets etc.	Y	Y	Y						
Complete Motor	Y	Y	Y						
<p>Note:</p> <ol style="list-style-type: none"> 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW. 2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard 3. Makes of major bought out items for HT motors will be subject to NTPC approval. <p>Y1 = for HT Motor / Machines only.</p>									




MOTOR

TESTS/CHECKS ITEMS/ COMPONENTS	Magnetic Characteristics	Hydraulic/Leak/Pressure Test	Thermal Characteristics	Run out	Dynamic Balancing	Routine & Acceptance tests as per IS-325/IS-4722 /IS- 9283/IS 2148/IEC60034/IEC 60079-I	vibration	Over speed	Tan delta, shaft voltage & polarization index test	Paint shade, thickness & adhesion
Plates for stator frame, end shield, spider etc.										
Shaft										
Magnetic Material	Y		Y							
Rotor Copper/Aluminium										
Stator copper			Y							
SC Ring										
Insulating Material			Y							
Tubes for Cooler		Y								
Sleeve Bearing		Y								
Stator/Rotor, Exciter Coils										
Castings, stator frame, terminal box and bearing housing etc.										
Fabrication & machining of stator, rotor, terminal box										
Wound stator										
Wound Exciter										
Rotor complete				Y	Y					
Exciter, Stator, Rotor, Terminal Box assembly										
Accessories, RTD, BTD,CT, , Space heater, antifriction bearing, gaskets etc.										
Complete Motor						Y	Y	Y	Y1	Y
<p>Note: 1. This is an indicative list of tests/checks. The manufacture is to furnish a detailed Quality Plan indicating the practices & Procedure followed along with relevant supporting documents during QP finalization. However, No QP for LT motor upto 50KW.</p> <p>2. Additional routine tests for Flame proof motors shall be applicable as per relevant standard</p> <p>3. Makes of major bought out items for HT motors will be subject to NTPC approval. Y1 = for HT Motor / Machines only.</p>										


LV MOTORS <u>DATA SHEET-A</u> ANNEXURE - I	SPECIFICATION NO.	
	VOLUME	II B
	SECTION	D
	REV NO. 00	DATE 02.08.2019
	SHEET 1	OF 1

- | | | | |
|------|--|---|--|
| 1.0 | Design ambient temperature | : | 50 °C |
| 2.0 | Maximum acceptable kW rating of LV motor | : | ≤200KW |
| 3.0 | Installation (Indoors/ Outdoors) | : | As required |
| 4.0 | Degree Of Protection (Indoor/Outdoor) | : | IP54/IP55 |
| 5.0 | Type of Cooling | : | TEFC/CACA/TETV |
| 6.0 | Details of supply system | | |
| | a) Rated voltage (with variation) | : | 415V ± 10% |
| | b) Rated frequency (with variation) | : | 50 Hz (Variation: +3% TO –5%) |
| | c) Combined voltage & freq. variation | : | 10% |
| | d) System fault level at rated voltage | : | 50 kA for 1 sec |
| | e) Short time rating for terminal boxes | | |
| | o 110kW & Above
(Breaker controlled) | : | 50 kA for 1 sec |
| | o Below 110kW (SFU+
Contactor controlled) | : | 50 KA for 0.20 sec. |
| | f) LV System grounding | : | Solidly |
| 7.0 | Class of insulation | : | Refer clause 7.03.00 of Customer Motor Specification |
| 8.0 | Minimum voltage for starting
(As percentage of rated voltage) | : | Refer clause 6.03.00 of Customer Motor Specification |
| 9.0 | Power cables data | : | Shall be given during Detailed engg. |
| 10.0 | Earth Conductor Size & Material | : | Shall be given during Detailed engg. |
| 11.0 | Space heater supply | : | 240 V, 1Φ , 50 Hz |
| 12.0 | Rating up to which Single phase motor | : | Acceptable upto 0.20 kW |
| 13.0 | Tests | : | As per Customer motor spec. (enclosed) |
| 14.0 | Energy efficient/ Flame proof motor | : | As per Customer spec. requirement |


- **Also detail Customer spec. for Motors to be referred as enclosed with the specification.**

CLAUSE NO.	Bidder's Name		
	DE-1B	LT MOTORS	
	A.	GENERAL	
	5.	Manufacturer & Country of origin. (Shall be as per approved QA make)	
	6.	Equipment driven by motor	
	7.	Motor type	
	8.	Quantity	
	B.	DESIGN AND PERFORMANCE DATA	
	18.	Frame size	
	19.	Type of duty	
	20.	Type of enclosure /Method of cooling/ Degree of	
	21.	Applicable standard to which motor generally	
	22.	Efficiency class as per IS 12615	
	23.	(a)Whether motor is flame proof	Yes/No
		(b)If yes, the gas group to which it conforms as per IS:2148	
	24.	Type of mounting	
	25.	Direction of rotation as viewed from DE END	
	26.	Standard continuous rating at 40 deg.C. ambient temp. as per Indian Standard (KW)	
	27.	Derated rating for specified normal condition i.e. 50 deg. C ambient temperature (KW)	
	28.	Maximum continuous load demand of driven	
	29.	Rated Voltage (volts)	
	30.	Permissible variation of :	
		a. Voltage (Volts)	
		b. Frequency (Hz)	
		c. Combined voltage and frequency	
	31.	Rated speed at rated voltage and	
	32.	At rated Voltage and frequency:	
		a. Full load current	


EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 13 OF 17
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CLAUSE NO.	Bidder's Name	
	b. No load current	
33.	Power Factor at	
	a. 100% load	
	b. NO load	
	c. Starting.	
34.	Efficiency at rated voltage and frequency,	
	a. 100% load	
	b. 75% load	
	c. 50% load	
35.	Starting current (amps) at	
	a. 100 % voltage	
	b. 85% voltage	
	c. 80% voltage	
36.	Minimum permissible starting Voltage (Volts)	
37.	Starting time with minimum permissible voltage	
	a. Without driven equipment coupled	
	b. With driven equipment coupled	
38.	Safe stall time with 100% and 110% of rated	
	a. From hot condition	
	b. From cold condition	
39.	Torques :	
	a. Starting torque at min. permissible voltage(kg-	
	b. Pull up torque at rated voltage.	
	c. Pull out torque	
	d. Min accelerating torque (kg.m) available	
	e. Rated torque (kg.m)	
40.	Stator winding resistance per phase (ohms at 20	
41.	GD ² value of motors	

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 14 OF 17
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CLAUSE NO.	Bidder's Name		
42.	No of permissible successive starts when motor is in hot condition		
43.	Locked Rotor KVA Input		
44.	Locked Rotor KVA/KW		
45.	Vibration limit :Velocity (mm/s)		
46.	Noise level limit (dBA)		
C.	CONSTRUCTIONAL FEATURES		
1.	Stator winding insulation		
	a. Class & Type		
	b. Winding Insulation Process		
	c. Tropicalised (Yes/No)		
	d. Temperature rise over specified maximum ambient temperature of 50 deg C		
	e. Method of temperature measurement		
	f. Stator winding connection		
2.	Main Terminal Box		
	a. Type		
	b. Location(viewed from NDE side)		
	c. Entry of cables(bottom/side)		
	d. Recommended cable size(To be matched with cable size envisaged by owner)		
	e. Fault level (MVA),Fault level duration(sec)		
	f. Cable glands & lugs details (shall be suitable for		
3.	Type of DE/NDE Bearing		
4.	Motor Paint shade		
5.	Weight of		
	a. Motor stator (KG)		
	b. Motor Rotor (KG)		
	c. Total weight (KG)		
D.	List of accessories.		

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)	TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2	DB07: MOTORS	PAGE 15 OF 17
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CLAUSE NO.	Bidder's Name	
1.	3 Space Heaters (Applicable for 30 KW & above motor) (Nos./Power in watts/supply voltage)	
2.	Terminal Box for Space Heater (Yes/No)	
3.	Speed switch (Yes/No)	
4.	Insulation of bearing (Yes/No)	
5.	Noise reducer(Yes/No)	
6.	Grounding pads	
	i) No and size on motor body	
	ii) Nos on terminal Box	
7.	Vibration pads	
	i) Nos and size	
	ii) Location	
8.	Any other fitments	
E.	List of curves.	
1.	Torque speed characteristic of the motor	
2.	Thermal withstand characteristic	
3.	Starting. current Vs. Time	
4.	Starting. current Vs speed	
5.	P.F. and Effi. Vs Load	
F.	Additional Data to be filled for each rating of DC Motor	
1.	Rated armature voltage (Volt)	
2.	Rated field excitation (Amp)	
3.	Permissible % variation in voltage	
4.	Minimum Permissible Starting voltage (volt)	
5.	At rated voltage	
	i)Full load Armature current.(Amp)	
	ii)Full load Field current (Amp)	
EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)		
TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2		
DB07: MOTORS		
PAGE 16 OF 17		

CLAUSE NO.	Bidder's Name	
	iii) No load Armature current (Amp)	
6.	Full load Field current (Amp)	
7.	No load Armature current (Amp)	
8.	Minimum permissible field current(Amp) to avoid	
	i) Maximum permissible voltage	
	ii) Rated voltage	
	iii) Minimum Permissible Voltage	
9.	Resistance (indicative Values) in ohm	
	i) Armature winding(Arm + IP + Series) at 25	
	ii) Field Winding at 25 deg. C	
10..	Inductance (indicative values)	
	i) Armature winding	
	ii) Field winding	
11	Value of trimmer resistance (ohm) to be connected in series with the shunt field to	
	i) 220 V DC	
	ii) 250 V DC	
	iii) 187 V DC	
12	Value of the external resistance (ohm)required to be connected in series with armature during starting only	
13	Technical data sheet for external resistance box	
14	GA drawing of motor	
15	Starting time calculation	
16	Starter resistance design calculation	
17	Electrical connection diagram of motor	
<p>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)</p>		
<p>TECHNICAL DATA SHEETS SECTION – VI, PART-G BID DOC. NO:CS-9585-001-2</p>		
<p>DB07: MOTORS</p>		
<p>PAGE 17 OF 17</p>		

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/INTT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No	
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOS					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
ANNEXURE-I																			
<p>NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER</p> <p>2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V</p> <p>: ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED)</p>																			
LOAD DATA (ELECTRICAL)												JOB NO. 434 PROJECT TITLE 3x800MW PATRATU STPP SYSTEM AGITATOR DEPTT. / SECTION MAUX ORIGINATING AGENCY PEM (ELECTRICAL) DATA FILLED UP ON DATA ENTERED ON DE'S SIGN. & DATE							



TITLE:

**PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS**

SPECIFICATION No: PE-TS-434-571-18000-A003


SECTION-I, SUB-SECTION-D

REV. 00

DATE: DEC 2021

SHEET : 1 OF 1

LIST OF MAKES OF SUB-VENDOR ITEMS

	TITLE: PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS		SPECIFICATION No: PE-TS-434-571-18000-A003	
			SECTION-I, Sub Section-D	
	REV. 00	DATE: DEC 2021		
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Sl.no.	Item	Category of Inspection	Sub-vendor	Place	Remarks
1.	PAINT	III	ASIAN PAINT		
		III	BERGER		
		III	KANSAI NEROLAC		
		III	JOTUN		
		III	SHALIMAR		
		III	JENSON & NICHOLSON (I) LTD		
		III	CDC CARBOLINE (I) LTD.		
		III	ADDISON PAINTS LTD		
		III	GRAND POLYCOAT		

NOTES: INSPECTION CATEGORIZATION

CAT I: INSPECTION BY OWNER, BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE WITH APPROVED QAP.

CAT II: INSPECTION BY BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE WITH APPROVED QAP.

CAT III: MDCC WILL BE ISSUED BASED COC & MTC ISSUED BY VENDOR AND VERIFICATION BY BHEL / OWNER IN LINE WITH APPROVED QAP/CHECK LIST

- The list of all bought out items like gearbox, coupling, bearings etc. with makes and country of origin and contact details of the manufacturers to be mentioned along with offer to be submitted in the format attached in [Section II, Annexure-6](#) as information to BHEL.
- Acceptance of makes shall be subject to BHEL/ End customer acceptance during the detailed engineering without cost and delivery implication to BHEL.
- Bidder has to submit the sub-vendor questionnaire (attached herewith) along with necessary credentials in case the proposed sub-vendor is not as per the list provided.
- The complete list will be necessarily submitted within one month of placement of LOI to ensure timely placement of order for BOIs. Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

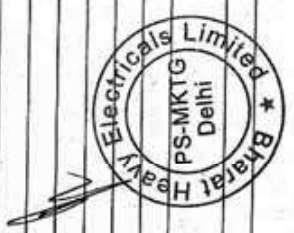


PROJECT : PATRATU STPS (3X800 MW)
 PACAKGE : EPC
 Sub Package: MOTORS & VVF Drive Panels
 CONTRACTOR : M/S BHEL
 CONT. NO. CS-9585-001-2

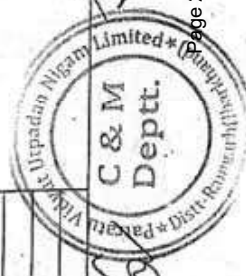
LIST OF ITEMS REQUIRING QP
 APPROVAL & ACCEPTABLE
 VENDOR ;
 CONTRACTOR-M/S BHEL

REF NO : 9585-001-QOE-R-01
 REVISION NO. 00
 DATE 20th April 2017

Sl. No.	ITEM	QP / INS CAT.	QP No:- 9585-001-QVE-	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL STATUS AS PER NTPC	SC APPL SCHE DULE	REMARKS
1)	L T (415 V) Motors	Refer Note 1				ABB ABB BHARAT BUJEE CGL. JYOTI KEC KEC LHP MARATHON NGEF SIEMENS	FARIDABAD BANGALORE MUMBAI AHMEDNAGAR BARODA BANGALORE HUBLI SOLAPUR KOLKATA BANGALORE MUMBAI	^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^ ^		UPTO 55KW 55KW - 200KW RQP. FOR FLAME PROOF ALSO FOR FLAME PROOF ALSO FOR FLAMEPROOF ALSO UPTO 90KW: FOR FLAME PROOF ALSO UPTO 200KW FOR FLAME PROOF ALSO UPTO 15KW
2)	HT MOTOR					BHEL	BIOPAL.	^		
3)	DC MOTOR	Refer Note 1				BHEL CGL KEC	HARIDWAR AHMEDNAGAR BANGLORE / HUBLI	^ ^ DR		
4)	VARIABLE FREQUENCY DRIVES PANELS	1				L&T-YASHIKAWA DANFOSS SCHNEIDER ROCKWELL ALLEN BRADLEY ABB SIEMENS GE	INDIA CHENNAI NASHIK DELHI-SHAHIBABAD BANGALORE NASHIK	^ ^ ^ ^ ^ ^ DR		



DR for HT



Am forsc

PROJECT : PATRATU STPS (3X800 MW) PACKAGE : EPC Sub Package: MOTORS & VVVF Drive Panels CONTRACTOR : M/S BHEL CONT. NO. CS-9585-001-2		LIST OF ITEMS REQUIRING QP APPROVAL & ACCEPTABLE VENDOR ; CONTRACTOR-M/S BHEL				REF NO : 9585-001-QOE-R-01 REVISION NO. 00 DATE 20 th April 2017				
Sl. No.	ITEM	QP / INS CAT.	QP No:- 9585-001-QOE	QP SUB. SCH.	QP APPL SCHE DULE	SUB-SUPPLIERS	PLACE	SUB-SUPPLIER APPL. STATUS AS PER NTPC	SC APPL. SCHE DULE	REMARKS
						HITACHI-HIREL	GANDHINAGAR/ SANAND	DR		
						INGETEAM TECHNOLOGIES	SPAIN	DR		
						NIDEC(ANSALDO)	ITALY	DR		
						FUJI ELECTRIC SYSTEMS	JAPAN	DR		
						TMEIC	BANGALORE	DR		
						L&T	MUMBAI	DR		

NOTE 1 : FOR LT MOTORS

a) Less than 30 KW

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:
It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets.

b) 30 KW -50KW

Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows:
It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets.

c) Above 50 KW as per NTPC approved quality plan

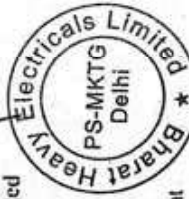
Approval Conditions attached to above vendors-as applicable shall prevail.

General Notes:

- 1) Vendor list & category of the mandatory spares shall be as mentioned above.
- 2) For item not appearing in the above list, main contractor to approach NTPC for acceptable vendors & inspection categorization of the same.

3) NTPC Approval conditions to above identified vendors shall be adhered to. Vendor's approval conditions will be informed on Specifying request of Main Contractor.

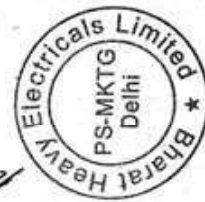
[Signature] NTPC




[Signature]
JATIN GAHLAWAT,
Ultra High Voltage Deptt.

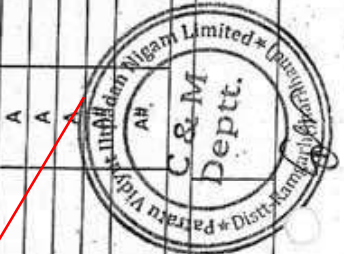


PROJECT : PATRATU		LIST OF ITEMS REQUIRING OP APPROVAL & ACCEPTABLE VENDOR AS APPROVED BY		REF. NO. : REVISION NO : 00 DATE : 1E-05-17					
PACKAGE : EPC (FGD) Package MAIN CONTRACTOR : M/s BHEL CONTRACT NO : CS-3555-001-2		Place		SS Approval Status					
No.	Major Equipment	Q/P Inspection Category	Q/P Sub Mission No.	Q/P Approval SCH	Proposed Sub Supplier	Place	SS Approval Status	SS Approval SCH	Remark
23	Tyres Cylinders				FL Smith Weir Minerals Multo Tech McVally Bharat	Chennai Bangalore S.Africa Bangalore	DR A A DR		
24	Rubber Lining of Pipes				Jasmino Polymertech CORI Engineers Western Rubber Elastomer Lining Emkay Rubber Rishi Poly Rubber Tennsec Rubber Presidency Rubber Aral Rubber Pvt.Ltd Industrial Moulders MILL Industries Lebracs rubber	Talaja Chennai Mumbai Ambermath Mumbai Bahaigah Mumbai Kolkata Howrah Hosur Vadodara Chennai Pondicherry	A A A A A A A A A A A DR DR		
25	FRP PIPE with fillings	III			Main contractor approved source		A	upto 3"	
26	Rubber Lining for Tank and absorber	III III III III			MIL Industries TIP TOP Sealuer Aul Rubber Tennsec Rubber Lebracs Rubber CORI Engineers	Chennai Germany Germany Hosur Kolkata Pondicherry Chennai	A A A A A DR DR		
27	Ventilation Fans				Patel Air Mehraboo Electric Hewden S.A System Andrew Yule	Amrohtabad Kolkata Kolkata / Chennai Sonapat Gurgaon Deptt.	A A A A A A		



BHEL
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		Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deneator				Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017		REMARKS	
SN	ITEM	QP/INS-PN CAT	QP No. xxx-110	QP SUB-MISSIO N SCHED ULE	QP APPL SCHE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S/ CAT	SS DETAIL SUB- SCHEDU LE	SC APPL SCHEDU LE	REMARKS		
						EDELSTAHLWERKE GROEDITZ PILSON STEEL (VHS,SKODA) JCFC JSC ENERGO MASH JSW KOBE STEEL CRUIST FORGE PETRO ROSA FINE FORGE C BLADE WUXI	GERMANY GERMANY CZECKOSLOVAKIA JAPAN UKRAIN JAPAN JAPAN FRANCE GERMANY HYDERABAD ITALY CHINA	A DR A A DR A A A A A A A					
33	PRECISION BLADE FORGINGS		QVM-Q-308			AZAD ENGG	HYDERABAD	A			AS PER NTPC APPROVAL CONDITIONS FOR MACHINING ONLY		
34	BAR STOCK FOR BLADES		QVM-Q-308			WALZWERK EINSL BOEHLER BGH BREITENFIELD STARWIRE FIAV	GERMANY AUSTRIA GERMANY AUSTRALIA BALLABHGARH ITALY GERMANY AUSTRIA MYSORE FRANCE	A A A A A A A A A					
35	DRAWN PROFILE FOR GUIDE BLADES (DRIVE TURBINE)		QVM-Q-308			LEISTRITZ	GERMANY	A					
36	GEAR BOX		QVM-Q-308			BOEHLER	AUSTRIA	A					
						TRIVENI ENGG	MYSORE	A					
						FLENDER	FRANCE	A					
						GRAFFENSTADEN							




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		Project : PATRATU STPP(3X800MW) Package : EPC Contractor : BHEL, Hyderabad Contract No.:				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUBCONTRACTOR APPROVAL SUB SYSTEM: BFP, Drive Turbine, Heaters (HP, LP) Drain Cooler and Deaerator				Ref No.: 9585-001-02 Revision No.: 00 Date: 05.04.2017		REMARKS	
SN	ITEM	Q/INS-PN-CAT	QF No. XXX-110	QP SUB-MISSIO N SCIED ULE	QP APPL SCHE DULE	PROPOSED SUB SUPPLIER	PLACE	SS APPL STATU S/CAT	SS DETAIL SUB-SCIEDU LE	SC APPL SCIEDU LE	REMARKS		
37	DRIVE TURBINE	I	QVM-Q-308			LUFKIN RENK TACKE GMBH WALCHANDNAGAR WINENERGY BHEL	USA/FRANCE GERMANY PUNE CHENNAI HYDERABAD	A# A# A# DR A					
38	CONNECTING COUPLING (GEAR TYPE) CONNECTING COUPLING (MEMBRANE)	I	QVM-Q-308			RENK TACKE GMBH LUFKIN FLENDER WALCHANDNAGAR EUROFLEX LTD., JOHN CRANE AMERDRIVES	GERMANY USA/FRANCE GERMANY WALCHANDNAGAR HYDERABAD UK USA	A A A A A A A					
39	AUX. CONTROL VALVE BODY & COVER	I	QVM-Q-309			RATHI TURBOFLEX CFPP KOLHAPUR STEELS UP STEELS STAR WIRES	PUNE HARDWAR KOLHAPUR MUJAFARNAGAR BALLABGARH	A A A A A					
40	LUBE OIL CENTRIFUGAL PUMP	II	QVM-Q-310			PRAKASH SPECTRO KSB KIRLOSOKARBARA SULZER ALLWEILER	VIJAYAWADA PUNE KIRLOSOKARWADI MUMBAI GERMANY	DR A A A A					
41	LUBE OIL PUMP (SCREW PUMP)	II	QVM-Q-311			TUSHACO PUMP LEISTRITZ IMOPUMP AMER DRIVES ALFALAVAL	DAMAN GERMANY USA USA PUNE/SW	A A A A A					
42	DISCONNECTING COUPLING	II	QVM-Q-312					A					
43	CENTRIFUGE	I	QVM-Q-313					A					



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	TITLE: PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS	SPECIFICATION No: PE-TS-434-571-18000-A003	
		SECTION-I, Sub Section-D	
		REV. 00	DATE: DEC 2021
		SHEET : 2	

ANNEXURE-A

- Refer electrical specification for applicable sub-vendor list for motors.
- The list of all bought out items like gearbox, coupling, bearings etc. with makes and country of origin and contact details of the manufacturers to be mentioned along with offer to be submitted in the format attached in section II Annexure-6 as an information to BHEL.
- Acceptance of makes shall be subject to BHEL/ End customer acceptance during the detailed engineering without cost and delivery implication to BHEL.
- Make of any unlisted items shall be subject to customer / BHEL approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for Customer / BHEL's review and approval. Bidder shall furnish following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.
 - a) Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.
 - b) Documentation in the form of certificate that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.
- The complete list will be necessarily submitted within one month of placement of LOI to ensure timely placement of order for BOIs. Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.



i.	Item/Scope of Sub-contracting	
ii.	Address of the registered office	Details of Contact Person (Name, Designation, Mobile, Email)
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured	Details of Contact Person: (Name, Designation, Mobile, Email)
iv.	Annual Production Capacity for proposed item/scope of sub-contracting	
v.	Annual production for last 3 years for proposed item/scope of sub-contracting	
vi.	Details of proposed works	
1.	Year of establishment of present works	
2.	Year of commencement of manufacturing at above works	
3.	Details of change in Works address in past (if any)	
4.	Total Area	
	Covered Area	
5.	Factory Registration Certificate	Details attached at Annexure – F2.1
6.	Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable)
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)	Details attached at Annexure – F2.3
8.	After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)	Applicable / Not applicable Details attached at Annexure – F2.4
9.	Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any	Details attached at Annexure – F2.5

784074/2022/PS-PEM-MAX




CORPORATE QUALITY ASSURANCE

SUB-VENDOR QUESTIONNAIRE

10.	Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing			Details attached at Annexure – F2.6		
11.	Manufacturing facilities (List of machines, special process facilities, material handling etc.)			Details attached at Annexure – F2.7		
12.	Testing facilities (List of testing equipment)			Details attached at Annexure – F2.8		
13.	If manufacturing process involves fabrication then-			Applicable / Not applicable		
	List of qualified Welders			Details attached at Annexure – F2.9		
	List of qualified NDT personnel with area of specialization			(if applicable)		
14.	List of out-sourced manufacturing processes with Sub-Vendors' names & addresses			Applicable / Not applicable Details attached at Annexure. –F2.10 (if applicable)		
15.	Supply reference list including recent supplies			Details attached at Annexure – F2.11 (as per format given below)		
	Project/ package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no/date	Supplied Quantity	Date of Supply
16.	Product satisfactory performance feedback letter/certificates/End User Feedback			Attached at annexure - F2.12		
17.	Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating) Note:- Reports need not to be submitted			Applicable / Not applicable Details attached at Annexure – F2.13 (if applicable)		
18.	Statutory / mandatory certification for the proposed product			Applicable / Not applicable Details attached at Annexure – F2.14 (if applicable)		
19.	Copy of ISO 9001 certificate (if available)			Attached at Annexure – F2.15		
20.	Product technical catalogues for proposed item (if available)			Details attached at Annexure – F2.16		
Name: _____						
Desig: _____						
Sign: _____						
Date: _____						

Company's Seal/Stamp:-

	TITLE: PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS	SPECIFICATION No: PE-TS-434-571-18000-A003	
		SECTION-I Sub Section-D	
		REV. 00	DATE: DEC 2021
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ANNEXURE-II
MANDATORY SPARE LIST

Sl. No.	PARTICULARS	Unit /Quantity (Nos./SET/%)
1.22.05	AGITATORS	
1.22.05.1	AUXILIARY ABSORBENT TANK AGITATOR	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.2	LIMESTONE SLURRY STORAGE TANK AGITATORS	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.3	PRIMARY HYDRO-CYCLONE FEED TANK AGITATOR	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.4	SECONDARY HYDROCYCLONE FEED TANK AGITATOR	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.5	FILTRATE WATER TANK AGITATOR	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.6	WASTE WATER TANK AGITATOR	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type
3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
1.22.05.7	AGITATOR FOR DRAIN PIT (FOR ABSROBER AREA, GYPSEM AREA AND LIMESTONE AREA)	
1	Impeller Assembly	1 no. of each type
2	Bearing Assembly	2 no. of each type

3	Motor	1 no. of each type
4	Belt and Pulley (If applicable)	2 no. of each type
5	Gear Box Assembly (If Applicable)	1 no. of each type
Note:		
<p>1) One set means 100% complete replacement of the particular component/equipment, as mentioned i.e., Set for the particular equipment, would include all components required to replace the item. For example, a set of bearing shall include all hardware normally required while replacing the bearings. It is further, intended that the assembly / sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly / sub-assembly, these shall be considered as different types of assembly/sub-assembly.</p>		
<p>2) Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed.</p>		
<p>3) In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.</p>		
<p>4) Any item which is quoted as "not applicable" in the above list and is found to be "applicable" at a later date shall be supplied by the bidder without any commercial implications. The Bidder shall note that if there in any change/ variation in equipment/ system during detail engineering which causes any change/ variation in the essential spares quantity, the same shall be supplied without any commercial implications. The price indicated for the mandatory spares shall be considered for the purpose of evaluation.</p>		
<p>5) Mandatory spares shall not be dispatched before dispatch of corresponding main equipment. Pls. refer NIT for delivery schedule. The spares shall be treated and packed for a long storage under the climatic condition prevailing at site.</p>		
<p>6) All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add or items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules supplied in the original package. All electronic modules should be pre-set and/or pre-programmed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre-setting/pre-programming before putting them in to service. The spare shall be treated and properly packed for long term storage.</p>		
<p>7) Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.</p>		


8) Set for the particular equipment, would include all components required to replace the item, for example a set of bearing shall include all hardware normally required while replacing the bearings. It is further intended that the assembly / sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly / sub-assembly, these shall be considered as different types of assembly/sub-assembly.

9) All the spares shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.


10) The Contractor shall warrant that all spares supplied will be new and in accordance with the Contract Documents and will be free from defects in design, material and workmanship.

11) Any cell left blank in the unpriced schedule shall be treated as "Quoted"

12) Bidder to provide mandatory spares as asked above for each type of tank separately, even in case type & size of tank of agitator is similar.

	TITLE: PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS	SPECIFICATION No: PE-TS-434-571-18000-A003	
		SECTION-I Sub Section-D	
		REV. 01	DATE: DEC 2021
		SHEET : 1 OF 1	

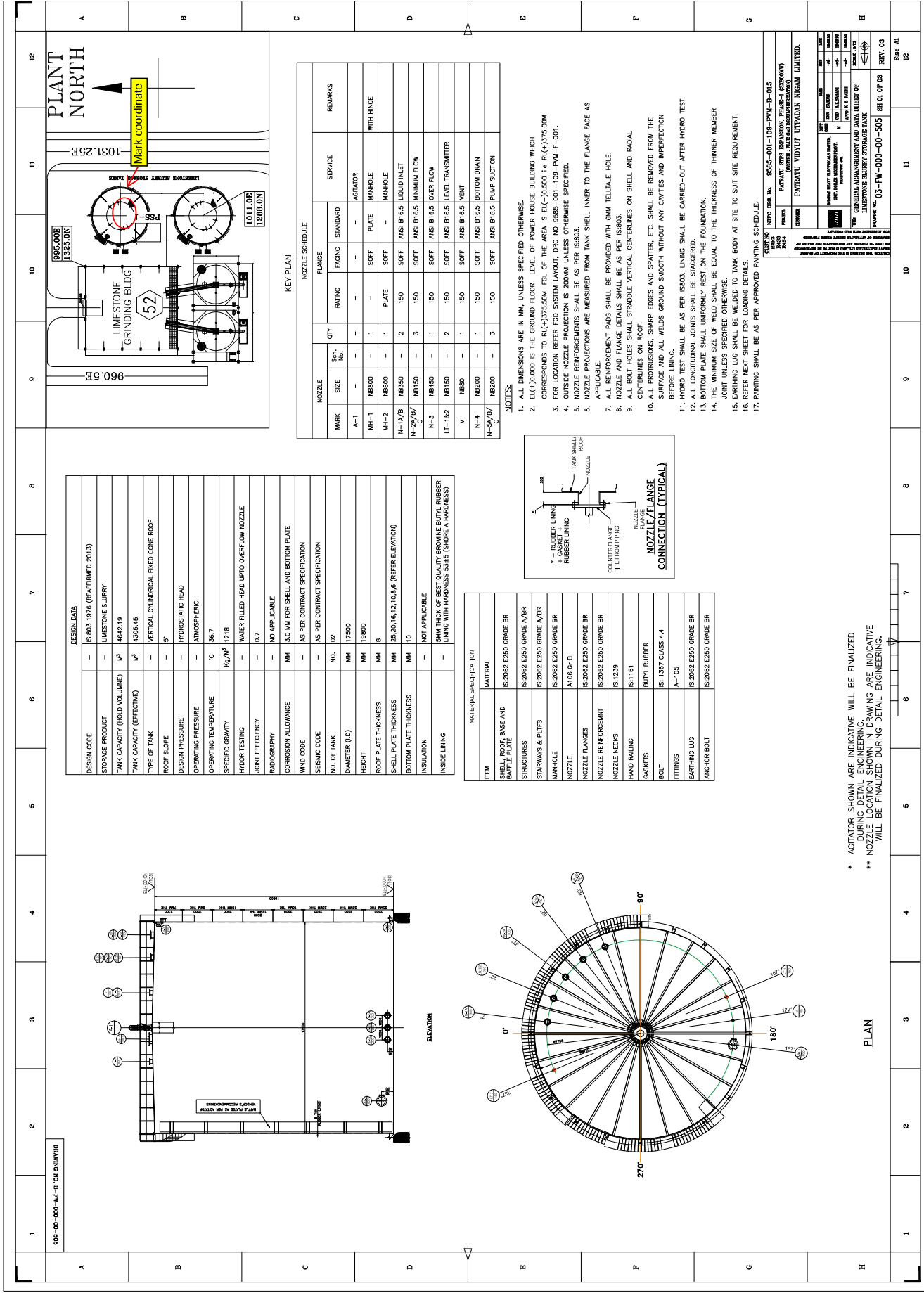
**ANNEXURE-III
INPUT DRAWINGS (GAD OF TANKS)**

	3x800 MW PATRATU TPS AGITATORS TECHNICAL SPECIFICATION INPUT DRAWING LIST	SPECIFICATION No: PE-TS-434-571-18000-A	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 1 OF 1	

ANNEXURE-III

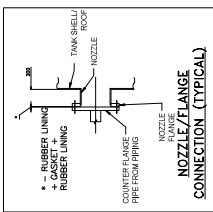
INPUT DRAWINGS BY BHEL

Sl.No.	Drawing Title	PVUNL/NTPC Drawing No.
1.	Data Sheet & General Arrangement of Limestone Slurry Storage Tank	9585-001-109-PVM-B-015
2.	General Arrangement of Secondary Hydro cyclone Feed Tank	9585-001-109-PVM-B-016
3.	General Arrangement of Filtrate Water Tank	9585-001-109-PVM-B-023
4.	General Arrangement of Waste Water Tank	9585-001-109-PVM-B-027
5.	General Arrangement of Auxiliary Absorbent(Storage) Tank	9585-001-109-PVM-B-031
6	General Arrangement of Primary Hydro cyclone Feed Tank	2-FW-000-00-407
7	Drawing of Drain Pit (Typical) for Absorber Area Drain Sump, Gypsum Area Drain Sump, Limestone area drain sump.	----



DESIGN DATA	
DESIGN CODE	IS403 1976 (REAFFIRMED 2013)
STORAGE PRODUCT	LIMESTONE SLURRY
TANK CAPACITY (HOLD VOLUME)	4842.19
TANK CAPACITY (EFFECTIVE)	4305.45
TYPE OF TANK	VERTICAL CYLINDRICAL FIXED CONE ROOF
ROOF SLOPE	5°
DESIGN PRESSURE	HYDROSTATIC HEAD
OPERATING PRESSURE	ATMOSPHERIC
OPERATING TEMPERATURE	36.7
SPECIFIC GRAVITY	1.218
HYDRO TESTING	WATER FILLED HEAD UP TO OVERFLOW NOZZLE
JOINT EFFICIENCY	0.7
RADIOGRAPHY	NO APPLICABLE
CORROSION ALLOWANCE	3.0 MM FOR SHELL AND BOTTOM PLATE
WIND CODE	AS PER CONTRACT SPECIFICATION
SEISMIC CODE	AS PER CONTRACT SPECIFICATION
NO. OF TANK	02
DIAMETER (L/D)	MM 17500
HEIGHT	MM 18800
ROOF PLATE THICKNESS	MM 8
SHELL PLATE THICKNESS	MM 25,20,16,12,10,8,6 (REFER ELEVATION)
BOTTOM PLATE THICKNESS	MM 10
INSULATION	NOT APPLICABLE
INSIDE LINING	5MM THICK OF BEST QUALITY BROMINE BUTYL RUBBER LINING WITH HARDNESS 5345 (SHORE A HARDNESS)

MATERIAL SPECIFICATION	
ITEM	MATERIAL
SHELL, ROOF, BASE AND BATTLE TOWER	IS2062 E230 GRADE BR
STAIRWAYS & PLITS	IS2062 E230 GRADE A / BR
MANHOLE	IS2062 E230 GRADE BR
NOZZLE	A106 Or B
NOZZLE FLANGES	IS2062 E230 GRADE BR
NOZZLE REINFORCEMENT	IS2062 E230 GRADE BR
NOZZLE NECKS	IS1239
HAND RAILINGS	IS1161
GASKETS	BUTYL RUBBER
BOLT	IS: 1367 CLASS 4.4
FITTINGS	A-105
BATHING LUG	IS2062 E230 GRADE BR
ANCHOR BOLT	IS2062 E230 GRADE BR

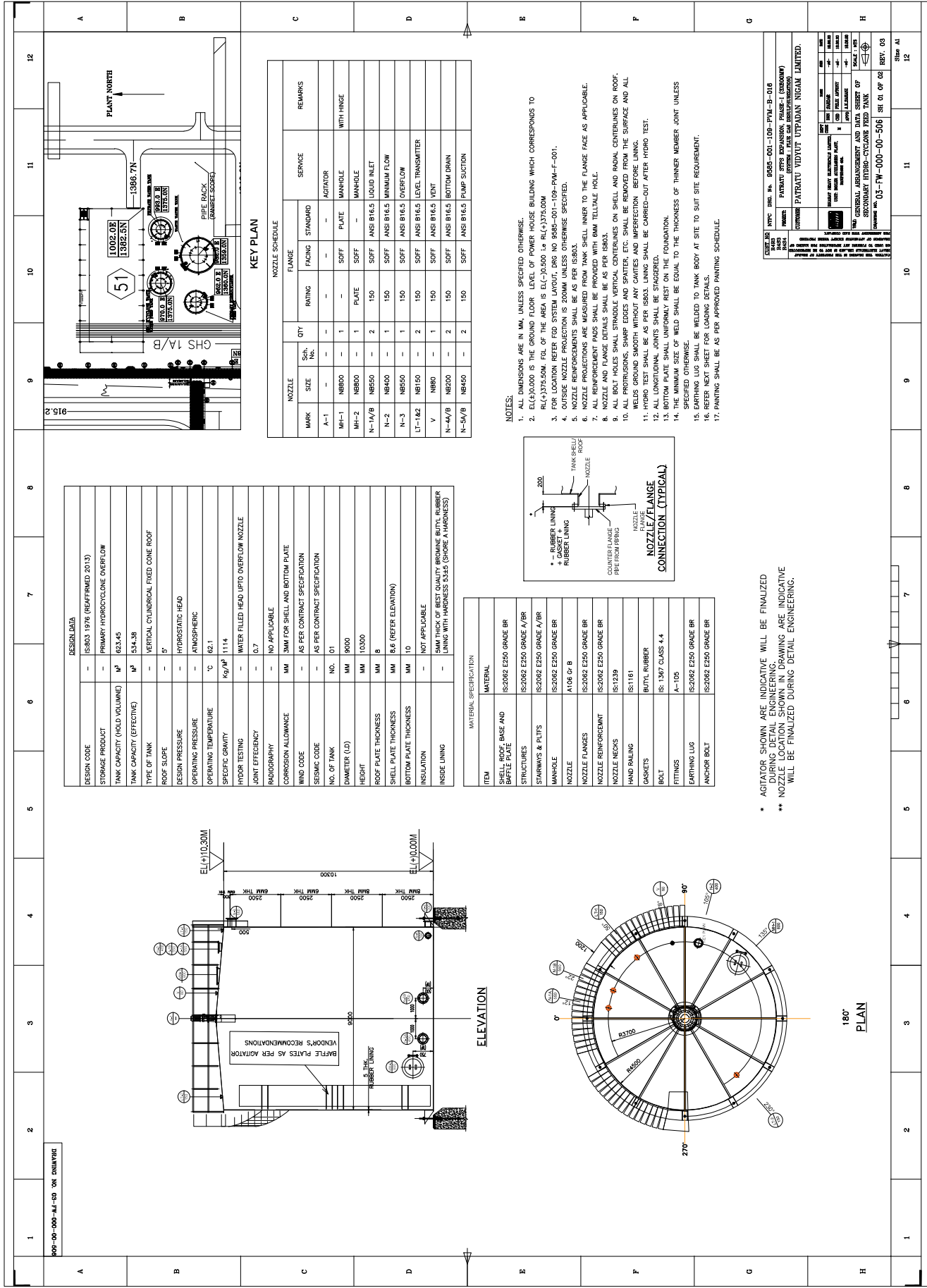


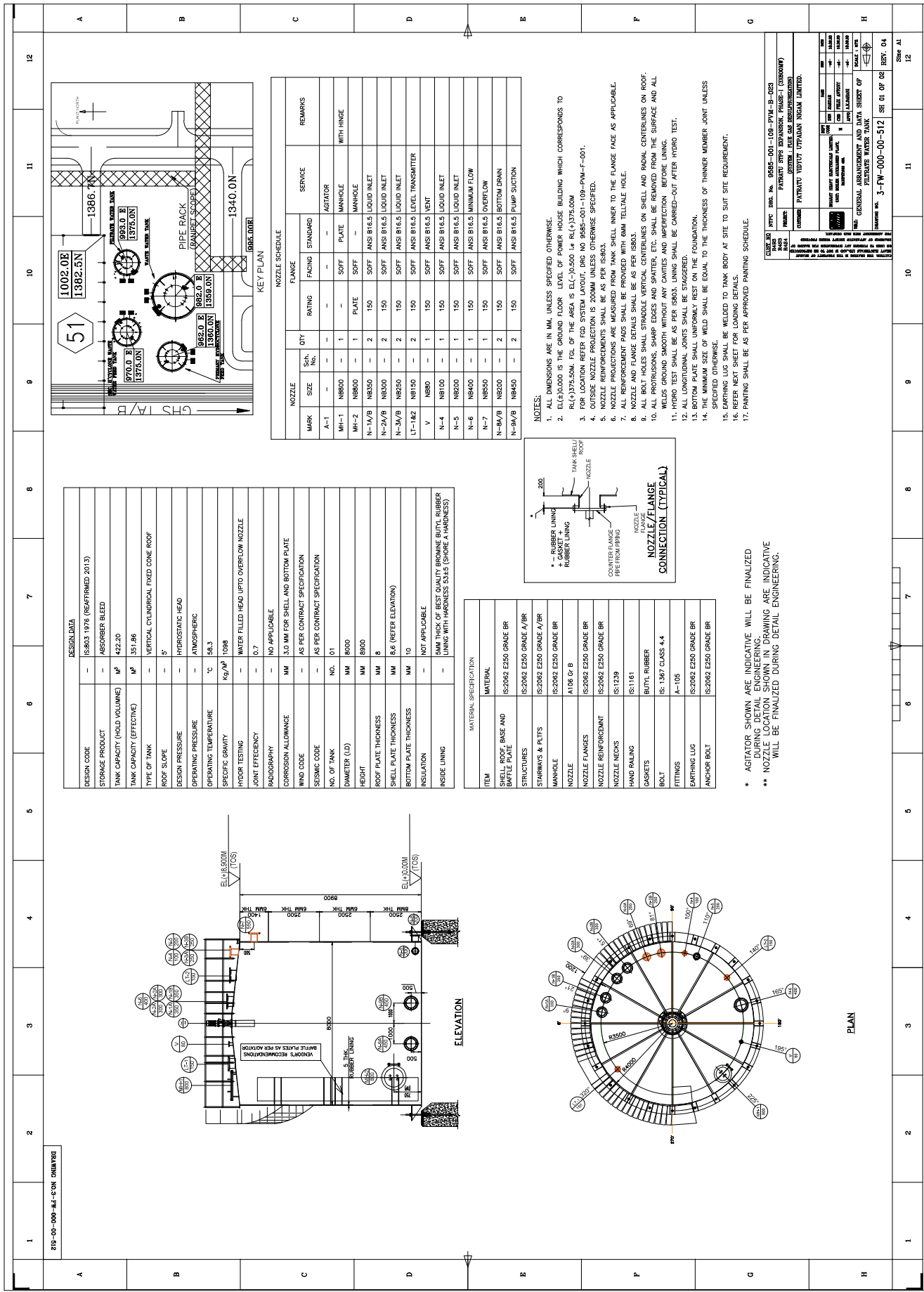
KEY PLAN						
NOZZLE SCHEDULE						
MARK	NOZZLE SIZE	SH. NO.	QTY	FLANGE		REMARKS
				RATING	STANDARD	
A-1	-	-	-	-	-	AGITATOR
MH-1	NB800	-	1	-	SOFF	MANHOLE WITH HINGE
MH-2	NB800	-	1	PLATE	SOFF	MANHOLE
N-1A/B	NB950	-	2	150 SOFF	ANS B16.5	LIQUID INLET
N-2A/B	NB150	-	3	150 SOFF	ANS B16.5	MINIMUM FLOW
N-3	NB450	-	1	150 SOFF	ANS B16.5	OVER FLOW
LT-1&2	NB150	-	2	150 SOFF	ANS B16.5	LEVEL TRANSMITTER
V	NB80	-	1	150 SOFF	ANS B16.5	VENT
N-4	NB200	-	1	150 SOFF	ANS B16.5	BOTTOM DRAIN
N-5A/B	NB200	-	3	150 SOFF	ANS B16.5	PUMP SUCTION

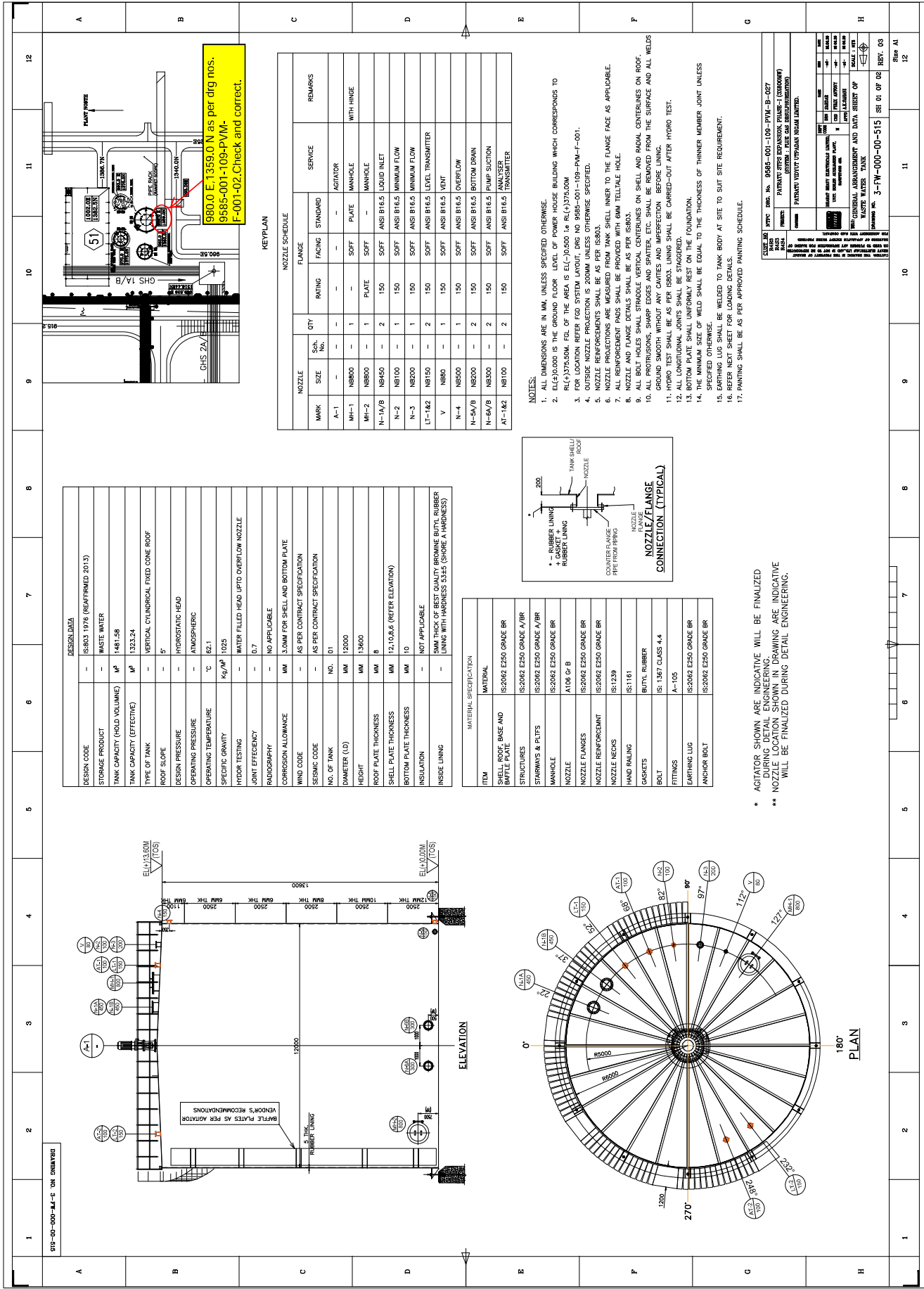
- NOTES:**
- ALL DIMENSIONS ARE IN MM, UNLESS SPECIFIED OTHERWISE.
 - ELC03000 IS THE GROUND FLOOR LEVEL OF POWER HOUSE BUILDING WHICH CORRESPONDS TO RL(+375.50M). FGL OF THE AREA IS EL(-36.500 i.e. RL(+375.50M).
 - FOR LOCATION REFER FOR SYSTEM LAYOUT. ENG NO 9855-001-109-PW-A1-001.
 - ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED.
 - NOZZLE REINFORCEMENTS SHALL BE AS PER IS803.
 - NOZZLE PROJECTIONS ARE MEASURED FROM TANK SHELL INNER TO THE FLANGE FACE AS APPLICABLE.
 - ALL REINFORCEMENT PADS SHALL BE PROVIDED WITH 6MM TELLTALE HOLE.
 - NOZZLE AND FLANGE DETAILS SHALL BE AS PER IS803.
 - ALL BOLT HOLES SHALL STRADDLE VERTICAL CENTERLINES ON SHELL AND RADIAL CENTERLINES ON ROOF.
 - ALL PROTRUSIONS, SHARP EDGES AND SPATTER, ETC. SHALL BE REMOVED FROM THE SURFACE AND ALL WELDS GROUND SMOOTH WITHOUT ANY CAVITIES AND IMPERFECTION BEFORE LINING.
 - HYDRO TEST SHALL BE AS PER IS803. LINING SHALL BE CARRIED-OUT AFTER HYDRO TEST.
 - ALL LONGITUDINAL JOINTS SHALL BE STAGGERED.
 - BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION.
 - THE MINIMUM SIZE OF WELD SHALL BE EQUAL TO THE THICKNESS OF THINNER MEMBER JOINT UNLESS SPECIFIED OTHERWISE.
 - TANK BODY AT SITE TO SUIT SITE REQUIREMENT.
 - REFER MS&T SHEET FOR LOADING DETAILS.
 - PAINTING SHALL BE AS PER APPROVED PAINTING SCHEDULE.

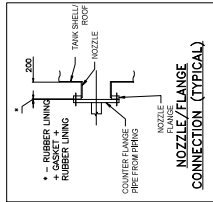
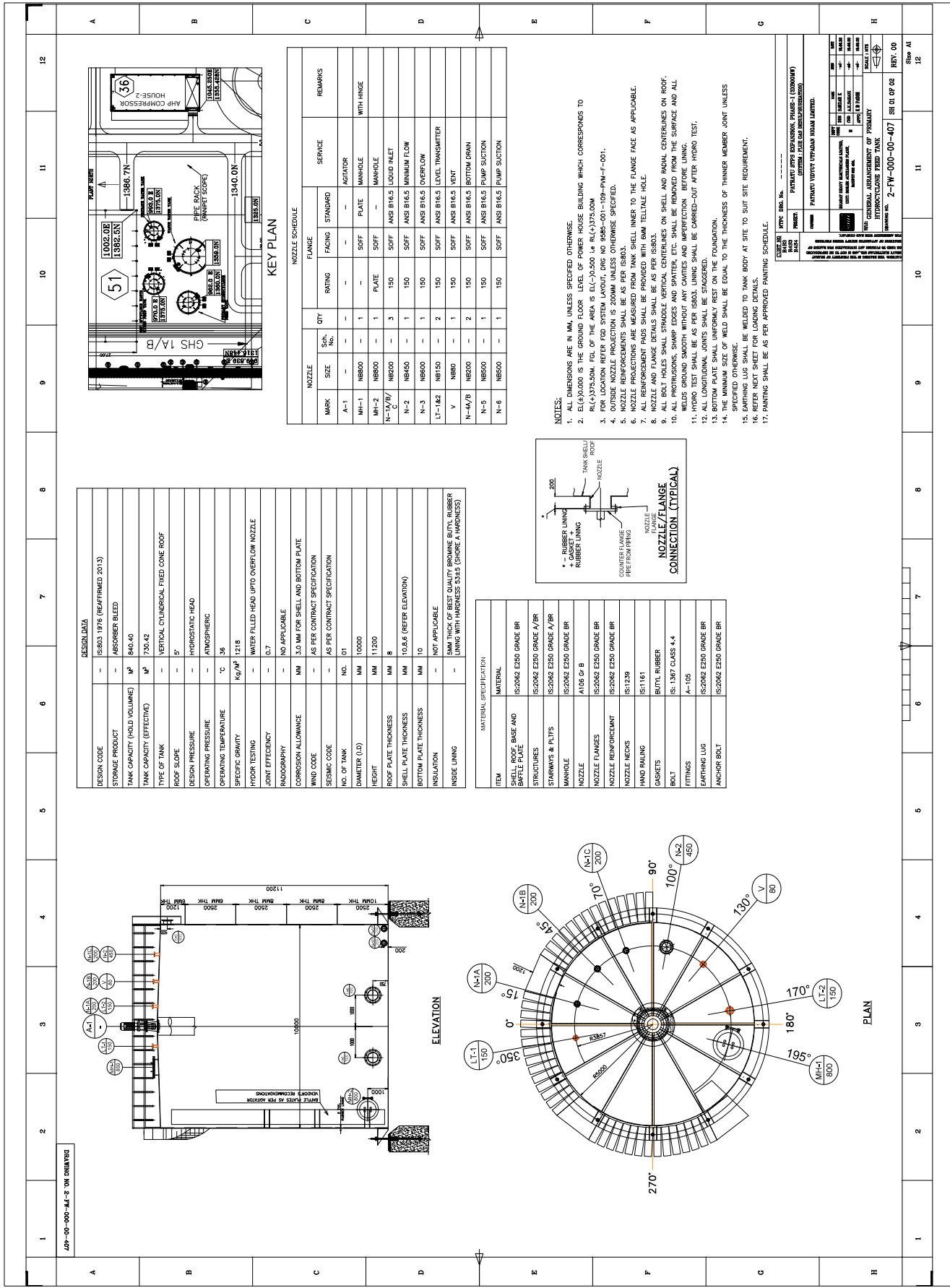
* AGITATOR SHOWN ARE INDICATIVE WILL BE FINALIZED DURING DETAIL ENGINEERING DRAWING ARE INDICATIVE
 ** NOZZLE WILL BE FINALIZED DURING DETAIL ENGINEERING.

PROJECT NO.	9855-001-109-PW-B-015
PROJECT NAME	PARAMOUNT POWER PLANT (REPOWERING)
CLIENT	PATRAPATI VIDYUT UTPADAN NIGAM LIMITED.
DATE	12/08/2022
SCALE	AS SHOWN
BY	...
CHECKED	...
APPROVED	...

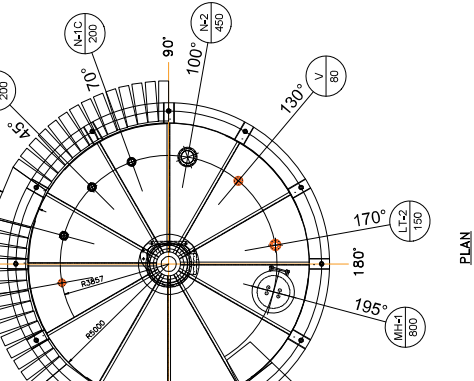




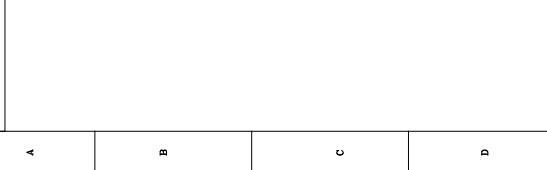
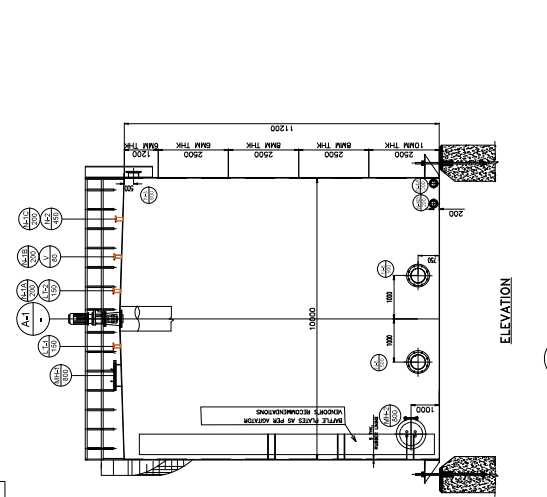




ITEM	MATERIAL SPECIFICATION
SHELL, ROOF, BASE AND Baffle PLATE	IS-2042 E250 GRADE BR
STRUCTURES	IS-2042 E250 GRADE A/ BR
STAIRWAYS & LIFTS	IS-2042 E250 GRADE A/ BR
MANHOLE	IS-2042 E250 GRADE BR
NOZZLE	A106 Gr B
NOZZLE FLANGES	IS-2042 E250 GRADE BR
NOZZLE REINFORCEMENT	IS-2042 E250 GRADE BR
NOZZLE NOZZLES	IS-1239
HAND RAILING	IS-1161
GASKETS	BUTYL RUBBER
BOLT	SF 1307 CLASS 4.4
FITTINGS	A-105
EARTHING LUG	IS-2042 E250 GRADE BR
ANCHOR BOLT	IS-2042 E250 GRADE BR



DESIGN DATA	VALUES
DESIGN CODE	IS803 1976 (REAFFIRMED 2013)
STORAGE PRODUCT	ABSORBER BLEED
TANK CAPACITY (GROSS VOLUME)	840.40
TANK CAPACITY (EFFECTIVE)	750.42
TYPE OF TANK	VERTICAL CYLINDRICAL FIXED CONE ROOF
ROOF SLOPE	5°
DESIGN PRESSURE	HYDROSTATIC HEAD
OPERATING PRESSURE	ATMOSPHERIC
OPERATING TEMPERATURE	35
SPECIFIC GRAVITY	1.218
HYDRO TESTING	WATER FILLED HEAD UPTO OVERFLOW NOZZLE
JOINT EFFICIENCY	0.7
RAIDERSHIP	NO APPLICABLE
CORROSION ALLOWANCE	3.0 MM FOR SHELL AND BOTTOM PLATE
WIND CODE	AS PER CONTRACT SPECIFICATION
SEISMIC CODE	AS PER CONTRACT SPECIFICATION
NO. OF TANK	01
DIAMETER (I/D)	10000
HEIGHT	11200
ROOF PLATE THICKNESS	MM B
SHELL PLATE THICKNESS	MM 10.6,6 (REFER ELEVATION)
BOTTOM PLATE THICKNESS	MM 10
INSULATION	NOT APPLICABLE
INSIDE LINING	5MM THICK OF BEST QUALITY BROMINE BUTYL RUBBER LINING WITH HARDNESS 53±5 (SHORE A HARDNESS)



NOZZLE	SIZE	QTY	FLANGE	SERVICE	REMARKS
A-1	1000	1	ANSI B16.5	AGITATOR	
MH-1	800	1	ANSI B16.5	MANHOLE WITH HINGE	
MH-2	800	1	ANSI B16.5	MANHOLE	
N-C/N	800	3	ANSI B16.5	MINIMUM FLOW	
N-3	800	1	ANSI B16.5	OVERFLOW	
N-2	800	1	ANSI B16.5	LEVEL TRANSMITTER	
N-5	800	1	ANSI B16.5	PUMP SUCTION	
N-6	800	1	ANSI B16.5	PUMP SUCTION	

- NOTES:
- ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
 - E.L. 10.000 IS THE GROUND FLOOR LEVEL OF POWER HOUSE BUILDING WHICH CORRESPONDS TO R.L. 1375.50M. F.O. OF THE AREA IS E.L. 10.200 i.e. R.L. 1378.00M.
 - FOR LOCATION REFER FRO SYSTEM LAYOUT, DRG NO 8486-001-109-PAN-F-001.
 - OUTSIDE NOZZLE PROJECTION IS 200MM UNLESS OTHERWISE SPECIFIED.
 - NOZZLE REINFORCEMENTS SHALL BE AS PER IS803.
 - ALL REINFORCEMENT Pairs SHALL BE PROVIDED WITH 5MM TELLTALE HOLE.
 - NOZZLE AND FLANGE DETAILS SHALL BE AS PER IS803.
 - NOZZLE AND FLANGE SHALL BE WELDED TO SHELL AND SHALL BE REMOVED FROM THE SURFACE AND ALL WELDS GRINDING SMOOTH WITHOUT ANY CAVITIES AND IMPERFECTION BEFORE UNING.
 - HYDRO TEST SHALL BE AS PER IS803. LINING SHALL BE CARRIED-OUT AFTER HYDRO TEST.
 - ALL LONGITUDINAL JOINTS SHALL BE STAGGERED.
 - BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION.
 - THE MINIMUM SIZE OF WELD SHALL BE EQUAL TO THE THICKNESS OF THINNER MEMBER JOINT UNLESS SPECIFIED OTHERWISE.
 - WELDING IS TO BE WELDED TO TANK BODY AT SITE TO SUIT SITE REQUIREMENT.
 - SPACING OF SHEET PILING FOR FOUNDATION DETAILS.
 - PAINTING SHALL BE AS PER APPROVED PAINTING SCHEDULE.

ITEM	QUANTITY	UNIT	REMARKS
NOZZLE	1	NO	
FLANGE	1	NO	
MANHOLE	2	NO	
MINIMUM FLOW	3	NO	
OVERFLOW	1	NO	
LEVEL TRANSMITTER	1	NO	
PUMP SUCTION	2	NO	

ITEM	QUANTITY	UNIT	REMARKS
NOZZLE	1	NO	
FLANGE	1	NO	
MANHOLE	2	NO	
MINIMUM FLOW	3	NO	
OVERFLOW	1	NO	
LEVEL TRANSMITTER	1	NO	
PUMP SUCTION	2	NO	

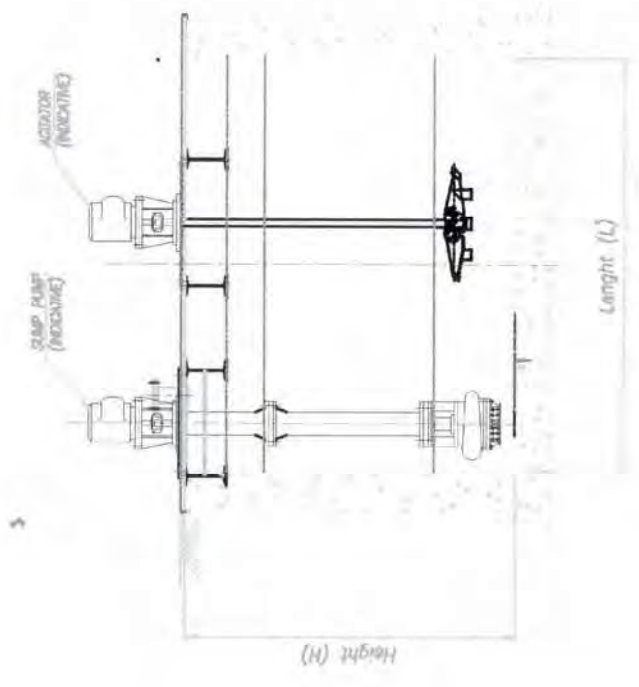
ITEM	QUANTITY	UNIT	REMARKS
NOZZLE	1	NO	
FLANGE	1	NO	
MANHOLE	2	NO	
MINIMUM FLOW	3	NO	
OVERFLOW	1	NO	
LEVEL TRANSMITTER	1	NO	
PUMP SUCTION	2	NO	

ITEM	QUANTITY	UNIT	REMARKS
NOZZLE	1	NO	
FLANGE	1	NO	
MANHOLE	2	NO	
MINIMUM FLOW	3	NO	
OVERFLOW	1	NO	
LEVEL TRANSMITTER	1	NO	
PUMP SUCTION	2	NO	

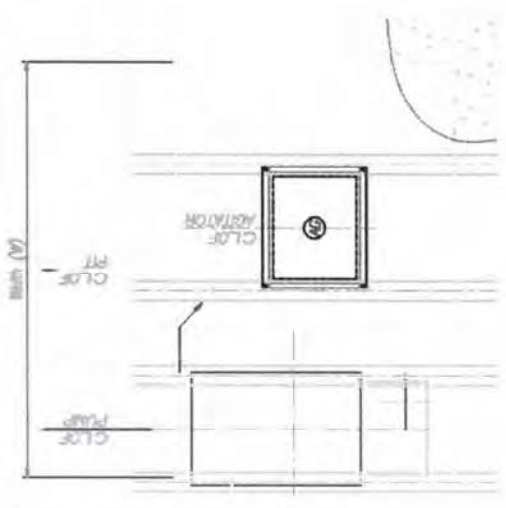
ITEM	QUANTITY	UNIT	REMARKS
NOZZLE	1	NO	
FLANGE	1	NO	
MANHOLE	2	NO	
MINIMUM FLOW	3	NO	
OVERFLOW	1	NO	
LEVEL TRANSMITTER	1	NO	
PUMP SUCTION	2	NO	

All dimensions are in mm

Sketch of Drain Pit (Typical)



Elevation



Plan

Note:

For dimension, please refer clause no: 5.1 Table No: 4 of technical specification



TITLE:

PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS

SPECIFICATION No: PE-TS-434-571-18000-A003

SECTION-I, SUB-SECTION- D


REV. 00

DATE: DEC 2021

SHEET : 1 OF 1

ANNEXURE-IV


MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION


	TITLE: PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS		SPEC. NO.: PE-TS-434-571-18000-A003
			SECTION-I, SUB-SECTION- D, ANNEXURE-IV
	REV. NO.: 0	DATE	DEC 2021


DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the following drawings / documents during detail engineering for approval / information / reference (as the case may be):-

Sl. No.	BHEL Drawing / Document No.	Title	Schedule Date	Drawing Classification
1	PE-V0-434-571-A001	GA drawing, Exploded view, sectional view with Material of construction, mechanical seal , gearbox for all Agitator models	2 weeks from LOI	Primary
2	PE-V0-434-571-A002	Data sheet for all Agitator	2 weeks from LOI	Primary
3	PE-V0-434-571-A003	Agitator Performance curve of all Agitators	2 weeks from LOI	Primary
4	PE-V0-434-571-A004	Electrical motor GA drawing & Data sheet and performance curves of all motors	2 weeks from LOI	Primary
5	PE-V0-434-571-A005	Quality plan & Inspection and Test Procedure	2 weeks from LOI	Primary
6	PE-V0-434-571-A006	Agitator and Motor Sizing Calculation	2 weeks from LOI	Primary
7	PE-V0-434-571-A007	O&M Manual for Agitator	4 weeks from LOI	Secondary
8	PE-V0-434-571-A008	Utility Consumption	4 weeks from LOI	Secondary
9	PE-V0-434-571-A009	Foundation Data including Anchor plan	4 weeks from LOI	Secondary
10	PE-V0-434-571-A010	Lubricating oil list	4 weeks from LOI	Secondary
11	PE-V0-434-571-A011	Special tools list, Start-up & Commissioning Spares	4 weeks from LOI	Secondary
12	PE-V0-434-571-A012	Installation and assembly procedure including Pre Commissioning Check List	4 weeks from LOI	Secondary

	<p style="text-align: center;">PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS</p>	<p>SPEC. NO.: PE-TS-434-571-18000-A003 SECTION-I, SUB-SECTION- D, ANNEXURE-IV REV. NO.: 0 DATE DEC 2021</p>
<p>NOTES:</p> <ol style="list-style-type: none"> 1. Bidder to note that BHEL reserves the right for drawing/document submission through web based document management system. Bidder would be provided access to the DMS for drawing/document approval and adequate training for the same. Detailed methodology would be finalized during the kick-off meeting. Bidder to ensure following at their end. <ol style="list-style-type: none"> a) internet explorer version – minimum internet explorer 7. b) Internet speed – 2 mbps (minimum preferred). c) Pop ups from our external DMS IP (124.124.36.198) should not be blocked. d) Vendor’s internal proxy setting should not block DMS application’s link (http://dmsserver.bhelpem.com/wrench%20web%20access/login.aspx). 2. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work. 3. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification. 4. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only. 5. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.: <ol style="list-style-type: none"> a) All drawings and documents shall indicate the list of all reference drawings including General Arrangement. b) All drawings shall include / show plan, elevation, side view, cross-section, skin section, blow-up view; all major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form. c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names. d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc. 		

	PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS	SPEC. NO.: PE-TS-434-571-18000-A003 SECTION-I, SUB-SECTION- D, ANNEXURE-IV REV. NO.: 0 DATE DEC 2021
<p>TITLE:</p> <p>e) Void.</p> <p>f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication.</p> <p>g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity.</p> <p>h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No. Documents marked for submission to BHEL's Customer shall also bear BHEL's Customer's drawing No.</p> <p>i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.</p> <p>j) Bidder to follow the following the drawing submission schedule.</p> <p>k) 1st submission of drawings from date of LOI as per the submission schedule.</p> <p>l) Every revised submission incorporating comments – within 7 days.</p> <p>m) Bidder to submit revised drawings complete in all respects incorporating all comments.</p> <p>n) The primary drawings are to be considered as the basic engineering drawings.</p> <p>Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder's account. For any clarification/ discussion required to complete the drawings, the bidder shall depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.</p> <p style="text-align: right;">SIGNATURE: _____ NAME : _____</p> <p>COMPANY SEAL</p>		

	<p>TITLE:</p> <p>PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS</p>	<p>SPEC. NO.: PE-TS-434-571-18000-A003</p> <p>SECTION-I, SUB-SECTION- D, ANNEXURE-IV</p> <p>REV. NO.: 0 DATE DEC 2021</p>
<p>DESIGNATION: _____</p> <p>COMPANY: _____</p>		



TITLE:

PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS

SPECIFICATION No: PE-TS-434-571-18000-A003

SECTION-I, SUB-SECTION- D

REV. 0

DATE: DEC 2021

SHEET : 1 OF 1

ANNEXURE-V

SEA-WORTHY PACKING PROCEDURE

SEAWORTHY PACKING

(PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)

1 GENERAL

This standard lays down packing instructions for seaworthy packing of Components /Assemblies/ Equipment to be dispatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit for storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.

2 SCOPE

This procedure gives minimum guidelines for seaworthy packing to be complied with for packing of Components /Assemblies / Equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

3 CROSS REFERRED SPECIFICATION

– Multi-layered cross laminated plastic film	: AA51420
– Packing Wood	: AA51401
– Silica gel	: AA55619
– Thermocole	: AA51416
– Packing slip holders	: AA7240901
– Corrugated Fibre Board	: AA51414
– Rubber sheet	: AA59001
– VCI paper	: AA51406
– High quality full glossy out door finishing paint	: AA56126
– Polyethylene air bubble film	: IS 12787
– Structural steel - standard quality (plates, sections, strips flats & bars)	: AA10108
– International Standards For Phytosanitary Measures No. 15	: ISPM-15:2009

4 WOOD SPECIFICATION FOR PACKING

The wood shall conform to specification AA51401.

For export packing wood in addition to the above the following has to be met:

The standard requires the use of debarked wood in the construction of compliant wood packaging material. Debarked wood is defined in the ISPM 5.

5 TYPE OF PACKING

The following 5 types of packings have been standardized for packing of General Components /Assemblies.

- ‘OP’ - Open Type
- ‘PP’ - Partially Packed
- ‘CP’ - Crate Packing - Components/Equipment requiring physical protection
- ‘CQ’ - Case Packing - Small medium Components/ Assemblies/ Equipment which require corrosion & physical protection
- ‘CR’ - Case Packing - Electrical Components/Assemblies which require special packing viz. Water Proof, Shock Proof, etc.

6 DESCRIPTION OF TYPES OF PACKING

The various types of packing, as standardized above, are described below.

6.1 ‘OP’ - Open Type

In case, of components which are not affected by water & dust & do not require special protection &, are generally not machined, shall be sent as open packages. However these components may be sent in crates, wherever necessary.

6.2 ‘PP’ - Partially Packed

Components which need special protection, at selected portions only, shall be dispatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces after application of TRP should be protected with Multi-layered cross laminated plastic film to AA51420.

6.3 ‘CP’ - Crate Packing – General

Assemblies/Components which need only physical protection from the point of view of handling shall be dispatched duly packed in crates.

6.4 ‘CQ’ - Case Packing - Machined Components/Assemblies/Equipment

- a) Small & Medium sized components/assemblies/equipment due to size/weight & to avoid handling, and pilferage, problems shall be packed in Case/Containers.
- b) Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/ Tablets, packed in thin muslin cloth cotton bags shall be suitably placed.
- c) Small machines/components of less weight shall be provided with suitable cushioning. Wood Wool/Expanded Polyethylene Foam Sheet, if used, shall be sandwiched between polyethylene sheets and sealed.
- d) The components inside the case shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, where-ever required.

6.5 ‘CR’ - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons.

- a) Adequate quantity of Silica gel to AA55619 packed in cotton bags, of 100 grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, before being packed in the cases.
- b) VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.
- c) Empty space in the cartons shall be filled with small chips of Expanded Polystyrene (Thermocole), Wood Wool etc. Polyethylene air bubble film shall conform to IS 12787/AA51420 Expanded polystyrene (Thermocole) shall conform to AA51416.
- d) The cartons shall be manufactured from corrugated Fibre Board, meeting requirements of AA51414.

6.6 Special Packing

Components requiring special packing (as per customer/contractual/ engineering requirements) not included in this specification shall be covered by product standards.

7 PREPARATION OF PACKING CASE

- 1) Cases and crates with gross weight up to 1,000 kgs. shall be provided with bottom cleats of min. 40 mm thicknesses to ensure clearance for handling by forklift. Cases and crates exceeding gross weight of 1,000 kgs. shall be provided with skid runners, number and size according to weight of package.
- 2) The base of the case shall be made of wooden batons for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200 mm from the ground level depending upon size & weight of equipment. However for packing cases of smaller size equipment can be at a height of 40 mm from the ground level.
- 3) In case of 'CR1 - Packing Viz. Electrical & Electronic components for instruments/assemblies, a rubber sheet, Self-expanded polyethene foam sheet, preferably 10 mm thick, shall be fixed on to the base to act as cushioning to the equipment.
- 4) The four sides, shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.
Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.
It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
- 5) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100 grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.
- 6) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.
- 7) Cover the whole equipment with polyethylene sheet of at least 100 micron thickness, on all sides preferably by a single piece.
- 8) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.
- 9) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.
- 10) The inner side of the top cover shall be lined with polyethylene sheet, of at least
- 11) 100 micron thickness, which shall project approximately 25 to 150 mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates & tacked, to, prevent ingress of water from the top.
- 12) For specific requirement of packing the cases are to be provided with Tongue and Groove joints.

8 STEEL CONTAINERS

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies.

The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections.

Following precautions are to be taken during packing:

- Put the Components/Assemblies/Equipment in the steel container properly. Cover the Components/Assemblies/Equipment with polythene.
- To arrest the movement in the steel container necessary wooden Blocks/Batons may be put.
- Put cover on steel, container and Bolt Properly.

9 SEALED PACKING

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture.

The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

10 SLING PLATE

Sling plate shall be provided to prevent damage to the packing box during lifting. Size of the sling plate shall be selected depending upon the net weight of the consignment.

11 PACKING SLIP HOLDERS

Two nos. steel packing slip holders, specification no. AA7240901 containing the packing list, sealed in thick polyethylene film, shall be fixed one inside and the other outside the packing box.

12 Volatile Corrosion Inhibitor (VCI) Paper

- a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.
- b) 7 m³ VCI paper is necessary for 1 m³ of packed item approximately as per AA51406.

Application Limitation:

VCI paper shall not be used for components made of aluminium, aluminium alloys as well as Zinc, copper, brass, cadmium and silver.

VCI powder is sprinkled inside the piping components ends shall be protected with end cover as specified in plant standards, drawings.

13 Moisture Absorber

Silica gel is used for this purpose to protect the contents over sufficiently long time from corrosion. At the time of use, silica gel should be so dried that its colour becomes dark blue. These shall be filled in small cotton bags. Before sealing the equipment, the silica gel bags should be kept inside the polyethylene film cover at different locations. The quantity of silica gel should not be less than 1.0 kg per cubic metre volume of the packing box

14 GENERAL PRECAUTIONS

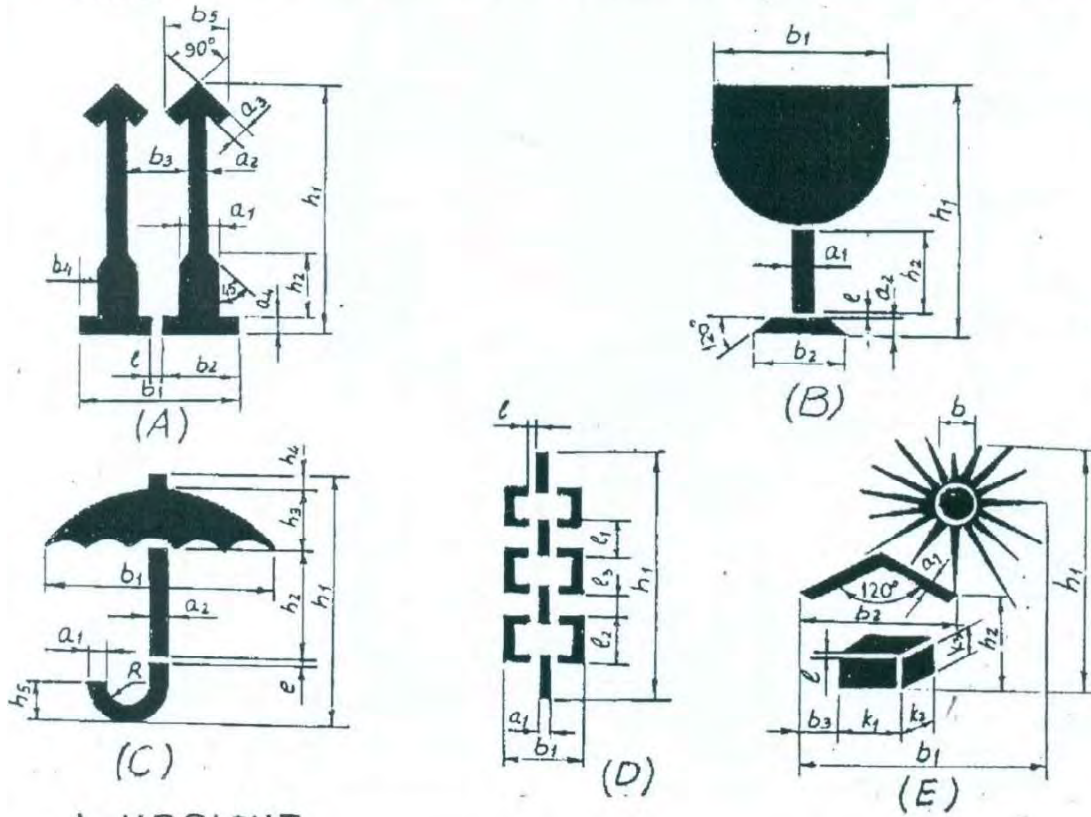
- a) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.
- b) Sling protection brackets to be provided on cases wherever required.
- c) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.
- d) The various caution signs shall be marked with stencil on both sides of the packing box.
- e) Do not pack any other Mechanical items with this case (do not use any other non-permitted packing materials).

THE FOLLOWING DETAILS ARE TO BE MARKED ON THE PACKING CASES.

- a) Address of consignee.
- b) Purchase Order No./ SO No/WO No.
- c) Description of item or title of packing list.
- d) Case identification Number/ Packing List No.
- e) Net Weight.
- f) Gross Weight.
- g) Dimensions of box
- h) Marking showing upright position.
- i) Marking showing sling position.
- j) Marking showing umbrella (i.e. for machines/components to be stored under covered storage.
- k) Loading and unloading precautions

MARKINGS ON PACKING CASE S

1. THIS PLANT STANDARD PRESCRIBES THE VARIOUS CAUTION SIGNS AND OTHER MARKINGS ON PACKING CASES.
2. DIMENSIONS IN THE TABLE 1 SHALL BE USED FOR MAKING STENCILS ONLY.



- A. UPRIGHT
- B. FRAGILE
- C. PROTECTION FROM FALLING OR CONDENSING MOISTURE.
- D. SLINGING POSITION
- E. PROTECTION FROM DIRECT RADIATIONS.

Figure 1

CENTER OF GRAVITY

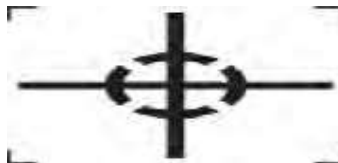


Figure 2

Table 1

DESIGNATION	DIMENSIONS IN mm.																								
	a ₁	a ₂	a ₃	a ₄	b ₁	b ₂	b ₃	b ₄	b ₅	b	l	h ₁	h ₂	h ₃	h ₄	h ₅	K ₁	K ₂	K ₃	l ₁	l ₂	l ₃	R		
A	1	12	5	5	4	52	25	19	8	21	-	2	84	23	-	-	-	-	-	-	-	-	-	-	
	2	17	7	7	6	75	36	29	11	30	-	3	119	33	-	-	-	-	-	-	-	-	-	-	
	3	24	10	10	8	104	50	38	16	42	-	4	168	46	-	-	-	-	-	-	-	-	-	-	
	4	34	14	14	11	147	71	59	23	60	-	5	239	65	-	-	-	-	-	-	-	-	-	-	
B	1	5	5	-	-	50	33	-	-	-	-	2	84	25	-	-	-	-	-	-	-	-	-	-	
	2	7	7	-	-	71	47	-	-	-	-	3	119	36	-	-	-	-	-	-	-	-	-	-	
	3	10	10	-	-	100	66	-	-	-	-	4	168	50	-	-	-	-	-	-	-	-	-	-	
	4	14	14	-	-	142	94	-	-	-	-	5	239	71	-	-	-	-	-	-	-	-	-	-	
C	1	4	3	-	-	66	-	-	-	-	-	2	80	39	19	5	11	-	-	-	-	-	-	6	
	2	6	4	-	-	85	-	-	-	-	-	3	114	55	27	7	16	-	-	-	-	-	-	9	
	3	8	6	-	-	120	-	-	-	-	-	4	160	78	38	10	22	-	-	-	-	-	-	12	
	4	11	9	-	-	170	-	-	-	-	-	5	227	110	54	14	31	-	-	-	-	-	-	17	
D	1	6	-	-	-	30	-	-	-	-	-	4	148	-	-	-	-	-	-	-	-	30	30	10	-
	2	9	-	-	-	42	-	-	-	-	-	5	209	-	-	-	-	-	-	-	-	42	42	14	-
E	1	3	-	-	-	69	47	10	-	-	16	2	91	26	-	-	-	17	8	11	-	-	-	-	
	2	4	-	-	-	98	67	15	-	-	23	3	128	33	-	-	-	24	11	16	-	-	-	-	
	3	6	-	-	-	138	94	20	-	-	32	4	182	62	-	-	-	34	16	22	-	-	-	-	

Black and Red Marking Ink to IS: 1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink.

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its Package No. as given in shipping list. All caution signs shall be stencilled in higher quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel (AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks. Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

15 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

- 15.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.
- 15.2 Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.
- 15.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.
- 15.4 For critical items, where specified, special handling fixtures shall be used for lifting.
- 15.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.
- 15.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.
- 15.7 Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.

15.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH:

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

- The markings showing the upright position.
- The markings showing the sling position
- Markings showing the fragile contents.
- Other required markings as per Clause No. 12

- 15.8.1 Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15°.
- 15.8.2 Handling and lifting should be done without jerks or impacts.
- 15.8.3 Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.
- 15.8.4 On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.
- 15.8.5 Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.
- 15.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

16 GI SHEET

The packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per the Figure-3 (GI sheet covering is applicable for all closed type of wooden packing).

17 Treatment of Wood & Application and use of the mark

For seaworthy export packing, treatment of wood has to be carried out as below subject to BHEL Engg & QC approval.

As per customer requirement for export packing, wood to be treated as applicable should be done as per International Standards for Phytosanitary Measures ISPM: 15 to control the growth stages viz. egg to adult of structural insects (beetles, borers, bugs, fleas, flies, lice, moths, roaches, termites) and other pests (mice, rats, spiders) etc. in stored products.

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in Annex 2 of ISPM 15.

17.1 Heat treatment using a conventional steam or dry kiln heat chamber (treatment code for the mark: HT)

When using conventional heat chamber technology, the fundamental requirement is to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including its core).

This temperature can be measured by inserting temperature sensors in the core of the wood. Alternatively, when using kiln-drying heat chambers or other heat treatment chambers, treatment schedules may be developed based on a series of test treatments during which the core temperature of the wood at various locations inside the heat chamber has been measured and correlated with chamber air temperature, taking into account the moisture content of the wood and other substantial parameters (such as species and thickness of the wood, air flow rate and humidity). The test series must demonstrate that a minimum temperature of 56 °C is maintained for a minimum duration of 30 continuous minutes throughout the entire profile of the wood.

Treatment schedules should be specified or approved by the National Plant Protection Organisation (NPPO). Treatment providers should be approved by the NPPO.

17.2 Heat treatment using dielectric heating (treatment code for the mark: DH)

Where dielectric heating is used (e.g. microwave), wood packaging material composed of wood not exceeding 20 cm when measured across the smallest dimension of the piece or the stack must be heated to achieve a minimum temperature of 60 °C for 1 continuous minute throughout the entire profile of the wood (including its surface). The prescribed temperature must be reached within 30 minutes from the start of the treatment.

Treatment schedules should be specified or approved by the NPPO.

17.3 Methyl bromide treatment (treatment code for the mark: MB)

Wood packaging material containing a piece of wood exceeding 20 cm in cross-section at its smallest dimension must not be treated with methyl bromide.

The fumigation of wood packaging material with methyl bromide must be in accordance with a schedule specified or approved by the NPPO (National Plant Protection Organisation) that achieves the minimum concentration-time product (CT) over 24 hours at the temperature and final residual concentration specified in Table 1. This CT must be achieved throughout the profile of the wood, including its core, although the concentrations would be measured in the ambient atmosphere. The minimum temperature of the wood and its surrounding atmosphere must not be less than 10 °C and the minimum exposure time must not be less than 24 hours. Monitoring of gas concentrations must be carried out at a minimum at 2, 4 and 24 hours from the beginning of the treatment. In the case of longer exposure times and weaker concentrations, additional measurement of the gas concentrations should be recorded at the end of fumigation.

If the CT is not achieved over 24 hours, corrective action needs to be taken to ensure the CT is reached; for example, the treatment is restarted or the treatment time extended for a maximum of 2 hours without adding more methyl bromide to achieve the required CT (see the footnote to Table 2).

Table 2 – Minimum CT over 24 hours for wood packaging material fumigated with methyl bromide

Temperature (°C)	CT (g·h/m ³) over 24 h	Minimum final concentration (g/m ³) after 24 h#
21.0 or above	650	24
16.0 – 20.9	800	28
10.0 – 15.9	900	32

In circumstances when the minimum final concentration is not achieved after 24 hours, a deviation in the concentration of ~5% is permitted provided additional treatment time is added to the end of the treatment to achieve the prescribed CT.

One example of a schedule that may be used for achieving the specified requirements is shown in Table 3.

Table 3 – Example of a treatment schedule that achieves the minimum required CT for wood packaging material treated with methyl bromide (initial doses may need to be higher in conditions of high sorption or leakage)

Temperature (°C)	Dosage (g/m ³)	Minimum concentration (g/m ³) at:		
		2 h	4 h	24 h
21.0 or above	48	36	31	24
16.0 – 20.9	56	42	36	28
10.0 – 15.9	64	48	42	32

Treatment providers should be approved by the NPPO.

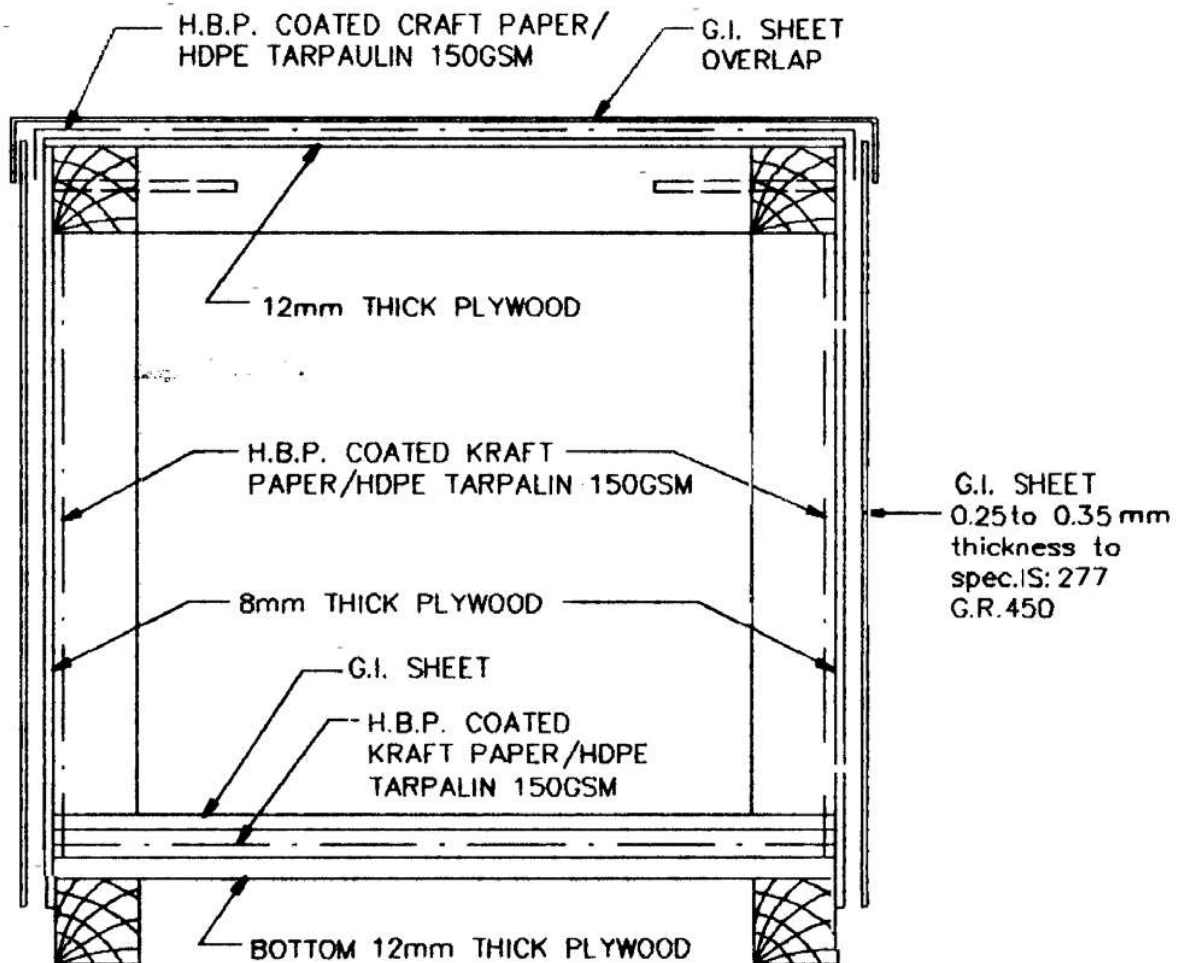
17.4 Marking

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in ISPM 15.

18 PROVISION FOR INSPECTION


This clause is applicable only where contractual requirement of customer is there. For other packings this is not applicable.

Each transportable packing's shall have provision for inspection by customer authority etc. during transport from origin of dispatched till destination. This inspection may require opening of the package and subsequently closing it again. For this purpose suitable designed opening with bolted cover shall be provided. Such an opening shall be clearly marked as "OPENING" with clear instruction for opening & closing written on this cover. For large consignment the size of the opening shall be suitable to facilitate entry of personnel.



CLOSED PACKING CASE WITH
G.I. SHEET SHOWING LAYERS
OF PACKING MATERIALS

Figure 3

	PATRATU STPP FGD PACKAGE TECHNICAL SPECIFICATION FOR AGITATORS OF FGD SLURRY TANKS LIST OF DOCUMENTS TO BE SUBMITTED WITH BID	SPECIFICATION No: PE-TS-434-571-18000-A003	
		SECTION : II	
		ANNEXURE-1	
		REV: 0	DATE: DEC 2021
		SHEET 1 OF 1	

BIDDER SHOULD SUBMIT THE SIGNED AND STAMPED COPY OF THE FOLLOWING DOCUMENTS:

Document for Evaluation:

1. Compliance cum confirmation certificate (Refer Annexure-2 of section-II).
2. Pre-bid clarification, if any, as per format given under Section-II (Annexure-3)
3. Amendment to specification, if any, issued by BHEL dully signed and stamped.
4. Deviation schedule as per format given under Section-II (Annexure-4), in case of any deviations by bidder.
5. Documents for meeting the Pre-Qualification Requirement (3K format has to be submitted along with supporting documents as given under Annexure-10, section-II).
6. List of special tools and tackles (Refer Annexure-7 of section-II).
7. Dully filled Guaranteed power consumption format (In the format attached with the price schedule) declaring guaranteed power consumption value in KW along with the Technical offer.

Document for Reference:

1. Agitator Schedule filled up by the bidder (Refer Annexure-8 of section-II).
2. GA drawing, Exploded view with Material of construction, total weight of all Agitators models offered.
3. Agitator Motor Sizing Calculation.
4. Electrical Load data filled up by the bidder (Refer Annexure-5 of section-II).
5. Test arrangement at shop
5. Product catalogue for offered agitators

Details mentioned under reference documents are subject finalization during detail engineering meeting requirements mentioned in various parts of the specification.



**PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS
COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

SPECIFICATION No:PE-TS-434-571-18000-A003

SECTION : II

ANNEXURE-2

REV. NO. 00

DEC 2021

SHEET: 1 OF 2

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account



PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
 AGITATORS OF FGD SLURRY TANKS
COMPLIANCE CUM CONFIRMATION
CERTIFICATE

SPECIFICATION No:PE-TS-434-571-18000-A003

SECTION : II

ANNEXURE-2

REV. NO. 00

DEC 2021

SHEET: 2 OF 2

- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.
- m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

784074/2022/PS-PEM-MAX



PATRATU STPP FGD PACKAGE
AGITATORS OF FGD SLURRY TANKS

SPECIFICATION NO. PE-TS-434-571-18000-A003

SECTION-II

ANNEXURE-3

REV 00

DEC 2021

SHEET: 1 OF 1

PRE-BID CLARIFICATION SCHEDULE

S.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL



**PATRATU STPP FGD PACKAGE
AGITATORS OF FGD SLURRY TANKS**

SPECIFICATION NO. PE-TS-434-571-18000-A003

SECTION-II

ANNEXURE-4

REV: 00

DEC 2021

ANNEXURE-4

**SCHEDULE OF TECHNICAL
DEVIATION**

(PLEASE REFER GCC FOR THE FORMAT OF DEVIATION)

LOAD TITLE	RATING (KW / A)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(C)/ INT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOS				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

ANNEXURE-5

Filtrate Water Tank Agitator				1	0				C									
Secondary Waste Water Hydro-cyclone Feed Tank Agitator				1	0				C									
Waste Water Tank Agitator				1	0				C									
Limestone Slurry Storage Tank Agitator				2	0				C									
Absorber Area Drain Sump Agitator-1				1	0				C									
Absorber Area Drain Sump Agitator-2				1	0				C									
Absorber Area Drain Sump Agitator-3				1	0				C									
Auxiliary Absorbent Tank Agitator				3	0				C									
Gypsum Area Drain Sump Agitator				1	0				C									
Limestone Area Drain Sump Agitator				1	0				C									

NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)/ CUSTOMER
 2. ABBREVIATIONS : * VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V
 : ** FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER (CONTACTOR CONTROLLED)

ANNEXURE-5 LOAD DATA (ELECTRICAL)	JOB NO.	434	ORIGINATING AGENCY	PEM (ELECTRICAL)
	PROJECT TITLE	3x800MW PATRATU STPP	NAME	DATA FILLED UP ON
	SYSTEM	AGITATORS OF FGD SLURRY TANKS	SIGN.	DATA ENTERED ON
	DEPTT. / SECTION	MAUX	SHEET 1 OF 1	REV. 00



3x800 MW PATRATU TPS

SPECIFICATION NO. PE-TS-434-571-18000-A003

AGITATORS OF FGD SLURRY TANKS
TECHNICAL SPECIFICATION

SECTION : II

ANNEXURE : 6

REV 00

DATE: DEC 2021

SUB-VENDOR LIST

SHEET 1 OF 1

LIST OF MAKES OF ITEMS

<u>S.N.</u>	<u>ITEM NAME</u>	<u>MANUFACTURER</u>	<u>LOCATION</u>



TITLE:
PATRATU STPP FGD PACKAGE
TECHNICAL SPECIFICATION FOR
AGITATORS OF FGD SLURRY TANKS

SPECIFICATION NO. PE-TS-434-571-18000-A003
SECTION : II
ANNEXURE-7
REV 00 **DATE: DEC 2021**
SHEET: 1 OF 1

LIST OF SPECIAL TOOLS AND TACKLES

Bidder shall supply a set of special tools and tackles required either for erection or operation or maintenance of the agitator units. A list of such tools and tackles shall be submitted along with the offer in the format below.

Sl.no.	Description of item	Quantity

In case bidder indicates that no special tools and tackles are required but the same is found applicable during detailed engineering the same shall be supplied by the bidder without any commercial and delivery implications.

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

ANNEXURE-8										
PATRATU TPS - AGITATOR SCHEDULE (To be submitted with the offer by Bidder)										
Sl.No.	Description	Primary Hydrocyclone feed tank Agitator	Filtrate water tank Agitator	Secondary Hydrocyclone feed tank Agitator	Waste water Tank Agitator	Limestone Slurry Storage tank Agitator	Auxiliary Absorbent Tank Agitator	Absorber Area Drain Pit Agitator	Gypsum Dewatering Area Drain Pits Agitator	Ball Mill Area Drain Pit Agitator
1	Agitator Sl No.	1	2	3	4	5	6	7	8	9
2	Type	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Marine Propeller – Horizontal Type (Side Entry),	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)	Vertical Type – (Center Mounted)
3	Medium to be handled	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Limestone slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Limestone slurry
4	Seal Type	Not required	Not required	Not required	Not required	Not required	Mechanical Seal (Flushless)	Not required	Not required	Not required
5	Duty	Continuous	Continuous	Continuous	Continuous	Continuous	Intermittent- Whenever FGD is under maintenance	intermittent	intermittent	Intermittent
6	Agitator Location	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
7	Tank details									
a)	Tank Shape	Vertical cylindrical	Vertical cylindrical	Vertical cylindrical	Vertical cylindrical	Vertical cylindrical	Vertical cylindrical	Rectangular	Rectangular	Rectangular
b)	Tank name	Primary Hydrocyclone feed tank	Filtrate water tank	Secondary Hydrocyclone feed tank	Waste water Tank	Limestone Slurry Storage tank	Auxiliary Absorbent Tank	Absorber Area Drain Pit	Gypsum Dewatering Area Drain Pits	Ball Mill Area Drain Pit
c)	Capacity of Slurry (in m3)	840.4	422.2	623.4	1481.6	4642.0	4714.4	56.0	56.0	56.0
	Dimension (in m)									
d)	Diameter	10.0	8.0	9.0	12.0	17.5	17.5	-	-	-
e)	Length	-	-	-	-	-	-	4	4	4
f)	Breadth	-	-	-	-	-	-	4	4	4
g)	Height	11.2	8.9	10.3	13.6	19.8	20.4	4	4	4
8	MOC of Agitator	Refer Clause no 3.2, Material of construction in SECTION-1, SUB SECTION-C1 of Specific technical requirement (Mechanical)								
9	Quantity of Agitator per tank	1	1	1	1	1	3 (Refer note-2)	1	1	1
10	Total quantity of agitators (for three units)	1	1	1	1	2	3 (Refer note-2)	3	1	1
11	Slurry Analysis									
a)	Slurry to be handled	Gypsum slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Limestone slurry	Gypsum slurry	Gypsum slurry	Gypsum slurry	Limestone slurry
b)	Maximum solid particle size	200 mesh (75 µ)	200 mesh (75 µ)	200 mesh (75 µ)	200 mesh (75 µ)	200 mesh (75 µ)	200 mesh (75 µ)	6-7 mm	6-7 mm	6-7 mm
c)	Normal solid particle size, d50	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)	325 mesh (43 µ)
d)	Solid to be handled	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	Limestone + impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	gypsum along with Limestone & other impurities	Limestone + impurities
e)	Chloride concentration	max 30000 ppm	max 30000 ppm	max 30000 ppm	max 30000 ppm	max 1000 ppm	max 30000 ppm	max 30000 ppm	max 30000 ppm	max 1000 ppm
f)	Hardness of particle	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale	5-7 mho scale
g)	Slurry concentration, wt%	25 wt%	14%	16.60%	3%	30 wt%	25%	25%	25%	30 wt%
h)	Sp. Gravity of slurry	1.177	1.098	1.114	1.025	1.218	1.177	1.177	1.177	1.218
i)	Sp. Gravity of Lime Stone & Gypsum	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)	2.32(avg)
j)	Viscosity of Slurry	10 cP	4 cP	4 cP	3 cP	30 cP	10 cP	10 cP	10 cP	30 cP
k)	pH	4 to 8	4 to 8	4 to 8	4 to 8	5 to 8	4 to 8	4 to 8	4 to 8	5 to 8
l)	SiO ₂ Content	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l	4 to 6 g/l
m)	Temperature	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.	Normal -62 deg C; Design-70 deg C.
12	Motor									
a)	Total Power consumed	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	Motor Rating	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Motor Explosion Proof Class	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof	Non-Flame Proof
d)	Motor Protection Class	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor	IP-55/ Outdoor
e)	Motor Efficiency Class	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3	IE-3
13	Tank Levels									
a)	Minimum Liquid level in the tank (in M)	1.0	1.0	1.0	1.0	1.0	1.0	1.4	1.4	1.4
b)	Normal Liquid Level in the tank (in M)	10.5	8.2	9.6	12.9	19.1	19.4	3.3	3.3	3.3
c)	Maximum Liquid Level in the Tank (in M)	10.7	8.4	9.8	13.1	19.3	19.6	3.5	3.5	3.5
14	Impeller									
a)	Type of impeller	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	No. of impeller per agitator	2	2	2	2	2	-	1	1	1
c)	Impeller diameter	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
d)	Impeller tip speed (Refer S.N. 19 c)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
e)	Operating speed	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
f)	Agitator Pumping Capacity	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
g)	Volume/Agitator	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
h)	Power Number for Agitator	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
15	Baffle Plates (not in bidder's scope)									
a)	No. & size of baffle plates	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Thickness of baffle plates (mm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
d)	Distance from Bottom of the tank	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
16	Nozzle (not in bidder's scope)									
a)	Size of the nozzle on which agitator frame is mounted	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	NA	NA	NA
17	Loads									
a)	Static Load	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
b)	Dynamic load	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
c)	Torsional Moment (Nm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
d)	Bending Moment (Nm)	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder	To be filled by bidder
18	Power loading for Auxiliary power consumption	Applicable	Applicable	Applicable	Applicable	Applicable	Not applicable	Not applicable	Not applicable	Not applicable
19	Parameters to be considered compulsarily by bidder for design of Agitators									

a)	Uniform suspension of solids by Agitators	The agitators shall keep the solid particles in suspended mode in liquid slurry with "Full off-Bottom Suspension" of solid particles to 98% of liquid column to virtually "Uniform Solid Concentration".								
b)	Mounting of Agitaor (For Vertical Agitators)	The Agitators shall be mounted on the Agitator platform which shall be approximately at a height of 1.0 m from the tank roof. However, the Agitator platform is excluded from bidder's scope.								
c)	Maximum permitted impeller tip speed	12 m/s								
d)	Impeller tip dia/ tank dia	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	1/3 (approx)	-	1/3 (approx)	1/3 (approx)	1/3 (approx)
Notes										
1	There shall be complete re-suspension of all solids after a 24 hour outage. Accumulation of solids shall not prevent agitator restart.									
2	Agitation shall be provided to prevent settlement of slurry by side entry agitators . All the side-entry agitators shall be similar									
3	Maximum Sound Pressure Level at a height of 1.5 m above floor level in elevation, and at a distance of 1.0 m horizontally shall be 85 dBA.									
4	Although the height of all tanks is fixed above, same may vary slightly during detailed engineering as per design calculation of tanks.									
5	Normal solid particle size shall be used for design of all Agitators in tanks and sumps.									
6	Bidder shall provide CFD analysis for establishing uniform suspension criteria. CFD shall be provided for Agitators for all the above tanks except drain pits. Further for Limestone slurry tank (total 2 no.) , CFD analysis shall be done only for one Agitatpr.									

3x800 MW PATRATU TPS - AGITATOR PACKAGE
LIST OF COMMISSIONING SPARES
Break up price for COMMISSIONING SPARES

Sl.no	Description	Qty.	Unit rate (INR)

NOTE -

Bidder shall furnish unit price of commissioning spares in above format alongwith the Bid. Any part even though not mentioned in list furnished but required at later date shall be supplied free of cost.

Annexure-10: Attachment-3k (of NTPC)-To be filled separately for horizontal and vertical agitators

CRITICAL EQUIPMENT, AUXILIARIES, SYSTEMS & BOUGHT OUT ITEMS FOR FLUE GAS DESULPHURISATION (FGD) SYSTEM

Summary of Critical Equipment indicated under clause 4.26, sub-section-IA, Part-A of Section-VI.

--Equipment Name	Sub-Vendor Name	Collaborator's Name, if applicable	Seeking Qualification as per clause..... Sub-Section-I, Part-A of Section-VI

--			
*Slurry Recirculation Pumps			*4.26.1 /*4.26.2 /*4.26.6
Oxidation Blowers			*4.26.1 /*4.26.2 /*4.26.3
Wet limestone Grinding mills			*4.26.1 /*4.26.2 /*4.26.4
Slurry Pumps			*4.26.1/*4.26.2
Agitators			*4.26.1 /*4.26.2 /*4.26.5
Vacuum Belt filters			*4.26.1 /*4.26.2

Note : *Strike-off whichever is not applicable.

1. If qualification sought as per clause 4.26.1 then the details of the sub vendor (manufacturer) shall be filled by the bidder in the format A to F.
2. If the qualification sought as per the clause 4.26.2, then the details of JV/Subsidiary Company formed for manufacturing of such equipments in India shall be furnished individually for each equipment by the bidder such as,
 - i) Copy of document of incorporation of JV/Subsidiary company in India
 - ii) Copy of collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with the collaborator or technology licensor who meets the requirement stipulated at 3.1.
 - iii) Copy of document of at least 26% equity participation of qualified equipment manufacturer in the Indian JV company/subsidiary company directly or indirectly through its holding company /Subsidiary company, which shall be maintained for a lock -in period of seven (7) years from the date of incorporation of such JV/subsidiary or up to the end of defect liability period of the contract which ever is later.

Signature of authorized signatory.....

Further, the details of collaborator or technology licensor or technology provider of the qualified equipment manufacturer who meets the requirement stipulated at 4.26.1, sub-section-IA, Part-A of Section-VI shall be filled by the Bidder in the format A to F (format given at 1.00.00). In addition to that, the sub vendor along with the Indian JV company/subsidiary company, qualified equipment manufacturer and its holding company/subsidiary company as applicable shall furnish the DJU.

*** strike out whichever is not applicable.**

1.00.00 (Applicable for Bidder/his sub vendors seeking qualification as per clause no. 4.26.1, Sub section-IA, Part-A of Section-VI. Bidder shall furnish the required data only for those equipments / auxiliaries which are proposed to be sourced under this route.)

We, hereby furnish the data on proveness criteria for critical equipment, auxiliaries, systems and Bought Out Items such as ~~Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, &~~ Agitators which have been designed (either by self manufacturer or under Collaboration/Licensing Agreement), *manufactured/ *got manufactured and supplied by us /Manufacturer (or manufactured/ got manufactured & supplied by our proposed sub-vendors) and these are in successful operation in at least one (1) plant for a period not less than one year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder. The details of type and minimum equipment rating of such equipment are given below:

Signature of authorized signatory.....



E. Agitators: We declare that, we/our Sub-Vendor, have manufactured and supplied at least one (1) number of Agitators with rating not less than that supplied for 500 MW or higher size unit for similar application, Vertical/Horizontal type working in Wet Limestone based FGD application in Coal fired power plant and which has been in successful operation for minimum one(1) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder, as per the details furnished below::

Sl. No.	Description	Reference Work
1.	Name of the reference plant & location:	--
2.	Client name and his address:	
3.	No. of units and capacity in MW of unit:	
4.	Whether power plant is coal fired	-*Yes/*No
5.	Whether operating in a Wet Limestone based FGD application in coal fired power plant	-*Yes/*No
6.	Name of equipment manufacturer & address:	
7.	Date of commission of the equipments:	
8.	Model no. of the equipment:	
9.	Brief Technical particulars of the equipments:	
10.	Agitators supplied forMW unit size
11.	Whether the equipment(s) are in successful operation in atleast one(01) plant for a period not less than one(01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder	-*Yes/*No

Signature of authorized signatory.....

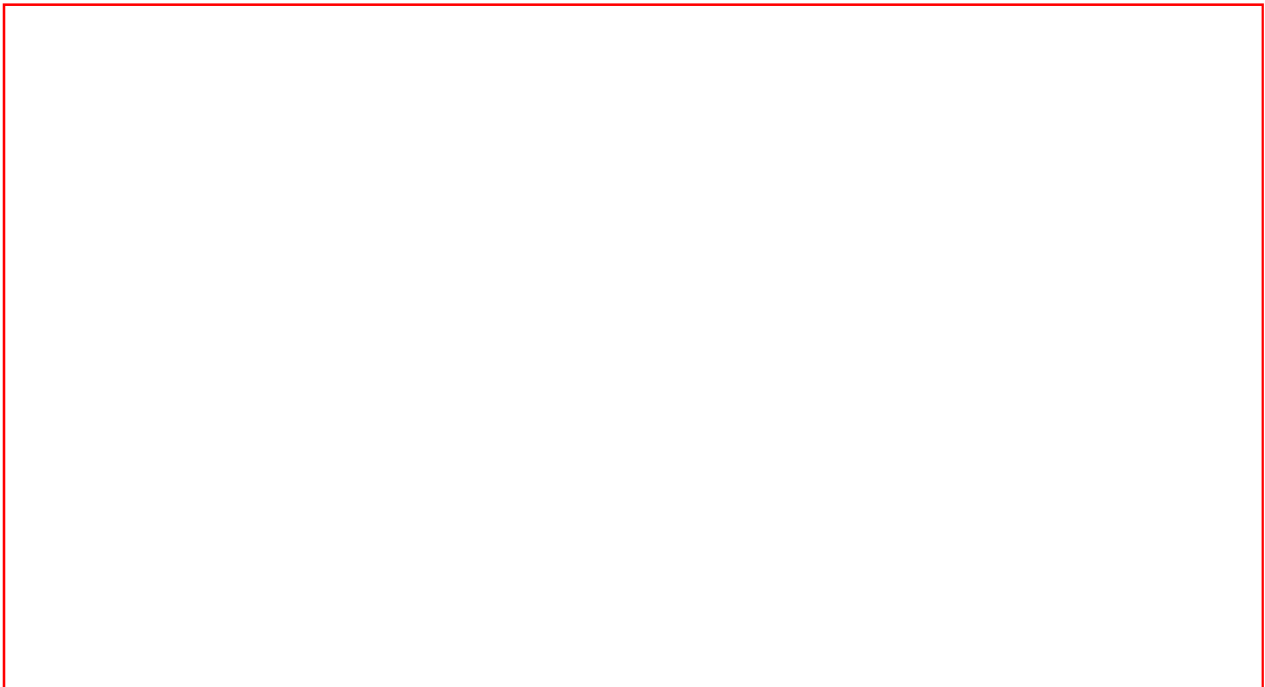
- 12. Flue gas Desulphurization system details:
 - *Technical extract/
 - *paper letter/ *email/
 - *Drawing from user or
 - *contract document or
 - *scheme or *any
 - document in public
 - domain enclosed at
 - annexure.....to
 - Attachment-3K

- 13. Scope of Work:
 - *Letter of Award or
 - *Contract or *P.O.
 - enclosed at
 - Annexure.....to
 - Attachment-3K

- 14. Performance details:
 - *Certificate/*Letter/*E-
 - mail from End user
 - enclosed at
 - Annexure.....to
 - ttachment-3K

 --

*** Strike off whichever is not applicable.**



Signature of authorized signatory.....

- 7. Date of commission of the equipment:
 - 8. Model no. of the equipment:
 - 9. Brief Technical particulars of the equipment:
 - 10. Capacity-TPH
 - 11. Whether the equipment(s) are in successful operation in atleast one(01) plant for a period not less than one (01) year reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder - *Yes/*No
 - 12. Flue gas Desulphurization system details: *Technical extract/ *paper letter/ *email/ *Drawing from user or *contract document or *scheme or *any document in public domain enclosed at annexure....to Attachment-3K
 - 13. Scope of Work: *Letter of Award or *Contract or *P.O enclosed at Annexure.....to Attachment-3K
 - 14. Performance details: *Certificate/*Letter/*E-mail from End user enclosed at Annexure.....to Attachment-3K
-
-
- * Strike off whichever is not applicable.**

***2.00.00 Applicable for JV Company/Subsidiary Company meeting provenness criteria as per clause no. 4.26.2, Sub section-IA, Part-A of Section-VI.**

Signature of authorized signatory.....

2.01.00 We, hereby confirm that JV company/ Subsidiary company (Strike off whichever is not applicable) formed for manufacturing and supply of equipment(s) (~~*Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators~~) has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of sub-section-IA, Part-A, Section VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers is having, directly or indirectly through its holding company/subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/subsidiary company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture / Subsidiary or up to the end of defect liability period of the contract, whichever is later. Further, JV / Subsidiary Company (Strike off whichever is not applicable) before resorting to design, engineering, manufacturing of such proven equipment(s) (~~*Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators~~) by himself should have sourced /shall source such proven equipment(s) (~~*Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps, *Agitators~~) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s) (~~*Slurry Recirculation Pumps, *Oxidation Blowers, *Wet Limestone Grinding Mills, *Slurry Pumps,*Agitators~~), the *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with the Indian *Joint Venture Company/ *Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed.

~~***3.00.00** **Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.26.3, Sub section-I, Part-A of Section-VI.**~~

~~**3.01.00** We, hereby confirm that *we/*our sub-vendors is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity. (Details of references enclosed at Annexure)~~

~~**(Data to be furnished in line with format given at 1.00.00 of this Attachment))**~~

~~**3.02.00** We further confirm that details in respect of collaboration / valid licencing agreement for the Oxidation Blower between *us/*our sub-vendors, as per 3.01.00 above, and with qualified Oxidation Blower manufacturer, who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI are enclosed as per **Annexure.....** to this Attachment. The data in respect of provenness criteria for the qualified Oxidation Blower manufacturer, which are in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of~~

Signature of authorized signatory.....



***5.00.00 Applicable for Bidder/his sub vendors seeking provenness criteria as per clause no. 4.26.5, Sub section-IA, Part-A of Section-VI.**

5.01.00 We, hereby confirm that *we/*our sub-vendors is a manufacturer of a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry. (Details of references enclosed at Annexure

(Data to be furnished in line with format given at 1.00.00 of this Attachment))

5.02.00 We further confirm that details in respect of collaboration / valid licencing agreement for the Agitator between *us/*our sub-vendors, as per 5.01.00 above, and with qualified Agitator manufacturer, who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI are enclosed as per **Annexure-.....** to this Attachment. The data in respect of provenness criteria for the qualified Agitator manufacturer, which is in successful operation in at least one (1) plant for a period not less than one reckoned as on the date of consideration for approval but not later than six months to award date of contract to the Main bidder are furnished below.

(Data to be furnished in line with format given at 1.00.00 of this Attachment)

Further, *we/*our sub-vendors before resorting to design, engineering, manufacturing of Agitator by itself *have sourced /*shall source ~~Oxidation Blower~~ for at least the first 800 MW unit completely from such qualified manufacturer who meets the requirement stipulated at clause **4.26.1**, sub-section-IA, Part-A, Section-VI. We further confirm that we/ our sub vendor(s) for subsequent units before taking up the manufacturing of such Agitator, *we/ *our sub vendor(s) *will create /*have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system.

In addition, the Bidder along with our sub-vendors, as per 5.01.00 above (if applicable) and the qualified Agitator manufacturer and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed.

Signature of authorized signatory.....

**FORM OF DEED OF JOINT UNDERTAKING TO BE PROVIDED
FOR(NAME OF EQUIPMENT)
AS PER CLAUSE 4.26.2 OF SUB-SECTION-I-A, PART A, SECTION VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR,
*INDIAN JOINT VENTURE COMPANY/*SUBSIDIARY COMPANY MEETING THE
REQUIREMENTS SPECIFIED AT CLAUSE NO. 4.26.2 OF SUB-SECTION-I-A, PART A,
SECTION VI ALONGWITH QUALIFIED EQUIPMENT MANUFACTURER
OF..... (NAME OF EQUIPMENT) MEETING THE REQUIREMENTS
AS PER CLAUSE 4.26.1 OF SUB-SECTION-I-A, PART A, SECTION VI AND ITS
*HOLDING/*SUBSIDIARY COMPANY, AS APPLICABLE FOR SUCCESSFUL
PERFORMANCE OF (NAME OF EQUIPMENT), IN WHICH
EXECUTANT OF THE DJU ARE JOINTLY AND SEVERALLY LIABLE FOR THE
SUCCESSFUL PERFORMANCE OF THE.....(NAME OF EQUIPMENT)**

The DEED OF UNDERTAKING executed thisday ofTwo thousand
.....by M/sa Company incorporated underhaving its
Registered Office at (hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) AND

**M/s, a (Name of Equipment)
Supplier/Manufacturer as per the requirement of Item 4.26.2 of sub-section-IA, Part-A, Section-
VI, incorporated under having its Registered Office at
..... (hereinafter called the "**Indian JV/*Subsidiary Company)", which
expression shall include its successors, administrators, executors and permitted assigns) AND

M/sa Company registered under the having its
Registered Office at (hereinafter called the "Qualified Equipment
Manufacturer", which expression shall include its successors, administrators, executors and
permitted assigns) AND

*M/s a Company registered under the having
its Registered Office at (hereinafter called the "**Holding/*Subsidiary
Company of Qualified Equipment Manufacturer", which expression shall include its successors,
administrators, executors and permitted assigns),

in favour of NTPC Limited, A Government of India Enterprise, incorporated under the
Companies Act, 1956, having its Registered Office at NTPC Bhawan, Scope Complex, 7,
Institutional Area, Lodhi Road, New Delhi-110003 INDIA (hereinafter called "NTPC" or
"Employer" which expression shall include its successors, administrators, executors and
assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of
guarantee tests for the **EPC Package for Patratu STPS Expansion Phase-I (3x800MW)**
(hereinafter referred to as "Plant") vide its Bidding Document No. **CS-9585-001-2.**

Signature of authorized signatory.....

AND WHEREAS vide clause 4.26.2 of Sub-Section-I-A, Part A, Section VI of bidding documents, it has been specified that a JV / Subsidiary Company formed for manufacturing and supply of equipment(s) in India as listed at clause no. 4.26.1 of Sub-Section-I-A, Part A, Section VI can also manufacture such equipments, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of Sub-Section-I-A, Part-A, Section-VI of bidding documents (or the technology provider of the qualified equipment manufacturer). Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, atleast 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. Further, the JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.26.1 of Sub-Section-IA, Part-A, Section-VI of bidding documents by himself should have sourced / shall source such proven equipment(s) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licensor's design, manufacturing and quality control system for such equipment(s) In addition, the Bidder/Contractor along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers and its holding/ subsidiary Company, as applicable, shall furnish DJU for each equipment in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for **EPC Package** for its **Patratu STPS Expansion Phase-I (3x800MW)** (hereinafter referred to as "Plant") against the Employer's Bidding Document No. **CS-9585-001-2**.

AND WHEREAS M/s (*Indian JV/*Subsidiary Company) has been formed for manufacturing and supply of equipment(s) as listed at clause no. 4.26.1 of Sub-Section-IA, Part A, Section-VI who has a valid collaboration or licensing agreement for design, engineering, manufacturing of(Name Of Equipment) in India with M/swho meets the requirements stipulated at clause 4.26.1 of Sub-Section-IA, Part A, Section-VI of bidding documents (or the technology provider of the qualified equipment manufacturer).

AND WHEREAS M/s (Qualified Equipment Manufacturer) is having, *directly *or *indirectly through its *holding company M/s...../ *subsidiary company M/s....., atleast 26% equity participation in the Indian *Joint Venture Company/ *Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture Company/ Subsidiary Company or upto the end of defect liability period of the contract, whichever is later.

The Bidder/Contractor alongwith the Indian Joint Venture Company/Subsidiary Company, Qualified Equipment Manufacturers and its Holding / Subsidiary Company, as applicable, are required to jointly execute and furnish prior to the placement of order on the approved Joint Venture Company/ Subsidiary Company of (Name of equipment), an irrevocable Deed of Joint Undertaking and be jointly and severally responsible and bound unto

Signature of authorized signatory.....

the Employer for successful performance of the (Name of Equipment) for **Patratu STPS Expansion Phase-I (3x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the (Name of Equipment).
2. In case of any breach of the Contract committed by the Indian *JV/*Subsidiary Company, we the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful performance of the (Name of Equipment) and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Indian *JV/*Subsidiary Company's obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian *JV/*Subsidiary Company / **Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Indian *JV/*Subsidiary Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Deed of Joint Undertaking to proceed against the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer.
3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:
 - (a) We the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the (Name of Equipment) is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of (Name of Equipment).

Further, we, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall extend our quality

Signature of authorized signatory.....

surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Indian *JV/*Subsidiary Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Indian *JV/*Subsidiary Company works/ Employer's project site as required by the Employer and agreed to by Indian *JV/*Subsidiary Company to facilitate the successful performance of the (Name of Equipment) as stipulated in the aforesaid Contract.

Further, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall advise the Indian *JV/*Subsidiary Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

- (b) In the event Indian *JV/*Subsidiary Company/**Contractor fail to demonstrate that the (Name of Equipment) meets the guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.
- (c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the (Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the **Contractor and Indian *JV/*Subsidiary Company and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer.

4. We, the **Bidder/Contractor and Qualified Equipment Manufacturer and the *Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Deed of Joint Undertaking shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.

Signature of authorized signatory.....

- 5. The ****Bidder/Contractor** and **Qualified Equipment Manufacturer** and the ***Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company** will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
- 6. In case of Award, in addition to the Contract Performance Security for the Contract, the **Qualified Equipment Manufacturer** and the ***Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company** shall each furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.5 Million (Indian Rupees One and Half Million)** and it shall be guarantee towards the faithful performance /compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
- 7. Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Deed of Joint Undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
- 8. We, the **Bidder/Contractor** and **Qualified Equipment Manufacturer** and the ***Holding/*Subsidiary Company of Qualified Equipment Manufacturer and Indian *JV/*Subsidiary Company** agree that this Undertaking shall form an integral part of the Contracts from the date of signing of this Deed of Joint Undertaking. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.
- 9. That this Deed of Joint Undertaking shall be operative from the effective date of signing of this Deed of Joint Undertaking.

IN WITNESS WHEREOF, the **Bidder/Contractor** and **Qualified Equipment Manufacturer** and the ***Holding/*Subsidiary Company of Qualified Equipment Manufacturer and *Indian Joint Venture Company/ *Subsidiary Company Vendor** through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS For M/s
 (Bidder/Contractor)
 (Signature of the Authorised
Signature of authorized signatory.....

(Signature Name)

Representative)

.....
(Official Address)

Name

Designation

Common Seal of the
Company

1. WITNESS

For M/s
(Indian *JV/*Subsidiary Company)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....
(Official Address)

Name.....

Designation

Common Seal of the
Company

1. WITNESS

For M/s
(Qualified Equipment Manufacturer)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....
(Official Address)

Name.....

Designation

Common Seal of the
Company

1. WITNESS

*For M/s
(*Holding/*Subsidiary Company of
Qualified Equipment Manufacturer)

.....
(Signature Name)

(Signature of the Authorised
Representative)

.....

Signature of authorized signatory.....

(Official Address)

Name.....

Designation

Common Seal of the
Company

Note : Power of Attorney of the persons signing the said Deed of Joint Undertaking is to be furnished.

* Contractor/Sub-Vendor shall strike out, whichever is not applicable.

Signature of authorized signatory.....

**FORM OF DEED OF JOINT UNDERTAKING TO BE PROVIDED
FOR(NAME OF EQUIPMENT)
AS PER CLAUSE *4.26.3/*4.26.4/*4.26.5/*4.26.6 OF SUB-SECTION-I-A, PART A, SECTION
VI**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

**DEED OF JOINT UNDERTAKING TO BE EXECUTED BY THE BIDDER/CONTRACTOR,
QUALIFIED INDIAN MANUFACTURING COMPANY MEETING THE REQUIREMENTS
SPECIFIED AT CLAUSE NO. *4.26.3/*4.26.4/*4.26.5/*4.26.6 OF SUB-SECTION-I-A, PART A,
SECTION VI ALONGWITH QUALIFIED EQUIPMENT MANUFACTURER
OF..... (NAME OF EQUIPMENT) MEETING THE REQUIREMENTS
AS PER CLAUSE 4.26.1 OF SUB-SECTION-I-A, PART A, SECTION VI FOR SUCCESSFUL
PERFORMANCE OF (NAME OF EQUIPMENT), IN WHICH
EXECUTANT OF THE DJU ARE JOINTLY AND SEVERALLY LIABLE FOR THE
SUCCESSFUL PERFORMANCE OF THE.....(NAME OF EQUIPMENT)**

The DEED OF UNDERTAKING executed thisday ofTwo thousand
.....by M/sa Company incorporated underhaving its
Registered Office at (hereinafter called the "Bidder/Contractor", which
expression shall include its successors, administrators, executors and permitted assigns) AND

**M/s a (Name of Equipment)
Manufacturer as per the requirement of Item *4.26.3/*4.26.4/*4.26.5/*4.26.6 of sub-section-IA,
Part-A, Section-VI, incorporated under having its Registered
Office at (hereinafter called the "Qualified Indian Manufacturing
Company"), which expression shall include its successors, administrators, executors and
permitted assigns) AND

M/sa Company registered under the having its
Registered Office at (hereinafter called the "Qualified Equipment
Manufacturer", which expression shall include its successors, administrators, executors and
permitted assigns) AND

in favour of NTPC Limited, A Government of India Enterprise, incorporated under the
Companies Act, 1956, having its Registered Office at NTPC Bhawan, Scope Complex, 7,
Institutional Area, Lodhi Road, New Delhi-110003 INDIA (hereinafter called "NTPC" or
"Employer" which expression shall include its successors, administrators, executors and
assigns).

WHEREAS, the Employer invited Bids for design, engineering, manufacture, supply,
transportation to site, construction, installation, testing, commissioning and conductance of
guarantee tests for the **EPC Package for Patratu STPS Expansion Phase-I (3x800MW)**
(hereinafter referred to as "Plant") vide its Bidding Document No. **CS-9585-001-2.**

AND WHEREAS vide clause *4.26.3/*4.26.4/*4.26.5/*4.26.6 of Sub-Section-I-A, Part A, Section
VI of bidding documents, it has been specified that a Qualified Indian Manufacturing Company
can also manufacture equipment(s) listed at clause no. 4.26.1 of Sub-Section-I-A, Part A,
Section VI for which it is qualified, provided that it has a valid collaboration or licensing

Signature of authorized signatory.....

agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 of Sub-Section-I-A, Part-A, Section-VI of bidding documents. Further, the Qualified Indian Manufacturing Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.26.1 of Sub-Section-IA, Part-A, Section-VI of bidding documents by himself should have sourced / shall source such proven equipment(s) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/ licensor's design, manufacturing and quality control system for such equipment(s) In addition, the Bidder/Contractor along with the Qualified Indian Manufacturing Company, qualified equipment manufacturers shall furnish DJU for each equipment in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment.

WHEREAS M/s (Bidder/Contractor) has submitted its proposal in response to the aforesaid Invitation for Bid by the Employer bearing No. dated for **EPC Package** for its **Patratu STPS Expansion Phase-I (3x800MW)** (hereinafter referred to as "Plant") against the Employer's Bidding Document No. **CS-9585-001-2**.

AND WHEREAS M/s (Qualified Indian Manufacturing Company) meets the requirement of clause *4.26.3/*4.26.4/*4.26.5/*4.26.6 of sub-section-IA, Part-A, Section-VI and has a valid collaboration or licensing agreement for design, engineering, manufacturing, supply of(Name Of Equipment) in India with M/swho meets the requirements stipulated at clause 4.26.1 of Sub-Section-IA, Part A, Section-VI of bidding documents.

AND WHEREAS M/s (Qualified Equipment Manufacturer) meets the requirements of clause 4.26.1 of sub-section-IA, Part-A, Section-VI for(Name Of Equipment).

The Bidder/Contractor alongwith the *Qualified Indian Manufacturing Company , Qualified Equipment Manufacturers, are required to jointly execute and furnish prior to the placement of order for..... (Name of equipment), an irrevocable Deed of Joint Undertaking and be jointly and severally responsible and bound unto the Employer for successful performance of the (Name of Equipment) for **Patratu STPS Expansion Phase-I (3x800MW)**, fully meeting the stipulated technical requirements, guaranteed parameters and characteristics as per the Bidding Documents, in the event the bid is accepted by the Employer resulting into a Contract.

NOW THEREFORE, THIS DEED WITNESSETH AS UNDER:

1. We the Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company and the Bidder/Contractor, do hereby declare and undertake that we shall be jointly and severally responsible to the Employer for the successful performance of the (Name of Equipment).
2. In case of any breach of the Contract committed by the Qualified Indian Manufacturing Company, we the Bidder/Contractor and Qualified Equipment Manufacturer do hereby undertake, declare and confirm that we shall be fully responsible for the successful

Signature of authorized signatory.....

performance of the (Name of Equipment) and undertake to carryout all the obligations and responsibilities under this Deed of Joint Undertaking in order to discharge the Qualified Indian Manufacturing Company obligations stipulated under the Contract. Further, if the Employer sustains any loss or damage on account of any breach of the Contract for the (Name of Equipment), we the Bidder/Contractor and Qualified Equipment Manufacturer jointly and severally undertake to promptly indemnify and pay such loss/damages caused to the Employer on its written demand without any demur, reservation, Contest or protest in any manner whatsoever. This is without prejudice to any rights of the Employer against the Contractor/ his Sub-Vendor under the Contract and/or guarantees. It shall not be necessary or obligatory for the Employer to first proceed against the Indian Qualified Indian Manufacturing Company / Bidder/Contractor before proceeding against the Qualified Equipment Manufacturer nor any extension of time or any relaxation given by the Employer to the Qualified Indian Manufacturing Company / **Bidder/Contractor shall prejudice any rights of the Employer under this Deed of Joint Undertaking to proceed against the Qualified Equipment Manufacturer.

3. Without prejudice to the generality of the Undertaking in paragraph 1 above, the manner of achieving the objective set forth in paragraph 1 above shall be as follows:

(a) We the Qualified Equipment Manufacturer shall ensure that complete design, manufacturing, quality assurance and installation of the (Name of Equipment) is carried out inline with our manufacturing & quality drawings and procedures and shall be fully responsible for its compliance so as to ensure satisfactory, reliable, safe and trouble free performance of (Name of Equipment).

Further, we, the Qualified Equipment Manufacturer shall extend our quality surveillance/ supervision/ quality control to the Contractor during manufacture, erection, commissioning and performance testing, both at Qualified Indian Manufacturing Company's works and/ or at Employer's project site.

Further, the Qualified Equipment Manufacturer shall depute their technical experts from time to time to the Qualified Indian Manufacturing Company's works/ Employer's project site as required by the Employer and agreed to by Qualified Indian Manufacturing Company to facilitate the successful performance of the (Name of Equipment) as stipulated in the aforesaid Contract.

Further, the Qualified Equipment Manufacturer shall ensure proper design, manufacture, installation, testing and successful performance of the (Name of Equipment) under the said Contract in accordance with stipulations of Bidding Documents and if necessary, the Qualified Equipment Manufacturer shall advise the Qualified Indian Manufacturing Company suitable modifications of design and implement necessary corrective measures to discharge the obligations under the contract.

(b) In the event Indian Qualified Indian Manufacturing Company /Contractor fail to demonstrate that the (Name of Equipment) meets the

Signature of authorized signatory.....

guaranteed parameters and demonstration parameters as specified in the contract, the Qualified Equipment Manufacturer shall promptly carry out all the corrective measures related to engineering services at their own expense and shall promptly provide corrected design to the Employer.

- (c) Implementation of the corrected design and all other necessary repairs, replacements, rectification or modifications to the
(Name of Equipment) and payment of financial liabilities and penalties and fulfillment of all other contractual obligations as provided under the contract shall be the joint and severally responsibility of the Contractor and Qualified Indian Manufacturing Company and Qualified Equipment Manufacturer.
4. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company do hereby undertake and confirm that this Undertaking shall be irrevocable and shall not be revoked till ninety (90) days after the end of the defect liability period of the equipment covered under the Contract and further stipulate that the Undertaking herein contained shall terminate after ninety (90) days of satisfactory completion of such defect liability period. In case of delay in completion of defect liability period, the validity of this Deed of Joint Undertaking shall be extended by such period of delay. We further agree that this Undertaking shall be without any prejudice to the various liabilities of the Contractor including Contract Performance Security as well as other obligations of the Contractor in terms of the Contract.
 5. The Bidder/Contractor and Qualified Equipment Manufacturer will be fully responsible for the quality of all the equipment/main assemblies/components manufactured at their works or at their Vendors' works or constructed at site, and their repair or replacement, if necessary, for incorporation in the Plant and timely delivery thereof to meet the completion schedule under the Contract.
 6. In case of Award, in addition to the Contract Performance Security for the Contract, the Qualified Equipment Manufacturer shall furnish 'as security' an on demand Performance Bank Guarantee in favour of the Employer as per provisions of the bidding documents. The value of such Bank Guarantee shall be equal to **INR 1.5 Million (Indian Rupees One and Half Million)** and it shall be guarantee towards the faithful performance /compliance of this Deed of Joint Undertaking in accordance with the terms and conditions specified herein. The bank guarantee shall be unconditional, irrevocable and valid till ninety (90) days beyond the end of defect liability period of the last equipment covered under the Contract. In case of delay in completion of the defect liability period, the validity of this Bank Guarantee shall be extended by the period of such delay. The guarantee amount shall be promptly paid to the Employer on demand without any demur, reservation, protest or contest.
 7. Any dispute that may arise in connection with this Deed of Joint Undertaking shall be settled as per arbitration procedure/rules mentioned in the Contract Documents. This Deed of Joint Undertaking shall be construed and interpreted in accordance with the Laws of India and the Courts of Delhi shall have exclusive jurisdiction.
 8. We, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company shall form an integral part of the Contracts from the date

Signature of authorized signatory.....

of signing of this Deed of Joint Undertaking. We further agree that this Deed of Joint Undertaking shall continue to be enforceable till its validity.

- 9. That this Deed of Joint Undertaking shall be operative from the effective date of signing of this Deed of Joint Undertaking.

IN WITNESS WHEREOF, the Bidder/Contractor and Qualified Equipment Manufacturer and the Qualified Indian Manufacturing Company through their authorised representatives, have executed these presents and affixed common seal of their respective companies, on the day, month and year first mentioned above.

1. WITNESS For M/s
(Bidder/Contractor)

.....
(Signature Name) (Signature of the Authorised Representative)

.....
(Official Address) Name

Designation

Common Seal of the Company

1. WITNESS For M/s
(Qualified Indian Manufacturing Company)

.....
(Signature Name) (Signature of the Authorised Representative)

.....
(Official Address) Name.....

Designation

Common Seal of the Company

1. WITNESS For M/s
(Qualified Equipment Manufacturer)

.....
(Signature Name) (Signature of the Authorised Representative)

Signature of authorized signatory.....

.....
(Official Address)

Name.....


Designation


Common Seal of the
Company


Note : Power of Attorney of the persons signing the said Deed of Joint Undertaking is to be furnished.


* Contractor/Sub-Vendor shall strike out, whichever is not applicable


Signature of authorized signatory.....

CLAUSE NO.	PROVENNESS																								
	<p>(5) Technology Transfer Agreement (Applicable for Clause 4.25.2, 4.25.3 & 4.25.4)</p> <p>The technology transfer agreement between the Bidder/Bidder's sub-vendor & QFGDM shall necessarily cover transfer of technological knowhow for Wet Limestone based Flue Gas Desulphurisation System in the form of complete transfer of design dossier, design software's, drawings and documentation, quality system manuals and imparting relevant personnel training to the Indian Manufacturing Company.</p>																								
4.26	<p>Provenness criteria for critical equipment, auxiliaries, systems and bought out items for Flue Gas Desulphurisation System:</p>																								
4.26.1	<p>The Bidder / Bidder's sub-vendor(s) is required to meet the provenness criteria and/or qualification requirement for critical equipment, auxiliaries, system and bought out items as per criteria stipulated below:</p> <p>Slurry Recirculation Pumps, Oxidation Blowers, Wet Limestone Grinding Mills, Slurry Pumps, Agitators & Vacuum Belt Filters for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such manufacturer(s) who has previously designed (either by itself or under collaboration / licensing agreement), manufactured / got manufactured the respective equipment(s) of the type, application and minimum equipment rating as stipulated below such that the respective equipment(s) should have been in successful operation in at least one (1) plant for a period not less than one(1) year:</p>																								
	<table border="1"> <thead> <tr> <th data-bbox="245 1058 370 1150">Sl. No.</th> <th data-bbox="375 1058 565 1150">Name of Equipment</th> <th data-bbox="570 1058 792 1150">Type of Equipment</th> <th data-bbox="797 1058 1062 1150">Application</th> <th data-bbox="1066 1058 1409 1150">Equipment Rating</th> </tr> </thead> <tbody> <tr> <td data-bbox="245 1157 370 1310">(a)</td> <td data-bbox="375 1157 565 1310">Slurry Recirculation Pumps</td> <td data-bbox="570 1157 792 1310">Centrifugal type</td> <td data-bbox="797 1157 1062 1310">Wet Limestone based FGD application in Coal fired power plant</td> <td data-bbox="1066 1157 1409 1310">80% of the flow & 100% of the head of the offered Slurry Recirculation Pump</td> </tr> <tr> <td data-bbox="245 1316 370 1598">(b)</td> <td data-bbox="375 1316 565 1598">Oxidation Blowers</td> <td data-bbox="570 1316 792 1598">Centrifugal/ positive displacement type blower</td> <td data-bbox="797 1316 1062 1598">Wet Limestone based FGD application in Coal fired power plant</td> <td data-bbox="1066 1316 1409 1598">80% of the flow & 100% of the head of the offered Oxidation Blower</td> </tr> <tr> <td data-bbox="245 1604 370 1766">(c)</td> <td data-bbox="375 1604 565 1766">Wet limestone Grinding mills</td> <td data-bbox="570 1604 792 1766">Horizontal Wet Ball mill</td> <td data-bbox="797 1604 1062 1766">Wet Limestone based FGD application in Coal fired power plant</td> <td data-bbox="1066 1604 1409 1766">80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru</td> </tr> </tbody> </table>	Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating	(a)	Slurry Recirculation Pumps	Centrifugal type	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Slurry Recirculation Pump	(b)	Oxidation Blowers	Centrifugal/ positive displacement type blower	Wet Limestone based FGD application in Coal fired power plant	80% of the flow & 100% of the head of the offered Oxidation Blower	(c)	Wet limestone Grinding mills	Horizontal Wet Ball mill	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Ball mill capacity with pulverizing fineness not less than 90% thru				
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<p>EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)</p>		<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9885-001-02</p>		<p>SUB-SECTION-IA PROVENNESS</p>	<p>PAGE 29 OF 54</p>																				

CLAUSE NO.		PROVENNESS			
Sl. No.	Name of Equipment	Type of Equipment	Application	Equipment Rating	
				325 mesh	
(d)	Slurry Pumps	Centrifugal type	Wet Limestone based FGD application or similar process/duty application.	Flow 50 m ³ /hr (minimum) with Head 30 Meters of Liquid Column (minimum)	
(e)	Agitators	Vertical/Horizontal	Wet Limestone based FGD application in Coal fired power plant	Agitator rating not less than that supplied for 500 MW or higher size unit for similar application	
(f)	Vacuum Belt filters	Belt type	Wet Limestone based FGD application in Coal fired power plant	80% of the offered Vacuum Belt filter capacity	
4.26.2	<p>Bidder shall offer and supply only the type of the above equipment(s) for which he himself or the manufacturer proposed by the bidder for the above equipment(s) is qualified.</p> <p>A JV / Subsidiary Company formed for manufacturing and supply of equipment(s) as listed at clause no. 4.26.1 above in India can also manufacture such equipments, provided that it has a valid collaboration or licensing agreement for design, engineering, manufacturing of such equipment(s) in India with a qualified equipment manufacturer who meets the requirements stipulated at clause 4.26.1 above (or the technology provider of the qualified equipment manufacturer) for the respective equipment(s). However, in this case, the proposed JV / Subsidiary Company before resorting to design, engineering, manufacturing of such proven equipment(s) listed at clause no. 4.26.1 above by himself should have sourced / shall source such proven equipment(s) for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment(s), the bidder/ his sub-vendor(s) must create /have created manufacturing facilities at his works as per collaborator's/licenser's design, manufacturing and quality control system for such equipment(s).</p> <p>Further, in such a case, such qualified equipment manufacturers should have, directly or indirectly through its holding company/ subsidiary company, at least 26% equity participation in the Indian Joint Venture Company/ Subsidiary Company, which shall be maintained for a lock-in period of seven (7) years from the date of incorporation of such Joint Venture/ Subsidiary or upto the end of defect liability period of the contract, whichever is later. In addition, the Bidder along with the Indian Joint Venture Company/ Subsidiary Company, qualified equipment manufacturers</p>				
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4.26.3	<p>and its holding/ subsidiary Company, as applicable, shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for a particular equipment. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only) for each equipment.</p> <p>In case the Bidder or the proposed sub-vendor is not manufacturer of proven Oxidation Blowers as per clause 4.26.1 (b) above but is a manufacturer of Blowers/compressors for minimum 50 NM³/min capacity, the Bidder or the proposed sub-vendor can also manufacture Oxidation Blowers, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Oxidation Blowers in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (b) above for the Oxidation Blowers. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.</p> <p>In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Oxidation Blowers. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).</p>			
4.26.4	<p>In case the Bidder or the proposed sub-vendor is not manufacturer of proven Wet limestone Grinding mills as per clause 4.26.1 (c) above but is a manufacturer of dry Grinding mills for power or cement industry of minimum 20 T/h capacity, the Bidder or the proposed sub-vendor can also manufacture Wet limestone Grinding mills, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Wet limestone Grinding mills in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (c) above for the Wet limestone Grinding mills. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.</p> <p>In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the</p>			
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4.26.5	<p>successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Wet limestone Grinding mills. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).</p> <p>In case the Bidder or the proposed sub-vendor is not manufacturer of proven Agitators as per clause 4.26.1 (e) above but is a manufacturer of Agitators for similar process/duty application in petrochemical or metals and mining industry, the Bidder or the proposed sub-vendor can also manufacture Agitators, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such Agitators in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (e) above for the Agitators. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipments.</p> <p>In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Agitators. In case of award, each executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).</p>		
4.26.6	<p>In case the Bidder or the proposed sub-vendor is a manufacturer of Slurry Pumps who meets the requirements stipulated at clause 4.26.1 (d) above, the Bidder or the proposed sub-vendor can also manufacture Slurry Recirculation Pumps, provided it has collaboration or valid licensing agreement for design, engineering, manufacturing, supply of such equipment in India with such manufacturer who meet the requirements stipulated at clause 4.26.1 (a) above for the Slurry Recirculation Pumps. However, in this case, Bidder or the proposed sub-vendor before resorting to design, engineering, manufacturing of such proven equipment by himself should have sourced / shall source such proven equipment for at least the first 800 MW unit completely from such qualified manufacturer. For subsequent units before taking up the manufacturing of such equipment, the bidder/ his sub-vendor must create /have created manufacturing facilities at his works as per collaborator's /licenser's design, manufacturing and quality control system for such equipment.</p> <p>In addition, the Bidder along with the qualified equipment manufacturer shall furnish DJU in which executant of the DJU shall be jointly and severally liable for the successful performance of the equipment as per the format enclosed in the bidding document. The DJU shall be submitted prior to the placement of order on the approved sub-vendor for Slurry Recirculation Pumps. In case of award, each</p>		
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4.26.7	<p>executant of the DJU except the Bidder shall be required to furnish an on demand bank guarantee for INR 1.5 Million (Indian Rupees One and Half Million only).</p> <p>Before taking up the manufacturing of such equipment(s) as per clause 4.26.2, 4.26.3, 4.26.4, 4.26.5 & 4.26.6 above, the Bidder / its sub vendor(s) must create (or should have created) manufacturing and testing facilities at its works as per Collaborator / licensor's design, manufacturing and quality control system for such equipments duly certified by the Collaborator / licensor. Further, the Collaborator / Licensor shall provide (or should have provided) all design, design calculation, manufacturing drawings and must provide (or should have provided) technical and quality surveillance assistance and supervision during manufacturing, erection, testing, commissioning of equipments.</p>		
4.26.8	<p>Bidder shall offer and supply only the type of the above equipment(s) for which it, itself or the manufacturer / Collaborator(s) / Licensor(s) proposed by the Bidder for the above equipment(s) is qualified.</p>		
4.26.9	<p>The Employer reserves the right to fully satisfy himself regarding capability and capacity of Bidder / its sub-vendor(s) and the proposed arrangement and may prescribe additional requirement before allowing manufacture of the equipment listed above for this contract.</p>		
5.0	PROVENNESS CRITERIA FOR ELECTRICAL EQUIPMENTS		
5.1	ISOLATED PHASE BUSDUCT		
5.1.1	<p>Bidder / Sub Vendor should have designed, manufactured, type tested, supplied, erected/ supervised erection and commissioned/supervised commissioning of Isolated Phase Busduct for a turbo-generator of at least 500MW, which should have been in successful operation for a period of not less than two (2) years.</p>		
	OR		
5.1.2	<p>(i) Bidder / Sub Vendor should have designed, manufactured, type tested, supplied, erected/ supervised erection and commissioned/ supervised commissioning of Isolated Phase Busduct for a turbo-generator of at least 200MW, which should have been in successful operation for a period of not less than two (2) years.</p> <p>(ii) Bidder / Sub Vendor has an on-going technical collaboration agreement with a party who in turn meets the requirements of 5.1 .1 above. Further in such an event the Bidder should furnish an undertaking jointly executed by it and its Associate or Collaborator, as per format, enclosed in the bidding document for the successful performance of the equipment. This Deed of Joint Undertaking should be submitted prior to the placement of order on approved Sub Vendor. In case of award, the Associate or Collaborator of the Bidder /Sub Vendor (as applicable) will be required to furnish an on demand Bank Guarantee for INR 2 Million (Indian Rupees Two Million only).</p>		
<p style="text-align: center;">EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-I (3X800 MW)</p>	<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION – VI, PART-A BID DOC. NO CS-9885-001-02</p>	<p style="text-align: center;">SUB-SECTION-IA PROVENNESS</p>	<p style="text-align: center;">PAGE 33 OF 54</p>

3X800 MW PATRATU TPS			REV-00,		
ANNEXURE-11: GUARANTEED POWER CONSUMPTION FORMAT					
Sl.No.	Description / Item	Quantity (working)	Power Consumption (KW) (at motor input terminal)	Duty Factor	Power Consumption (KW)
1	2	3	4	5	6 = 3 x 4 x 5
A)	Limestone slurry storage tank agitator	2	To be filled by Bidder	1	To be filled by Bidder
B)	Primary hydro-cyclone feed tank agitator	1	To be filled by Bidder	1	To be filled by Bidder
C)	Secondary hydrocyclone feed tank agitator	1	To be filled by Bidder	1	To be filled by Bidder
D)	Filtrate water Tank Agitator	1	To be filled by Bidder	1	To be filled by Bidder
E)	Waste Water Tank Agitator	1	To be filled by Bidder	1	To be filled by Bidder
F)			Total Guaranteed power (KW)		To be filled by Bidder
Notes					
1	Power consumption (KW) of motors shall be measured at motor input terminals when the system operating at the rated capacity.				
2	Total Estimated Power Consumption Figure for the above mentioned Agitators is considered as 270 KW which is to be treated as base power. Declared Guaranteed Power Consumption in this Format duly signed and stamped shall be submitted along with technical bid. Total GPC given by the bidder shall not exceed 270 kW failing which offer of bidder will not be considered for evaluation.				
3	Total power (@ S.No. F above) and not individual power quoted by bidder shall be termed as 'Guaranteed Power consumption' (GPC) and bidder shall be liable to demonstrate compliance to GPC value during PG test/ Demonstration test at site. If the actual power consumption exceeds 270 kW , liquidated damages shall be payable by the successful bidder at the rate of USD 3025 per KW excess power consumption over 270 kW. Such liquidated damages may be recovered by the BHEL by deduction from the contract price or by enforcing the contract performance guarantee or in any other manner deemed fit by the BHEL. Acceptable short fall limit for GPC <u>WITH LD</u> will be (+1%) of base power (270 kW)				
4	USD conversion rate shall be taken as defined in NIT.				