
TECHNICAL SPECIFICATION ROS: 9079
FOR WATER PUMPS
OF NTPC PROJECT

CONFIDENTIAL

CUSTOMER	: NTPC
PROJECT	: (3X200+4X500)MW KORBA
APPLICATION	: FLUE GAS DESULPHURIZATION SYSTEM



Water Systems

Bharat Heavy Electrical Limited

Ranipet – 632 406.

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD: WATER PUMP	
KORBA (3X200 + 4X500MW)	

TECHNICAL SPECIFICATION FOR WATER PUMPS

Department	Prepared	Checked	Approved
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ROS : 9079 Rev00: Dtd:28 Jun'21		COMMENTS : -----	

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KORBA (3X200 + 4X500MW)	

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1.0 PROJECT INFORMATION:

As per Annexure A, Clause 1.0

2.0 APPLICABLE CODES & REGULATIONS

The design and materials shall conform to the requirements of applicable codes and regulations of the latest edition. The design, manufacture, installation and testing of the pump shall follow the latest applicable Indian/International (ASME/EN/Japanese) Standards.

3.0 WATER ANALYSIS:

As per Annexure A, Clause 3.0

4.0 INTENT OF SPECIFICATION

This specification covers the minimum requirements for the complete design, material, manufacturing, shop inspection, testing at the manufacturer's works, supervision of erection & performance testing at bidder's works of water pumps along with accessories, which is furnished in the Flue Gas Desulphurization system. The following points may be noted.

- Each unit is envisaged with one FGD system. The details for the pumps is envisaged in the Annexure A.
- Bidder shall assume full unit responsibility for the entire equipment assembly and make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.
- In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), the same shall be separately listed in the Bidder's proposal under separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (Annexure-IV)".
- Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable.
- No deviation or exception shall be permitted without the written approval of the purchaser.
- Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.
- In case, the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, the same shall be recommended along with reasons in a separate section and include the same in scope of supply.
- All accessories, items of work, though not indicated but required to make the system complete for its safe, efficient, reliable and trouble free operation and maintenance shall also be in supplier's scope unless specifically excluded

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5.0 Scope of Supply & Services

1. All the pumps shall be supplied along with individual drive motor (IE3), Base Plate along with required isolations, Coupling, Coupling Guard, Drain Plug Vent Valves, Companion Flanges Foundation Bolt and Expansion Bellows (Neoprene) at inlet & outlet , Pressure gauges at inlet & outlet, Y – Type suction strainer & other accessories required for the smooth erection and commissioning of the pumps.
2. First Fill of Consumables, Oil & Lubricants shall be supplied alongwith the main supply.

6.0	TECHNICAL REQUIREMNTS											
1.	The pumps shall be designed for continuous operation. The pump shall be centrifugal type capable of delivering the rated flow at rated head as specified in the respective clauses.											
2.	The pump shall be provided with seals of proven type and shall be designed for minimization of seal water consumption. The shaft shall be supported on heavy duty ball/roller bearings.											
3.	All pumps shall be designed to withstand a test pressure of 1.5 times the maximum possible pump shut off pressure under maximum suction pressure conditions											
4.	The Pump flow/head characteristics shall be such that within the operation range the head will continuously increase with decreasing flow, maximum head (shut off head) being at least 15% higher than the duty point head.											
5.	Each pump will have a coupling of adequate size, designed for full load and capable of supporting start –Up an overload moment.											
6.	The Pump coupling motor and base frame shall be supplied in assembled condition. The Bidder at site without any implication shall assemble any items supplied loose.											
7.	Each rotating equipment shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).											
8.	Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation: <table><tr><td>Speed</td><td>Antifriction Bearing</td><td>Sleeve Bearing</td></tr><tr><td>1500 rpm and below</td><td>75.0 micron</td><td>75.0 micron</td></tr><tr><td>3000 rpm</td><td>50.0 micron</td><td>65.0 micron</td></tr></table>			Speed	Antifriction Bearing	Sleeve Bearing	1500 rpm and below	75.0 micron	75.0 micron	3000 rpm	50.0 micron	65.0 micron
Speed	Antifriction Bearing	Sleeve Bearing										
1500 rpm and below	75.0 micron	75.0 micron										
3000 rpm	50.0 micron	65.0 micron										
9.	The pumps shall be capable of starting with discharge valve fully open and close condition. Motors shall be selected to suit to the above requirements. Minimum motor margin (as per table below) shall be provided above maximum load demand of the pump in the entire operating range to take care of the system frequency variation and no case less than the maximum power requirement at any condition of the entire characteristic curve of the pump. Continuous Motor rating shall be at 50 deg.C ambient. Motor margin shall be as below											

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	<table border="1"> <tr> <th data-bbox="459 488 794 517">Pump rated BKW</th><th data-bbox="801 488 1177 517">Motor rating</th></tr> <tr> <td data-bbox="459 517 794 546"><22 kW</td><td data-bbox="801 517 1177 546">125% of pump rated BKW</td></tr> <tr> <td data-bbox="459 546 794 575">22 kW – 55 kW</td><td data-bbox="801 546 1177 575">115% of pump rated BKW</td></tr> <tr> <td data-bbox="459 575 794 604">>55 kW</td><td data-bbox="801 575 1177 604">110% of pump rated BKW</td></tr> </table>	Pump rated BKW	Motor rating	<22 kW	125% of pump rated BKW	22 kW – 55 kW	115% of pump rated BKW	>55 kW	110% of pump rated BKW
Pump rated BKW	Motor rating								
<22 kW	125% of pump rated BKW								
22 kW – 55 kW	115% of pump rated BKW								
>55 kW	110% of pump rated BKW								
10.	Make of the Bearings: SKF/FAG/ Equivalent subjected to customer approval.								
11.	Make of seal: Flowserve / Eagle Burgmann /Jone Crane / Equivalent subjected to customer approval.								
6.1	CONSTRUCTIONAL FEATURES								
	General:								
	The pumps shall be complete with drive motors, baseplate and other accessories. The constructional features of the pump shall be as follows: a). Pump casing may be radially split. The casing shall be of robust construction. Casing drain and vent connections shall be provided. (If applicable). b). Impeller shall be made in one piece and securely keyed to the shaft. Locking device shall be provided to prevent its loosening during all conditions of operation. c). Wearing rings shall be of renewable type. Opposed wearing surface shall be of hardened material and shall have a hardness difference of at least 50 BHN. d). Replaceable shaft sleeves shall be provided to protect the shaft where it passes through bearings and stuffing boxes. The end of the shaft sleeve assembly shall extend through the packing gland. Shaft sleeve shall be securely locked or keyed to the shaft to prevent loosening or rotation. Shaft and shaft sleeves shall be machined and assembled for concentric rotation. e). The design of the shaft shall take into consideration the critical speed, which shall be at least 20% more than operating speed. f). Pump bearings shall be of antifriction type. Bearings shall be readily accessible without disturbing the alignment of pump. g). Packed stuffing boxes shall be of sufficient length to prevent leakage along the shaft and shall be complete with all packing and lantern rings required. h). Pumps shall be furnished complete with an approved type of flexible - coupling. i). Couplings guards made of expanded metal and bolted to the base plate shall be furnished. j). The common base plate for pumps and motor shall be in one piece and shall be made of fabricated steel. k). Pump speed shall be less than 1500 rpm for pumps of capacity more than 10 m³/hr.								

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	l). The Pump shall be capable of developing the required total head at rated capacity for continuous operation. Also, the pumps shall be capable of being operated to give satisfactory performance at any point on the HQ characteristics curve. The operating range of the pump shall be 40% to 120% of the duty point unless otherwise mentioned elsewhere. The maximum efficiency of pump shall preferably be within $\pm 10\%$ of the rated design flow as indicated in data sheets. m). The total head capacity curve shall be continuously rising from the operating point towards shut-off without any zone of instability and with a minimum shut-off head of about 15% more than the design head. The power, head and flow characteristics of each pump shall be suitable for parallel operation. The Power characteristics of the pumps shall be of non-overloading type. All rotating parts of the pumps shall be statically and dynamically balanced. The motor shall be rated for continuous operation and confirm to companion electrical specification. However, motor rating shall not be less than the max. power demand throughout the entire range of operation of pump. Design duty point of pump shall match with the average value of maximum and minimum flow rates of the pump in the stable operation zone.
A)	Casing, Gland & Stuffing Box
a.	The material of the Casing, Gland & Stuffing Box shall be of <u>2.5 Ni Cast iron to IS 210 Grade FG260 or equivalent.</u>
b.	The casing and flanges shall be designed to withstand the maximum shut-off pressure developed by the pump.
c.	Lifting provision (Lugs) of pump should be provided.
B)	IMPELLER & Wearing Rings (As applicable)
a.	The Impeller & wearing Rings (as applicable) material shall be of <u>Stainless Steel 316</u> grade.
C)	SHAFT AND SHAFT SLEEVES
a.	All Shafts & Shaft Sleeves shall be of SS 410 grade. All Pump shafts shall be of ample size to transmit the maximum possible output from the prime mover.
b.	The pump shaft and coupling are to be so dimensioned that the maximum permissible torque of the shaft is higher than the maximum transmissible torque of the coupling.
c.	Shafts shall be conservatively designed to transmit maximum power required and to assure rigidity. Shafts shall be machined and ground to close tolerances and shall be tapered to permit easy removal of the seals and bearings.
D)	BASE PLATE

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a.	A common base plate (epoxy coated) shall be provided for pump assembly & Motor and the same shall be rigidly constructed, adequately braced and provided with finish pads for mounting pump.
b.	Suitable holes shall be provided for grouting and these shall be so located that the base plate can be grouted in place without disturbing the pump and motor.
c.	Common base plate for Pump and Motor shall be in the scope of the bidder.
d.	Base plate must be stress-relieved for any residual welding stress and certificate to that effect is to be submitted as per inspection requirement.
E)	BEARINGS
a.	The bearings may be ball, roller or sleeve bearing. If sleeve bearings are used these shall be machined for close running fit. The bearings shall be designed to take the necessary radial load as well as the net axial thrust
b.	Make of the Bearings: SKF/FAG/ Equivalent subjected to customer approval.
F)	ACCESSORIES:
1.	FASTENERS
I	All fasteners shall be SS316 only irrespective of wetted / non wetted parts.

6.2 POWER SUPPLY

1. POWER SUPPLY	
The following voltage levels shall apply:	
3 phase, 3.3 kV AC ,50 Hz	: Voltage for motors equal to / bigger than 200KW and for power distribution within the plant.
3 phase, 415 V, AC , 50 Hz	Standard voltage for power supplies to electric power consumers and motors Above 0.2 KW and upto 200 kW.
240V AC / 3 phase 415 V AC, 50 Hz	Standard voltage for power supplies to electric power consumers and motors Upto 0.2 kW.
1. All equipment's 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. 2. Bidder shall design and supply the equipment suitable for satisfactory operation under above mentioned power supply condition.	

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6.3	PACKING AND FORWARDING
1.	Proper packing to be ensured. Indigenous Supply: Pump & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the pump internals during storage in the outer yard of power plant.
2.	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.
3.	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.
4.	Crates and packing material used for shipping will become the property of owner.(NTPC)
5.	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.
6.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: - Destination - Package Number - Gross and Net Weight - Dimensions - Lifting places - Handling marks and the following delivery marking
7.	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.
8.	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping papers

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	shall clearly indicate in which packages the technical documents are contained.
9.	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.
10.	Wherever necessary besides usual inscriptions the cases shall bear special indication such as "Top", "Do not turn over", "Care", "Keep Dry" etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks)
11.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: - Upright position - Sling position and center of Gravity position - Storage category - Fragile components (to be marked properly with a clear warning for safe handling)
12.	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.
13.	The packing slip shall contain the following information: - Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of pump & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.
14.	Prior to transport from manufacturer's work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.
6.4	Motor
	Refer to technical specification TECI: LT MOTOR: REV 04; Date : 25.08.2020
7.0	EXCLUSION
	The following work associated with the water pumps will be by others: - Civil foundations - Walkways, platforms and ladders - Element handling hoists

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8.0	SPARES,TOOLS & TACKLES
8.1	START UP & COMMISSIONING SPARES
	Start-up & Commissioning Spares shall be part of the main supply of the Water pumps. Start-up & commissioning spares are those spares which may be required during the start- up and commissioning of the equipment/system. All spares required for successful operation till commissioning of pump shall come under this category. Bidder shall provide an adequate stock of such start up and commissioning spares to be brought by him to the site for the equipment erection and commissioning. The spares must be available at site before the equipments are energized. The List of such spares to be provided by bidders with their offer.
8.2	MANDATORY SPARES
	Bidder to quote for below mentioned mandatory spares with break up price as per Annexure A (Clause 6.0): Bidder shall quote for the Mandatory Spares List and it will be considered for L1 evaluation. Mandatory Spares Parts items shall be handed over separately and shall not be mixed with the supply of the main equipment parts. Spares shall be sent in pre-decided lots in containers/secure boxes. All boxes/containers are to be distinctly marked in red color with boldly written "S" mark on each face of the containers. Spares shall not be dispatched before dispatch of corresponding main equipment's. Each item shall be labelled in English and be packed against damage and sealed to prevent deterioration from corrosion.
9.0	DEFECT LIABILITY & WARRANTY
1.	The Bidder warrants that the equipments/items shall be free from defects in the design, engineering, materials and workmanship of the Plant and Equipment supplied and of the work executed. The Defect Liability Period shall be Twenty four (24) months from the date of delivery or eighteen (18) months from the date of commissioning, whichever first occurs. If during the Defect Liability Period any defect should be found in the design, engineering, materials and workmanship of the Plant and Equipment supplied or of the work executed by the Bidder, the Bidder shall promptly, in consultation and agreement with BHEL regarding appropriate remedying of the defects, and at its cost, repair, replace or otherwise make good (as the Bidder shall, at its discretion, determine) such defect as well as any damage to the Facilities caused by such defect.
2.	In case of failure of the equipment to meet the guarantee, NTPC/BHEL reserves the right to reject the equipment. However, NTPC/BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement .

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10.0	PERFORMANCE GUARANTEE
	All performance tests for Water pumps shall be carried out in accordance with any latest international codes/standards. 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the water pumps and its accessories 2) Bidder shall guarantee and demonstrate the rated capacity of the pump at the rated head. 3) Noise level-≤85 dB (A) at 1m horizontal distance from equipment/enclosures and 1.5m above operating floor is to be guaranteed. 4) Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions. 5) Acceptance tests to be carried out as per the procedure defined by the bidder, which shall be submitted for customer approval. 6) In the event that the performance test is unsuccessful, bidder shall take necessary remedial action at his cost and the performance test shall be repeated.
11.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
	As per Annexure A Clause 7.0
12.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
	As per Annexure A Clause 8.0
13.0	DOCUMENTATION
A	DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER
	The Bidder shall submit all documents, drawings, diagrams and all such information, which are necessary to fully understand the offer for techno – commercial evaluation as per Annexure-III A. Annexure-III documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.
B	DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT
	The Successful bidder shall submit necessary data, documents and drawings for review, approval as specified under Annexure-III B . All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by NTPC must be furnished by bidder in soft and hard copy forms. Unless agreed otherwise, Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language. Electronic Copies shall be submitted in primary original data format (e.g. DOC, XLS, DWG) as well as in a printable non-proprietary document format (e.g. PDF). However all the engineering related information shall be furnished in soft form to BHEL.

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14.1

ANNEXURE

Sl. No	Description	Data
1.	Rated capacity of pump m ³ /hr	:
2.	Total head at design capacity M	:
3.	Guaranteed shaft power consumption at rated capacity & head kW	:
4.	Noise level at a distance of 1.0 meter from the equipment at site and 1.5 m above operating floor dB(A)	:
5.	Maximum vibration (peak to peak amplitude at site) microns	:
6.	Equipment Availability (%)	:
7.	Pump Efficiency (%)	:

SIGNATURE OF BIDDER

NAME

DESIGNATION

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14.2	ANNEXURE-II - LIST OF DEVIATIONS/EXCEPTIONS TO THE ENQUIRY DOCUMENT
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SI No	Clause No	Page No	Description of Deviation

Note: Enlarge the table to incorporate items

SIGNATURE OF BIDDER

NAME

DESIGNATION

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14.3	ANNEXURE-III
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A) DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER

Sl. No.	Description	No of copies With proposal
1.	Specification duly signed and seal on each	1
2.	Anchor Plan & Civil foundation Loading	1
3.	GA drawings of pump assembly	1
4.	Data Sheet	1
5.	Performance curve	1
6.	Test Arrangement & Test procedure	1
7.	Reference plant details	1
8.	Required Electric power & other Utility List	1
9.	Deviation List	1
10.	Scope of Supply	1
11.	Start-up & Commissioning Spares	1

SIGNATURE OF BIDDER

NAME

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B) DOCUMENTS TO BE SUBMITTED AFTER CONTRACT:

Sl. No.	Description	No of copies After award of contract	Delivery Time
1.	Utility Consumption	1	2 weeks after contract
2.	Foundation Data including Anchor plan	1	2 weeks after contract
3.	Performance curve	2	2 weeks after contract
4.	GA Drawing	1	1 month after contract
5.	Cross section detail drawing	1	1 month after contract
6.	Data Sheet	1	2 weeks after contract
7.	Lubricating Chart	1	2 months after contract
8.	Installation and assembly procedure	1	4 months after contract
9.	Inspection Certificate	1	In 2 weeks after test
10.	Manufacturing Schedule	1	2 weeks after contract
11.	Proforma Packing List	1	2 months prior to
12.	Pump and Motor Sizing Calculation	1	2 weeks after contract
13.	Material Test Certificates	2	In 2 weeks after test
14.	Pre Commissioning Check	2	4 months after contract
15.	Quality Plan	4	1 month after contract
16.	Operation and Maintenance Manual	• 10 hardcopies and 5 electronic copies in English	4 months after contract
17.	Start-up & Commissioning	2	1 month after contract
18.	Test Arrangement & Test procedure	2	1 month after contract

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

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14.4	ANNEXURE-IV : TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING
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Applicable for Import Supply

Refer to Specification No: PE-TS-888-100-A001 for detailed specification on Seaworthy packing

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

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14.5 Annexure-V: Data Sheet to be filled by vendor: (to be filled by bidder for each pump)

Sl. No	Description	Value		
TECHNICAL DETAILS				
1	Make			
2	Model			
3	Application			
4	Design Flow at Rated Speed (m3/hr)			
5	Minimum & Maximum Continuous Flow (m3/hr)			
6	Total Discharge Head @ design flow MWC			
7	Shut off Head @ MWC			
8	NPSH required (minimum) @ MWC			
9	Hydraulic test pr.@ Kg/Sq. Cm			
10	Pump efficiency -			
10.1	At design point %			
10.2	At maximum flow %			
11	Pump shaft power reqd. at design point @ KW			
12	Maximum shaft power required @ KW			
13	Selected motor @ KW			
14	Rated speed & critical speed @ rpm			
15	GD2 of the pump @ kgm2			
16	Operating flow range from design point % : + -			
17	Noise level at duty range dBA at 1.0 m distance			
18	Vibration level -			
18.1	Displacement microns			
18.2	Velocity (Peak) mm/sec			
19	Balancing quality as per ISO 1940 std. .			

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20	Rotation of shaft viewing from drive end			
21	Tolerance on head and efficiency at rated speed and flow.			
CONSTRUCTIONAL DETAILS				
1.0	Suction / Discharge nozzle			
1.1	Size mm			
1.2	Rating psi			
1.3	Flange drilling standard			
1.4	Nozzle Orientation looking from DE			
2.0	Material of construction / make			
2.1	Pump casing			
2.2	Impeller			
2.3	Shaft			
2.4	Shaft sleeve			
2.5	Wear rings			
2.6	Diffuser			
2.7	Mechanical seal			
2.8	Bearing housing			
2.9	Fasteners			
2.10	Others if any			
3.0	No. of stage			
3.1	Impeller type			
3.2	Impeller diameter Trimmed / Untrimmed			
4.0	Bearings			
4.1	Type			
4.2	Make			
4.3	Lubrication Oil - Specification			
4.4	Lub. Oil Quantity / pump Litre			
5.0	Mechanical seal			
5.1	Type			
5.2	Make			
5.3	Model			
5.4	Drawing No			
6.0	Performance curve references No.			
7.0	Foundation Draws No.			
7.1	Pump Dimension L x W x H in mm			
7.2	Pump Weight in Kg			

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD: WATER PUMP	
KORBA (3X200 + 4X500MW)	

COUPLING				
1.0	Type			
2.0	Make , Model No			
3.0	Coupling guard Material			
4.0	Dimension detail with BOM enclosed			
5.0	Weight in Kg			
BASE FRAME AND ACCESSORIES				
1.0	Material			
2.0	Dimension detail in mm			
3.0	Weight kg :			
GENERAL				
1.0	Shipping package dim. in mm			
2.0	Total assembly weight in Kg			
3.0	Total shipment weight in Kg			

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

ANNEXURE A

FOR

WATER PUMPS

OF NTPC PROJECT

(As reference to Tech. Spec. ROS 9079)

CONFIDENTIAL

CUSTOMER : NTPC

APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM

PROJECT : (3X200+4X500) MW KORBA STG-I&II



Water Systems

Bharat Heavy Electrical Limited

Ranipet – 632 406.

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

CONTENTS

1.0	PROJECT INFORMATION
2.0	PROVENNESS CRITERIA:
3.0	WATER ANALYSIS
4.0	PUMP DETAILS
5.0	PAINTING PROCEDURE
6.0	MANDATORY SPARES
7.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
8.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
9.0	WATER TANK LEVEL
10.0	NOISE
11.0	PACKING & FORWARDING

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC : FGD : WP : KORBA : ANNEXURE –A	

1.0 PROJECT INFORMATION:

a.	Owner	NTPC
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization
d.	Site Location	Korba District of Chhattisgarh State (India)

A) SITE CONDITIONS

1. Ambient Temperature and Relative Humidity		
Average Site Condition ASC		
Ambient Temperature	:	32 deg C
Ambient Temperature (Design)	:	49 deg C
Relative Humidity	:	89 %

B) PROJECT LOCATION AND APPROACH

a	Site Address	BHEL SITE OFFICE KORBA (3x200+4X500MW) NATIONAL THERMAL POWER CORPORATION, Korba District of Chhattisgarh State (INDIA) EPC-CONTRACTOR- BHARAT HEAVY ELECTRICALS LIMITED, INDIA
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	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

2.0 PROVENNESS CRITERIA:

Bidder should have previous experience of design, manufacture, supply, erection and commissioning / supervised erection & commissioning of the Water Pumps as per criteria given in table below and the water pump(s) should have been in successful operation for a period not less than One (1) year prior to Part-I (Techno-commercial) bid opening date”

Sl. No.	Name of Equipment	Type of Equipment	Equipment Rating
1	Water Pumps	Centrifugal pump	80% of the flow & 100% of the head of the offered water Pump(s)

The Bidder shall offer only proven design, which meets the Proveness criteria indicated above. Necessary documentary evidences as per Annexure-I for qualification shall be submitted along with the bid. If bidder does not meet the specified Provenness criteria, they are denied to participate in this tender.

a) REFERENCE LIST as per format shown below

S. No.	Project Name , Customer & Plant capacity	Flow	Head	Motor KW	Qty	Year of Commg	Performanc e Certificate/ Documentar y Evidence
1.							to be enclosed
2.							to be enclosed

SIGNATURE OF BIDDER

NAME

DESIGNATION

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
	NTPC:FGD:WP: KORBA:ANNEXURE-A

3.0 WATER ANALYSIS:

Process water is envisaged for Emergency Quenching. Process water analysis is provided below

S.no	Constituents	Unit	PROCESS WATER
1.	Calcium as CaCO ₃	ppm	153.6
2.	Magnesium as CaCO ₃	ppm	42
3.	Nitrate as CaCO ₃	ppm	0
4.	Chlorides as CaCO ₃	ppm	45
5.	Sodium+Potassium as CaCO ₃	ppm	75
6.	Silica as SiO ₂	ppm	33
7.	Sulphate as CaCO ₃	ppm	118.5
8.	Iron as fe	ppm	1.0
9.	Total Cations as CaCo3	ppm	270.6
10.	Total Anions as CaCo3		270.6
11.	Carbonates as CaCO ₃	ppm	0
12.	pH		7.8-8.2
13.	Bicarbonates as CaCO ₃	ppm	107.1
14.	Turbidity	NTU	60

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

4.0 PUMP DETAILS:**i). For 3X200MW Korba –**

Sl.No	Description	Unit	Process water Pumps	Mist eliminator Wash & Emergency Quench pumps
1.	Number of pumps	Nos	1W + 1S	1W + 1S
2.	Drive Motor		Included in the bidder's scope of supply. The motor make is subjected to customer approval.	
3.	Head of the pump	m	50	65
4.	Capacity of the Pump	m3/ hr.	200	151
5.	Coupling		Direct drive	Direct drive
6.	Type of Pumps		Horizontal centrifugal	Horizontal centrifugal
7.	Specific Gravity	--	1	1
8.	Viscosity	Pa-s	0.003	0.003
9.	Fluid medium	---	Process water	Process water
10.	Water Characteristics		As per Clause No: 3.0	As per Clause No: 3.0
11.	Mode of operation	--	Continuous	Continuous
12.	Maximum operating temperature	°C	45	45
13.	Maximum operating speed	rpm	Vendor to Specify	Vendor to Specify
14.	Service	---	Outdoor. Pump along with motor to be supplied with Canopy.	Outdoor. Pump along with motor to be supplied with Canopy
15.	Casing, Gland and stuffing Box		2.5 Ni Cast Iron to IS 210 Grade FG 260 or equivalent	
16.	Impeller (Wear Rings, as applicable)		Stainless Steel-316 grade	
17.	Shaft & Sleeves		Stainless Steel-410	
18.	Sound (maximum)	dB	85 @ 1m distance	
19.	Pump (η)	%	75 %(min.)	75 %(min.)
20.	Auxiliary Power at motor input terminal	KW	37.9	38.0

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

ii). For 4X500MW Korba -

Sl.No	Description	Unit	Process Water Pumps	Mist eliminator Wash & Emergency Quench pumps
1.	Number of pumps	Nos	4W + 4S	4W + 4S
2.	Drive Motor		Included in the bidder's scope of supply. The motor make is subjected to customer approval.	
3.	Head of the pump	m	50	65
4.	Capacity of the Pump	m3/ hr.	140	151
5.	Coupling		Direct drive	Direct drive
6.	Type of Pumps		Horizontal centrifugal	Horizontal centrifugal
7.	Specific Gravity	--	1	1
8.	Viscosity	Pa-s	0.003	0.003
9.	Fluid medium	---	Process water	Process water
10.	Water Characteristics		As per Clause No: 3.0	As per Clause No: 3.0
11.	Mode of operation	--	Continuous	Continuous
12.	Maximum operating temperature	°C	45	45
13.	Maximum operating speed	rpm	Vendor to Specify	Vendor to Specify
14	Service	---	Outdoor. Pump along with motor to be supplied with Canopy.	Outdoor. Pump along with motor to be supplied with Canopy
15	Casing, Gland and stuffing Box		2.5 Ni Cast Iron to IS 210 Grade FG 260 or equivalent	
16	Impeller (Wear Rings, as applicable)		Stainless Steel-316 grade	
17	Shaft & Sleeves		Stainless Steel-410	
18	Sound (maximum)	dB	85 @ 1m distance	
19	Pump (η)	%	75 %(min.)	75 %(min.)
20	Auxiliary Power at motor input terminal	KW	26.6	38.0

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC : FGD : WP : KORBA : ANNEXURE –A	
6.0	MANDATORY SPARES
	Bidder to quote for below mentioned mandatory spares with break up price : 1. Complete Impeller Assembly - 1 nos for each type & size. 2. Casing Wear Rings - 1 set for each type. 3. Bearings - 1 Set 4. Motor- 1 No. of each type Note: Any change in size material design etc. that obviates one to one replacement of the part shall be considered a different type. Unless otherwise stated a set shall mean complete replacement for one equipment.
7.0	BID EVALUATION CRITERIA FOR POWER CONSUMPTION:
1.	POWER GUARANTEE: Bidder to specify the guaranteed power consumption at motor input terminal per Pump operating at the duty point in their offer.
2.	BID EVALUATION CRITERIA FOR POWER CONSUMPTION: Power loading is applicable for the following Pumps 1) Process water Pump 2) Mist Eliminator wash. In case, Guaranteed Shaft power offered by the bidder exceeds the base value specified (Auxiliary Power at motor Input as per clause 4.i.19 & 4.ii.19), his bid price will be loaded for excess power consumption as per the formula given below. Adjustment factor for excess power consumption in USD = $(GPC-BV) \times PL \times$ No's of Working pumps. Exchange rate as applicable on price bid opening date will be considered GPC- Guaranteed Power Consumption quoted by bidder in KW BV- Base Value for Guaranteed Power Consumption in KW PL- Power Loading per KW shall be 191,661 INR
8.0	LIQUIDATED DAMAGES FOR POWER CONSUMPTION
	If actual shaft Power Consumption during prove out (or) PG Test operating at the duty point exceeds the value guaranteed by the bidder, liquidated damages for shortfall in performance shall be deducted from contract price as per the formula given below

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

	Liquidated damage deductible in USD = (APC-GPC) X P X Total No's of Working pumps Where • GPC- Guaranteed Power Consumption quoted by bidder in KW • APC- Actual Power Consumption in KW • P- Penalty per KW : 191,661 INR Contractor's aggregate liability to pay liquidated damages for failure to attain the functional guarantee shall not exceed twenty five percent (25%) of the Contract Price.
--	--

SIGNATURE OF BIDDER _____

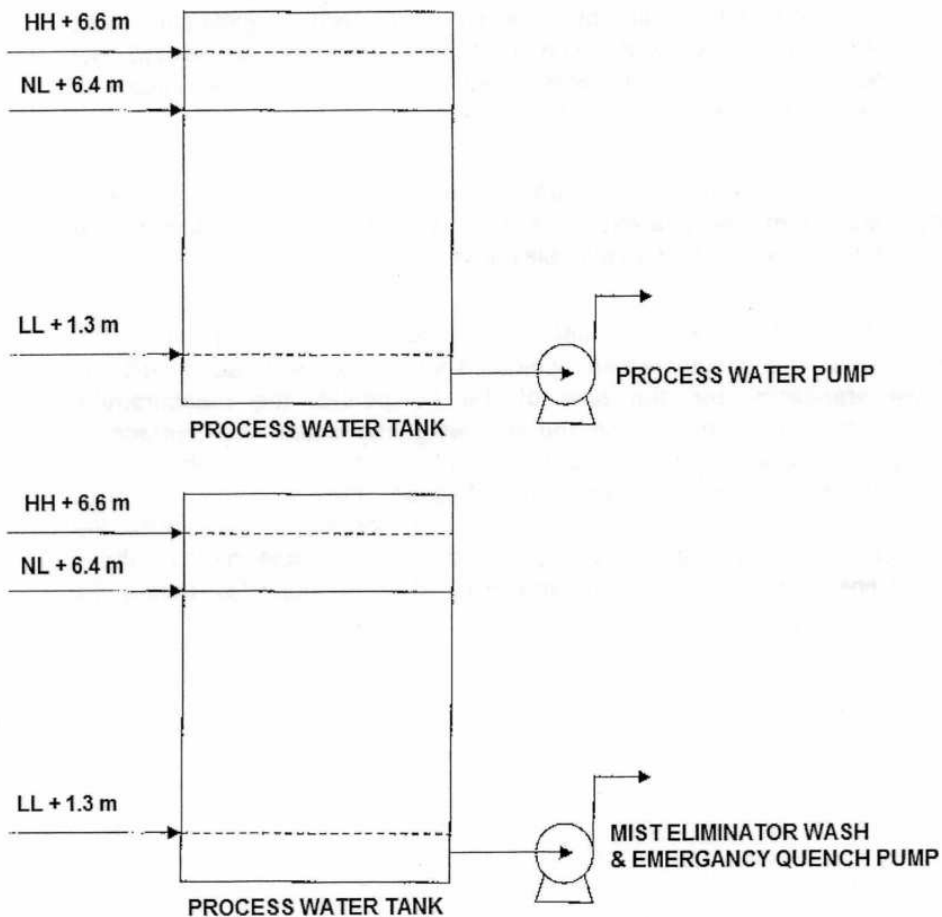
NAME _____

DESIGNATION _____

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
	NTPC:FGD:WP: KORBA:ANNEXURE-A

9.0 TANK WATER LEVEL

Process water Tank Level is provided below:-



SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

10.0 Noise

Noise level measurement shall be carried out using applicable and internationally acceptable standards. The measurement shall be carried out with a calibrated integrating sound level meter meeting the requirement of IEC 651 or BS 5969 or is 9779.

Sound pressure shall be measured all around the equipment at a distance of 1.0 m horizontally from the nearest surface of any equipment/ machine and at a height of 1.5 m above the floor level in elevation.

A minimum of 6 points around each equipment shall be covered for measurement. additional measurement points shall be considered based on the applicable standards and the size of the equipment. the measurement shall be done with slow response on the a - weighting scale. the average of a-weighted sound pressure level measurements expressed in decibels to a reference of 0.0002 micro bar shall not exceed the guaranteed value. corrections for background noise shall be considered in line with the applicable standards. all the necessary data for determining these corrections, in line with the applicable standards, shall be collected during the tests

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____

	TECHNICAL SPECIFICATION FOR WATER PUMPS –NTPC
NTPC:FGD:WP: KORBA:ANNEXURE-A	

11.0	PACKING AND FORWARDING
1.	Each Package or shipping units shall be marked or stenciled on at least two sides as Pre Annexure A. BHEL SITE OFFICE KORBA (3x200+4X500MW) NATIONAL THERMAL POWER CORPORATION, Korba District of Chhattisgarh State (INDIA) EPC-CONTRACTOR:- BHARAT HEAVY ELECTRICALS LIMITED, INDIA In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.

SIGNATURE OF BIDDER _____

NAME _____

DESIGNATION _____



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TECI: LT MOTOR: REV 04
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DOCUMENT TITLE : TECHNICAL SPECIFICATION FOR BOUGHT OUT ITEMS				
ITEM : LT MOTOR				
PROJECT : BHEL STANDARD				
	NAME	DESIGNATION	SIGNATURE	DATE
PREPARED BY	ALAN S G	ET		25/8/20
REVIEWED BY	NAZEER AHAMED T M	DGM		25/8/20
APPROVED BY	JEYAMURUGANAND M	AGM		25/8/20
ISSUED BY		EDC – ECI		
RECORD OF REVISIONS:				
REVISION NUMBER 00		INITIAL RELEASE - Dt. 19.03.2013		
REVISION NUMBER 01				
REVISION NUMBER 02		Cl. No: 5- Packing and Drawing included		
REVISION NUMBER 03		Cl. No: 2.20, 2.21, 2.38, 2.39, 2.43 added		
REVISION NUMBER 04		Cl.No: 2.3, 4(b) - ECI:DATASHEET:LTMOTOR:00 added		

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	<u>SPECIFICATION</u>	<u>VENDOR COMPLIANCE/REMARKS</u>
1	<u>SITE CONDITIONS</u>	
1.1	Altitude above mean sea level	>1000 m.
1.2	Ambient temperature condition	6 to 50°C.
1.3	Relative humidity	100%
1.4	Atmosphere	Tropical, Dusty, salty, corrosive & highly polluted as in a coal based Thermal power plant.
2	<u>GENERAL</u>	
2.1	Reference standards	IS 15999, IS 12615, IS/IEC-60034, IS 1231, IS 6362, IS 2253, IS 12065, IS 12075
2.2	Design ambient	50 Deg.C
2.3	Application/ Type(Normal/ Energy efficient)	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS
2.4	Duty cycle	Continuous S1
2.5	Rated voltage, frequency & Phases	415 V AC $\pm 10\%$; 50 Hz (+5% to -5%); 3 phase
2.6	Combined variation of Voltage and frequency	10% absolute sum
2.7	Motors efficiency class	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS
2.8	Minimum starting voltage	80% of the rated voltage
2.9	Minimum voltage under which motor will run satisfactorily	75% of the rated voltage for 5 minutes
2.10.	Capacity to restart (at specified voltage)	i. Two successive starts from cold condition ii. Two HOT restarts starts from Hot condition iii. Three equally spread start per hour
2.11	High speed bus transfer withstand capability	Suitable to withstand 150 % of rated voltage
2.12	Type of balancing for rotor	Dynamic balancing
2.13	Direction of rotation	Suitable for both direction
2.14	Direction of cooling air	Non-drive end to driving end
2.15	Class of insulation	Class F with temperature rise limited to Class B.
2.16	Winding treatment	The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid & tropical climate.
2.17	Allowed winding temperature rise at continuous full load	60°C by thermometer method & 70°C by resistance method
2.18	Accelerating Torque at minimum permissible Starting voltage	10% of full Load Torque

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2.19	Pullout Torque at rated voltage	205% of full load torque	
2.20.	Ratio of Locked rotor KVA to KW for	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.21	Starting current	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.22	Starting time & locked rotor withstand time	The locked rotor withstand time (LRWT) at 110% rated voltage (RV) under HOT condition shall be at least 2.5 sec more than the starting time at 80% of rated voltage for motors with acceleration time upto 20 sec at RV and 5 sec where the accelerating time is more than 20 sec at RV.	
2.23	Momentary overload withstand capability	60% of full load torque for 15 second without any damage.	
2.24	Over speed withstand	120% of rated speed for 2 minutes without any mechanical damage.	
2.25	Hot thermal withstand curve	margin of at least 10% over the full load current	
2.26	Cooling	Totally enclosed fan cooled- IC 411(TEFC)	
2.27	Vibration	The peak amplitude of vibration shall be as per IS 12075	
2.28	Noise level	Within the limits specified by IS 12065 / <85 dB at 1 meter distance from motor.	
2.29	Type of enclosure	TEFC, IP 55 as per IS/IEC 60034-5	
2.30.	Type of mounting	Horizontal foot mounted.	
2.31	Bearings	Ball or roller type / bearings effectively sealed against ingress of dust. The bearing shall be so constructed that the loss of lubricating grease is kept to minimum. Sealed bearings are also acceptable	
2.32	Lubricant Type	Grease	
2.33	Bearing life	minimum life of 40000 Working hours	
2.34	Shaft extension	Key slotted bare shaft extension with key at the driving end.	
2.35	Terminal box Type	Weather proof IP 55 as per IS/IEC 60034-5; Capable of being turned through 360° in steps of 90°.	
2.36	Cable gland and lugs	Double compression type nickel plated brass cable glands and insulated tinned copper crimping lugs to suit the cable size i) Size of power cables will be intimated after PO. ii) For space heater cable glands and lugs suitable for 2CX2.5 to be provided	

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2.37	Type of terminals	Stud / screw type with plain washers, spring washers / checknuts & lugs	
2.38	Min.Spacing between Gland plate and Center stud(in mm)	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.39	Phase to Phase/Phase to Earth air clearance(in mm) in Terminal Box	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.40.	Fault level	50KA for 1Sec	
2.41	Painting	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.42	Space heaters:		
2.42.a	i) Motors above 30 kW	Separate space heater suitable for 240V, Single Phase, AC,50 Hz	
2.42.b	ii) Motors below 30 kW	Winding shall be suitable for heating at 24 V, Single phase, AC,50 Hz	
2.43	Terminals for space heater	As per the document LT MOTOR:PROJECT SPECIFIC DETAILS	
2.44	RTD for winding	Two numbers of Thermistors / RTD for each phase as below are to be provided A. Motors above 37 Kw shall have thermistors Or RTD if specifically called for in enquiry. B. Motor rated 160kW and above shall have RTDs	
2.45	Bearing RTD	For motors 132 Kw and above	
2.46	Terminals for RTD/ Thermistor	Thermistors/ RTDs shall be terminated in a auxiliary terminal box. Details shall be furnished in TB diagram.	
2.47	Earthing	Two no of earthing provisions on terminal box and on motor body(on opposite sides)	
2.48	Name plate	As per IS/IEC 60034-8 and Additional data on name plate: a. Bearing DE/ NDE details. b. Year of manufacture	
2.49	Lifting Device	Eye bolt or lugs to facilitate safe lifting	
3	INSPECTION & TESTING	As per applicable quality plan	

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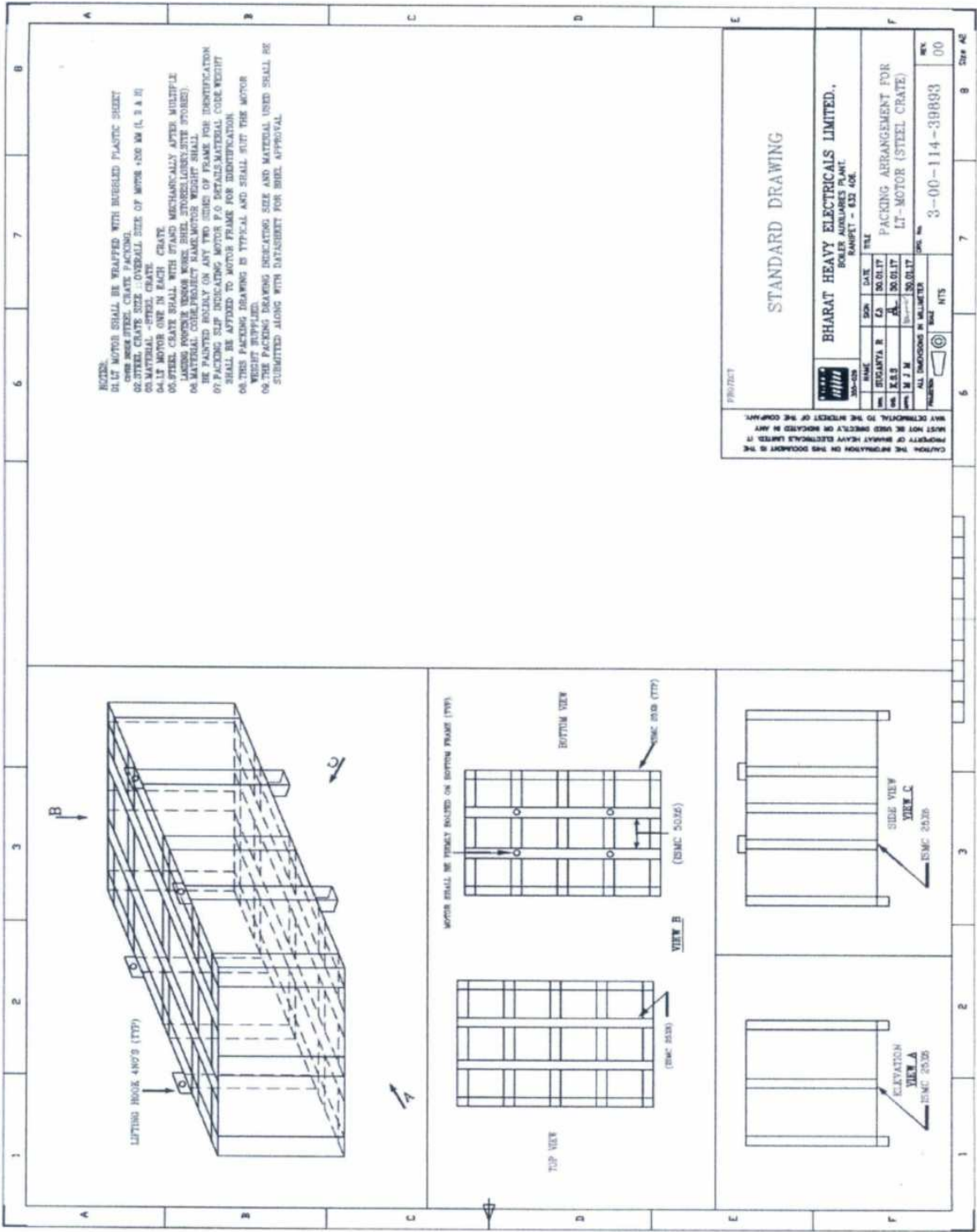
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4 DOCUMENTS

a) Along with offer:	One set of technical data sheet as per the enclosed format and Motor general arrangement drawing giving foundation details, shaft details.	
b) After placement of Purchase order (within 15 days)	Three sets of the following for approval: 1. Technical Data sheet as per the enclosed format ECI:DATASHEET:LTMOTOR:00 2. Motor general arrangement drawing giving foundation details, shaft details and weight 3. Motor Terminal box arrangement drawing 4. Motor characteristic curves : Torque vs Speed with load curve superimposed Speed vs Current Time vs Current Thermal with stand curve Load vs Efficiency Load vs Slip Load vs Power factor Speed vs Time Load vs Current 5. Steel crate packing drawing. The following shall be submitted: 1. Guarantee certificate. 2. O & M manuals. 3. Acceleration time and LRWT calculation shall be submitted for review.	
5 <u>PACKING</u>	a) As per Drawing No:- 3-00-114-39893 b) The packing shall meet the Transport, Environment & Storage hazards. c) As per Packing Procedure QA:CI: STD:PR:03 or as per Manufacturer's Standard Practice subject to approval.	

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ECI: DATASHEET: LTMOTOR: 00

TECHNICAL DATA SHEET OF LT MOTOR

P.O No:

DATA SHEET - Customer No: Project:

CL.NO	CHARACTERISTICS	VENDOR DATA(To be filled by Vendor)
1.0	Application	
1.1	Fan / Load Curve referred	
2.0	Manufacturer	
3.0	Type & frame size	Normal/ Energy efficient Frame size:
3.1	Degree of Protection	IP55
4.0	Rated output in kW	
4.1	Rated speed	
5.0	Rated voltage , frequency & phases	415 V $\pm$ 10% AC; 50 Hz $\pm$ 5%; (Check voltage as per Enquiry) 10% absolute sum; 3 phase
6.0	Full load current	Amps
7.0	Energy efficient	As per IS 12615
8.0	Efficiency & power factor at Full load	Eff- Pf-
9.0	Efficiency & power factor at 75 % load	Eff- Pf-
10.0	Efficiency & power factor at 50 % load	Eff- Pf-
11.0	Duty Cycle	SI - Continuous
12.0	Rated torque	
13.0	Starting current	As per IS standards
14.0	No load current (with mechanism coupled)	(at Rated.V and Frequency)
15.0	Starting torque in % of full load torque	
16.0	Pull up torque in % of full load torque	
17.0	Pull out torque in % of full load torque	

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18.0	No load starting time (without mechanism coupled)	
19.0	Locked rotor withstand time at rated voltage	a.Hot b.Cold
20.0	Locked rotor withstand time at minimum starting voltage	a.Hot b.Cold
21.0	Locked rotor withstand time at 110% rated voltage	a.Hot b.Cold
22.0	Starting time at minimum starting voltage with mechanism coupled	
23.0	Starting time at rated voltage with mechanism coupled	
24.0	Maximum permissible starting time	
25.0	Stator thermal time constant	Minutes
26.0	Type & No of terminals brought out	
27.0	Stator winding connection	Delta / Star
28.0	Class of insulation & temperature rise	Class F; 60°C by thermometer method / 70°C by resistance method.
29.0	Minimum permissible starting voltage	Volts
30.0	Resistance per phase at 20Deg C (Indicative)	Ohms
31.0	No of successive starts in Hot condition	
32.0	Quantity and power consumption of space heater	Quantity: Watts:
33.0	Direction of rotation	Bi-Directional.
34.0	Bearing make & type	Make: Drive End: Non Drive End:
35.0	Lubricant quantity grade & recommended interval of lubrication	

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36.0	Type of mounting & shaft orientation	Foot mounting; Horizontal.
	<u>Terminal Box</u>	
37.0	Location & angle of rotation	
38.0	Gland size for stator winding	
39.0	Gland size for space heater	Suitable for 2CX2.5 sq.mm (armoured), if applicable.
40.0	Cable entry	
41.0	GD ² of motor (kg-m ²)	
42.0	Total weight of motor (kg).	
43.0	Weight of stator (kg)	
44.0	Weight of rotor (kg)	
45.0	Anticipated bearing life in Hours	
46.0	Method of connection to driven equipment	
47.0	Limiting rotor temperature for determining safe stall time	
48.0	RTD for winding/ Bearing	Applicable: YES ☐ NO ☐
49.0	Grade of balance of motor	
50.0	Standard continuous rating at 40 Deg C ambient.	
51.0	Derated rating of motor at 50 Deg C.	
52.0	a. Locked Rotor KVA	
	b. Ratio of Locked rotor KVA / Rated KW	
53.0	a. Motor Dynamic Load	Upward/ Downward—
	b. Motor Static load	Upward / Downward—
54.0	PAINT SHADE	

Vendor's signature and seal

Rev No :

Date :

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The following curves are to be enclosed during datasheet approval.

1. GA drawing , Terminal box arrangement
2. Torque Vs Speed with load curve superimposed.
3. Speed Vs Current
4. Time Vs Current
5. Thermal with stand curve
6. Load Vs Efficiency
7. Load Vs Slip
8. Load Vs Power factor
9. Speed Vs Time
10. Load Vs Current.

The following information shall be specifically provided for motors suitable for VFD drive (if called for in eqny during datasheet approval in addition to datasheet.

1. Stator Resistance
2. Stator leakage reactance
3. Magnetising reactance
4. Rotor resistance referred to stator
5. Rotor reactance referred to stator

Vendor's signature and seal.

Date

Additional Sheet

LT MOTOR: PROJECT SPECIFIC DETAILS

INDENT NO: RFW11195 & RFW11196

PROJECT: NTPC KORBA(3x200+4x500M W)

Customer No: G205 to G207 & G505 to G508

ENERGY EFFICIENT	IE3
SUPPLY	Supply: 415V + 10%, 3 Phase, 50 Hz, +3% & -5%. System fault level of 50kA rms for 1s
STARTING CURRENT	As per IS 12615
RATIO OF LOCKED ROTOR KVA TO KW	
i) 50KW to 110KW	11
ii) 110KW to 200KW	9
MIN. SPACING BETWEEN GLAND PLATE AND CENTER STUD(IN MM)	
upto 3KW	As per manufacturer's practice
above 3KW and upto 7KW	85
above 7KW and upto 13KW	115
above 13KW and upto 24KW	167
above 24KW and upto 37KW	196
above 37KW and upto 55KW	249
above 55kw and upto 90KW	277
above 90KW and upto 125KW	331
above 125KW and upto 200KW	203
PHASE TO PHASE/ PHASE TO EARTH AIR CLEARANCE(IN MM) IN TERMINAL BOX	
upto 110	10
above 110kw and upto 150KW	12.5
above 150KW	19
ADDITIONAL DATA TO BE INCLUDED IN DATASHEET	
GRADE OF BALANCING OF MOTOR	
STANDARD CONTINUOUS RATING AT 40DEG.C AMBIENT	
DERATED RATING OF MOTOR AT 50DEG.C(DSIGN POINT)	
NO LOAD CURRENT OF MOTOR AT RATED VOLTAGE AND FREQUENCY	
STARTING TORQUE VALUE IN KGM	
LOCKED ROTOR KVA @ RATED KW	
POWER FACTOR AND EFFICIENCY AT 75% LOAD	
POWER FACTOR AND EFFICIENCY AT 50% LOAD	
SPACE HEATER TERMINAL	Separate terminal box shall be provided
PAINTING	RAL 5012

ANNEXURE-IV

ANNEXURE-VI- Seaworthy Packing Specification

VOLUME IIB

**TECHNICAL SPECIFICATION
FOR
SEAWORTHY PACKING FOR EXPORT JOBS**

SPECIFICATION NO. PE-TS-888-100-A001



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI, INDIA**

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
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1.0 Purpose

The purpose of this specification is to describe minimum packing requirements for the different items/equipment for all export Project and also to define marking and shipping requirements during transportation by ship, road and air for all export jobs.

2.0 SCOPE

For export jobs, sea worthy packing capable of performing all necessary functions like prevention of damage to the contents, sufficient to support frequent handling and lengthy period of outdoor storage in adverse weather conditions are required. Workmanship and materials used shall be of high standard meeting the technical requirements and in accordance with best commercial export packing practices. Vendor shall be responsible for sea worthy export packing, however it shall meet the minimum requirements specified herein. Equivalent or better packing methods may be deployed subject to approval of the BHEL/Purchaser. Vendor shall submit the packing procedure for its equivalent for purchaser's approval during detailed engineering.

The scope this specification is to define VENDOR's responsibilities in terms of:

- Preservation of the GOODS/items/equipments before packing.
- Packing of the GOODS for road, rail, sea and/or air transportation to desired destination i.e. project site
- Making cases/crates
- Chemical Treatment/Fumigation before packing to prevent fungus, damage due to termite, borer, rats, etc.
- Marking of cases/crates.
- Other Services required.

3.0 Application

This specification is applicable to all the goods to be transported to project site and requires to be in transit for longer duration. *However, for "Misc cable erection items", "Fire sealing system" & "Exothermic welding material", the packing requirements shall be as per the procurement specification.*

4.0 Definitions

- "BHEL" : Main EPC vendor
- "OWNER" : Customer for a particular export project.
- "VENDOR" : Company(ies)/VENDOR(s) to whom the BHEL has placed Purchase Order for GOODS/ items/system/package.
- "GOODS": means all or part of the articles, material, equipment supplies including technical documentation, as described in the Purchase Order, to be supplied by VENDOR.
- "PACKER": Packaging Company to whom VENDOR intends to sub-contract the packing in case they do not have own packing capability/facilities .
- "FREIGHT FORWARDER" : Means the Company responsible for performing freight forwarding activities.

5. General Information

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The following requirements are intended as minimum requirements, and compliance to these requirements in no way absolves or relieves VENDOR of any responsibility or obligation outlined in the Purchase Order. In all circumstances, the packing will be designed and constructed in order to support GOODS during transportation as well as to prevent the Goods from damage due to impact, extreme climatic conditions, sun and rain. It must be ensured that the delivery of the GOODS to the jobsite by sea, road or air, in good condition.

GOODS shall be export packed in compliance with the best-established practices for international projects, in accordance with the following instructions. In the event of any conflict between these specified requirement and the established practices, specification requirement shall govern.

Due to climatic conditions and the complex transport operation(s), it is essential that protection and packing is of the highest standard. Packing means to efficiently protect the GOODS during the total transport operation; from the moment they leave the factory until they are delivered to the jobsite, including handling operations (loading/unloading) and storage.

When VENDOR do not have packing capabilities/facilities of their own and therefore intends to sub-contract, VENDOR have to inform BHEL/Purchaser of the name and address of proposed PACKER(s) for approval.

6.0 Criteria for Selection of Packaging

Packages are to be made according to categories, described in articles 8.1 to 8.5, depending on the type of materials, their fragility and size.

These categories have been established for the protection of equipment and material during multi-mode transports, i.e.: combination of overland and sea transport; containerization, air transportation.

In a general manner, the GOODS have to be packed in such a way that crates, bundles, pallets can be stored into General Purpose containers, wherever possible.

If VENDOR has any doubt about the correct method of protection or packing, he should contact BHEL/Purchaser in order to mutually agree on the adequate type of packing to be used.

Materials can be classified in following categories

- Hazardous Material
- Non-Hazardous Material
-

Further to above categorisation, non-hazardous materials can be sub- categorised for selection of packing.

6.1 Hazardous Materials

Though handling of hazardous material may is not applicable in the scope of this specification. All hazardous material must be packed in adherence to the detailed requirement relating to packing, marking and labelling set out in the most recent report of the Board's Standard Advisory Committee on the Carriage of Dangerous Goods in Ships for sea freight, and the Restricted Articles Regulations, laid down by the International Air Transport Association for airfreight.

6.2 Non-Hazardous GOODS

The scope of this specification is to provide necessary guidelines for packing for power plant equipment, components, Pipings & Valves, Fittings, other structural items, electrical items, spare parts and erection materials. The procedure is defined in subsequent paragraphs in details in clause no. 8.0.

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7.0 Marking Instructions & Despatch details, Storage Code**7.1 Marking Instructions & despatch details**

Packages and crates will be marked with indelible black paint, resistant to seawater. Marking must be perfectly legible.

The shipping marks, which will be as per fig-13, shall be stencilled on two sides and one end in clear characters at least 5 centimetres high (where crate size permits, otherwise use optimum size for each package dimension).

When the GOODS are to be shipped in containers then marking may be stencilled on one end only. However, packages must be stowed in a manner that shows these marks.

Crates containing fragile articles must be packed with special precaution against risk of breakage and must be stencilled on all sides "FRAGILE - HANDLE WITH CARE". Where crates are not to be overturned, VENDOR must show on the crates, clear and readily visible identification as per fig-12, to ensure they are kept in the correct position.

Packages/equipment of 2,000 kg or more must be marked with slinging points on all sides, in addition to the centre of gravity marks.

Number packages consecutively i.e. 1 of 10, 2 of 10, etc. Do not duplicate package numbers. VENDOR is responsible for any loss or damage caused by incorrect marking.

All cases/crates shall also be marked with the appropriate international standard graphic symbols for handling as shown in Fig 12.

As a minimum, all cases/crates are to be marked clearly on all four sides with:

- "HANDLE WITH CARE"
- "RIGHT SIDE UP"
- "KEEP DRY"

In the case of packages with a single gross weight totalling 2,000 kg and/or a height of more than 1m, the centre of gravity shall be clearly marked with the symbol on two adjoining sides. For all items of equipment with an eccentric centre of gravity this symbol shall be marked at the bottom, side and top of the package.

The slinging and lashing points shall be marked with a chain symbol.

When packing in cases/crates, these packages shall also have metal corners at the slinging points. (Fig-11)

External front and rear sides of the boxes to be planed for writing instructions.

Dispatch details such as consigner/consignee address, contract and case details, country of origin, port of delivery, stacking instructions shall be written on one side of the boxes. An anodized aluminum plate as per details and specifications given in fig-13 shall be provided on one side of the boxes.

One copy of packing slip wrapped in polyethylene bag covered with aluminum packing slip holder to be nailed on the external surface of the box. One more copy of the packing slip wrapped in polyethylene bag is to be kept inside the box at the pertinent place.

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7.2 Storage Code

The type of storage required is required to be specified, it will be shown on each packaging in RED colour.

- X Crates or packages to be stored outdoor without covers
- XX Crates or packages to be stored under tarpaulin
- XXX Crates or packages to be stored in covered or enclosed premises
- XXXX Crates or packages which must be stored in air-conditioned premises

8.0 GUIDELINES FOR PACKING GOODS

- 8.1** In the subsequent paragraphs details of different types of packings for different types of GOODS are defined. Vendor shall make packing details/procedure based on the guidelines and submit for approval.

8.1.1 Packing for Pipe, Fittings, Flanges and Valves, Structural Steel

Particular attention should be brought to pipe, fittings, flanges, valves and structural steel. Packing categories for piping and fittings will differ according to the diameter and wall thickness of these products. VENDOR shall comply with the following established practice.

IMPORTANT NOTE:

Depending on the project schedule and availability of ocean vessels, the piping and structural steel may be shipped in containers. In this event, VENDOR has to arrange the packages in such a way it allows the stuffing into Open Top in gauge containers.

8.1.2 Pipe

Where practicable, pipe lengths shall be limited to 11.8 meters.

All pipes 2" included and below shall be packed in crates. All pipes to be capped and ends sealed with waterproof tape.

Pipes over 2" up to 6", shall be bundled and banded in bundles of uniform length. Bundling is carried out with U-IRON or traversal planks, joined with threaded connecting rods with locknuts. Quantities and strapping positions depend on the lengths, with a 120 cm spacing to prevent distortion. Bundle weight shall not exceed 2,000 kg. All pipes are to be capped and ends sealed with waterproof tape (tape is not necessary if end caps are of the pre-shrunk or self-sealing type).

Pipes larger than 6" shall be shipped as single lengths with the ends capped. End caps are to be of the recessed type to enable the use of soft faced hooks, but still completely sealing the end and also protecting the weld.

All stainless steel piping must be packed separately in wooden crates. Any banding of bundles is to be with the same material.

8.1.3 Pipe Fittings, Flanges and Valves

All pipe fittings, flanges and valves up to 6", are to be packed in cases/crates. For items over 6", these may be fixed securely to a pallet base and enclosed in a crate, for protection. Where valves have actuators attached, rigidity must be ensured for the valve and actuator. The vulnerable parts of the actuator are to be completely protected within a wooden crate.

All stainless steel fittings, flanges and valves of all sizes, must be packed separately in wooden crates. Any strapping is to be with the same material.

8.1.4 Structural Steel

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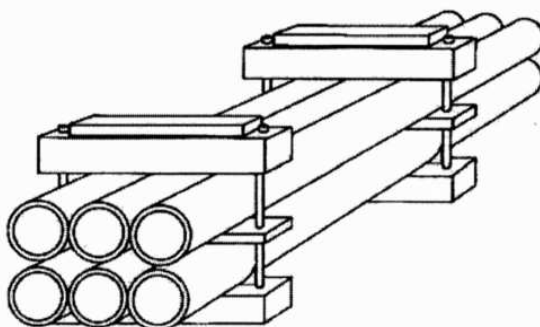
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long bolting to secure the load.

8.2 Bundling – Packing Category I

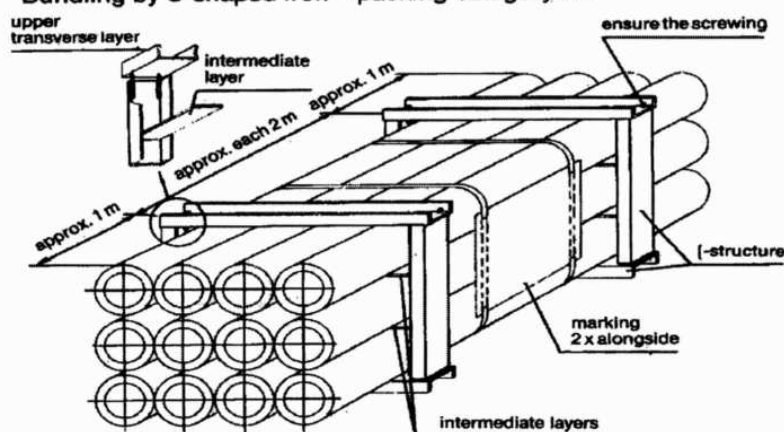
8.2.1 Type of Equipment

Equipment which is not subject to damage by corrosion or mechanical effect, i.e. pipes, piping, structural steel.

Packing category I



Bundling by U-shaped iron – packing category I A



8.2.2 Type of Construction

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Bundling has to be effected

- By squared timber and threaded rods.
- With an intermediate layer (threaded on tightening bolts) according to the weight of the package.
- Wedge-shaped timbers must be added at the outer points of lower layer.
- Between the bolts a spacer must be nailed.
- The bolts must be secured (e.g. by locking nut).
- If single parts could protrude, an appropriate protection must be installed (flat iron or plates).
- Bundling with steel straps or PVC straps is not accepted.

8.3 Skids, Square Timber Constructions, Casings – Packing (Category II)

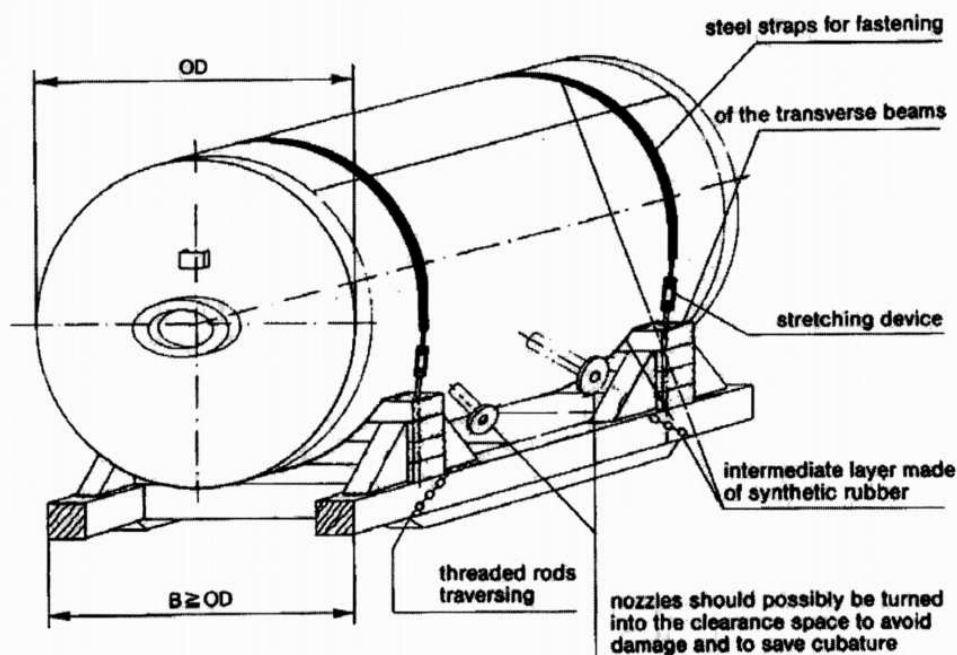
8.3.1 Type of Equipment

Voluminous apparatus, tanks and/or heavy pieces those are not vulnerable to mechanical or corrosive effects.

8.3.2 Type of Construction

- The construction skid can be made of wood or of metal.
- The fastening of the packages on the skid will be made by steel straps (flat iron) which have to be elastically lined, non-slip and securely bolted onto the skids.
- Flange openings have to be closed with gaskets and blind flanges or, if necessary, provided with cover.
- Skid constructions may not be less than the dimensions of the package in length or in width.
- Tanks and apparatus with their own support cradles must be supplied with an anti-slip lining.

PACKING CATEGORY-II



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8.4 Packing of GOODS in Wooden Crates/Cases/Boxes

The construction of wooden crate/cases/boxes shall be as per the details indicated in clause 9.0 & Fig 1 to 11. Details indicated in the sketches for different categories Packing crates/boxes are only for a typical equipment considered for illustration.

8.4.1 Packing Category III

8.4.1.1 Type of Equipment

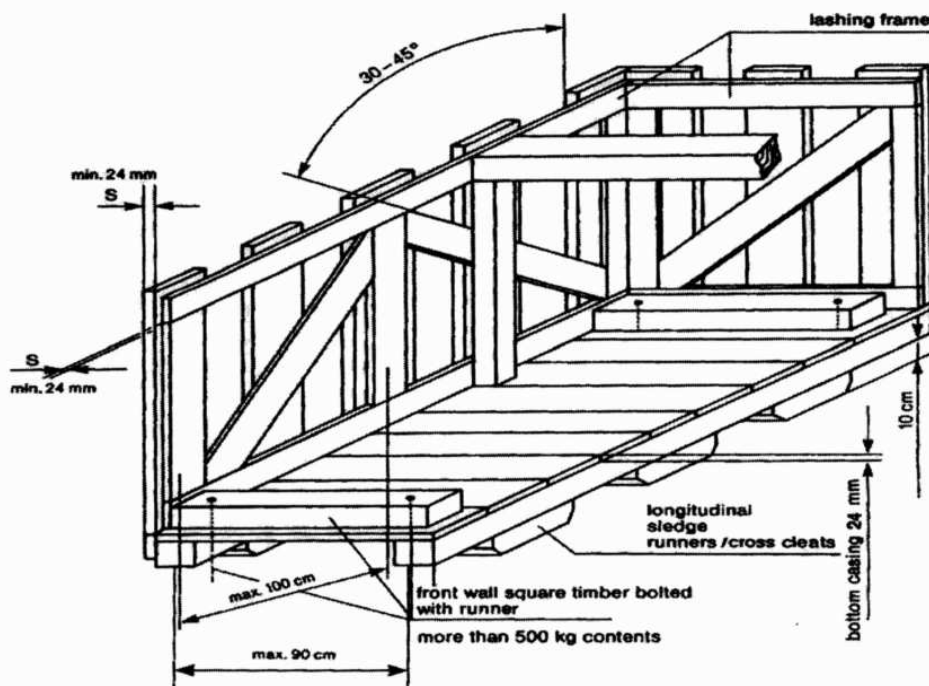
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.

8.4.1.2 Type of Construction

The equipment must be safely fastened to the bottom with bolts, possibly by the runners or to be spread in such a manner that no protruding parts are possible. For parts, sensitive to rainwater and/or debris, a protection has to be made by a foil cap.

If it is possible that single part could protrude through the front/back side wall, they shall be closed completely. The marking of the package shall be done on plywood plates at the prescribed sides.

Packing Category III



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8.4.2 Cases with Lining – Packing Category IV

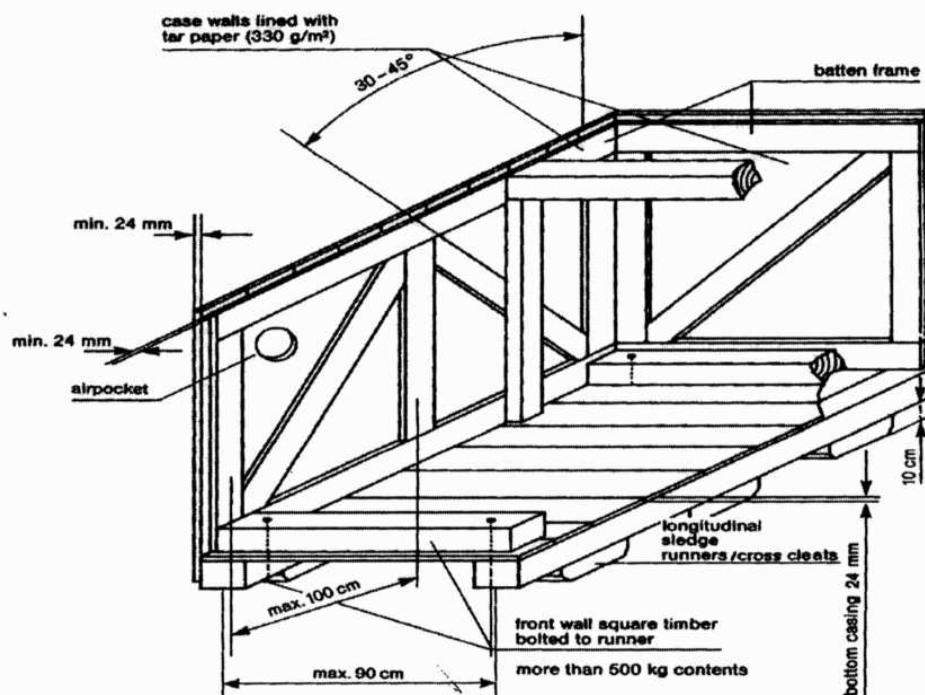
8.4.2.1 Type of Equipment

Recommended for equipment and mechanical parts Equipment sensitive to mechanical damage or parts and components that are particularly at risk of theft or loss; pumps, elbows, flanges, fittings, tools, erection materials, etc.

8.4.2.2 Type of Construction

The same type of construction as article 8.4.1.2, but with all sides completely boarded without space between the boards. Sides to be provided with waterproof lining; fabric-reinforced waterproof tar paper or polyethylene-foils resistant to ultraviolet rays can be used. Polyethylene-foil shall be fixed under the lid cover to avoid penetration of water. At weights of more than 500 kg the longitudinal runner must be bolted to the front all square timber. For ventilation inside the case, an opening in the waterproof lining must be placed between the diagonal battens and diagonal joists.

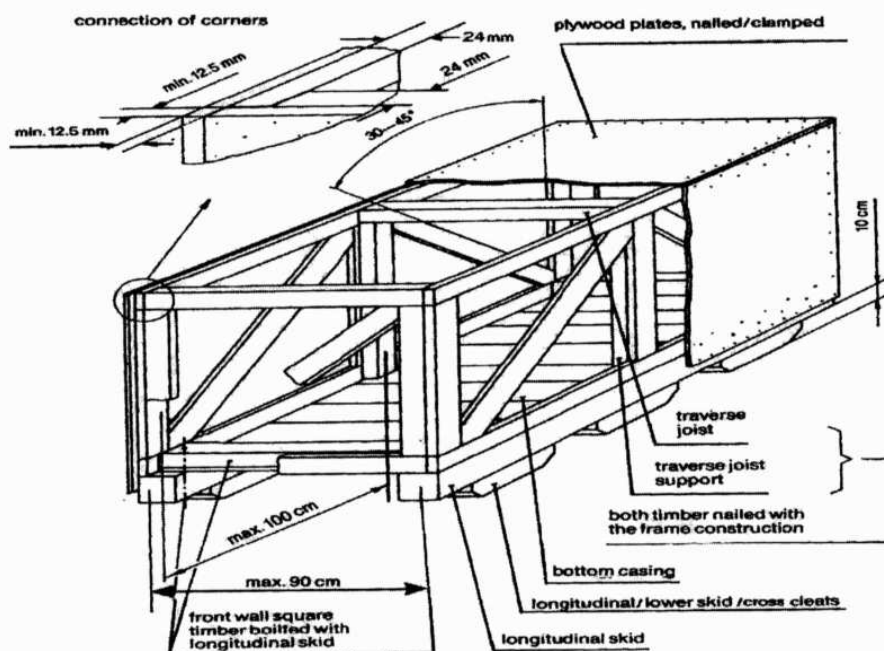
Packing Category IV



8.4.3 Cases with Alternative Surface Materials

8.4.3.1 Plywood Box – Packing Category IV A

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Case constructed of 5 layers of watertight, glued plywood with a total thickness of 12.5 mm. The frame must be constructed from minimum 24 mm timber or as per guide lines given above against clause 8.0, Fig 1 to 11 and must be suitable for the weight and nature of the parts to be packed. Planed square timber must be bolted with longitudinal skid and covered with diagonal joists. If applicable, construction of the cover and sides is to include diagonal bracing. Covers consisting of several layers of plywood are to be sealed with durable elastic putty or additional water-resistant sheets to be fixed.

8.4.4 Case with Barrier Material – Polyethylene Foil – Packing Category V

8.4.4.1 Type of Equipment

Sensitive equipment, simple electrical equipment, insulation materials, fire-resistant materials, with non-corrosion- guarantee for a period up to twelve (12) months.

8.4.4.2 Type of Construction

Preservation by welding in polyethylene-foil with addition of desiccants and if necessary, application of non-corrosive contact agents, otherwise, type of construction as indicated in article 8.4.2.2.

Additional marking:

- Case with desiccants.

8.4.5 Case with Barrier Material – Aluminium Compound Foil – Packing Category VI

8.4.5.1 Type of Equipment

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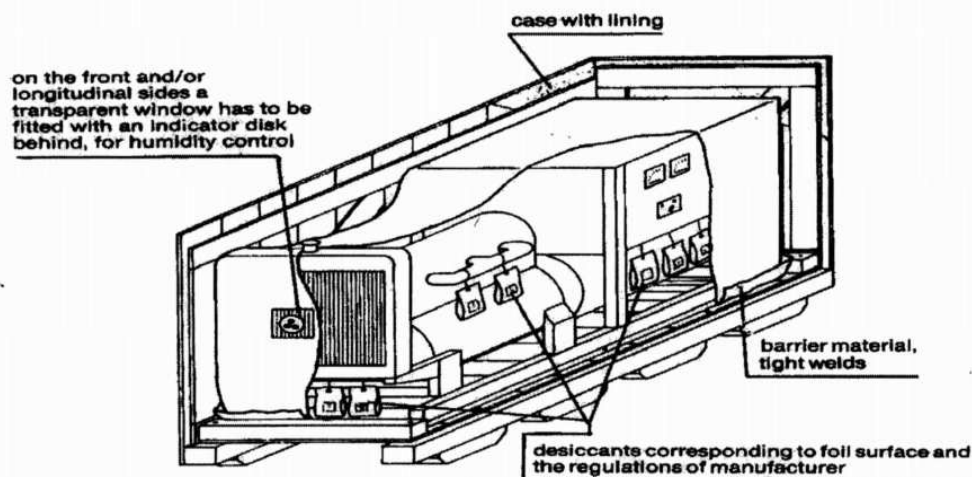
Electrical equipment such as, switchboards, electric motors, sensitive equipment, with non-corrosion guarantee, for a period up to twelve (12) months.

8.4.5.2 Type of Construction

Type of construction as indicated in article 8.4.2.2. Preservation by sealing an aluminium compound foil, with the addition of desiccants. Humidity indicators, if required and installed in the barrier wrapping, shall allow easy control from the outside.

Additional marking:
• Case with desiccants.

Packing Category V/VI



8.4.6 Double Case – Packing Category VII

8.4.6.1 Type of Equipment

GOODS which are of high sensitivity to shock, impact and vibration, for instance, special electrical equipment like computers, switchboards, laboratory instruments

8.4.6.2 Type of Construction

Case construction as indicated in article 8.4.2.2, with additional floating inner packing (case-in-case principle), padding corresponding to weight and sensitiveness. Preservation by sealing in aluminium compound foil with the addition of desiccants. The inner case has to be made of plywood or equivalent material with a thickness of 8-12 mm, depending on the weight of the GOODS to be packed. The inner buckles and/or frame borders have to be dimensioned so that the full stability of the inside case will be reached and no twisting is possible. The inner sides of the inside case will be lined with bituminous kraft paper on all sides (except bottom).

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8.4.7 Cable Drum – Packing Category VIII**8.4.7.1 Type of Equipment**

All type of cables, wires, ropes, hoses.

8.4.7.2 Type of Construction

For all type of cables refer clause no. 11.1. For other items (wires, ropes, hoses) new or practically new drums are to be used. Planking of the e drums by use of boards, thickness minimum 20 mm, with additional double steel strapping, nailed, and carefully preserved/protected cable ends prior to packing.

8.4.8 Hazardous Materials – Packing Category IX**8.4.8.1 Type of Equipment**

Hazardous materials according to the law are explosives, compressed gases, liquefied gases dissolved under pressure or deeply refrigerated, flammable liquids, flammable solids: substances liable to spontaneous combustion; substances which, on contact with water, emit flammable gases, oxidizing substances, organic peroxides, poisonous (toxic) and infectious substances; radioactive materials, corrosives, miscellaneous dangerous goods.

8.4.8.2 Type of Construction

Hazardous materials shall always be packed and documented separately from any other material. Selection of packaging materials, execution of packing and marking as well as documentation shall always be in compliance with the applicable laws and regulations. Any certificates required for transportation or for authorities to be supplied before shipment of the GOODS.

8.4.9 Wooden Floor as a Transport Support – Packing Category X**8.4.9.1 Type of Equipment**

Any materials to be stuffed in containers or on flat racks and that are not stowed on standard pallets or otherwise suitably packed

8.4.9.2 Type of Construction

- Longitudinal internal square timbers bolted to the front wall runners, longitudinal skid.
- Maximum distance between longitudinal runners 90 cm (middle to middle of the runner).
- Full boarding of the floor.
- Attaching of lifting lugs and/or iron ropes for lifting/pulling the units off the transport equipment.
- If applicable, preservation of the equipment by sealing in polyethylene-foil or aluminium compound foil and the addition of desiccants.

8.5 Air Transport Packing**8.5.1 General**

Certain types of material may have to be shipped by air from their country of origin. This means of transport will be exceptional, and will be used only:

- For GOODS, which are highly sensitive to shock or vibrations, such as computers, electronic instruments, or those of small dimensions and weight.
- For GOODS urgently required at the module yard(s) and/or jobsite.

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8.5.2 Type of Packing

Depending on the goods to be packed, VENDOR may use one of the following types:

- A triple-corrugated cardboard container made with waterproofed glue and a barrier layer of polyethylene on the outsides to keep out humidity.
- Wooden/cardboard packing cases: the wood being used for the framework and base of the cases, waterproofed triple-corrugated cardboard being used for the sides and top. These cases are of the "Bell" type, and used for material of small or medium dimensions.
- For larger dimensions, plywood cases are acceptable. The timber characteristics, cross-sections and thickness will be systematically determined by the nature of the loads to be packed.

8.5.3 Dimensions

In order to optimize the existing transport facilities (passenger or cargo aircraft), the dimensions of:

- Triple-corrugated containers.
 - Wooden/cardboard packing cases.
 - Plywood cases.
- Are to be adapted to pallets used for air transportation.

9.0 Detailed specification for Wooden Crates/Boxes/Cases and other packing materials**9.1 Technical specification for wood**

The wood shall be Fir, Chir, Silver Oak (Gravillea Robusta), chemically treated mango and Pinewood with moisture content not exceeding 50%. The wood shall have flexural and compressive strength, stiffness, shock absorption and nail retention properties. The wood shall be free from common defects such as warp, bone, twist, knot, crakes, splits, end splits, bend, visible sign of infection and any kind of decay caused by insects or fungus, etc. Surface cracks with maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

9.2 Chemical Treatment of Wood:

The wood shall be chemically treated to provide protection against deterioration due to fungi and attack by termites, borers, marine organism and any other kind of infection. It shall be treated only after final processing like cutting, planning, joint grooving, etc.

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:**9.3.1 PACKING OF EQUIPMENTS**

Various mechanical, electrical and C&I equipment e.g. Pumps, motors, equipment skids, heat exchangers, control panels, switch gears, transformers, etc. shall be wrapped in weather proof packing and then secured in wooden packing cases. The construction of wooden packing cases/crates shall be as per details given below and also given in figure 1 to 11.

9.3.1.1 Bottom Frame

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The construction of bottom frame shall be as per Fig-2. The No. of slides/runners for bottom frames shall be selected depending upon the weight and overall dimensions of the load to be carried. The equipment shall be secured by fixing their base frame/plate with the help of bolt and nuts etc. to bottom frame of the wooden packing cases/crates. The equipment not provided with base frame/plate like cylindrical vessels, etc to be secured to the bottom frame of the wooden cases with "C" clamps fabricated from steel channels/ angle iron.

9.3.1.2 TOP FRAME

The construction of top frame shall be as per fig-3.

9.3.1.3 END PANELS

The dimension of the end and lateral panels shall be calculated according to overall dimensions of the items to be packed. Diagonal braces shall be used for packing cases having height exceeding 500mm. Details of bracings shall be as per fig 5 to 9.

9.3.1.4 Sling Plate

To facilitate lifting of cases, longitudinal under slide boards shall be fixed. To avoid damage to the box while lifting sling plates shall be provided. Refer fig-11.

9.3.1.5 Angle Iron Cleats

Angle iron cleats shall be used for strengthening the joints as indicated in fig-10

9.3.1.6 Other Requirements

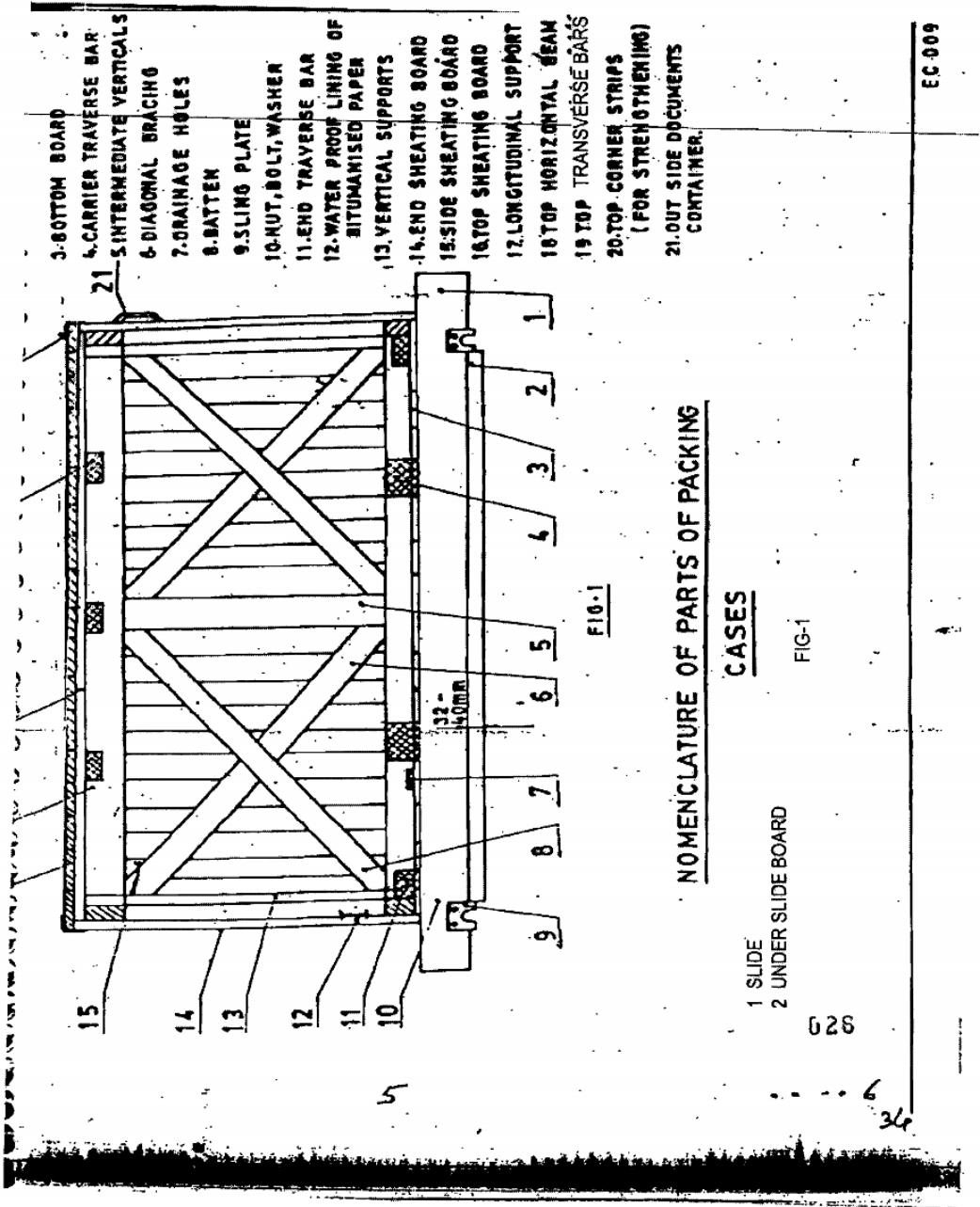
- The thickness of planks for top, bottom, side and end panels shall be at least 25mm. Planks used for this purpose shall be joined with each other by tongue and groove joint. The groove dimension shall be such that tongue fits tightly into groove to make the joint.
- Runners/slides, traverse bars, etc shall be of single length i.e. without any joint. Planks for sheathing, diagonal bracing etc shall also be of single length up to 2400mm, proper jointing is permitted for planks for sheathing and diagonal bracings.
- Each equipment to be individually covered with double polyethylene petticoat. Sheet thickness of polythene sheet shall not be less than 0.175 mm (175 microns). The sealing shall be such so as not to allow moisture inside.
- The inner surface of 4 sides of shooks shall be nailed with bituminized water proof craft paper. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- All the inner sides of the box shall be nailed with bitumen coated HESSIAN POLYTHYLENE KRAFT PAPER. For top frame it shall project on all sides by 100mm and shall be nailed on sides. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- For delicate equipment like control panels and switchgears, lighting panels and lighting transformers, suitable cushioning material like rubberised coir (min. 50 mm thick and 100 mm wide) shall be provided on their bottom support and the gap between the panel and casing

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shall be filled with rubberized coir with distance between consecutive supports less than 500 mm (ref fig15). For other equipment suitable support from sides of the casing shall be provided.

- Switchgear cubicles, control panels and control desks shall be packed and shipped in separate convenient sections. The components e.g. circuit breakers relays and instruments etc. which are removed from panels for shipping purpose and shall be separately packed and shipped as per packing instructions in clause 10.4.
- Packing case for control panels and switchgear panels shall be finally covered with GI sheet of minimum thickness of 0.4mm.
- Packing cases shall be bound at edges by nailing MS clamps/brackets at sufficient intervals. Further heavier boxes shall be strapped with C clamps (ref fig-4) fabricated from steel channels/angles and lighter boxes shall be strapped with hoop iron strips.
- Silica gel is used for this purpose to protect contents over sufficiently long time from corrosion. Silica gel shall be indicating type confirming to IS-304 (1979) packed in cotton bags placed at different positions inside the packing for absorbing moisture and shall not come into directly contact with equipment/material inside the package. The quantity of silica gel shall be adequate for storage period of one year, however it shall not be less than 4 gm. per ltr. Volume of case subject to minimum 400 gm. Per case.

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BOTTOM FRAME ARRANGEMENTS

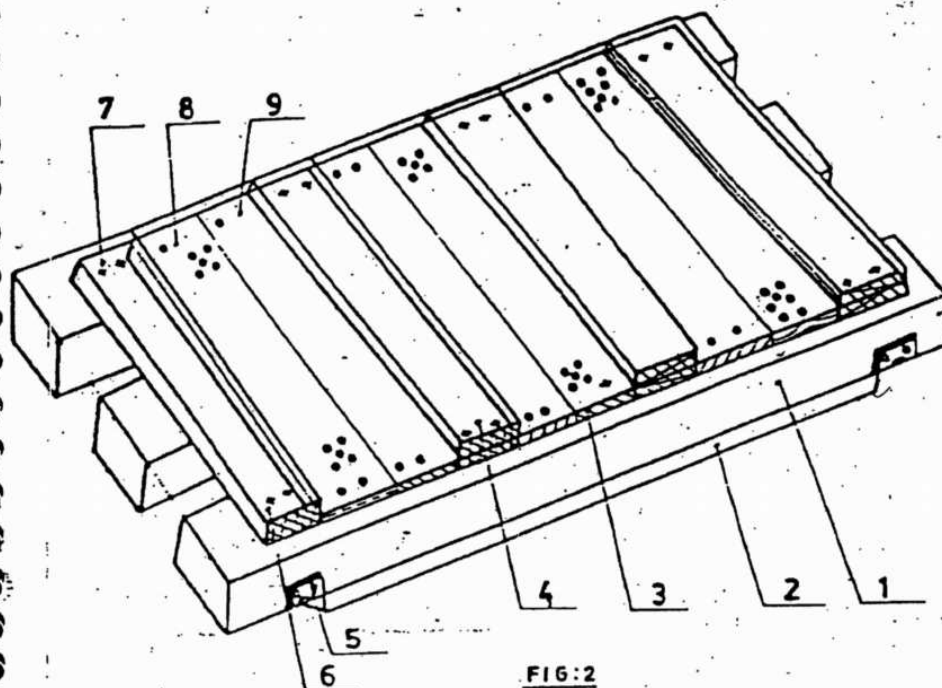


FIG:2

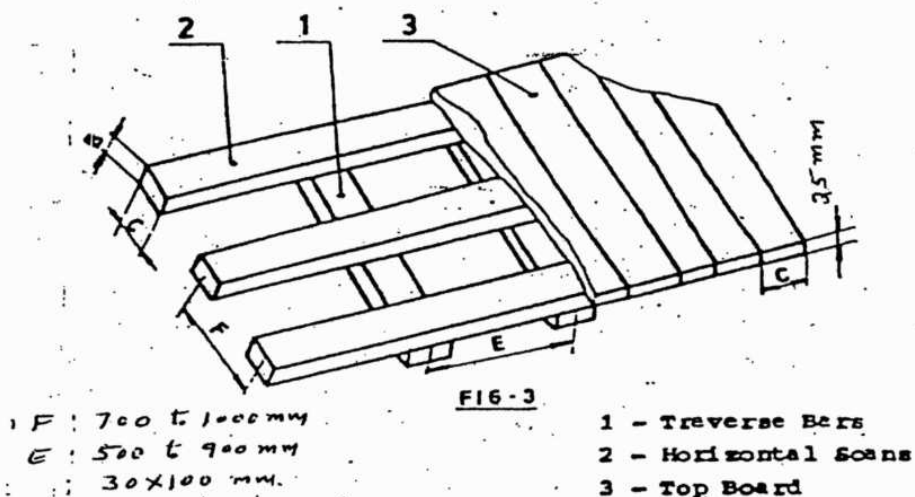
Nos. of slides: Minimum 2 Nos.
 For length more than 1800 mm or
 load more than 1000kg, Nos. of
 slides shall be minimum 3 Nos.
 For dimensions of slides, refer Table 1
 Cross section of end traverse bar; 100x100 mm.
 (minimum)

1. SLIDE
2. UNDER SLIDE BOARD /
3. BOTTOM BOARD
4. CARRIER TRAVERSE BAR
5. SLING PLATE
6. TRAVERSE BAR
7. BOLT, NUT & WASHER
8. DRAINAGE HOLES
9. NAILS

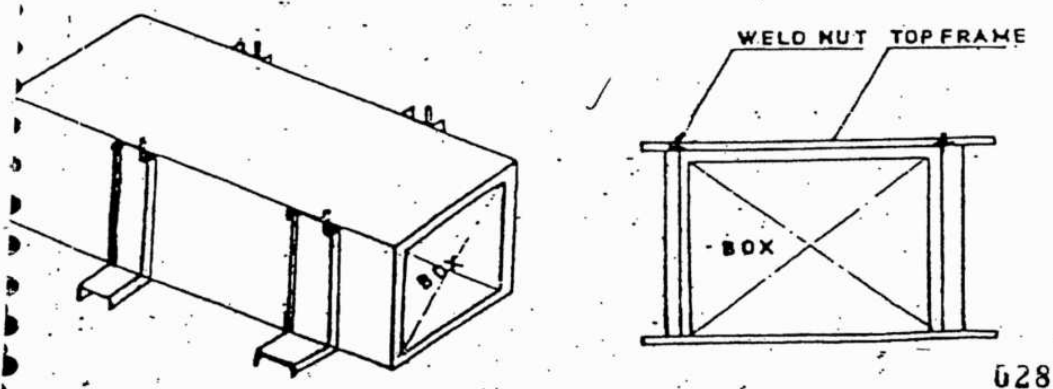
027

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TOP FRAME ARRANGEMENT



ARRANGEMENT OF C-CLAMPS AROUND CASES



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ARRANGEMENT OF DIAGONAL BRACING AND HORIZONTAL SUPPORT

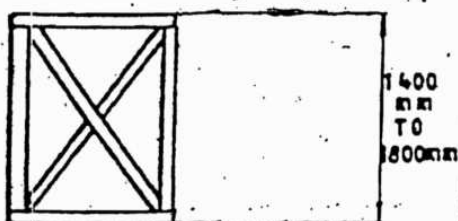


FIG: 6

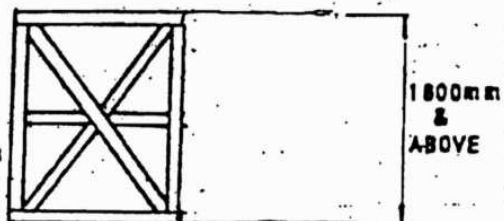


FIG: 8

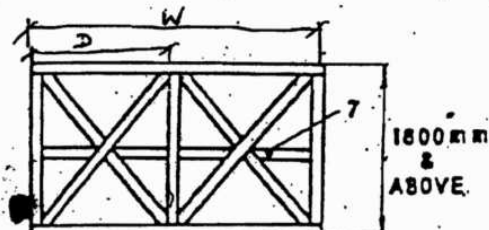


FIG: 9

7- Middle Horizontal Support

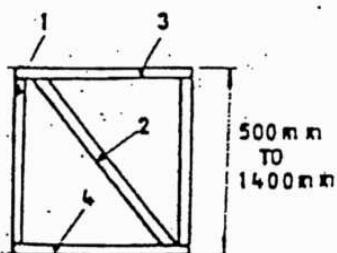


FIG: 5

1- Vertical Support

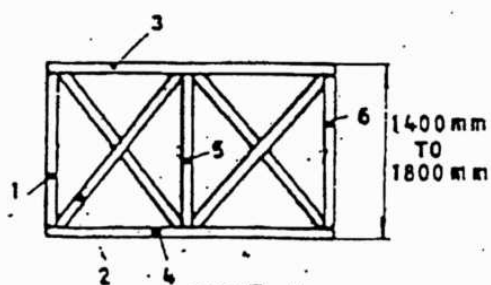


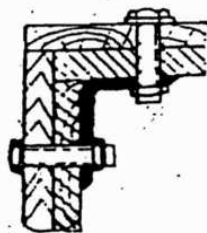
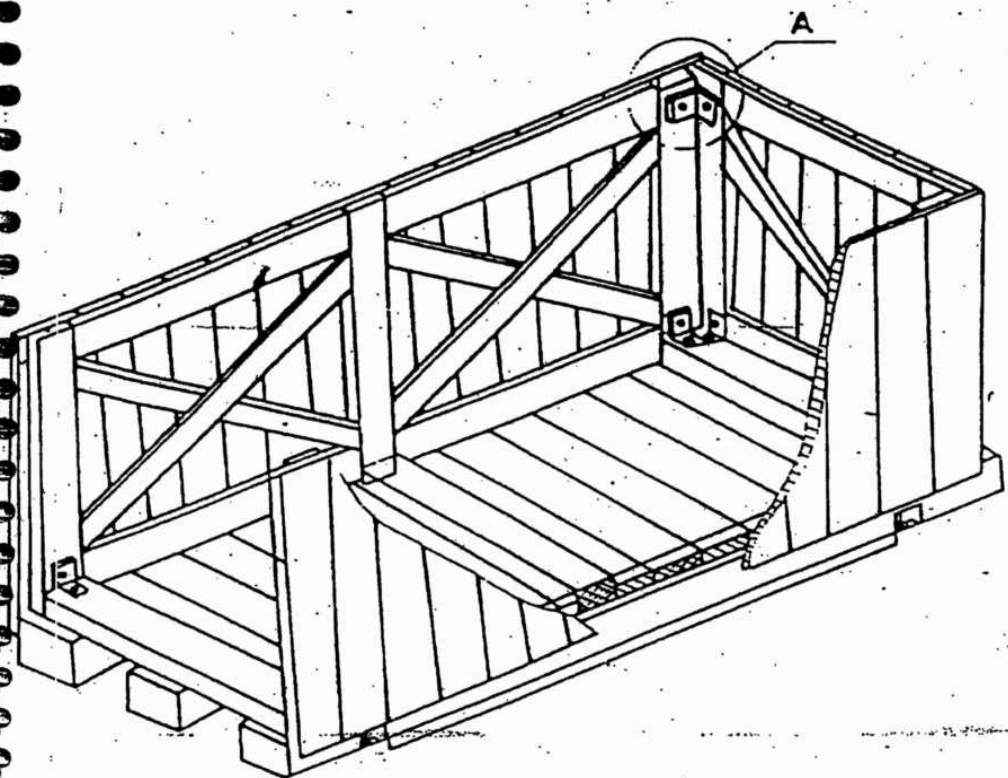
FIG: 7

1, 5, 6 - Vertical Support

029

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ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

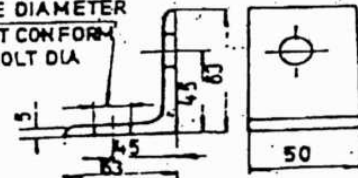
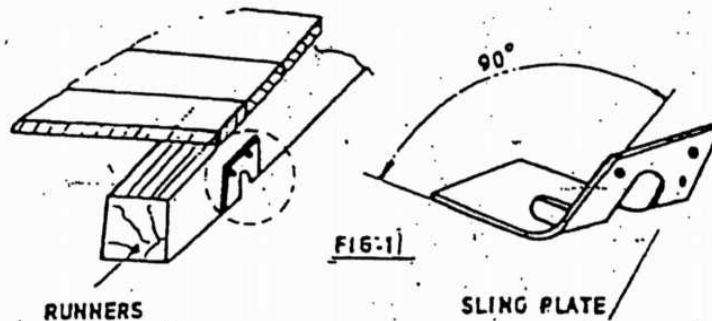


FIG:10

030

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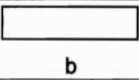
**ARRANGEMENT OF SLING & PLATE ON
CASES**



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TABLE-1

LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c						
500	50 X 100	50 X 100	50 X 100	50 X 100	75 X 100	75 X 100	100 X 100
800	50 X 100	50 X 100	75 X 100	75 X 100	75 X 100	75 X 100	100 X 100
1000	75 X 100	75 X 100	75 X 100	100 X 100	100 X 100	100 X 110	100 X 150
1500	75 X 100	75 X 100	100 X 100	100 X 100	100 X 100	100 X 150	100 X 150
2000	75 X 100	100 X 100	100 X 100	100 X 150	100 X 150	100 X 150	150 X 150
2500	75 X 100	100 X 100	100 X 150	100 X 150	100 X 150	150 X 150	150 X 150
3000	100 X 100	100 X 150	150 X 150	150 X 150	150 X 150	150 X 150	150 X 150

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Table-2

End and side panels	Width of the panel "W"	Distance between longitudinal support (Dimension "D")						
		600	800	1000	1200	1400	1600	1800
		Cross section b x c				Item 1 to 7		
Fig- 5 to Fig-9	600 to 1200	30	30	30	30	30	30	30
		X	X	X	X	X	X	X
	1201 to 1600	100	100	100	130	130	130	130
		X	X	X	X	X	X	X
	1601 to 2000	130	130	130	130	130	130	130
		X	X	X	X	X	X	X
	2001 to 3000	130	130	130	130	130	130	130
		X	X	X	X	X	X	X
	3001 to 4000	130	130	130	130	130	130	150
		40	40	40	40	40	40	40
		X	X	X	X	X	X	X
		150	150	150	150	150	150	150

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INDICATION MARKS ON CASES/BOXES/CRATES

Designation	Symbol	Explanation
Fragile, Handle with care		The symbol should be applied to easily broken cargoes. Cargoes marked with this symbol should be handled carefully and should never be tipped over or slung.
Use no hooks		Any other kind of point load should also be avoided with cargoes marked with this symbol. The symbol does not automatically prohibit the use of the plate hooks used for handling bagged cargo.
Top		The package must always be transported, handled and stored in such a way that the arrows always point upwards. Rolling, swinging, severe tipping or tumbling or other such handling must be avoided.
Keep away from heat (solar radiation)		Compliance with the symbol is best achieved if the cargo is kept under the coolest possible conditions. In any event, it must be kept away from additional sources of heat. It may be appropriate to enquire whether prevailing or anticipated temperatures may be harmful.
Protect from heat and radioactive sources		Stowage as for the preceding symbol. The cargo must additionally be protected from radioactivity.
Sling here		The symbol indicates merely where the cargo should be slung, but not the method of lifting. If the symbols are applied equidistant from the middle or center of gravity, the package will hang level if the slings are of identical length. If this is not the case, the slinging equipment must be shortened on one side.
Keep dry		Cargo bearing this symbol must be protected from excessive humidity and must accordingly be stored under cover. If particularly large or bulky packages cannot be stored in warehouses or sheds, they must be carefully covered with tarpaulins.

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Center of gravity		This symbol is intended to provide a clear indication of the position of the center of gravity. To be meaningful, this symbol should only be used where the center of gravity is not central. The meaning is unambiguous if the symbol is applied onto two upright surfaces at right angles to each other.
No hand truck here		The absence of this symbol on packages amounts to permission to use a hand truck on them.
Stacking limitation		The maximum stacking load must be stated as "... kg max.". Since such marking is sensible only on packages with little loading capacity, cargo bearing this symbol should be stowed in the uppermost layer.
Clamp here		Stating that the package may be clamped at the indicated point is logically equivalent to a prohibition of clamping anywhere else.
Temperature limitations		According to regulations, the symbol should either be provided with the suffix "...°C" for a specific temperature or, in the case of a temperature range, with an upper ("...°C max.") and lower ("...°C min.") temperature limit. The corresponding temperatures or temperature limits should also be noted on the consignment note.
Do not use forklift truck here		This symbol should only be applied to the sides where the forklift truck cannot be used. Absence of the symbol on other sides of the package amounts to permission to use forklift trucks on these sides.
Electrostatic sensitive device		Contact with packages bearing this symbol should be avoided at low levels of relative humidity, especially if insulating footwear is being worn or the ground/floor is nonconductive. Low levels of relative humidity must in particular be expected on hot, dry summer days and very cold winter days.

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Do not destroy barrier		A barrier layer which is (virtually) impermeable to water vapor and contains desiccants for corrosion protection is located beneath the outer packaging. This protection will be ineffective if the barrier layer is damaged. Since the symbol has not yet been approved by the ISO, puncturing of the outer shell must in particular be avoided for any packages bearing the words "Packed with desiccants".
Tear off here		This symbol is intended only for the receiver.

FIG-12

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BHEL-PEM-DEHHI-INDIA	
CONSIGNEE	
MATERIAL	
CUSTOMER REF.	MO. NO.
DESPATCH ADVISE NOTE NO.	CASE NO.
DIMENSIONS(MM) LXBXH	NET WT - KGS
	GROSS WT - KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE -- KEEP DRY DO NOT DROP -- DO NOT TILT

FIG-13: MARKING PLATE.

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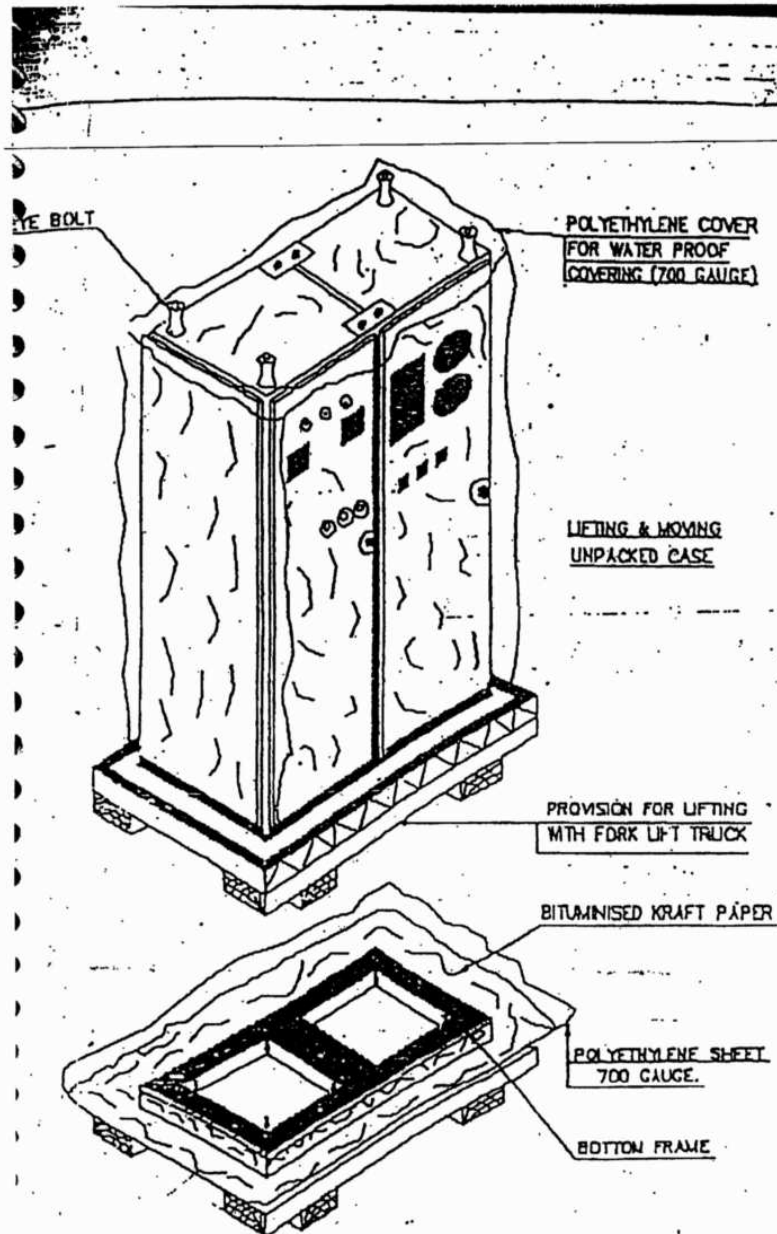
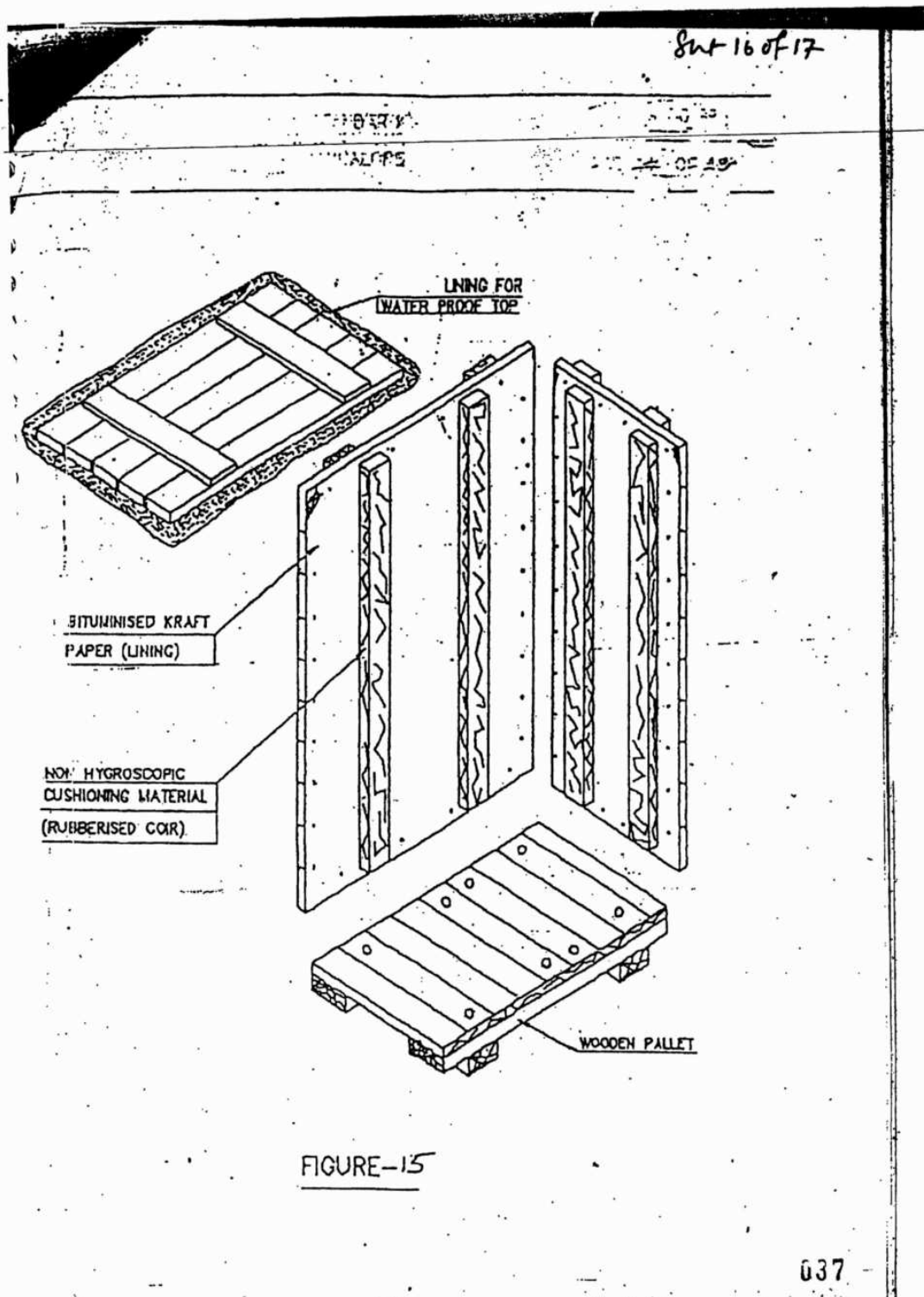


FIGURE-14

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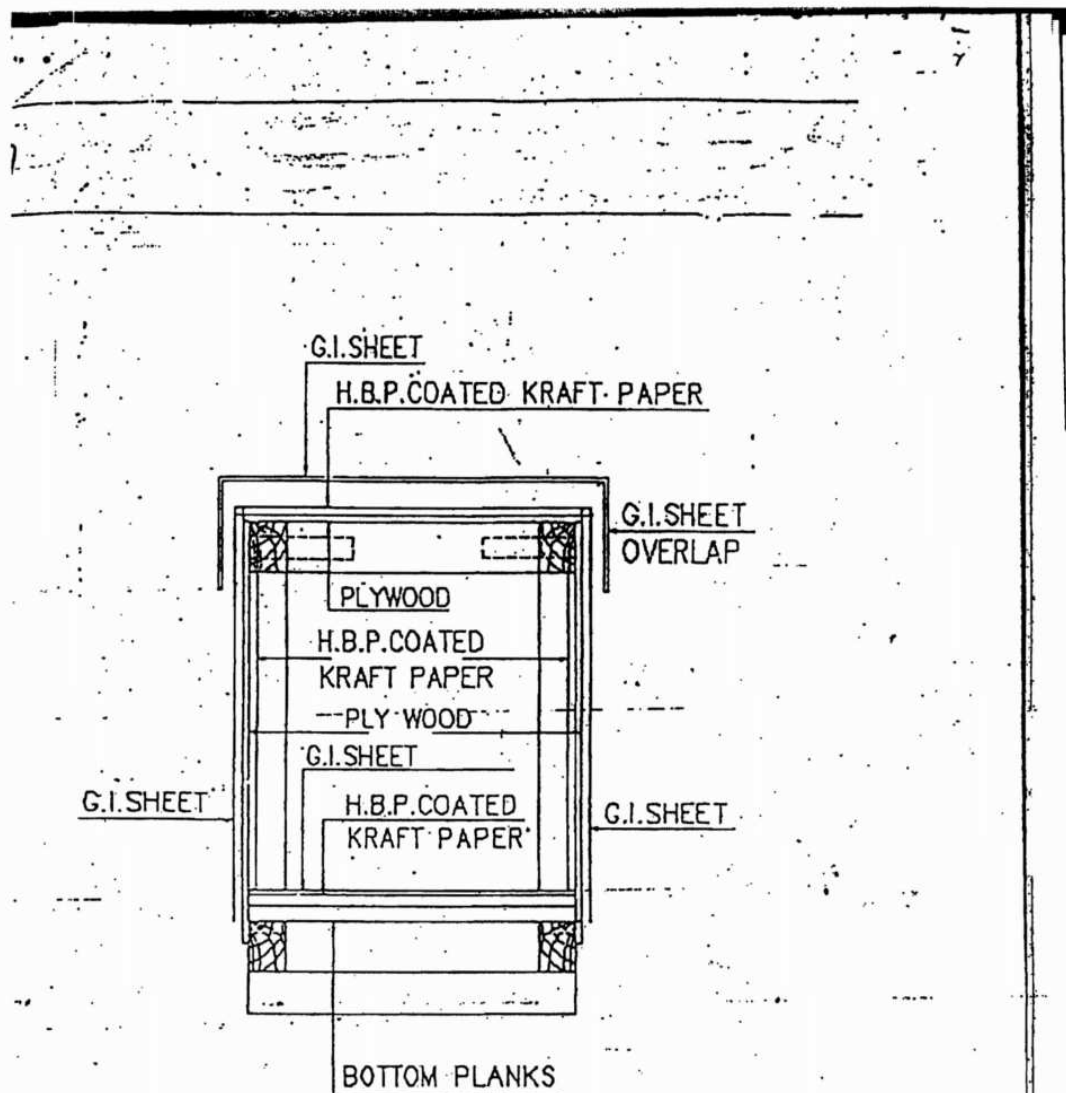


FIG-16 : CLOSED PACKING CASE WITH G.I. SHEET
SHOWING LAYERS OF PACKING MATERIALS.

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10.0 TYPICAL PACKING DETAILS/PROCEDURE FOR MECHANICAL ITEMS**10.1 INSULATION MATERIAL (MINERAL WOOL MATTRESSES)**

This specification covers the requirements of seaworthy packing and marking for bonded mineral (rock) wool mattresses having metallic hexagonal wire netting as facing on one or both sides.

10.1.1 TYPE OF CONSTRUCTION

Mattress shall be packed in Polythene (of 0.2 mm thickness) all around and sealed to prevent moisture absorption during transit and storage. Further it shall be wrapped with Bitumen coated Polythene bonded/lined Hessian and stitched and then packed in 5 ply DFC carton box.

Silica gel is used for this purpose to protect contents over sufficiently long time from corrosion. Silica gel shall be of indicating type conforming to IS:304-1979 packed in cotton bags placed at different positions inside the packing for absorbing moisture and shall not come into direct contact with the material inside the package. The quantity of silica gel shall be enough for storage period of one year. However, it shall not be less than 4 gms per litre volume of case subject to minimum of 400 gms per case.

Each mattress as well as the packages shall be serial numbered. Also, printed sheets indicating the nominal thickness, density and wire netting details (i.e. material and size) shall be placed below the wire netting.

Following details shall be legibly written on the packages. The details shall also be typed on a sheet of paper & kept in a sealed Polythene cover, inside the packages

- a) Project Name
- b) Purchase Order No.
- c) Sl. No. of package
- d) Size of mattress (Thickness x Length x Width)
- e) Density
- f) Wire netting material and size
- g) Weight of the package

10.2 INSULATION MATERIAL (ALUMINIUM COIL)

Heavy Gauge Aluminium Coil Packaging are done by Eye-to-Sky packaging or by Eye to eye packaging as per the proven practice being followed by manufacturer of Aluminium sheets.

10.2.1 Type of construction for Eye to Sky packaging

- a. Strapping of coil with polyester strap around circumference at one place.
- b. Putting paper I. D. Edge protector.
- c. Wrapping the coil with VCI stretch film after putting silica gel bags (4 nos.) Inside the coil.
- d. Wrapping the coil with HDPE film.
- e. Covering the coil including its build up & bore with masonite / particle board.
- f. Putting metallic I. D on coil.
- g. Putting O.D edge protector (paper) on coil.

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- h. Putting circumferential polyester strap (3 nos.) & eye polyester strap (4 nos.).
- i. After placing the coil on coil tilter ply wood (10mm thick) of suitable size along with wooden pallet is to be put at the bottom side of the coil.
- j. Coil is to be tilted to eye-to-sky position.
- k. Final strapping with metallic strap to unit coil and skid at 2 places with top cover of plywood.
- l. Fixing the coil with wooden blocks at 4 corners.
- m. Labeling 2 nos.(one metallic & one adhesivetype) For specification, net wt. & gross wt.

10.2.2 Type of construction for Eye to Eye packaging

- a. Strapping of coil with polyester strap around circumference at one place.
- b. Putting paper I. D. Edge protector.
- c. Wrapping the coil with VCI stretch film after putting silica gel bags (4 nos.) Inside the coil.
- d. Wrapping the coil with HDPE film.
- e. Covering the coil including its build up & bore with masonite / particle board.
- f. Putting metallic I. D on coil.
- g. Putting O.D edge protector (paper) on coil.
- h. Putting circumferential polyester strap (3 nos.) & eye polyester strap (4 nos.).
- i. Placing of coil on wooden skid Coil is to be tilted to eye-to-sky position.
- j. Final strapping of coil and skid at 2 places with steel strap. Fixing the coil with wooden blocks at 4 corners.

Labeling 2 nos.(one metallic & one adhesive type) For specification net wt. & gross wt.

10.3 Packing Procedure for Online Tube Cleaning System and accessories

This procedure is applicable for the shipment of Onload Tube Cleaning System and accessories by sea.

10.3.1 Packing details:

- The Packing case shall be made of treated rubber wood. The design of the case shall be as per Annexure IIIA & IIIB.
- The Equipments shall be placed on the wooden base of the Packing case and fastened if required to arrest the movement of the same.
- Equipment shall be covered by Polythene sheet and inside wall surfaces of the wooden cases also shall be covered by polythene sheet.
- All Nozzles shall be closed with plywood dummies.
- All electrical components assembled or loose shall be covered with polythene sheets along with silica gel pack.
- Silica gel desiccants shall be kept inside each case in sufficient quantities in order to absorb the moisture.

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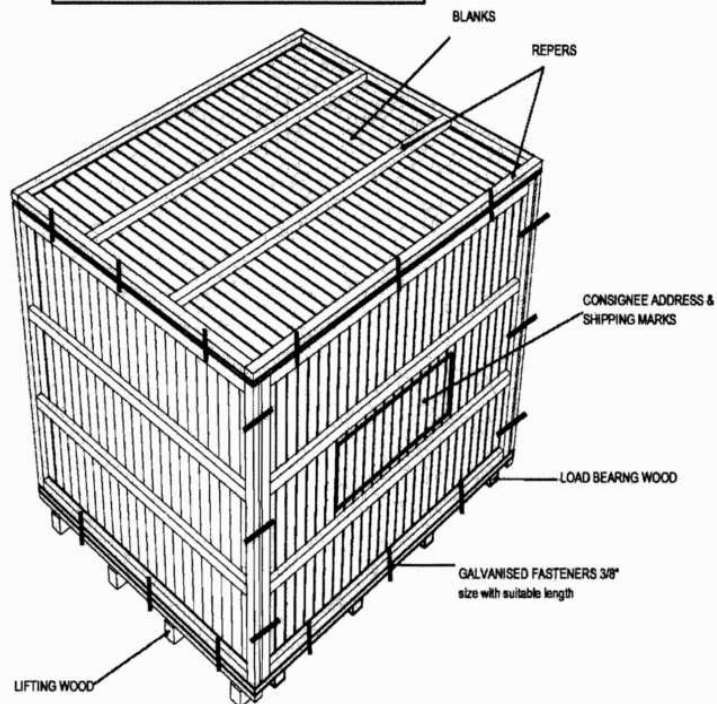
- Thermocol packing shall be made for glass items like Ball vessel sight glass, Vpiece
- sight glass & pressure gauge.
- Silica gel desiccants shall be kept inside of each case to absorb the moisture.
- A Packing list covered in a polythene envelope shall be fixed inside and outside of each packing case.
- Shipping marks and consignee address shall be painted on the outer surface of the case.
- All handling instruction required for the case like top, sling, rain, handle with care etc, shall be marked on the case as per the symbol attached.
- Machined surface will be applied with Anti rust oil and covered by polyurethane sheet to protect from external oxidation.
- All valves will be closed with dummies to protect the internals and placed in the wooden case which will covered by polyurethane sheet.

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MODEL: FASTNERS TYPE (BASE, SIDE & TOP
ATTACHED WITH BOLT, NUT & WASHER)

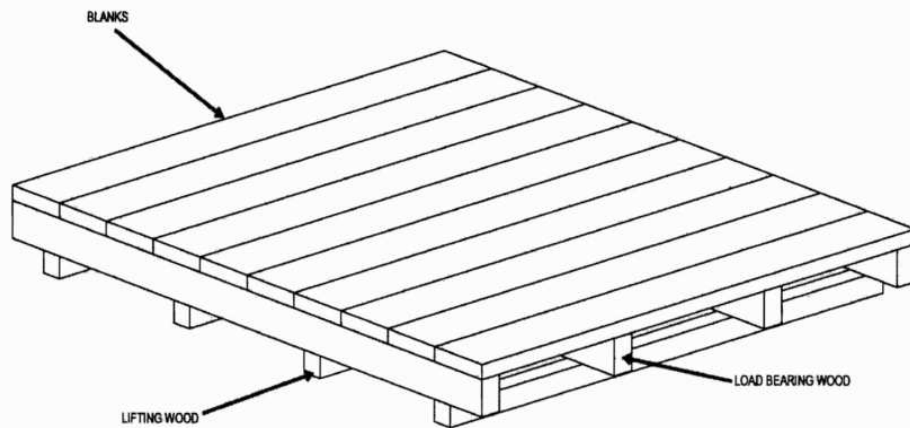
This Type of case to be used for
following items:

1. BALL SEPARATOR
2. BALL COLLECTOR SKID



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BASE FRAME

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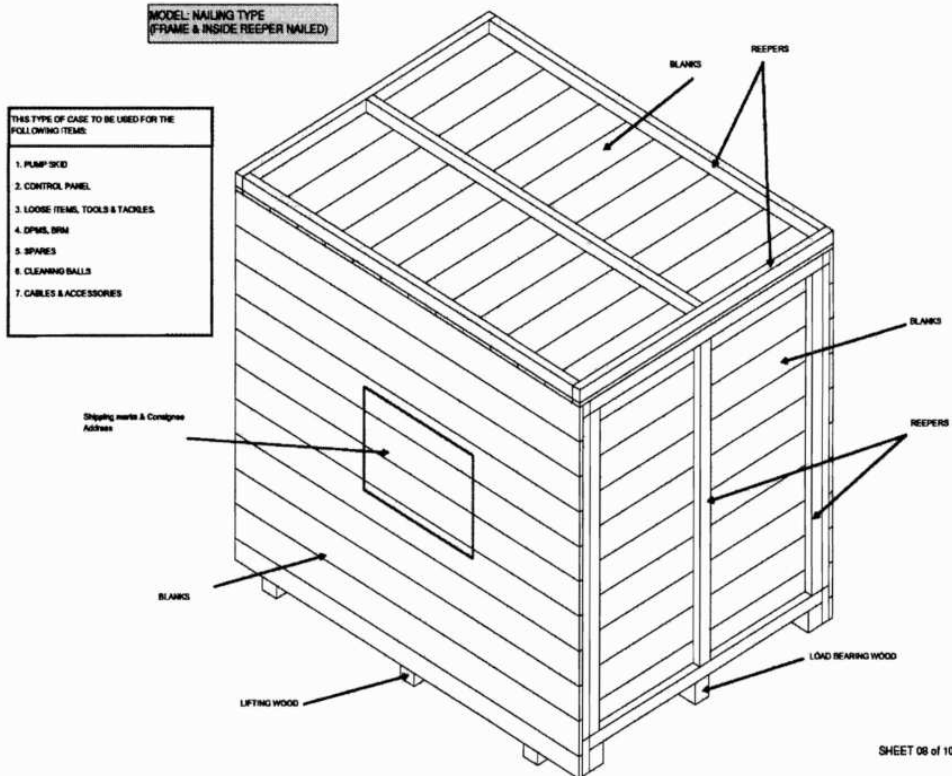
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MODEL: FASTNERS TYPE - WITHOUT TOP

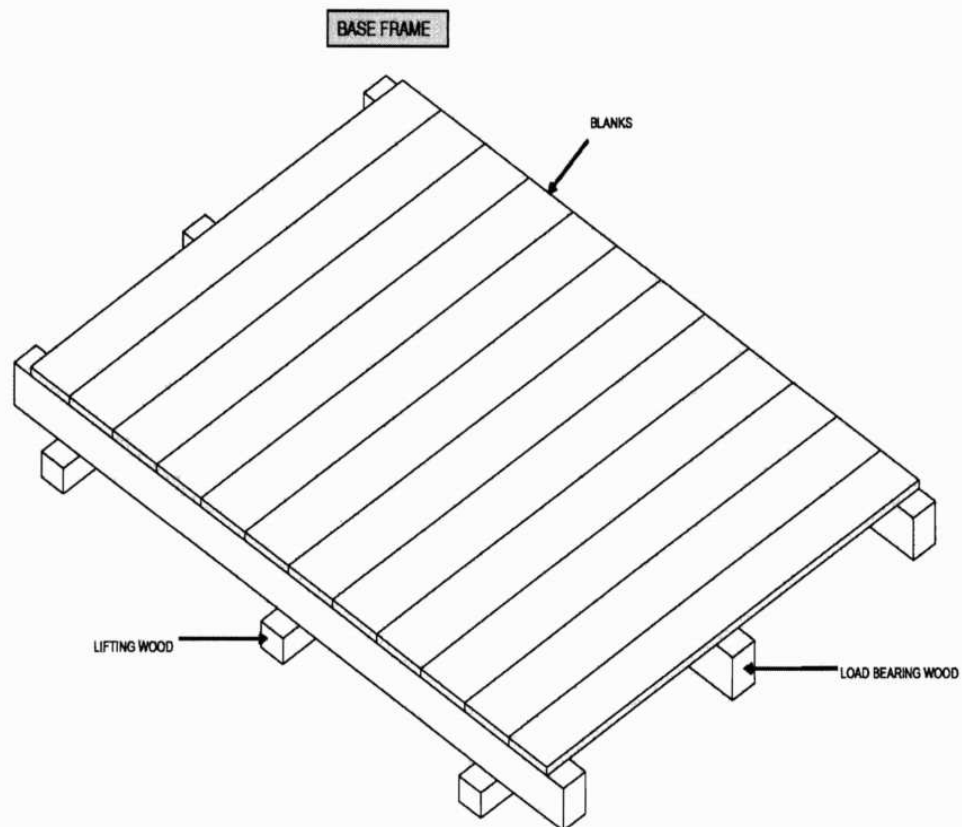


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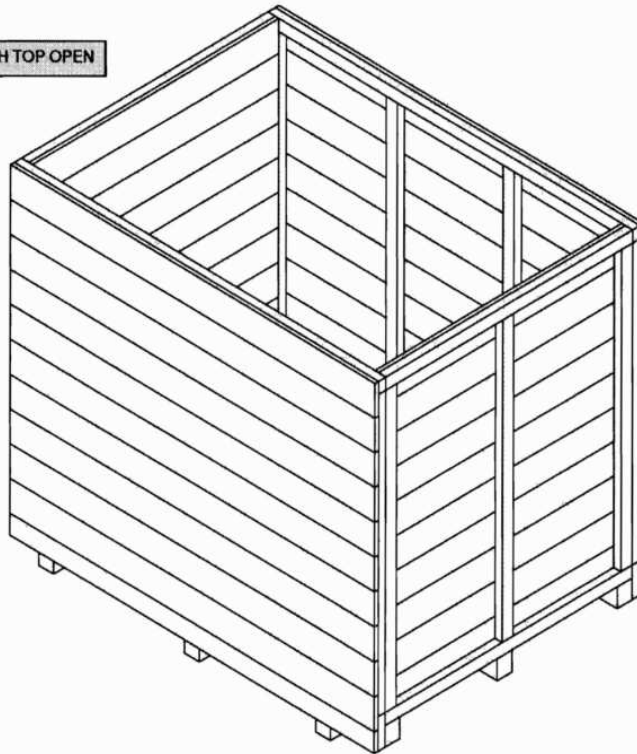
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
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NAILING TYPE MODEL WITH TOP OPEN



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10.4 PACKING OF LOOSE ITEMS

Loose mechanical, electrical and C&I items e.g. valves, fittings, pressure/temperature gauges/switches, circuit breakers, relays etc shall be individually wrapped using polyethylene sheets/U foam/ thermocol sheets/air bubble sheets depending upon the items and then packed in wooden boxes. The left out spaces and top of the boxes shall be filled with rubberized coir to get proper cushioning effect, Special attention shall be paid to relays, instruments etc for arresting the movements of their operating mechanism during transportation.

The construction of wooden packing cases shall be as per clause 9.3.1 retaining its all features concerning strength of the box. The construction of wooden packing case for electrical and C&I items shall be as per fig-16.

Inner surface of 6 sides of the box shall be lined with bitumen coated hessian polyethylene kraft paper. Rubberized coir of min. 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of the boxes.

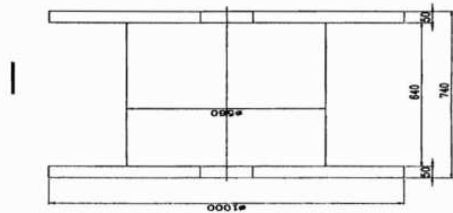
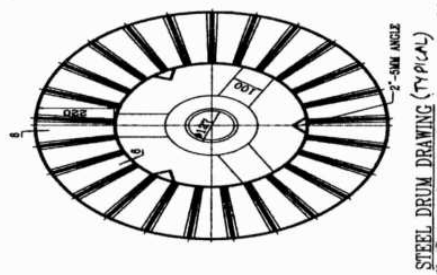
11.0 PACKING OF ELECTRICAL ITEMS**11.1 CABLES****11.1.1 Type of Equipment**

All type of cables..

11.1.2 Type of Construction

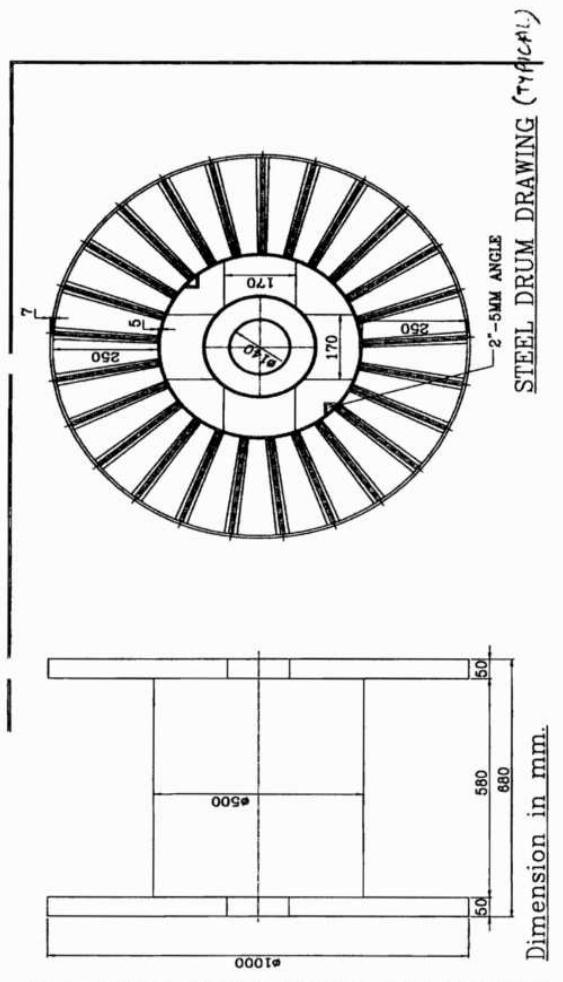
New or practically new cable drums made of steel and painted with epoxy resin paint are to be used. Cable ends are carefully protected before packing. Over the cables polyethylene sheet shall be wrapped and then sealed properly. Cable drum can be put in wooden crates for ease in transportation and handling. (Wooden cable drum is also acceptable, however vendor to furnish constructional details for approval).

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Dimension in mm.

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11.2 PACKING OF CABLE TRAYS & ACCESSORIES AND CABLE TRAY SUPPORT MATERIAL

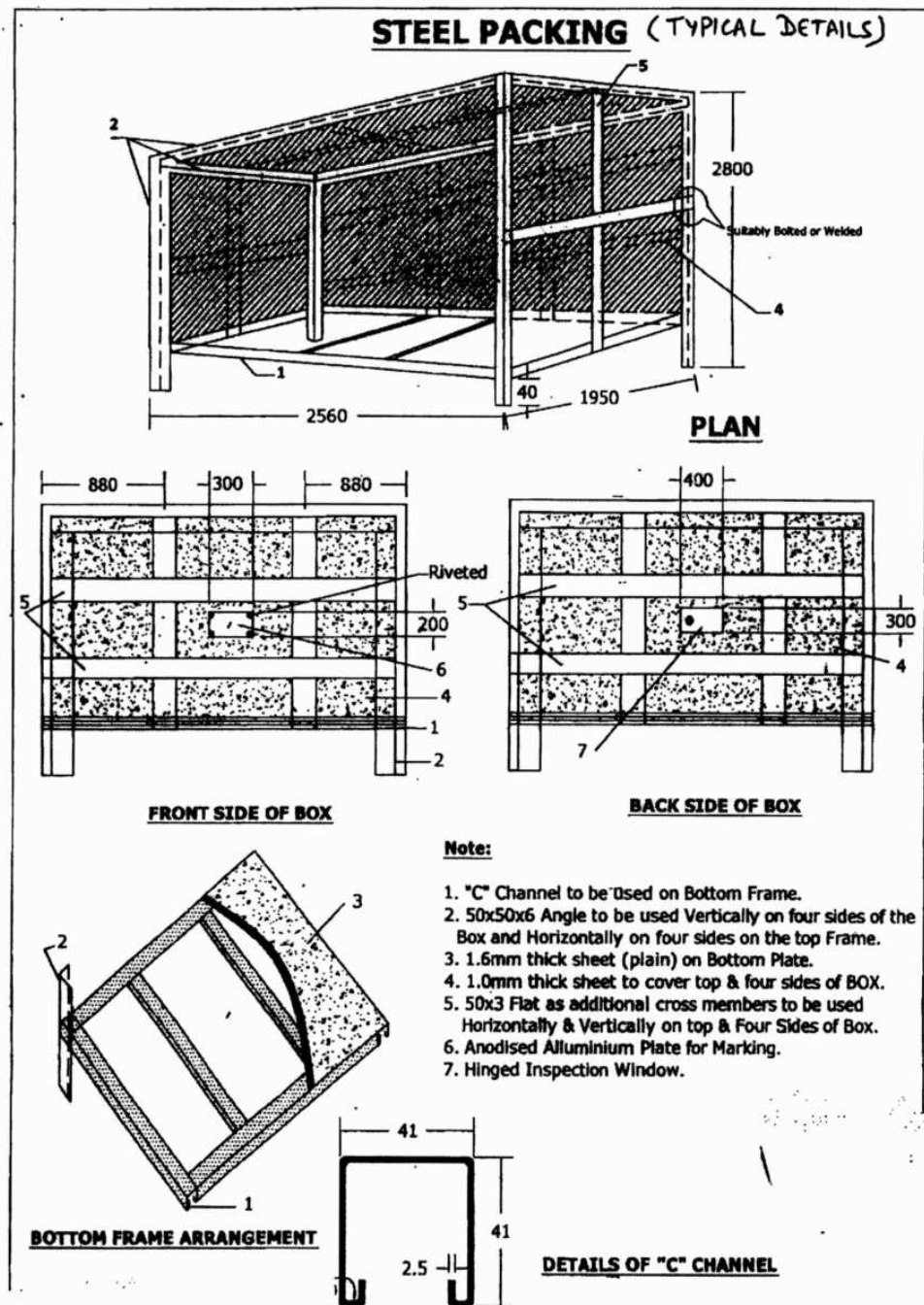
11.2.1 Cable trays can be packed in wooden boxes as per fig 1 to 11 or in steel boxes. Details of steel box construction is as indicated below.

- 1) All Dimensions are in "mm" unless otherwise stated.
- 2) Packing Box shall be fabricated using 50x50x6mm MS Angle, 50x3mm Flat, 2.5 mm thick C Channel, 1mm & 1.6mm Thick sheet.
- 3) Finish of Packing Box Shall be Galvanized.
- 4) Angle & Channel Section forming part of the Main frame shall be welded thoroughly with each other to give a rigid structure.
- 5) Sheet Section and Flat section shall be bolted/ Riveted/ Welded suitably to the Main frame stated in '4' above.

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- 6) Welding Portion on galvanized surfaces shall be painted with Zinc Rich Paint.
- 7) Dispatch details such as consignor/consignee address, contract and case details, 'country of origin, port of delivery, stacking instructions shall be written on one of the side of boxes. An anodized aluminium plate as per details and specifications given in page 3 of 5 shall be provided on the boxes
- 8) One copy of packing slip wrapped in polythylene bag covered with suitable aluminium .packing slip holder to be nailed on the external surface of the box. One more copy 9f the packing Slip wrapped in polythylene bag to be kept inside the box at the prominent place.
- 9) **INDICATION MARKS ON THE BOXES:** Markings shall be provided on the boxes indicating position of Boxes for handling, storage and nature of consignment. For guidelines referred page 4 of 5. The ink issued for this purpose as well as for marking dispatch instruction shall be indelible/non-washable marking ink.
- 10) Each item as mentioned in BOQ shall be packed & supplied as a set comprising of required numbers of associated fasteners & hardware etc

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11.3 PACKING FOR STATION LIGHTING SYSTEM

Aspects of packing specific to equipments / items of station lighting system are given here. All other instructions / aspects as per the main specification of export packing which are not covered here shall also be applicable.

11.3.1 For LIGHTING TRANSFORMER, DISTRIBUTION BOARDS, LIGHTING PANELS,

- Construction of packing case for LIGHTING DISTRIBUTION BOARDS, LIGHTING PANELS, TRANSFORMER . shall be EITHER as per FIGURE 1,2,3,5,6,7,8,9,10,11 OR FIGURE 14,15,16.
- Each Panel/Transformer shall be individually covered with double polythene sheet of thickness 175 microns minimum.
- All the 6 inner surfaces of packing shall be nailed with bitumen coated hessian polythene craft paper. Wherever 2 pieces of craft paper are used, the joint shall have minimum overlap of 20mm.

For the top frame it shall be project on all sides by 100mm and shall be nailed on sides .

- The gap between the panels and packing case shall be filled with rubberized coir of thickness 50mm minimum and width 100mm. The distance between two consecutive supports of rubberized coir shall be less than 500mm.
- Silica get packed in cotton bags shall be placed at different positions inside the packing.
- Packing case shall be finally covered with GI sheet of thickness 0.4mm minimum.

11.3.2 For LUMINARIES, RECEPTACLES. EMERGENCY LIGHT, 240/24V TRANSFORMER, CEILING FAN, SWITCH BOARDS, FLEXIBLE CONDUIT, WIRES, EARTH WIRE. JUNCTION BOXES, ERECTION COMMISSIONING SPARES, RECOMMENDED SPARES , ERECTION MATERIAL AND CONSUMABLES

- Construction of packing case for THE ABOVE MATERIAL shall be as per FIGURE 1to11.
- Items placed inside the case shall be covered with double polythene sheet of thickness 175 microns minimum.
- All the 6 inner surfaces of packing shall be nailed with bitumen coated hessian craft paper. wherever 2 pieces of craft paper are used, the joint shall have minimum overlap of 20mm. For the top frame it shall be project on all sides by 100mm and shall be nailed on sides.
- Silica get packed in cotton bags shall be placed at different positions inside the packing.

11.3.3 For CONDUIT PIPE

As per international practice pipes are shipped in open bundles with metal strapping. Packing as per attached figure A shall be provided which is described as following:

- Each bundle shall be wrapped with 2 layers of 175 microns thick polythene sheet.
- Then bundle will be wrapped with bitumen coated hessian craft paper.
- Bundle shall be strapped with steel straps.
- An anodized aluminium packing description plate as per Figure No. 13 shall be provided.

11.3.4 For POLES

Poles will be wrapped with 2 layers of minimum 175 microns thick polythene sheet and then with bitumen coated hessian craft paper, packed as per Figure – C i.e. bundling.

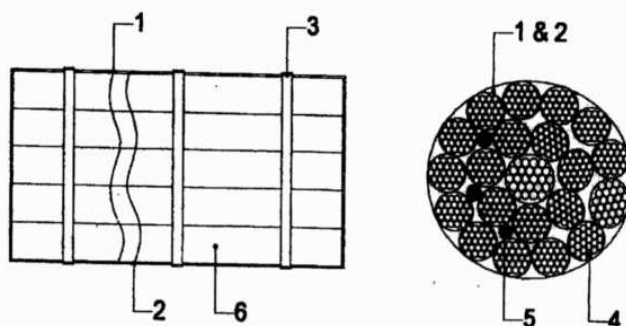
11.3.5 For STRUCTURAL STEEL

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Structural steel will be different sizes and shapes. Hence it will be packed as per Figure No. B and described as following :

- a) Each bundle shall be wrapped with 2 layers of 175 microns thick polythene sheet.
- b) Then bundle will be wrapped with bitumen coated hessian craft paper.
- c) Bundle shall be strapped with steel straps.
- d) An anodized aluminium packing description plate as per Figure No. 13 shall be provided.

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PACKING PROCEDURE FOR CONDUIT PIPE**FIGURE "A"**

- 1) LAYER OF BITUMEN COATED HESSIAN KRAFT PAPER.
- 2) LAYER OF POLYTHENE SHEET.
- 3) METAL STRAPPING.
- 4) CONDUIT PIPES.
- 5) SILICA GEL POUCHES.
- 6) BUNDLES OF CONDUIT PIPES.

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PACKING PROCEDURE FOR STRUCTURAL STEEL

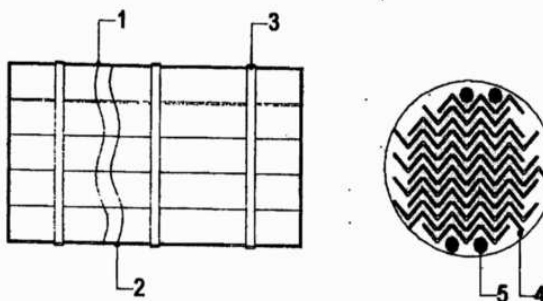
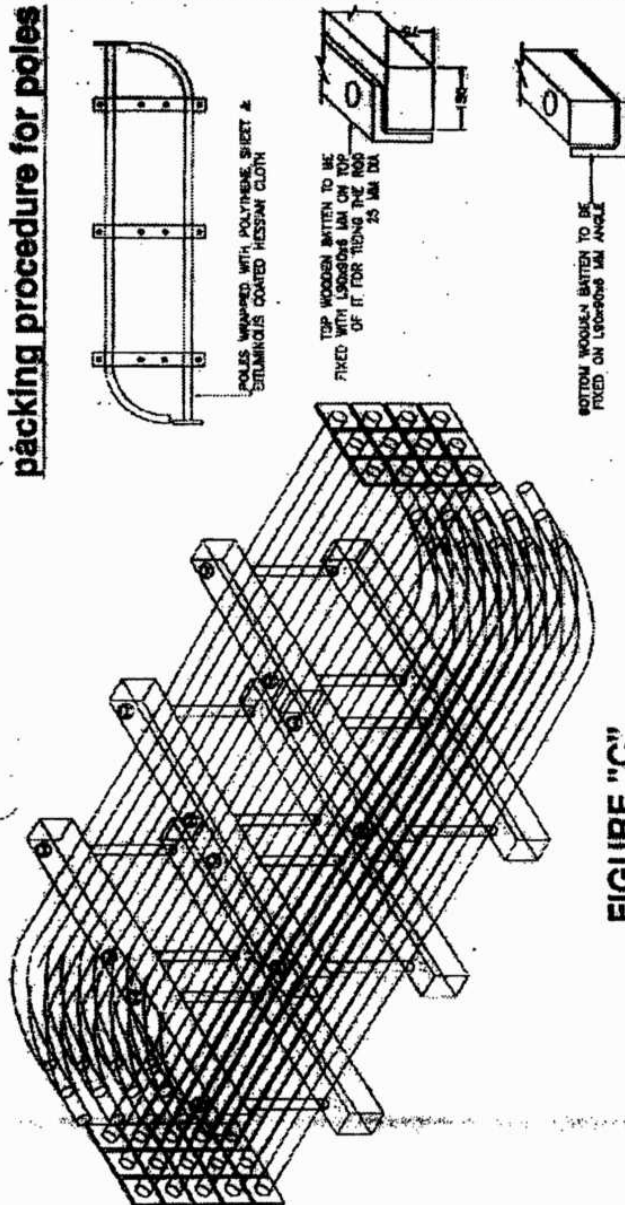


FIGURE "B"

- 1) LAYER OF BITUMEN COATED HESSIAN KRAFT PAPER.
- 2) LAYER OF POLYTHENE SHEET.
- 3) METAL STRAPPING.
- 4) STRUCTURAL STEEL.
- 5) SILICA GEL POUCHES.

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packing procedure for poles



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11.4 PACKING FOR DC BATTERY

The packing procedure for seaworthy packing of DC Battery is defined below, which is capable of withstanding impacts, compression, vibration, toppling, sea water spray, prevention against rust, temperature and extreme atmospheric conditions. Aspects of packing specific to equipments / items of DC Battery are given here. All other instructions / aspects as per the main specification of export packing which are not covered here shall also be applicable.

The packing procedure consists of various stages namely primary packing, cushioning, securing, desiccant, outside packing box, Runners/ sliders/ transverse bars of plywood, etc., provided for each movement.

- a) The packing boxes shall be made up of plywood boxes (thickness 9mm min.) with blocks at the bottom of the box for provision for handling the boxes using the forklift. The packing boxes sizes are generally standardized to half-euro size (capable of handling equipment's weight).
- b) Rubberized coir of 25mm thickness shall be provided as cushioning material at the bottom and thermocole of 20mm shall be provided inside on all four sides. Other than this polyethylene film wrap or cover also will be provided. Left out spaces to be filled with rubberized coir/ thermocol to get cushioning effect.
- c) Silica gel in dust free air permeable cotton/paper bag shall be placed in the packing boxes for storage period of 1 year as per IS 304 (1979)
- d) While packing the cells, transit caps (polypropylene) of red and blue shall be used for big size cells for ensuring that cells does not get damaged during the transport due to vibrations etc.
- e) The battery accessories shall be packed with suitable precautions as follows:
 - i) Copper connectors shall be packed after making bunches with lead wire seals to avoid misplacement.
 - ii) Hardware items shall be packed in polyethylene bags (Thickness $\geq 0.175\text{mm}$) with item slip
 - iii) Battery rack shall be packed in dismantled condition, wrapped with polyethylene sheet
 - iv) For Ni-Cd type battery, electrolyte in solid form for dry cells shall be packed in cans with KOH, LiOH being packed separately.
 - f) Galvanized Steel straps are provided for binding the packing box sides.
 - g) The handling instructions shall be marked in indelible/ non-washable ink, indicating the upright position.

11.5 PACKING OF SERVICE TRANSFORMERS(OIL FILLED) & ACCESSORIES

This instruction is applicable for packing of transformers (oil filled), its accessories and components so as to ensure safe delivery to end user. Aspects of packing specific to equipments / items of transformers(oil filled) are given here. All other instructions / aspects as per the main specification of export packing which are not covered here shall also be applicable.

11.5.01 PACKING DETAILS :

- a) Items shall be packed in case / crates as per the shipping list.
- b) All fragile items and small items shall be packed in cases and to be marked as "Fragile, handle with care Fragile items".
- c) Fragile accessories are to be first packed in their original boxes (VENDOR's packing). Very

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- small / delicate items such as glass thermometer, door keys shall be packed in separate box.
- d In case original box is found damaged, suitable alternate box or packing method using felt or foam sheet and polythene wrap to be used.
- e These boxes are then placed in identified wooden boxes. Inside of such boxes are lined with a layer of polythene sheet, packing wool / grass and another layer of polythene sheet before placing the boxes. All boxes are then wrapped with this polythene sheet before closing the box. Fragile items shall not be placed loose, one above the other inside the case.
- f All wiring cables, connection flats of non-ferrous materials, CTs, valves bellows shall also be packed.
- g Items like CTs, Oil communicating bushings, insulators, wired equipments and housings such as RTCC Panel, M. Box, Drive Mechanism, thermometers, gauges shall be wrapped in polythene from all around.
- h Buchholz relay and OSR relay openings will be blanked using covers, before putting them in the box
- i Items shall be carefully lowered and arranged inside the crate / case and each item shall be locked from all sides in such a way to avoid its movement in any way. Wooden stoppers and separators shall be provided for this and nailed to the crate / case wood.
- j Wooden planks and batons in contact with fragile items shall be provided with kit foam at the locations of contact.
- k Oil communication bushings shall be packed in separate case on V or U shape wooden felted supports, as in case of condenser bushings.
- l While placing and arranging the items inside the crates / cases, these shall be verified for correctness and then the packing note shall be signed. The cover top of the crate / case shall then be closed.
- m The main equipment like transformer tank shall be packed suitably to prevent any damage during transit / storage. Support structures like frame, header supports etc. shall be crated. Conservator headers shall also be crated. Radiators pipe work and other instruments & components shall be packed in cases. All the cases shall be lined with polythene from inside.

11.6 ALTERNATIVE PACKING CASES FOR CONTROL PANELS AND SWITCH GEARS

For Control and switch gear panels, construction of wooden packing cases may be provided as per fig 14 & 15 and as detailed below.

Thickness of planks for all sides, binding and jointing battens shall be at least 25 mm. Width of the plank shall be at least 125mm and that of binding and jointing planks shall be at least 100mm.

Top frame shall be suitable so that it does not collapse due to sandwiching between slings while lifting. Longitudinal and traverse bars for the bottom wooden pallet to be suitably selected.

Diagonal bracings shall be as per cl 9.3.1.3 and all other requirements shall be as per clauses 9.3.1.4 to 9.3.1.6.

12.0 Containerization

As required by BHEL, the VENDOR shall stuff the GOODS into 20 or 40 foot containers (dry, open top, flat racks, etc.).

The maximum inside dimensions of containers are to be considered:

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- 40 foot containers: 11.80 m x 2.20 m x 2.05 m
- 20 foot containers: 5.80 m x 2.20 m x 2.05m
-

The present definition of containerization is valid for sea containers only. Vendor to check the size of containers before start of packing of equipment.

12.1 Protection of Cases/Crates

Since shipping containers are in general not water tight, packing in contact with the floor of the container shall be raised in order to prevent it from being damaged by the accumulation of water.

12.2 Mechanical Constraints

The mechanical constraints for "general use" closed containers are of a different nature (height of "stacking" being limited inside the containers), the packing for the GOODS may be of a lighter structure. However, it is necessary that the packing be appropriate so as to protect the GOODS on site during the storage period, as required after discharging of the GOOD'S from the containers.

Note:

It is the responsibility of the VENDOR to ensure that the cases/crates are stowed, secured and fastened inside the container. The VENDOR will take all necessary precautions to conform to the maximum weight allowed and the centre of gravity of the container. The securing and fastening of the cases/ crates can be carried out by nailing timbers on the bottom or on the vertical sides of the container.

13.0 Other Services to be provided by Vendor

In addition to the packing and shipping documents, VENDOR must also carry out the following services, which shall be included in his quotation:

Carriage of VENDOR's sub-contracted equipment and material, which must be re-grouped in VENDOR's or PACKER's workshops, whilst waiting for packaging.

BHEL reserves the right to postpone the shipping of the GOODS. In this event, any storage and insurance costs during the first ninety (90) days shall be borne by the VENDOR.

Loading, including lifting, securing, lashing, and stowing, of all cases, crates, or packages onto means of transportation such as, but not limited to, trailers, containers, etc.

14.0 Responsibilities and Guarantees

VENDOR is responsible for the choice of category for packing according to the transport facilities used, and on the basis of the present document. In case of doubt or disagreement regarding the choice, VENDOR must inform BHEL prior to packing and await BHEL's approval. All phases of packaging, marking, loading, etc. will be subject to BHEL inspection.

BHEL reserves the right to reject the packing when the packing does not conform to these instructions and/or when the packing does not ensure perfect protection of the GOODS. VENDOR is responsible for the weights and dimensions declared, and the marking of the packages.

The documents must be in strict conformity with the packing contents.

The packing specified in these "Packing, Marking and Shipping Instructions" is guaranteed for a twelve (12) months storage period after delivery on site.

VENDOR is responsible for providing storage recommendation adapted to the GOODS. According to this guarantee, VENDOR is held responsible in the event of goods becoming

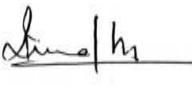
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useless, damaged or broken, as a result of poor packing and/or stowing, or due to corrosion, subsequent to insufficient or inadequate protection. All direct or indirect costs resulting thereof, will be back-charged to VENDOR.

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 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 1 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

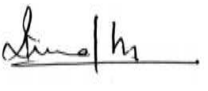
RAW MATERIAL INSPECTION													
1	CASTING	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-	NO REPAIR WELDING IS PERMITTED ON CI AS CAST / PUNCHED HEAT NO SHALL BE PROVIDED FOR CORRELATION	
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%	CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIES, POROSITY SAND FUSION ETC	IR	√	P	V	-		
2	IMPELLER	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		HEAT TREATMENT (As applicable)	CRITICAL	REVIEW OF TIME- TEMP CHART	100%	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	HT CAHRT	√	P	V	-		
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%	CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIES, POROSITY SAND FUSION ETC	IR		P	V	-		
3	BRASS (ROLLED / FORGED) FOR SHAFT SHAFT SLEEVES	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		SOUNDNESS	CRITICAL	VISUAL INSPECTION	100%	RELEVANT PROCEDURE	UT Report	√	P	V	-	FOR BAR DIA ≥50 MM.	
4	WEARING RINGS	CHEMICAL PROPERTIES	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	Report	√	P	V	-		

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Receipt No : 344091/2021/BAP-WS(CON)

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 2 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

IN PROCESS INSPECTION																		
5	CASING & WEAR AREA	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	√	P	V	-					
		HYDROSTATIC TEST OF CASTING	CRITICAL	PRESSURE TEST	100%	20%	SEE NOTE 2	NO LEAKAGE	IR	√	P	W	-	SEE NOTE -1				
6	IMPELLER	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	√	P	V	-					
		DYNAMIC BALANCING	CRITICAL	MEASURE	100%	20%	ISO 1940, GR. 6.3		IR	√	P	W	-	SEE NOTE-1				
7	DPT OF MACHINED AREA OF CASINGS & IMPELLER	SOUNDNESS OF CASTING	MAJOR	NDT-DPT	100%		MANUFACTURER PROCEDURE		DPT Report	√	P	V	-					
8	SHAFT & SLEEVES	DIMENSIONAL	MAJOR	VISUAL	100%		MANUFACTURING DRAWING		IR	√	P	V	-					
		SOUNDNESS	CRITICAL	ULTRASONIC TEST	100%		RELEVANT PROCEDURE		UT Report	√	P	W	-	FOR SHAFT DIA≥50 MM ONLY (EXCEPT THREADED PORTION) SEE NOTE-1				
		DP TEST ON MACHINED AREA	MAJOR	DP TEST	100%		RELEVANT PROCEDURE		DPT Report	√	P	V	-					
FINAL INSPECTION																		

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

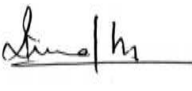
Receipt No : 344091/2021/BAP-WS(CON)

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 3 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

9	PUMP ASSEMBLY	DIMENSIONAL	MAJOR	MEASURE	100%	100%	APPROVED G.A. DRAWING	IR	√	P	V	-	
10	PERFORMANCE TEST WITH JOB	Q VS H Q VS P Q VS E	CRITICAL	MEASURE	100%	100%	APPROVED PERFORMANCE TEST PROCEDURE & APPROVED DATA SHEET	IR	√	P	W	-	REFER NOTE-3
		NOISE LEVEL	MAJOR	MEASURE				IR		P	W	-	REFER NOTE-4
		VIBRATION	MAJOR	MEASURE				IR		P	W	-	REFER NOTE-4
		BEARING TEMP	MAJOR	MEASURE				IR		P	W	-	
11	NPSHR TEST	NPSHR TEST	CRITICAL	MEASURE	100%	1 NO / MODEL	APPROVED NPSHR TEST PROCEDURE	IR	√	P	W	-	REFER NOTE-6
12	PAINTING AND PACKING	TYPE OF PAINT. APPEARANCE. DFT CONFORMANCE TO PACKING SPECIFICATION	MAJOR	VISUAL & MEASURE	100%		TECHNICAL SPECIFICATION MANUFACTURE STANDARD PRACTICE	IR	√	P	V	-	

NOTES:

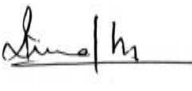
1	For these checks, Witness (M) by Main supplier and End Customer shall be based on the following criteria
	For Pump Motor rating less than equal to 60 KW, Both Main Supplier & End Customer shall only verify the Test Reports of the check by Supplier. For Pump motor rating more than 60 KW Main Supplier shall witness the check & End Customer shall verify the Test Reports.
2	For Performances Test of Pumps Witness (W) by Main supplier and End Customer shall be based on the following criteria
3	For Pumps motor rating less than equal to 60KW, the performance test of 1 pump per type (min. 1) offered for inspection. Per visit shall be randomly selected for witness by main supplier. For pumps motor rating more than 60 KW but less than 110KW the performance test of 20% of the total no of pumps of each type (min.10 offered for inspection per visit shall be randomly selected for witness by Main supplier as well as End Customer. For pumps, motor rating more than 110 KW and pumps for firefighting applications the performance test of 50% of total no of pumps of each type offered for inspection per visit shall be randomly selected for witness by main supplier as well as End Customer.
4	Noise & Vibration level shall be recorded during shop test for reference purpose only. However values as per approved data sheet / technical specification to be guaranteed at site
5	In case of abnormal noise , pump shall be stripped and shall be re-offered for performance test after correction
6	For pump motor rating less than equal to 110 KW, both Main supplier & End Customer shall review the test reports of the NSPH test witnessed by Vendor / Third party Agency . During Final Evaluation For Pump motor rating more than 110 KW both Main supplier & End Customer shall witness NPSH test. However in case NPSH test has been carried out previously on the same model as of the certified Pump and was witnessed by End Customer then retest of the nps test is not required & End Customer shall only review such NPSH Test Report during final inspection.
General Notes:	a. All the inspection/ test reports shall be submitted to Inspection agency for review and record purpose. b. Latest revision of Drawings, specification and standard shall be used. c. Materials shall be procured in compliance to Functional Technical Specification.

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Receipt No : 344091/2021/BAP-WS(CON)

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 4 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

d. Gauges and measuring instruments with valid calibration only shall be used. e. Inspection / Inspection waiver / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO. f.. BHEL /BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO. g. In case of Vendor Drawing, it needs approval by BHEL Engineering. h. This QP Shall be read along with relevant PO, BHEL Specification/Drawing/Approved Datasheet.

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (✓) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Bharat Heavy Electricals Limited
Ranipet-632406, India
Quality Département

To,

Shri. V Ragupathy, SM/Purchase
 Kind Attn: Shri M Venkateswarlu, Mgr. /Purchase

BAP: QA: Mech: Korba: WP: 209
 Dt. 24-07-2021

Project: KORBA (3x200 MW + 4x500 MW) FGD Package-reg.

Item Name	Indent No.	Indent Date	PGMA	Technical specification
Process Water Pump and Mist eliminator Pump	RFW11195	29.06.2021	FW702	ENGG SPEC: ROS: 9079 and TECI: LT Motor/04, DT: 25.08.2020
	RFW11196	29.06.2021	FW997	

Indent file reviewed and Quality recommendations as follows:

1. BHEL Approved vendors are acceptable.
2. Inspection and testing shall be done as per QP NO.HZ PUMP: 610/00, DT: 29.12.2019 attached herewith.
3. Painting shall be as per customer approved Painting schedule.
4. Arrange acceptance on Our MQP from vendors (QP NO.HZ PUMP: 610/00, DT: 29.12.2019) with their duly sign and acceptance.
5. All Pumps shall be inspected at supplier works as per approved QP/Approved Drawing/Approved datasheet and Specification by BHEL/ BHEL TPI.
6. Annexure 'Q' and BOI's shall be part of enquiry File. Vendor shall fill the columns as appropriate.
7. BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO. The supplier shall inform BHEL in advance about the readiness of the goods for inspection and testing. Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO. Material Test Certificates shall be submitted to BHEL.
8. Packing shall be as per Technical specification/ Engg Approved packing drawing.
9. **General Inspection Notes:**
 - a. Latest version of standards & Specification shall be applied.
 - b. Materials shall be procured in compliance to Functional Technical specification.
 - c. Gauges and measuring instruments with valid calibration only shall be used.
 - d. Inspection / Inspection wavier / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.
 - e. BHEL /BHEL Authorized representatives shall have the right to witness the necessary Inspection and testing of goods mentioned in the PO .
 - f. In case of Vendor Drawing & Datasheet, it needs approval by BHEL Engineering.
 - g. This QP shall be read along with relevant PO, BHEL Specification / Approved Drawing / Datasheet.



Prepared by.
 Rakesh Kr Madhu (Dy.Mgr/QA)

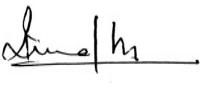


Reviewed & Approved by.
 K Renjith(Mgr/QA)

Receipt No : 380007/2021/BAP-QA_MECH

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 1 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

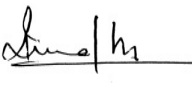
RAW MATERIAL INSPECTION													
1	CASTING	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-	NO REPAIR WELDING IS PERMITTED ON CI AS CAST / PUNCHED HEAT NO SHALL BE PROVIDED FOR CORRELATION	
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%	CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIES, POROSITY SAND FUSION ETC	IR	√	P	V	-		
2	IMPELLER	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		HEAT TREATMENT (As applicable)	CRITICAL	REVIEW OF TIME- TEMP CHART	100%	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	HT CAHRT	√	P	V	-		
		SURFACE EXAMINATION	MAJOR	VISUAL INSPECTION	100%	CASTING WILL BE FREE FROM CRACKS, SHRINKAGE, COLD SHUT, INJURIES, POROSITY SAND FUSION ETC	IR		P	V	-		
3	BRASS (ROLLED / FORGED) FOR SHAFT SHAFT SLEEVES	CHEMICAL COMPOSITION	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		SOUNDNESS	CRITICAL	VISUAL INSPECTION	100%	RELEVANT PROCEDURE	UT Report	√	P	V	-	FOR BAR DIA ≥ 50 MM.	
4	WEARING RINGS	CHEMICAL PROPERTIES	MAJOR	CHEMICAL ANALYSIS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	MTC	√	P	V	-		
		MECHANICAL PROPERTIES	MAJOR	TENSILE TEST & HARDNESS	1 SAMPLE / HEAT	RELEVANT MATERIAL SPECS AS PER APPD. DRG. / DATA SHEETS	Report	√	P	V	-		

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Receipt No : 380007/2021/BAP-QA_MECH

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 2 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

IN PROCESS INSPECTION														
5	CASING & WEAR AREA	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	√	P	V	-	
		HYDROSTATIC TEST OF CASTING	CRITICAL	PRESSURE TEST	100%	20%	SEE NOTE 2	NO LEAKAGE	IR	√	P	W	-	SEE NOTE -1
6	IMPELLER	DIMENSIONAL	MAJOR	MEASURE	100%		MANUFACTURING DRAWING		IR	√	P	V	-	
		DYNAMIC BALANCING	CRITICAL	MEASURE	100%	20%	ISO 1940, GR. 6.3		IR	√	P	W	-	SEE NOTE-1
7	DPT OF MACHINED AREA OF CASINGS & IMPELLER	SOUNDNESS OF CASTING	MAJOR	NDT-DPT	100%		MANUFACTURER PROCEDURE		DPT Report	√	P	V	-	
8	SHAFT & SLEEVES	DIMENSIONAL	MAJOR	VISUAL	100%		MANUFACTURING DRAWING		IR	√	P	V	-	
		SOUNDNESS	CRITICAL	ULTRASONIC TEST	100%		RELEVANT PROCEDURE		UT Report	√	P	W	-	FOR SHAFT DIA≥50 MM ONLY (EXCEPT THREADED PORTION) SEE NOTE-1
		DP TEST ON MACHINED AREA	MAJOR	DP TEST	100%		RELEVANT PROCEDURE		DPT Report	√	P	V	-	
FINAL INSPECTION														

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
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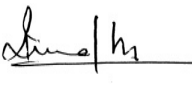
Receipt No : 380007/2021/BAP-QA_MECH

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL- RANIPET /BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN		PROJECT: STANDARD							
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 3 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

9	PUMP ASSEMBLY	DIMENSIONAL	MAJOR	MEASURE	100%	100%	APPROVED G.A. DRAWING	IR	√	P	V	-	
10	PERFORMANCE TEST WITH JOB	Q VS H Q VS P Q VS E	CRITICAL	MEASURE	100%	100%	APPROVED PERFORMANCE TEST PROCEDURE & APPROVED DATA SHEET	IR	√	P	W	-	REFER NOTE-3
		NOISE LEVEL	MAJOR	MEASURE				IR		P	W	-	REFER NOTE-4
		VIBRATION	MAJOR	MEASURE				IR		P	W	-	REFER NOTE-4
		BEARING TEMP	MAJOR	MEASURE				IR		P	W	-	
11	NPSHR TEST	NPSHR TEST	CRITICAL	MEASURE	100%	1 NO / MODEL	APPROVED NPSHR TEST PROCEDURE	IR	√	P	W	-	REFER NOTE-6
12	PAINTING AND PACKING	TYPE OF PAINT. APPEARANCE. DFT CONFORMANCE TO PACKING SPECIFICATION	MAJOR	VISUAL & MEASURE	100%		TECHNICAL SPECIFICATION MANUFACTURE STANDARD PRACTICE	IR	√	P	V	-	

NOTES:

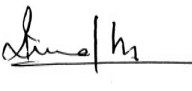
1	For these checks. Witness (M) by Main supplier and End Customer shall be based on the following criteria
	For Pump Motor rating less than equal to 60 KW. Both Main Supplier & End Customer shall only verify the Test Reports of the check by Supplier. For Pump motor rating more than 60 KW Main Supplier shall witness the check & End Customer shall verify the Test Reports.
2	For Performances Test of Pumps Witness (W) by Main supplier and End Customer shall be based on the following criteria
3	For Pumps motor rating less than equal to 60KW , the performance test of 1 pump per type (min. 1) offered for inspection. Per visit shall be randomly selected for witness by main supplier. For pumps motor rating more than 60 KW but less than 110KW the performance test of 20% of the total no of pumps of each type (min.10 offered for inspection per visit shall be randomly selected for witness by Main supplier as well as End Customer. For pumps, motor rating more than 110 KW and pumps for firefighting applications the performance test of 50% of total no of pumps of each type offered for inspection per visit shall be randomly selected for witness by main supplier as well as End Customer.
4	Noise & Vibration level shall be recorded during shop test for reference purpose only. However values as per approved data sheet / technical specification to be guaranteed at site
5	In case of abnormal noise , pump shall be stripped and shall be re-offered for performance test after correction
6	For pump motor rating less than equal to 110 KW, both Main supplier & End Customer shall review the test reports of the NSPH test witnessed by Vendor / Third party Agency . During Final Evaluation For Pump motor rating more than 110 KW both Main supplier & End Customer shall witness NPSH test. However in case NPSH test has been carried out previously on the same model as of the certified Pump and was witnessed by End Customer then retest of the nps test is not required & End Customer shall only review such NPSH Test Report during final inspection.
Notes:	a. All the inspection/ test reports shall be submitted to Inspection agency for review and record purpose. b. Latest revision of Drawings, specification and standard shall be used. c. Materials shall be procured in compliance to Functional Technical Specification.

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (√) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Receipt No : 380007/2021/BAP-QA_MECH

 Ranipet		MANUFACTURER'S NAME & ADDRESS BHEL-RANIPET/BHEL APPD SUPPLIERS		STANDARD QUALITY PLAN			PROJECT: STANDARD						
				Item/subsystem: HORIZONTAL CENTRIFUGAL PUMP	QP NO: HZ PUMP:610 Rev:00 Date:29.12.2019 Page 4 of 4								
SL NO 1	COMPONENT & OPERATION 2	CHARACTERISTICS 3	CLASS 4	TYPE OF CHECK 5	QUANTUM OF CHECK 6		REFERENCE DOCUMENTS 7	ACCEPTANCE NORMS 8	FORMAT OF RECORD 9 D	AGENCY 10			REMARKS 11
					M	B/C				M	B	C	

- d. Gauges and measuring instruments with valid calibration only shall be used.
- e. Inspection / Inspection waiver / approval by BHEL does not absolve Supplier's responsibility for conformity of the specification as per the terms of PO.
- f. BHEL /BHEL Authorized representatives shall have the right to witness the necessary inspection and testing of goods mentioned in the PO.
- g. In case of Vendor Drawing, it needs approval by BHEL Engineering.
- h. This QP Shall be read along with relevant PO, BHEL Specification/Drawing/Approved Datasheet.
- i. This QP is applicable for Mandatory spare supply also specific to the item/project wise.

M - Manufacturer / Subcontractor, B - BHEL /BHEL Authorized Inspection Agency, C- End Customer , P - perform, V - Verification of reports, IR - Inspection Report. W - Witness, TC - Test certificate, DP- Dye penetrant. DR - Dimensional report. MTC- Material test Certificate. * Record, identified with "tick" (✓) under column 'D' shall be submitted to customer as a QA documentation package.	Prepared by	Reviewed by	Approved by
	 Sanjib Pandit (AE/QA)	 Rakesh Kr Madhu(Dy. Mgr/QA)	 K C Gandhiparimalam(DGM/QA)

Annexure Q		
	Indent No:	Enquiry no:
Sl.No	BHEL / Customer Requirements	##Specific confirmations by the manufacture(Acceptable/Not acceptable)
1	Quality Plan Requirement: (If SQP is not given & Vendor QP applicable)	
	(i) MQP (Manuafcutering Quality Plan) shall be submitted in attached format for BHEL/Customer review & approval. Our SQP/Typical MQP/ MQP Format is attached for guidance & use.	
	(ii) MQP shall invariably cover w.r.t Inward inspection including on Raw materail Procurement, In process and Final inspection in elaborated way/details.	
	(iii) Bidder shall also to give specific confirmation that on need basis, their competent officials shall visit to BHEL/customer for finalization of Quality plan including test procedure/methodology during preaward / post award approval / detailed engineering in the event of an order.	
	(iv) No deviation on BHEL/Customer approved MQP/ SQP (In case BHEL SQP is provided) is acceptable.	
	(v) Bidder shall agree to submit all cross referred documents other than codes/standrads to BHEL/Customer/Consultant.	
2	Important Notes shall be included in MQP : (a) Latest revision of Standard s & Specification shall apply. Only International Standards are applicable. (b) Materials shall be procured in compliance to Functional Technical Specification. (c) Inspection shall be in compliance with Approved Quality Control Procedure for the Product. (d) NDT shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME Section V. (e) Gauges and measuring Instruments, with valid calibration only shall be used. (f) Cleaning and Painting of products shall be carried out as per Approved Painting Schedule. (g) Finished Products shall be packed to comply with Approved Packing Schedule. (h) Welding shall be carried out by Qualified Personnel with compliance to Approved NDT Procedures and Acceptance Norms, as per ASME Section V.	
	Domestic / Inland Inspection will be carried out by BHEL/BHEL apointed Third Party Inspection Agency (TPIA) / Customer/Customer Apointed Inspection Agency/Consulatnat. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data sheet / Scheme / PID / PFD / SLD (Process Instrumentaion Diagram / Process Flow Diagram / Single Line Diagram) etc (As applicable).	
3	Inspection Agency for Foreign Bidders and also for Indian Bidder but importing from Forgign Sources: (1) Any one of the flowing Third Party Inspection Agency (TPIA) shall be appointed by the bidder and same shall be furnished by the bidder in techno commercial bid itself. (2) The details of TPIA with contact details like Name of the official, Phone no, Email id shall also to be submitted during pre/post award. However cost for such inspection agency shall be borne by the bidder only. Inspection charges for such inspection agency shall be indicated separately so that if BHEL/Customer is undertaking the inspection by on their own , then these charges non claimable by the bidder. <u>List of TPIA</u> 1.M/s Bureau Veritas 2.M/s TUV-Nord 3.M/s TUV-SUD 4.M/s TUV Rheinland 5.M/s Lloyds Register 6.M/s SGS 7.M/s Germanischer Lloyds 8.M/s QUEST 9.M/s Certification Engineers International 10.M/s Intertek 11.M/s IR Class Systems and Solutions 12.M/s DNV 13. M/s Fichtner 14. M/s ABS Inspection Services	

Receipt No : 380007/2021/BAP-QA_MECH

Sl.No	BHEL / Customer Requirements	##Specific confirmations by the manufacture(Acceptable/Not acceptable)
4	Stage Inspection during manufacturing Process : Stage Inspection during manufacturing shall be carried out as per approved quality plan and all necessary documents shall be provided for review, verification and clearance for further processing. This inspection call shall be given well in advance (atleast 2 weeks before for Indeginious and 45 days for foreign) to TPI/Bidder's own inspection agency to avoid delay in the manufacturing processes.	
5	Inspection before despatch for domestic supplier : Inspection before despatch at supplier's works shall be carried out by Bidder appointed Inspection agency(As in SI no.3.) Inspection shall be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet .	
6	Inspection at Forign Source/Supplier: (a) As in sl no: 3. shall be ensured without fail (b) No materail / items shall be despatched without getting the written communication from BHEL / Customer inspection carried out by Bidder apointed Third Party Inspection Agency (As per SI no.3) / Customer/Customer Apointed Inspection Agency/Consulatnat. This is applicable for all Stage inspection and Final Inspection identified as "W" - Witness or "CHP" - Customer Hold Point as per customer approved Quality Plan/ Technical specification / Approved Drawing/ Approved Data sheet / Scheme / PID / PFD / SLD (Process Instrumentaion Diagram / Process Flow Diagram / Single Line Diagram) etc (As applicable). Inspection before despatch for Foreign supplier : Inspection before despatch at supplier's works shall be carried out by bidder appointed inspection agencies having international presence at vendors and or vendor's sub vendor works. Inspection shall be done as per approved Quality plan/ Technical specification/ Approved Drawing/ Approved Data sheet by TPIA mentioned in SI no: 03 at supplier's cost.	
7	Painting shall be done strictly as per BHEL/Customer approved painting schedule / scheme only. Paint Thickness / Paint shade shall be ensured as per BHEL / Customer approved painting schedule / specification / data sheet etc. No deviation is acceptable unless otherwise accepted by BHEL/Customer in writing. Any conflict if any among BHEL / Customer approved painting schedule / Spec / data sheet etc shall be brought to the notice to BHEL well in advance before proceeding including the BOI being procured for assy / skid like motors etc	
8	Specific conformation for document package in the event of an order (2 Hard copies & soft copy in PDF file) is to be given containing the following with proper linkages (i) Index Sheet (ii) MQP/RQP/Endorsement Sheet (As applicable) (iii) TCs identified by BHEL/ Customer for record for "CHP" / "W" and Verification portion ("V") as given in approved QP. (iv) Final inspection report + TC including Chemical + Mechnaical + HT + NDT etc (v) Third party Inspection report + TC (vi) Customer CHP/ MDCC (vii) Type test / Performance Test reports conducted (viii) Type test / Performance Test approval/ clearance obtained from BHEL/Customer (ix) BOM with As Build Drgs with actual make / rating used with BHEL/customer approved drawings.	
9	Packing / Seaworthy Packing shall be as per BHEL Packing schedule / approved drg / sketch. This shall be ensured to take care tarsnit / handling / transhipment in Road / Sea / Air. Photographs are to be submitted for BHEL review before despatching the material as per contract conditions.	
10	Outsourcing of test facilities: Bidder shall ensure all the testing facilities in house. However If any of the test facilities are not available with successful bidder, then bidder shall ensure the same at NABL accreadted third party lab / Govt / Govt Lab for major testing such as NDT, Electrical & Mechanical testing.	
11	Important Note: No deviation on the above requirement 01 to 10 is acceptable w.r.t Quality Requirement and those offers not meeting these specific customer requirement is liable for rejection and hence the bidder shall submit all the required documentary evidences in the offer itself.	
12	## Necessarily to be filled up by the bidder at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirement being customer specific requirement.	
13	If the OEM/Principal engaging the services of an agent to participate on their behalf, Then mention OEM /vendor Name & address as well as agent details with their sign and seal.	
VENDOR SIGN AND STAMP:		Vendor Name & Address:

Details of BOI's/ Sub Systems with respect to Main Items

Sl No.	Item/ Sub system Name	Quantity	Supplier Name	Place of Manufacturing
OEM (ORIGINAL EQUIPMENT MANUFACTURER) SEAL AND SIGN.				

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW****(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 2 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation), India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors(IE3) - Up to 200KW

01	Type Test Requirement(Contd)	D. The following Type test reports to be submitted covering the following for above 50KW LT Motor as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc i. Measuring of resistance of winding of stator and wound rotor (if applicable) ii. No load test at rated voltage to determine input current, power and speed. iii. Open circuit voltage ratio of wound rotor motor (in case slip ring motors) iv. Full load test to determine efficiency power factor and slip v. Temperature rise test. vi. Momentary excess /over load test vii. High voltage test viii. Test for vibration severity of motor ix. Test of noise levels of motor (Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A).) x. Over speed test xi. Degree of Protection Tests (Minimum Ingress Protection - IP 55). xii. Type test reports for motors located in fuel oil area having flame proof enclosures as per BIS 2148/ IEC 60079-1 E. The TCs/Test reports shall also be given as PDF file with index sheet & page control through Email & Soft Copy (File size to less than 9MB).	
02	Quality Plan Requirement	a. MQP (Manufacturing Quality Plan) is applicable for these LT Motors and accordingly Actual LT Motor Manufacture shall submit the MQP in ultimate customer – NTPC format for review and approval by BHEL / Ultimate Customer - NTPC. b. If any of LT Motor manufacture is having, ultimate customer NTPC approved MQP (Manufacturing Quality Plan) and having validity, the same is applicable for these LT Motor for inspection purposes subject to obtaining ultimate customer NTPC formal approval in the event of an order through endorsement sheet approval route as in sl no: 01 (c) below	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW****(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 3 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
SI. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation), India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors(IE3) - Up to 200KW

02	Quality Plan Requirement	c. Accordingly, LT Motor Manufacture & OEM supplier shall submit the filled up Endorsement sheet (copy attached) with ultimate customer approved MQP with signature & seal in the event of a Purchase Order from BHEL for BHEL/Ultimate Customer – NTPC review and approval. d. If LT Motor Manufacture / OEM vendor does not have MQP, they should submit a fresh MQP to BHEL/NTPC (in NTPC format) for review & approval. (copy attached). e. Typical Indicative MQP is attached for inf and & guidance purposes only and it is not final and binding on BHEL / Ultimate Customer NTPC.	
03	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor	a. All LT Motors are to be inspected by BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet/drg/spec/ as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc by BHEL / Ultimate Customer-NTPC b. All Routine Tests are to be witnessed by BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet/drg/spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc by BHEL / Ultimate Customer-NTPC c. BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-NTPC will also ensure LT Motor type tests reports review including Degree of Protection Test Reports & acceptance as per approved MQP & approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc. d. BHEL AIA (BHEL authorized inspection Agency)) / Ultimate Customer-NTPC to witness / perform inspection at LT Motor Supplier works and submit all the inspection documents and routine & Type test reports including Degree of Protection Test Reports (IP 55) as per approved MQP & approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc.	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW**(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 4 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
SI. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation), India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors(IE3) - Up to 200KW

03	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor...contd	<u>LT Motors up to 30KW – Inspection Categorization: III</u> All Routine tests on LT Motors are to be ensured by OEM Vendor & same are to be inspected & witnessed by OEM Vendor / BHEL / BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works as per approved MQP & approved data sheet /drg / spec/ as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc and all the Routine Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC for review and to obtain inspection and dispatch clearance. LT Motor Manufacturer has to issue COC(Certificate of Conformance) states that the above motor/ motors was manufactured taking care of Customer specific requirements regarding ambient temp., voltage and frequency variation, hot starts,pull out torque,starting KVA/KW, temp. rise, distance between centre of stud and gland plate, space heater and tested in accordance with approved drawing/data sheets	
		<u>LT Motors (30KW to 50KW) – Inspection Categorization: II</u> All Routine Tests on LT Motors are to be ensured by OEM vendor & same are to be inspected & witnessed by BHEL / BHEL AIA (BHEL authorized inspection Agency) at LT Motor manufacture works including review of Type Test Reports and Degree of Protection Test Reports (IP 55) as per approved MQP & approved data sheet/drg/spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc and all the Routine Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC for review and to obtain inspection and dispatch clearance .	
		<u>Above 50KW and up to 200KW – Inspection Categorization: I</u> All Routine & Type Tests if any on LT Motors are to be ensured by OEM Vendor at Actual LT Motor Manufacture Works and same shall be offered to BHEL/ BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-NTPC for inspection & witnessing including review of Degree of Protection Test Reports as per approved MQP /RQP (Reference Quality Plan with endorsement sheet approved) / approved data sheet / drg / spec / as per relevant BIS (Bureau of Indian Standard) - BIS 325 / IEC 60034 etc and all the Routine Test Reports with Inspection report (IR) to be submitted for BHEL/Ultimate Customer – NTPC review and to obtain inspection and dispatch clearance.	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW****(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 5 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation), India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors(IE3) - Up to 200KW

03	Inspection Methodology to be adopted at Actual LT Motor Manufacture works by OEM vendor...contd	All the checks / tests /review of documents / inspection & witnessing at LT Motor Manufacture by OEM /BHEL / BHEL AIA (BHEL authorized inspection Agency) / Ultimate Customer-NTPC are under OEM scope and any cost implication arising out of due to conducting checks / tests including for witnessing of any of the tests at Actual LT Motor Manufacture Works (or) at third party etc by BHEL / BHEL AIA / Ultimate Customer – NTPC are in the scope of OEM Supplier only. As such No extra cost if any will be admissible and paid in the event of an order and also during execution of the contract.	
		No material shall be dispatched without BHEL / BHEL AIA and Ultimate Customer – NTPC Inspection and dispatch clearance.	
04	Painting Requirements	Painting requirement like paint shade and painting thickness including no of coats if any are to be ensured by the OEM vendor for these LT Motors as per BHEL/ Ultimate Customer -NTPC approved data sheet/drg/spec (As applicable)	
05	Packing	Packing shall be as per Specification / Drg. / Data sheet including sea worthy packing if any to avoid any transit & handling damages	
06	For Inspection call	Inspection call by OEM Vendor for LT Motor inspection at Actual LT Motor Manufacture works to be raised for BHEL/BHEL AIA inspection/ Ultimate Customer – NTPC including for type test witnessing if any to be ensured / addressed to Mr R Kesavan., DGM (QC-Proc)., Mobile no: +91 9443006303., Email id: kesavan@bhel.in and Mr Kovarathanan., DM (QC-Proc)., Mobile no: +91 8903502628., Email id: kovak@bhel.in including for inspection related activities for immediate response / resolution.	
07	Document Package / Dossier	Specific confirmation for Document Package in the event of an order (3 hard copies + soft copies in Pdf file) is to be given containing the following with proper linkages (.) (i) Index Sheet (ii) MQP/RQP/Endorsement sheet (iii) TCs identified by BHEL/NTPC for record for “CHP” (Customer Hold Point) Verification & Witness “W” portion as given in MQP / RQP / MQP (as applicable). (iv) Final Inspection Report + TC (v) BHEL AIA (BHEL Appointed Inspection Agency) / BHEL report + TC (vi) Ultimate customer NTPC (National Thermal Power Corporation)	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW**(For FOREIGN (OUTSIDE INDIA) OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 002 Rev NO.: 00 PAGE : Page 6 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation), India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors(IE3) - Up to 200KW

07	Document Package / Dossier...contd	CHP (Customer Hold Point) / MDCC (Material Dispatch Clearance Certificate) (vii) Type test reports conducted/submitted with approval with approved data sheet and BOM with actual make used with Customer approved drgs.																																																																					
08	Important notes	Inspection Categorization: I Inspection by BHEL/BHEL AIA and also by Ultimate Customer – NTPC based on MQP/RQP approved and as in sl no:03 Inspection Categorization: II Inspection by Main contractor (BHEL) / BHEL AIA based on Ultimate Customer – NTPC approved MQP/RQP & based on inspection as in sl no:03 Inspection Categorization: III COC by Main contractor (BHEL) to Ultimate Customer – NTPC based on inspection as in sl no:03 Any cost implication for conducting checks / tests including for witnessing of any of the tests at Actual LT Motor Manufacture Works by BHEL / BHEL AIA / Ultimate Customer – NTPC is in the scope of OEM Supplier only and no extra cost if any will be admissible in the event of an order and also during execution of the contract.																																																																					
09	Motor details:- Vendor shall furnish following LT Motor (upto 200kW) details for the Pumps applicable for this enquiry.																																																																						
	<table border="1"> <thead> <tr> <th rowspan="2">S. No</th> <th rowspan="2">Pump</th> <th colspan="3">LT Motor</th> </tr> <tr> <th>Rating (in kW)</th> <th>Quantity (in nos)</th> <th>Make and Country of origin</th> </tr> </thead> <tbody> <tr><td>1</td><td>Process Water Pump</td><td></td><td></td><td></td></tr> <tr><td>2</td><td>Mist Eliminator Wash Water Pump</td><td></td><td></td><td></td></tr> <tr><td>3</td><td>Other LT Motors involved in the system (if any)</td><td></td><td></td><td></td></tr> <tr><td>4</td><td></td><td></td><td></td><td></td></tr> <tr><td>5</td><td></td><td></td><td></td><td></td></tr> <tr><td>6</td><td></td><td></td><td></td><td></td></tr> <tr><td>7</td><td></td><td></td><td></td><td></td></tr> <tr><td>8</td><td></td><td></td><td></td><td></td></tr> <tr><td>9</td><td></td><td></td><td></td><td></td></tr> <tr><td>10</td><td></td><td></td><td></td><td></td></tr> <tr><td>11</td><td></td><td></td><td></td><td></td></tr> <tr><td>12</td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	S. No	Pump	LT Motor			Rating (in kW)	Quantity (in nos)	Make and Country of origin	1	Process Water Pump				2	Mist Eliminator Wash Water Pump				3	Other LT Motors involved in the system (if any)				4					5					6					7					8					9					10					11					12						
S. No	Pump			LT Motor																																																																			
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OEM Supplier signature with seal

Necessarily to be filled up & submitted by the OEM vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements against LT Motors being BHEL/ ultimate customer – NTPC (National Thermal Power Corporation Limited) specific requirements.

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

ENDORSEMENT SHEET FOR QP REFERENCE / STANDARD / FIELD QUALITY PLAN (RQP / SQP/RFQP/SFQP)		
TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		 To be filled in by NTPC
PROJECT NAME	NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) BHEL W.O NO: G205 to G207, G505 to G508	2 REVIEW & ENDORSEMENT BY NTPC PROJECT SPECIFIC QP NUMBER ALLOTTED QP NO: REV. NO.: 00 DT :
CONTRACT NO.:	CS-2100-109(3)-9-FC/SC-COA-6844/6844	
MAIN SUPPLIER	M/S.BHEL, RANIPET, TAMIL NADU., INDIA	
MANUFACTURER WORKS & ADDRESS	TO BE FILLED BY OEM / LT MOTOR SUPPLIER	
ITEM /EQUIPMENT / SYSTEM/ SUB-SYSTEM DETAILS i.e. MODEL TYPE/SIZE/RATING etc.	LT MOTOR(IE3) - PROCESS WATER PUMPS AND MIST ELIMINATOR WASH WATER PUMPS FOR FGD APPLICATION	
APPROVED QP NO.: RQP/SQP/RFQP/SFQP	TO BE FILLED BY OEM / LT MOTOR SUPPLIER	
Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)		(TICK APPLICABLE)
I. That the item/ component is identical to that considered for SQP approval. ✓		The MQP/RQP/SQP is endorsed for this project without any change
II. That there are minor changes in the item/ component with respect to that considered for MQP/RQP/SQP approval, however the same do not affect the contents of MQP/RQP/SQP		
III. That there are minor changes in the item/ component with respect to that considered for MQP/RQP/SQP approval, however the same affect the MQP/RQP/SQP slightly, as indicated below / in attached sheet.		The SQP is endorsed for this project with changes as indicated. <u>DISTRIBUTION OF ENDORSEMENT OF</u> A) MQP/RQP/SQP: 1. MAIN SUPPLIER (WITH A COPY OF MQP/RQP/SQP) 2. MANUFACTURER 3. RIO 4. CQA-SPL 5. CQA-O/C B) RFQP/SFQP: 1. MAIN SUPPLIER (with a copy of MQP/RQP/SQP) 2. MANUFACTURER 3. NTPC FQA (with a copy of MQP/RQP/SQP) 4. NTPC Erection (with a copy of MQP/RQP/SQP) 5. CQA-SPL 6. CQA-O/C
TO BE FILLED BY OEM / LT MOTOR SUPPLIER		NTPC (Reviewed /Approved by/ Date & Seal)
SIGN.: (Main Supplier) DATE:	SIGN.: (Manufacturer) DATE:	

Note No. #5

Attachment: COP Foreign OEM vendor Annex I hpdf

OEM SUPPLIER WITH OEM MFRG.'s LOGO (TO BE FILLED BY OEM SUPPLIER)	LT MOTOR MANUFACTURER'S NAME AND ADDRESS (TO BE FILLED BY OEM/ LT MOTOR MANUFACTURE)	MANUFACTURING QUALITY PLAN												
		ITEM: LT MOTOR(IE3) UP TO 200KW FOR FGD APPLICATION SUB-SYSTEM: FGD - PROCESS WATER PUMPS AND MIST ELIMINATOR WASH WATER PUMPS					QP NO.: PROCESS WATER PUMPS AND MIST ELIMINATOR WASH WATER PUMPS: LT MOTOR:001 REV.NO.: 00 DATE: PAGE: OF....							
PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) BHEL W.O NO: G205 to G207, G505 to G508) FGD PACKAGE NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA- 6844/6844 MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (TO BE FILLED BY OEM SUPPLIER)														
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
					M	C/N				D*	M	C	N	
1.	2.	3.	4.	5.	6.		7.	8.	9.	D*	** 10.			11.

		LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** M: OEM MANUFACTURER/LT MOTOR SUB-SUPPLIER C: MAIN SUPPLIER - BHEL/BHEL AIA, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION. AS APPROPRIATE, CHP: NTPC SHALL IDENTIFIED IN COLUM "N" AS 'W'	DOC. NO.: REV..... CAT.....			
OEM MANUFACTURER/ LT MOTOR SUPPLIER	MAIN (BHEL) SUPPLIER		FOR NTPC USE			
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

FORMAT NO.: QS-01-QAI-P-09/F1-R1

1/1

ENGG. DIV./QA&I



Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application						MQP:E.LTM:NTPC KORBA:FGD PWMEMP :001			
	To be filled by OEM Supplier								REV:NO:00			
	LT MOTOR Manufacture								DATE: 24.07.2021			
	To be filled by OEM Supplier								Page :			
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	AGENCY M	BHEL/ BHEL AIA	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.
INCOMING INSPCTIONS:												
1.1	Enamelled round copper conductor(Dual coated)MM	1.Overall diameter	Major	Mechanical	1 sample/lot	IS 13730 1993 Part 13 / IEC 60317-0-1-2008 (As applicable)	IEC 60317-0-1 2008	Plant format		P	V	
		2.Bare conductor diameter	Major	Mechanical	1 sample/lot	BHEL / NTPC Spec & Apprd Datasheet	BHEL / NTPC Spec & Apprd Datasheet	Plant format		P	V	
		3.BDV test	Major	Electrical	1 sample/lot	--do--	--do--	Plant format		P	V	
		4.Elongation	Major	Mechanical	1 sample/lot	--do--	--do--	Plant format		P	V	
		5.Continuity (insulation)	Major	Electrical	1 sample/lot	--do--	--do--	Insp report/ Supplier TC		P	V	
		6.Tan Delta (If applicable)	Major	Electrical	1 sample/lot	--do--	--do--	Insp report/ Supplier TC		P	V	
1.2	Aluminum Ingots	1.Chemical composition	Major	Chemical	1 sample/lot	--do--	--do--	Supplier Tc		P	V	EC gr purity: -99.6%
1.3	FAN	1.Diameter (ID&OD)	Major	Mechanical	1 sample/lot	--do--	--do--	Inspection Report		P	V	
1.4	Bearings (SKF OR FAG)	1.Type & Make	Major	Visual	100%	--do--	--do--	Inspection Record		P	V	
		2.Dimensions - ID,OD&width	Major	Mechanical	1 sample/lot	--do--	--do--	Inspection Record		P	V	
1.5	Terminal Block	1.Dimensions	Major	Mechanical	Plant std.	--do--	--do--	Inspection Report		P	V	
		2.Proof voltage test	Major	Electrical	Plant std.	--do--	--do--	Inspection Report		P	V	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application						MQP:E:LTM:NTPC KORBA:FGD PWMEMP :001		
	To be filled by OEM Supplier								REV:NO:00		
	LT MOTOR Manufacture								DATE: 24.07.2021		
	To be filled by OEM Supplier								Page :		
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC		AGENCY	REMARKS
									D	M	BHEL/ BHEL AIA
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
INPROCESS INSPCETIONS:											
2.1	Stator core	1.Core length dia	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	
		2.Core locking	Major	Visual	100%	--do--	--do--	Inspection Record	P	V	
		3.Rigidity of core	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	
2.2	Die cast rotor	1.Core length	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	
		2.Blow holes	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	
2.3	Wound stator (if applicable)	1.Resistance	Major	Electrical	100%	--do--	--do--	Inspection Record	P	V	
		2.H.V.Test	Major	Electrical	100%	--do--	--do--	Inspection Record	P	V	
		3.Insulation resistance	Major	Electrical	100%	--do--	--do--	Inspection Record	P	V	
2.4	Final Assembly	1.Completeness	Major	Visual	100%	--do--	--do--	Inspection Record	P	V	
		2.Runout in case of flanged motors	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	
		3.Mounting dimensions	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	V	

Note No. #5

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BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application						MQP:E:LTM:NTPC KORBA:FGD PWMEWP :001		
	To be filled by OEM Supplier								REV: NO:00		
	LT MOTOR Manufacture								DATE: 24.07.2021		
	To be filled by OEM Supplier								Page :		
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	AGENCY M	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
FINAL INSPECTION AND TESTING:											
3.1	Routine Test	1. Resistance Measurement on winding & space heater	Major	Electrical	100%	BHEL / NTPC Spec, GA Drawing & Apprd Datasheet and IS/IEC 60034 (As applicable)	BHEL / NTPC Spec, GA Drawing & Apprd Datasheet and IS/IEC 60034 (As applicable)	Inspection Record	P	W	
		2.HV Test	Major	Electrical	100%	--do--	--do--	Inspection Record	P	W	
		3.Phase sequence & direction of rotation	Major	Electrical	100%	--do--	--do--	Inspection Record	P	W	
		4.No load run test	Major	Electrical	100%	--do--	--do--	Inspection Record	P	W	
		5.Vibration test	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	W	
		6.Name plate recheck	Major	Visual	100%	--do--	--do--	Inspection Record	P	W	
		7.Paint shade thickness & adhesion	Major	Visual & Measurement	100%	--do--	--do--	Inspection Record	P	W	
		8.Mountings & Overall dimensions	Major	Mechanical	100%	--do--	--do--	Inspection Record	P	W	

Note No. #5

Attachment: CQR Foreign OEM vendor Annex II.pdf

BHEL BAP/ RANIPET / TAMIL NADU INDIA	OEM SUPPLIER		MANUFACTURING QUALITY PLAN FOR LT MOTOR (Up to TO 200KW) - FGD Application						MQP:E:LTM:NTPC KORBA:FGD PWMWP :001		
	To be filled by OEM Supplier								REV:NO:00		
	LT MOTOR Manufacture								DATE: 24.07.2021		
	To be filled by OEM Supplier								Page :		
S1.No.	COMPONENT/ASSEMBLY/OPERATION/TESTS	CHARACTERISTIC	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	FORMAT OF REC	D	AGENCY M	REMARKS BHEL/ BHEL AIA
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
3.2 TYPE TESTS ###											
3.3	Preservation and Packing	1.Completeness	Major	Review	100%	--do--	--do--	Inspection Record		P	V
		2.Motors covered with polythene sheets	Major	Visual	100%	--do--	--do--	Inspection Record		P	V
		3.Packing	Major	Visual	100%	--do--	--do--	Inspection Record		P	V
### TYPE TEST REQUIREMENTS FOR LT MOTOR INCLUDING DEGREE OF PROTECTION TEST REPORT (IP 55)											
BHEL/BHEL AIA (Authorised Inspection Agency) shall review the Identical design type test report during including degree of Protection Test report (IP 55) for acceptance in line with BHEL/ Ultimate Customer - NTPC approved Data sheet/Drg/Spec for LT Motor rating up to 50KW and BHEL/Ultimate Customer NTPC approved type test report for LT Motor rating more than 50KW and up to 200KW. If not available for Similar / Identical Design of any of the LT Motor motor, then OEM / LT Motor Manufacture shall conduct all these type tests at Third party lab / Government Approved Lab / Own lab in presence of BHEL/BHEL AIA / without any cost implication to BHEL/Ultimate Customer - NTPC within reasonable time.											
1. Measurement of Resistance of Stator 2. No Load test at Rated Voltage 3. Pull out test 4. Temperature Rise Test 5. Momentary Exceeds Torque Torque Test 6. High Voltage Test 7. Test for Vibration Severity 8. Test for Noise Level Measurement 9. Over Speed Test 10. Degree of Protection TC (IP 55)											
LEGEND: OEM = Original Equipment Supplier M = LT Motor Manufacture - BHEL AIA = BHEL AUTHORISED INSPECTION AGENCY GA Drawing : General Arrangement Drawing NTPC - NATIONAL THERMAL POWER CORPORATION (Ultimate Customer) OEM SUPPLIER : (To be Filled up by OEM Supplier) LT MOTOR Manufacture : (To be Filled up by OEM Supplier)											

Note No. #5

Attachment: CQR Indigenous OEM vendor Annex I.pdf**CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTORS(IE3) Up to 200KW****(For INDIGENOUS OEM VENDOR ONLY)**

PROJECT: NTPC KORBA FGD Stage I, II,III (3X200 MW + 4X500 MW) NTPC CONTRACT NO: CS-2100-109(3)-9-FC/SC-COA-6844/6844 PACKAGE: FGD PACKAGE MAIN CONTRACTOR: BHEL - RANIPET SUB CONTRACTOR (OEM) & ADDRESS: (To be filled by OEM VENDOR)	CONTRACT QUALITY REQUIREMENTS (CQR) for <u>LT MOTORS(IE3) - Up to 200KW used in Process Water Pumps and Mist Eliminator Wash Water Pumps</u> NTPC KORBA FGD Stage I, II, III (3X200 MW + 4X500 MW) Project (BHEL W.O NO: G205 to G207, G505 to G508)	DOC.NO: BAP/QR/ G205-G207 & G505-508/NTPC Korba/ LTM/ PWMEW Pumps: 001 Rev NO.: 00 PAGE : Page 1 of 6 DATE: 24.07.2021	##Enquiry No: ## OEM Supplier Name & Address: ##Offer reference: ##Date: Contact Official Name: Mobile no: Email id:
Sl. NO.	DESCRIPTION	BHEL and Ultimate Customer - NTPC (National Thermal Power Corporation),, India Quality Requirements	##Specific confirmations by the vendor

ITEM: LT Motors (IE3) Up to 200KW

01	Type Test Requirements	A. Vendor shall submit the type test reports of all the type tests as listed in SL NO: 01 (D) below and carried out within 10 years from the data of ultimate NTPC bid opening dt 24.04.2019. These reports should be for the test conducted on the identical/similar LT Motors to those proposed to be supplied under this enquiry and test (s) either should have been conducted at an independent laboratory (or) should have been witnessed by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL (or) Ultimate client NTPC at respective LT Motor Manufacture of OEM vendor.	
		B. However, if vendor is not able to submit the similar / identical type test report as per above condition (or) in the case of type test reports are not found to be meeting the specification requirement, the vendor shall conduct all the tests at no additional cost to BHEL either at third party lab (or) own lab in the presence of BHEL AIA (BHEL Appointed Inspection Agency) / BHEL /Ultimate client NTPC and submit the reports for review & approval.	
		C. Type Test reports review and approval by BHEL AIA (BHEL Appointed Inspection Agency) / BHEL / Ultimate client NTPC is must in line with NTPC approved data sheet / BOM/GA Drawing etc.	