

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

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

VOLUME II B

SECTION D

REV. NO. 0 DATE 10/08/2010

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BHEL-PEM-DELHI-INDIA	
CONSIGNEE	
MATERIAL	
CUSTOMER REF.	MO. NO.
DESPATCH ADVICE 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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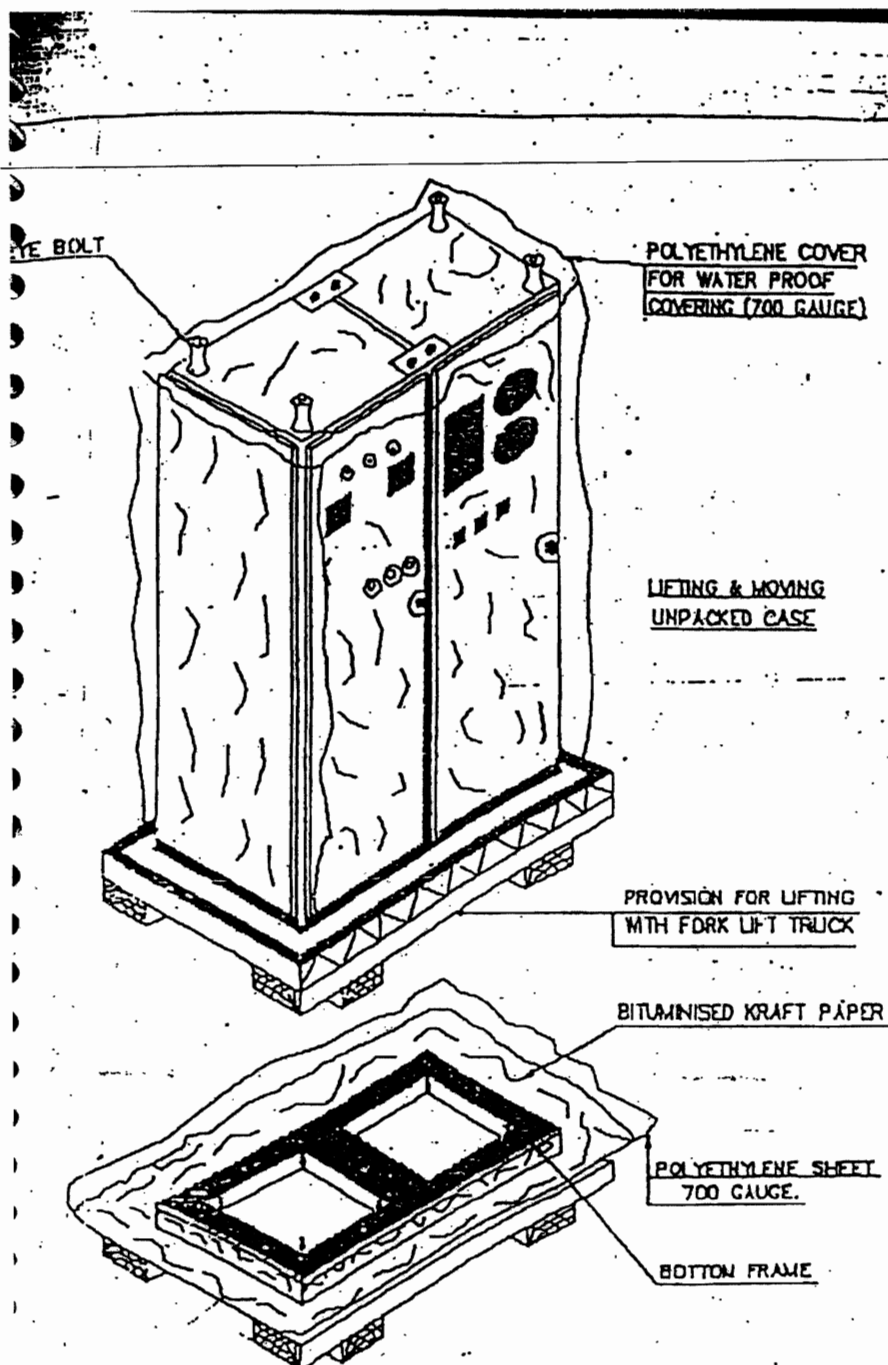


FIGURE-14



TITLE

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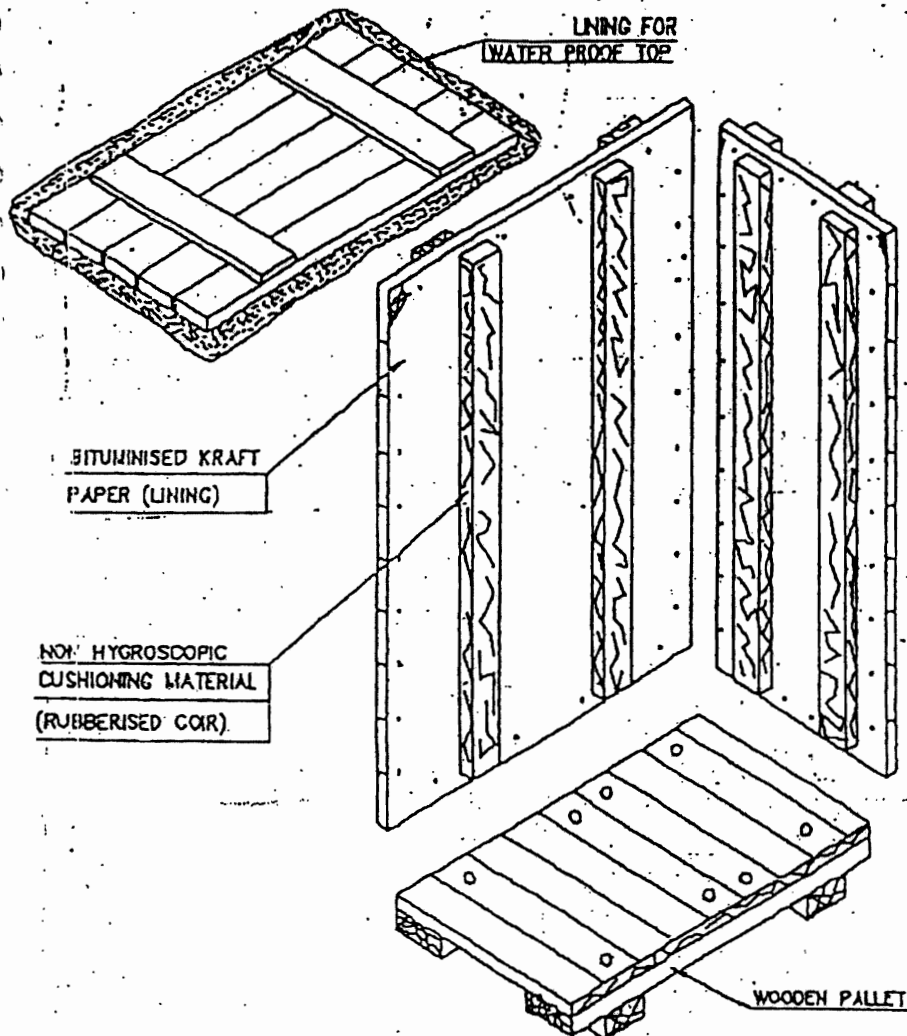
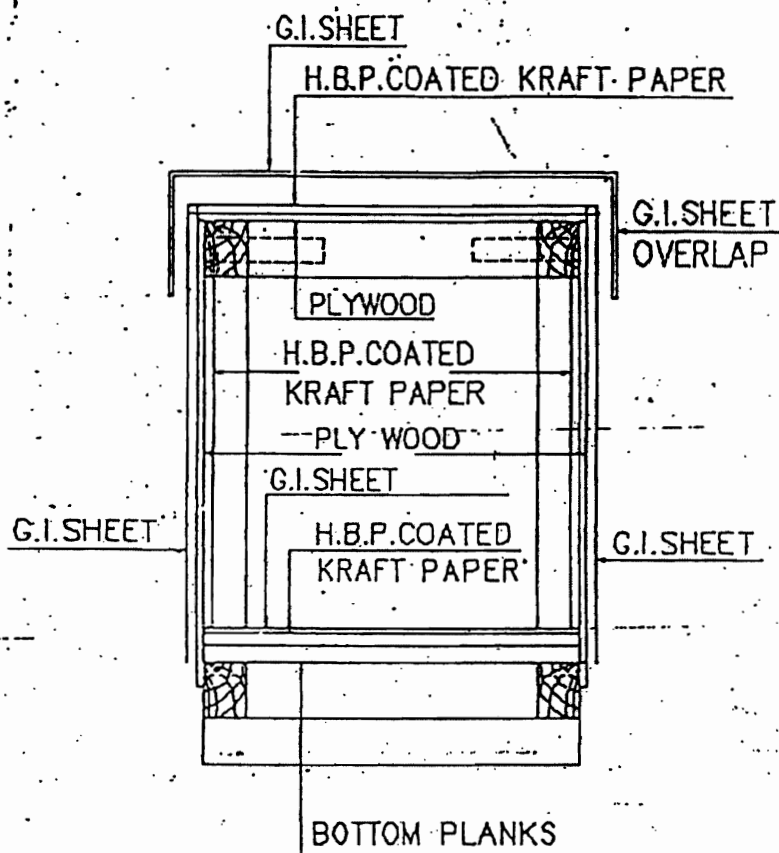


FIGURE-15

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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.

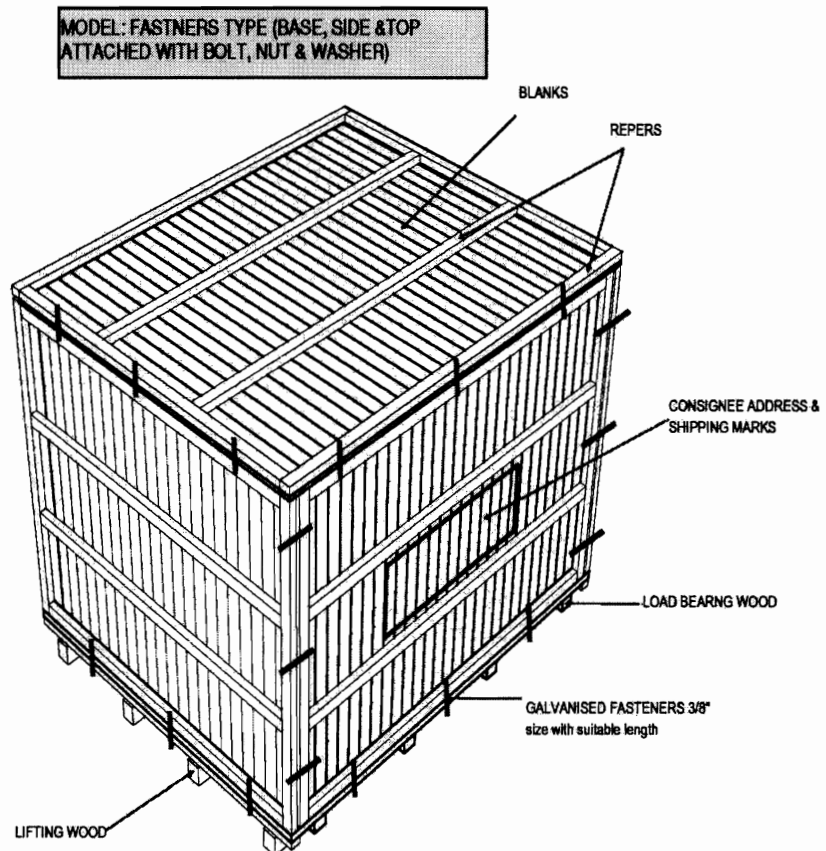
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- Thermocol packing shall be made for glass items like Ball vessel sight glass, Vpiece
- sight glass & pressure gauge.
- Silica gel desiccants shall be kept inside of each case to absorb the moisture.
- A Packing list covered in a polythene envelope 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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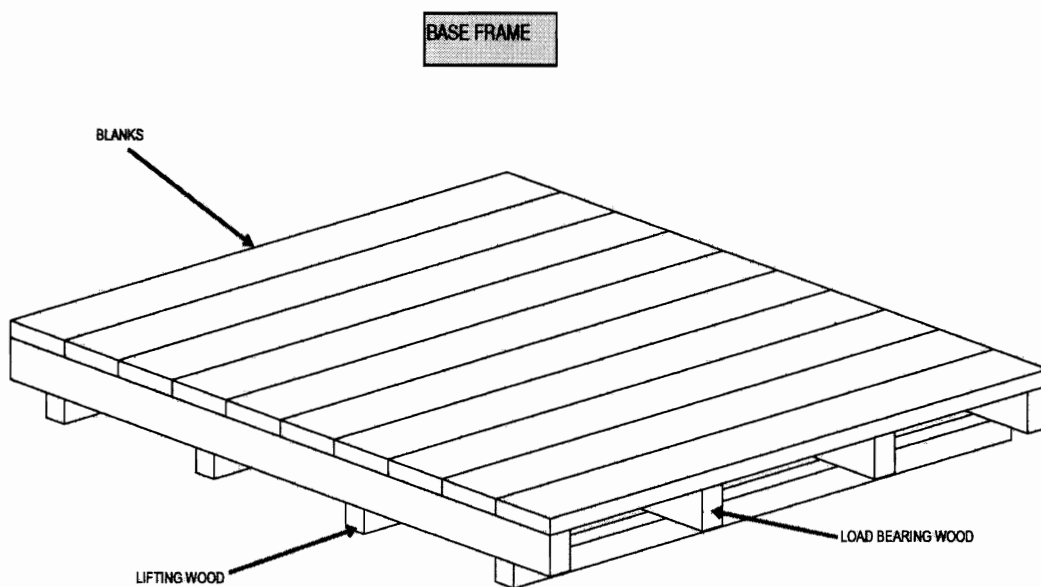
This Type of case to be used for following items:

1. BALL SEPERATOR
2. BALL COLECTOR SKID



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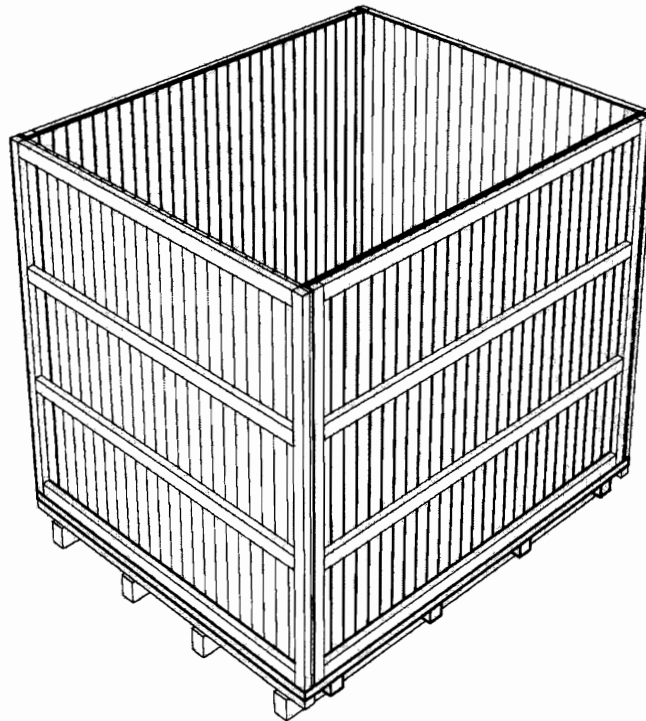
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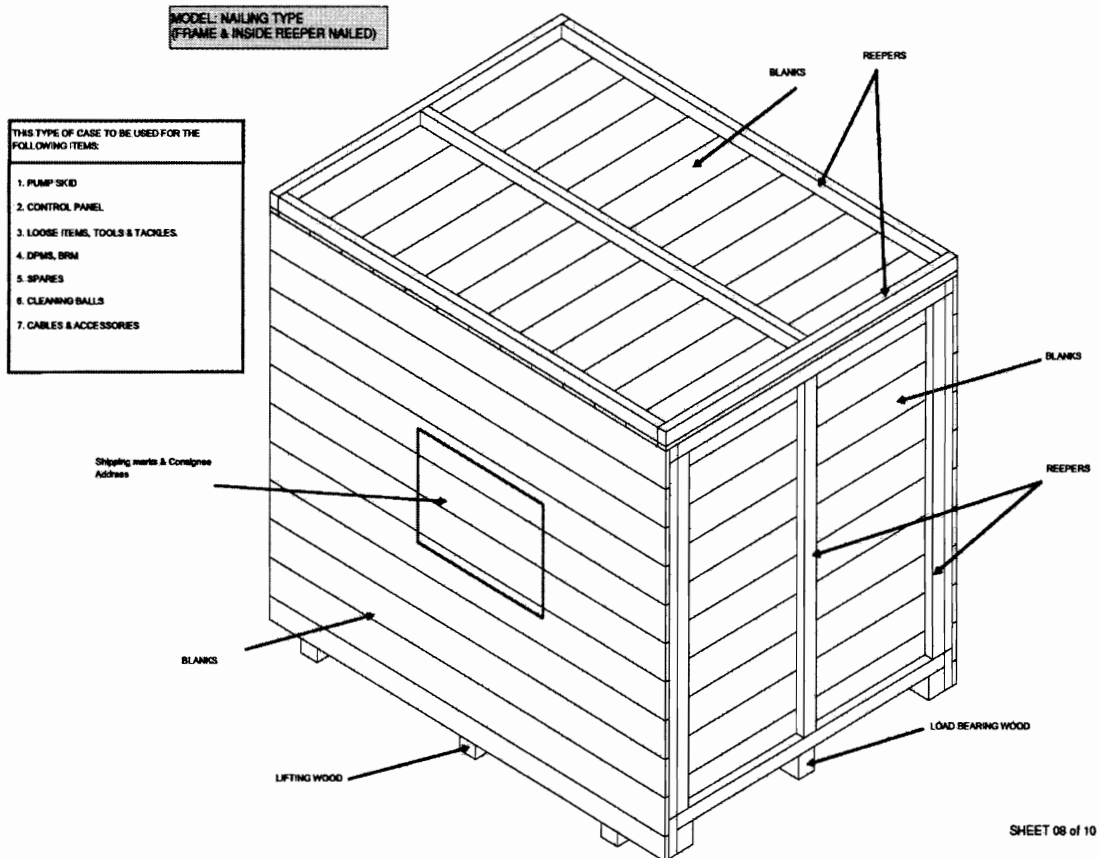
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MODEL: FASTNERS TYPE - WITHOUT TOP



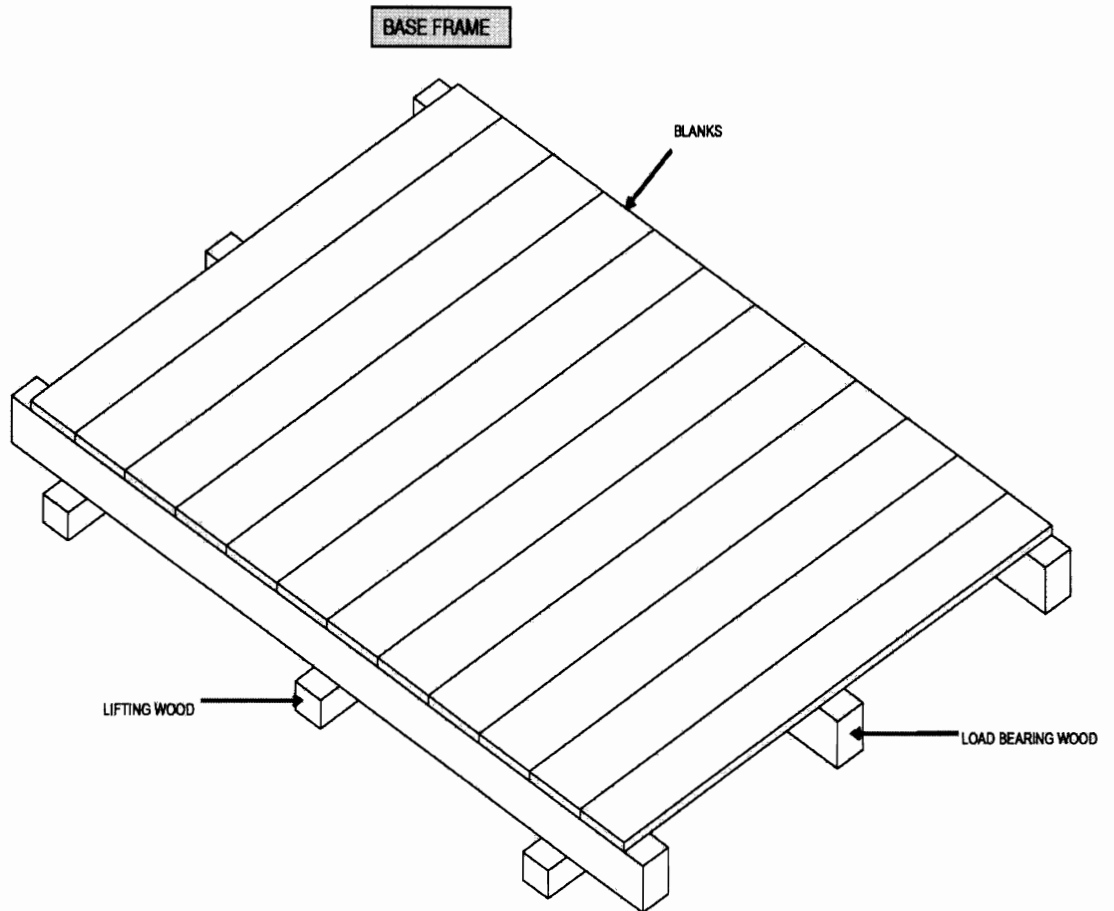
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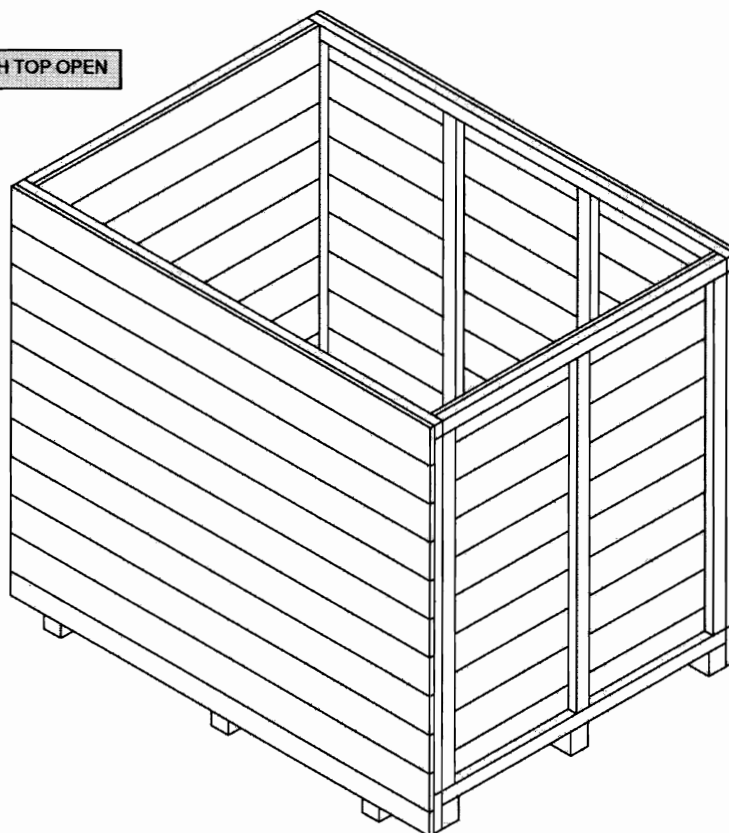
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NAILING TYPE MODEL WITH TOP OPEN



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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

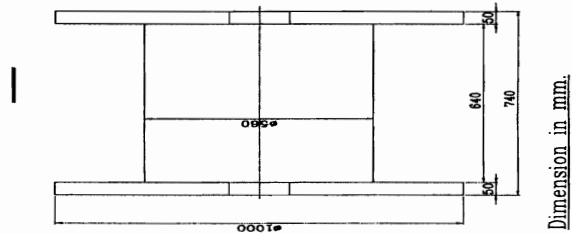
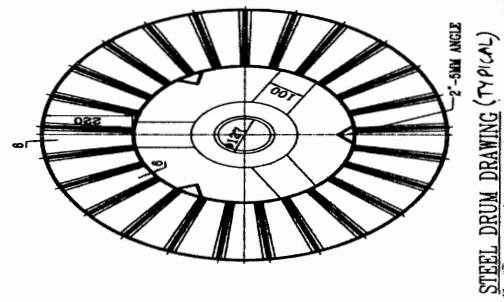
11.1 CABLES

11.1.1 Type of Equipment
All type of cables..

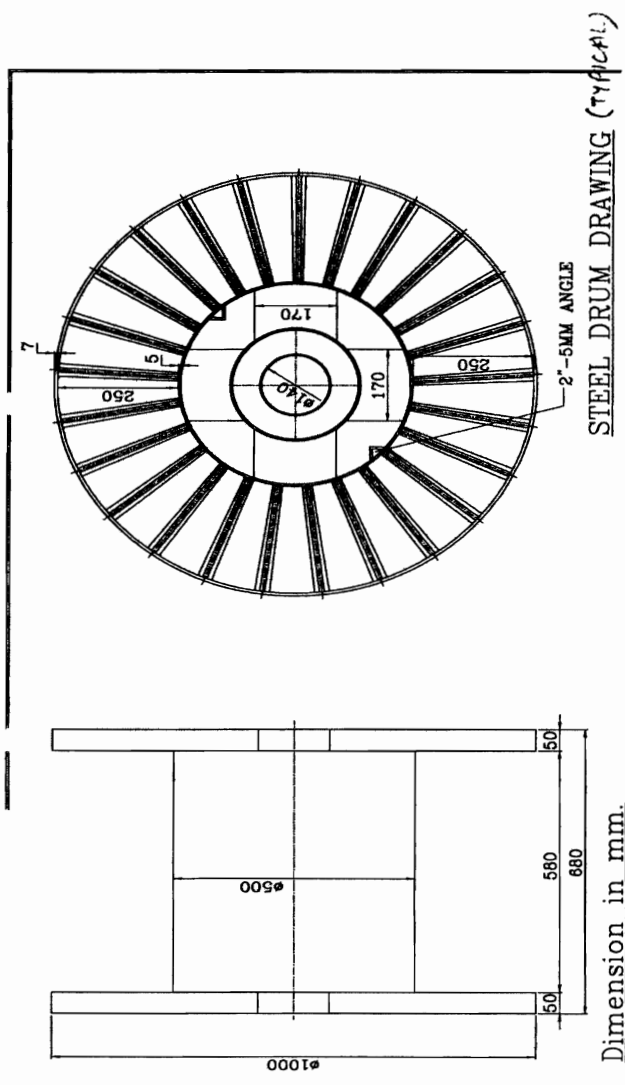
11.1.2 Type of Construction

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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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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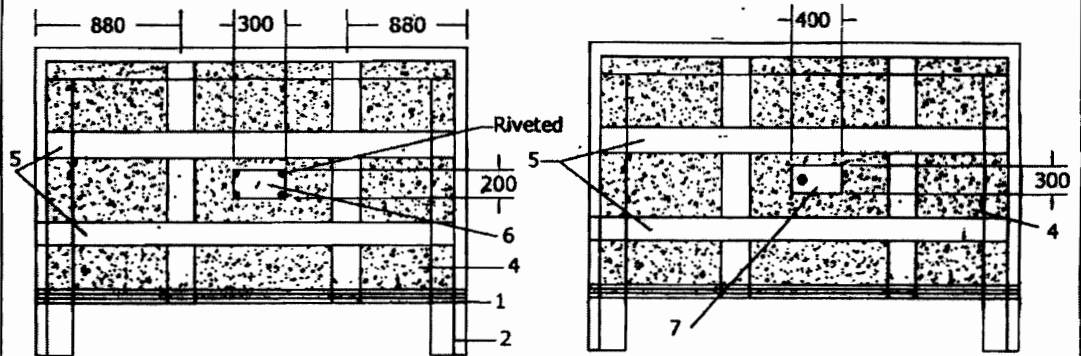
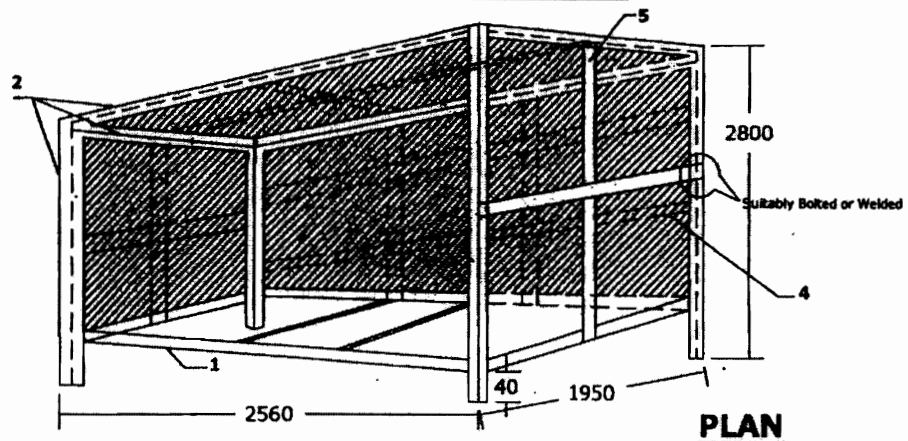
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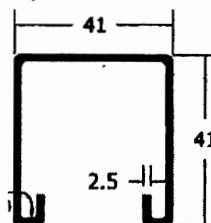
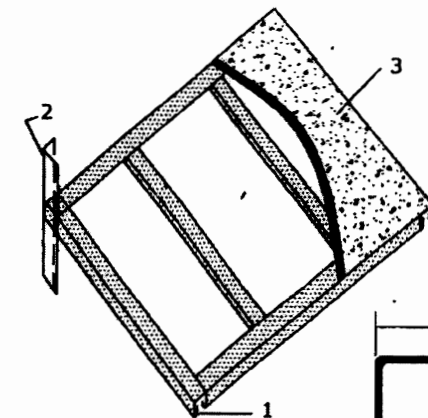
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STEEL PACKING (TYPICAL DETAILS)**Note:**

1. "C" Channel to be used on Bottom Frame.
2. 50x50x6 Angle to be used Vertically on four sides of the Box and Horizontally on four sides on the top Frame.
3. 1.6mm thick sheet (plain) on Bottom Plate.
4. 1.0mm thick sheet to cover top & four sides of BOX.
5. 50x3 Flat as additional cross members to be used Horizontally & Vertically on top & Four Sides of Box.
6. Anodised Aluminium Plate for Marking.
7. Hinged Inspection Window.



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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

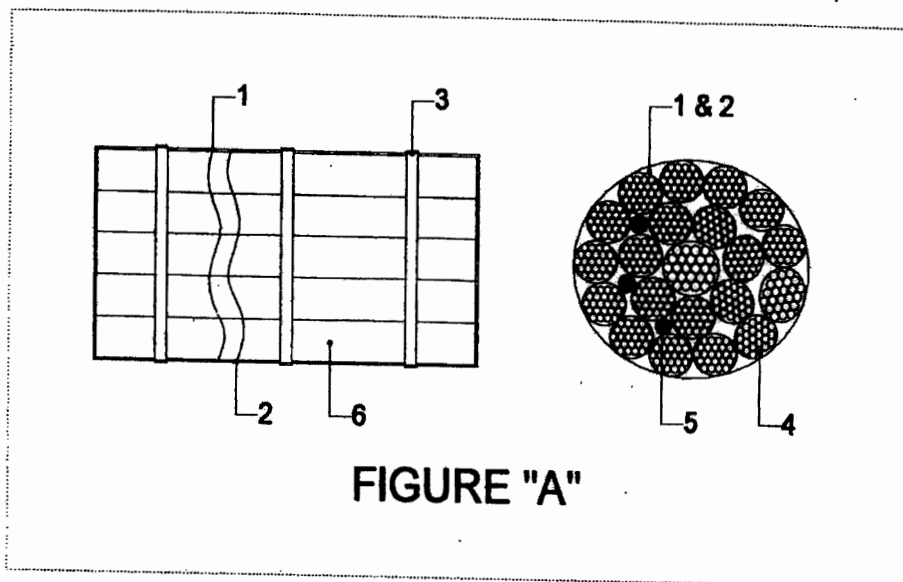


FIGURE "A"

- 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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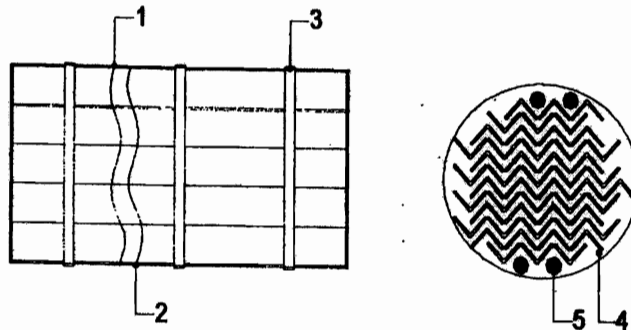
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PACKING PROCEDURE FOR STRUCTURAL STEEL**FIGURE "B"**

- 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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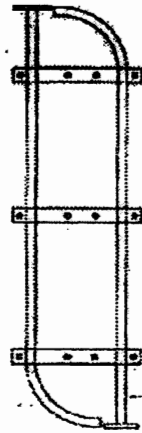
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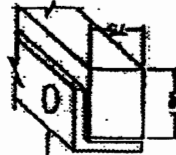
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packing procedure for poles



POLES WRAPPED WITH POLYTHENE SHEET &
EXTRUDING COATED HESSIAN CLOTH



TOP WOODEN BATTEN TO BE
FIXED WITH L50x80x6 MM ON TOP
OF IT FOR TIEING THE ROD
25 MM DIA



BOTTOM WOODEN BATTEN TO BE
FIXED ON L50x80x6 MM ANGLE

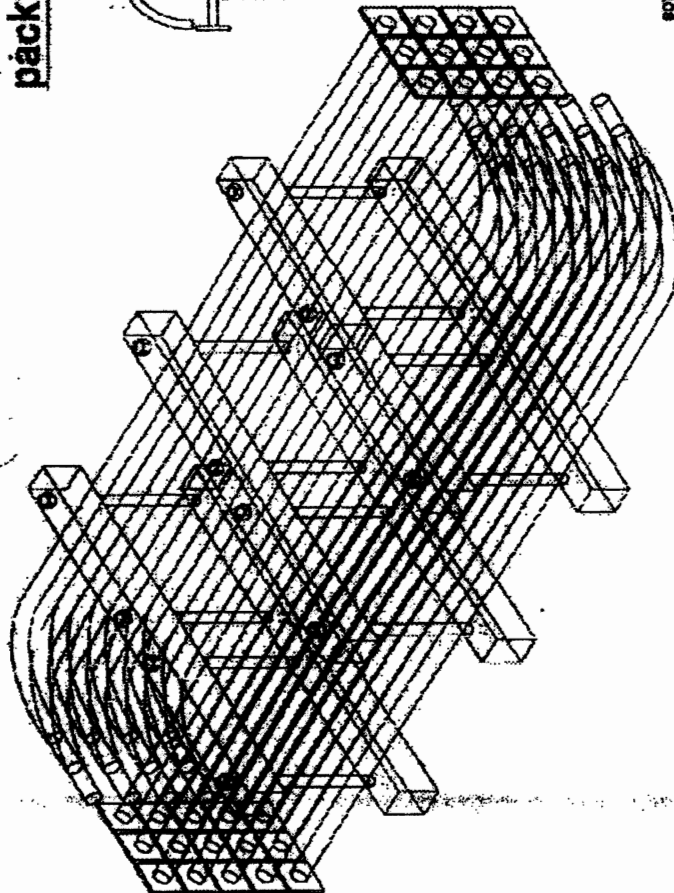


FIGURE "C"

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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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- d 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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SECTION II

STANDARD TECHNICAL SPECIFICATION



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1.0 STANDARD TECHNICAL REQUIREMENTS – EQUIPMENTS/ COMPONENTS OF GDS

I	DESIGN CONSTRUCTION –VACUUM BELT FILTERS
1.	The vacuum belt filter shall be proven design in operation for similar capacities. The filter cloth shall be polyester or polypropylene as per the proven design of the supplier and shall be guaranteed for a minimum life of not less than 7000 hrs.
2.	The complete frame of the filter and all parts in contact with gypsum shall be made of corrosion resistant material.
3.	In case, the contractor offers a design with an underlying belt for carrying the filter cloth, the same shall be endless, factory vulcanized rubber belts. The belt shrouds and the sealing belts shall provide a leak tight arrangement to prevent overflow of gypsum slurry. The sealing belt shall have minimum life of not less than 7000 hrs.
4.	The vacuum box shall ensure tight sealing with the belt/cloth and shall be of proven design.
5.	The belt filter shall have an automatic cloth tracking mechanism and shall be provided with all required instrumentation as per the supplier's proven practice. The belt filter shall have an automatic cloth tensioning mechanism.
6.	The filter shall be provided with minimum 2 stages of cake washing for removing impurities in the gypsum. One stage of cloth washing arrangement shall also be provided.
7.	Local control panel shall have display on the front panel, inverter, PLC controller and necessary electrical parts.
8.	The service factor of the gear unit (if any) shall be minimum 1.5.
9.	Piping and wiring within the skid should be in the vendor's scope.
10.	Nozzles and connections The suction and discharge pipes will be flanged and will have the same nominal test procedure as the body of the pump. Threaded connections are not admitted in these pipes.
11.	The flanges shall comply with the following standards: - Steel flanges as per ANSI B16.5 (raised face type, at least class 150) - Cast iron flanges as per ANSI 16.1 (flat face type, at least class 125) The pipe shall be designed according to API676 with regards to the force.
II	DESIGN AND CONSTRUCTION OF VACUUM PUMPS
	Design and construction of various components of the pumps shall conform to the following general specifications. For material of construction of the components, data sheets shall be referred to.
a)	Pump Casing
	Pumps shall be radial split casing, close/semi-open, over-hang, end suction type back pull-out design, vertical discharge type for horizontal centrifugal pump. The casing shall be designed to withstand the maximum shut-off pressure developed by the pump at the pumping temperature. Pump casing shall be provided with a vent connection and piping with fittings & valves. Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pressure gauge as standard feature. It shall be structurally sound to provide housing for the pump assembly and shall be designed hydraulically to minimum radial load at part load operation.



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b)	Impeller
	Impeller shall be closed, semi-closed or open type as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled. The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying, pinning or lock rings. On pumps with overhung shaft, impellers shall be secured to the shaft by a lockout or cap screw which tightness in the direction of normal rotation.
c)	Impeller/Casing Wearing Rings
	Replaceable type wearing rings shall be provided at suitable locations of pumps. Suitable method of locking the wearing ring shall be used. Wearing rings shall be provided in pump casing and/or impeller as per manufacturer's standard practice.
d)	Shaft
	The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed. The shaft shall be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads, vibration and torques coming in during operation.
e)	Shaft Sleeves
	Renewable type fine finished shaft sleeves shall be provided at mechanical seals. Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.
f)	Bearings
	Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble free operation shall be furnished. The bearings offered shall be capable of taking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional thrust bearings shall be provided. Antifriction bearings of standard type, if provided, shall be selected for a minimum life 20,000 hrs. of continuous operation at maximum axial and radial loads and rated speed. Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearings assembly. Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearings housing.
g)	Mechanical Seals
	Mechanical seals shall be of single type with either sliding gasket or bellows between the axially moving face and shaft sleeves or any other suitable type. The sealing faces should be highly lapped surfaces of materials known for their low frictional coefficient and resistance to corrosion against the liquid being pumped.
	The pump supplier shall coordinate with the seal maker in establishing the seal chamber of circulation rate for maintaining a stable film at the seal face. The seal piping system shall form an integral part of the pump assembly. For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure even when the pumps are not operating. Necessary provision for seal water supply along with complete piping fittings and valves as required shall form integral part of pump supply.
h)	Pump Shaft Motor Shaft Coupling
	The pump and motor shafts shall be connected with an adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guards shall also be provided.



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i)	Base Plate
	A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be fabricated steel and of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the piping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, internal differential thermal expansion and hydraulic piping thrust. Suitable drain troughs and drip lip shall be provided.
j)	Drive Motor (Prime Mover)
	The kW rating of the drive shall be based on continuously driving the connected equipment for the conditions specified.
III	GYPSUM DISCHARGE CHUTE
a)	The minimum valley angle of chutes shall be 60 degrees at the feeding point to guide the material in the direction of belt travel. Transfer chutes shall be adequately sized and sloped to ensure smooth flow of Gypsum without any accumulation anywhere.
b)	Chutes shall be made of minimum 20 mm thick TISCRAAL / SAILHARD/ LSLAS07 or equivalent material. All chutes should have one inspection door at every floor and for the ones in between the floors (more than 1.5 meter above the operating floor level) suitable access for trouble free maintenance shall be provided. For sealing of inspection doors labyrinth type arrangement to be provided.
c)	Complete chute work in the region of flap gates shall be fabricated from 20 thk TISCRAAL or equivalent. In case of vertical chute (valley angle more than 80 degree) complete chute, work shall be of 20 mm thick TISCRAAL or equivalent material. While finalizing the chute work inside the building, arrangement for shifting and replacing chute legs, proper handling arrangement/wall openings, trolleys, hoists shall also be provided. While fabricating the chute, no welds in between shall be allowed.
	One (1) no. chute blockage switch for each belt filter of proven type (subject to approval of the employer) shall be provided. Chute blockage switch shall trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment.
IV	PIPING
a)	The slurry pipes shall be sized to minimize erosion and avoid settling of the gypsum at all load operation. Slurry pipes shall be designed to keep the velocity above the settling velocity under all operating conditions. The bidder may provide a recirculation line with motorized isolation valve for the above purpose. All the pipes handling slurry shall be provided with replaceable rubber lining of proven quality. The slurry pipes shall be lined with replaceable wear resistant natural rubber lining of minimum 6 mm thickness. Additional thickness of 2 mm in rubber lining shall be provided at bends. The bidder can provide slurry pipes of size lower than 3" made up of FRP material (silicon carbide coating on slurry exposed surface) if it has previous experience of providing the same. All the rubber-lined pipes shall be of flanged connection.
b)	The isolation valves provided in all the slurry lines shall be of knife gate type/butterfly type unless specifically mentioned. Motorized actuators shall be provided for valves requiring frequent operation as indicated in the relevant scheme.
c)	Necessary arrangements for purging & flushing of all the process pipelines, equipments etc. shall be required.
d)	Belt filter washing pumps shall have a minimum flow line to tank with a restriction orifice to control.
e)	All Lube oil , Instrument Air piping shall be made up of Gr.304 Stainless Steel material.
f)	All process water & Cooling water piping shall be made up of Carbon Steel Pressure Piping.



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LIST OF DOCUMENTS TO BE SUBMITTED WITH
BID

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DRAWINGS / DOCUMENTS TO BE SUBMITTED WITH THE BID

Bidder should submit the filled up (wherever applicable), signed and stamped copy of the following documents along with the offer/ bid for technical evaluation:

Sl. No.	Reference	Description
1.	Annexure-2	COMPLIANCE CUM CONFIRMATION CERTIFICATE
2.	Annexure-3	PRE BID CLARIFICATION SCHEDULE
3.	Annexure-4	DEVIATION SHEET (COST OF WITHDRAWAL)
4.	Annexure-5	SCHEDULE OF GUARANTEES
5.	Annexure-6	LIST OF MAKES OF SUB VENDOR ITEMS
6.	Annexure-7	LIST OF TOOLS & TACKLES
7.	Annexure-8	EQUIPMENT DATA SHEET/ SCHEDULE (TO BE FILLED BY BIDDER)
8.	Annexure-9	LIST OF COMMISSIONING SPARES
9.		UNPRICED SCHEDULE IN THE PRICE FORMAT ISSUED ALONG WITH TENDER



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**COMPLIANCE CUM CONFIRMATION
CERTIFICATE**

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COMPLIANCE-CUM-CONFIRMATION CERTIFICATE

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

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

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

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same are deemed to be included in the base price.
- g) All sub-vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee/Warranty for plant/equipment shall be as per relevant clause of GCC / SCC / other Commercial Terms & Conditions
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break-up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site



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commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account.

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



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PRE-BID CLARIFICATION SCHEDULE

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PRE-BID CLARIFICATION SCHEDULE

S. NO.	SECTION/CLAUSE/PAGE NO.	STATEMENT OF THE REFERRED CLAUSE	CLARIFICATION REQUIRED

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

Signature: _____

Name: _____

Designation: _____

Company: _____

Date: _____

Company Seal



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DEVIATION SCHEDULE

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DEVIATION SHEET (COST OF WITHDRAWAL)

**(TO BE FILLED UP BY BIDDER IN THE FORMAT ATTACHED AS
ANNEXURE –II OF GENERAL CONDITIONS OF CONTRACT ISSUED
ALONG WITH TENDER. ANY DEVIATION QUOTED ELSEWHERE/ IN
OTHER FORMAT SHALL NOT BE CONSIDERED)**



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SCHEDULE OF GUARANTEES

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SCHEDULE OF GUARANTEES



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SCHEDULE OF GUARANTEES

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1.0 PERFORMANCE GUARANTEE

All performance tests for GDS shall be carried out in accordance with the relevant latest international codes/standards.

- 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the GDS and its accessories.
- 2) Bidder shall furnish guaranteed power consumption for the gypsum dewatering system. Guaranteed Power Consumption in the applicable format shall be submitted in sealed envelope along with price bid as part of techno commercial offer. However along with unpriced format, bidder shall furnish guaranteed power consumption format indicating "Quoted" in the table provided in Annexure-IV of the price schedule.
- 3) Vendor shall Guarantee and demonstrate each Vacuum Belt Filter capacity of minimum 136 TPH wet gypsum cake with an inlet solid concentration of 45% by weight.
- 4) The contractor shall guarantee and demonstrate that gypsum cake moisture content shall not be more than 10% and chloride content shall not be more than 100 ppm. Purity of gypsum shall be 90% or more.
- 5) The filter cloth shall be guaranteed for a minimum life of not less than 7000 hrs.
- 6) The liners in hydro-cyclone shall have a minimum wear life of not less than 7000 hrs.
- 7) Noise level ≤ 85 dB (A) at 1 m horizontal distance from equipment/enclosures & 1.5m above operating floor is to be guaranteed.
- 8) 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.
- 9) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ PVUNL approval.
- 10) 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.

Bidder is required to submit signed & stamped copy of this document.



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SUB-VENDOR LIST

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LIST OF MAKES OF ITEMS

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



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LIST OF SPECIAL TOOLS & TACKLES

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LIST OF SPECIAL TOOLS & TACKLES

S.N.	ITEMS	QUANTITY



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EQUIPMENT DATA SHEET/SCHEDULE

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EQUIPMENT DATA SHEET/SCHEDULE

S.No.	Description	Data
1.0	GENERAL	
	a. Client	: BHEL-PEM, Noida
	b. Project	: PVUNL Patratu 3x800 MW
	c. End Customer	: PVUNL/NTPC
	d. Location	: Ramgarh, Jharkhand
	e. Service	: Continuous
	f. Installation	: Inside the Building
	g. Quantity for all 3 FGD units	: 2 sets (1W+1S)
2.0	MANUFACTURER DETAILS	
	a. Model	: Bidder to Provide
	b. Type	: Bidder to Provide
3.0	OPERATING CONDITION	
	Medium to be handled	: Gypsum Slurry
4.0	Technical Data	
4.1	PRIMARY HYDRO-CYCLONE	
	i. Stage	Bidder to Provide
	ii. Manufacturer	Bidder to Provide
	iii. Number of Hydro cyclone	Bidder to Provide
	iv. Diameter of Hydro cyclone	Bidder to Provide
	v. Diameter of Vortex Finder	Bidder to Provide
	vi. Diameter of Apex Valve	Bidder to Provide
	vii. Diameter of Feed Inlet	Bidder to Provide
	viii. Design Pressure	Bidder to Provide
	ix. Working Pressure	Bidder to Provide
	x. Feed Flow rate	Bidder to Provide
	xi. Overflow Rate	Bidder to Provide
	xii. Underflow Rate	Bidder to Provide
	xiii. Mesh of separation (50% Removed)	Bidder to Provide



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EQUIPMENT DATA SHEET/SCHEDULE

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	xiv. Solid content of feed slurry	Bidder to Provide
	xv. Solid content in underflow of Hydrocyclone	Bidder to Provide
	xvi. Solid content in Overflow of Hydrocyclone	Bidder to Provide
	xvii. Type of cyclone	Bidder to Provide
	a) Cyclone Dia/Height (mm)	Bidder to Provide
	b) Required Liquid Feed Pressure	Bidder to Provide
	c) Cyclone Connection Number/Dia. (mm)	Bidder to Provide
	d) Feed	Bidder to Provide
	e) Overflow	Bidder to Provide
	f) Underflow	Bidder to Provide
	g) Rf Value (Underflow Slurry (m3/hr/Feed	Bidder to Provide
	h) Material	Bidder to Provide
	i) Shell	Bidder to Provide
	j) Internal Structure Part	Bidder to Provide
	k) Lining	Bidder to Provide
	l) Particle Size Distribution	Bidder to Provide
	m) Weight	Bidder to Provide
4.2	VACUUM BELT FILTERS (VBF)	
	a. Manufacturer	: Bidder to Provide
	b. Model No.	: Bidder to Provide
	c. Dimensions (W x L x H) (m x m x m)	: Bidder to Provide
	d. Cloth Width m	: Bidder to Provide
	e. Cloth Length m	: Bidder to Provide
	f. No. Working / Stand-by	: Bidder to Provide
	g. Capacity (Guaranteed) Gypsum (Dry) Kg/hr	: Bidder to Provide
	h. Inlet Flow Volume m3/h	: Bidder to Provide
	i. Gypsum Flow (Dry) Kg/hr	: Bidder to Provide



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j.	Moisture Removed	%	:	Bidder to Provide
k.	No. of stages of cake washing / water flow	m3/h	:	Bidder to Provide
l.	No. of stages of cloth washing / water flow	m3/h	:	Bidder to Provide
m.	Design Pressure of Vacuum Chamber		:	Bidder to Provide
n.	Operating Pressure of Vacuum Chamber		:	Bidder to Provide
o.	Material / Thickness	mm	:	Bidder to Provide
i.	Casing		:	Bidder to Provide
ii.	Cloth		:	Bidder to Provide
iii.	Gypsum Discharge Hopper		:	Bidder to Provide
iv.	Vacuum Box		:	Bidder to Provide
p.	Life of Cloth	hrs	:	Bidder to Provide
q.	Type /Material of Carrying Belt		:	Bidder to Provide
r.	Type / Material of Sealing Belt		:	Bidder to Provide
s.	Life of Carrying Belt	hrs	:	Bidder to Provide
t.	Life of Sealing Belt	hrs	:	Bidder to Provide
u.	Automatic Cloth Tensioning Mechanism Provided		:	Yes / No - Bidder to confirm
4.3	VACUUM RECEIVER TANK			
a.	No. of Tank for each VBF		:	Bidder to Provide
b.	Capacity (m3)		:	Bidder to Provide
c.	Dimensions (Dia x Height) (mm x mm)		:	Bidder to Provide
d.	Material / Thickness (mm)		:	Bidder to Provide
e.	Lining Material / Thickness mm		:	Bidder to Provide
4.4	Vacuum Pumps			
a.	Manufacturer		:	Bidder to Provide
b.	Make/Model		:	Bidder to Provide
c.	Type		:	Bidder to Provide
d.	No. of Pumps for each Vacuum Belt Filter		:	Bidder to Provide
e.	Rated Capacity Flow (m ³ /hr)		:	Bidder to Provide



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	Rated Capacity Head (mWCI)	:	Bidder to Provide
	Rated Capacity Power (KW)	:	Bidder to Provide
f.	Power consumption (KW)	:	Bidder to Provide
g.	Pump Speed (rpm)	:	Bidder to Provide
h.	Motor Rating (KW)	:	Bidder to Provide
i.	Motor Speed (rpm)	:	Bidder to Provide
j.	Margins (Flow/Head) (%/%)	:	Bidder to Provide
k.	Operation Pressure	:	Bidder to Provide
l.	Design Pressure	:	Bidder to Provide
m.	Material/Thickness (mm) of	:	Bidder to Provide
	Base/Lining	:	Bidder to Provide
	Casing	:	Bidder to Provide
	Shaft	:	Bidder to Provide
	Impeller	:	Bidder to Provide
n.	Type of seal	:	Bidder to Provide
o.	Sealing Water Flow (m3/hr)	:	Bidder to Provide
p.	Bearing	:	Bidder to Provide
	No. of Bearings	:	Bidder to Provide
	Type Of Bearings	:	Bidder to Provide
q.	Type of coupling	:	Bidder to Provide
r.	Whether silencer provided at outlet	:	Yes/No
4.5	SLURRY PIPES	:	
a.	Pipe size (mm)	:	Bidder to Provide
b.	Type of Joints	:	Bidder to Provide
	Pipe to Pipe/Pipe to Fittings	:	Bidder to Provide
	Fittings	:	Bidder to Provide
c.	Material / Thickness (mm)of Pipe	:	Bidder to Provide
d.	Material Thickness of lining	:	Bidder to Provide
e.	Estimated Life of liners (hrs.)	:	Bidder to Provide
f.	Slurry Solid concentration (w/w %)	:	Bidder to Provide



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g.	Slurry Settling Velocity (m/s)		Bidder to Provide
h.	Pipe Velocity (m/s)		Bidder to Provide
4.6	BELT FILTER WASH PUMPS		
a.	No. for each VBF		
b.	No. of stand-by pumps for each VBF		
c.	Make / Model		
d.	Impeller Type		
e.	Material / Thickness (mm) of Impeller and lining		
f.	Casing Type		
g.	Material/Thickness of Casing/Lining		
h.	Rated Flow/Head (m3/hr./mWCI)		
4.7	CAKE WASH PUMPS		
i.	No. for each VBF		
j.	No. of stand-by pumps for each VBF		
k.	Make / Model		
l.	Impeller Type		
m.	Material / Thickness (mm) of Impeller and lining		
n.	Casing Type		
o.	Material/Thickness of Casing/Lining		
p.	Rated Flow/Head (m3/hr./mWCI)		
4.8	BELT ACCESSORIES		
4.8.1	Bearing		
a.	Carrying	:	Bidder to Provide
b.	Return	:	Bidder to Provide
4.8.2	Material		
a.	Roller	:	Bidder to Provide
b.	Spindle	:	Bidder to Provide
4.8.3	Pulleys		
i)	General (for all types of Pulleys)	:	Bidder to Provide
a.	Pulley Shaft Diameter	:	Bidder to Provide



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ii)	Drive Pulleys		
a.	Lagging	:	Bidder to Provide
b.	Lagging thickness	:	Bidder to Provide
c.	Minimum angle of wrap	:	Bidder to Provide
d.	Maximum out of roundness	:	Bidder to Provide
iii)	Other Pulleys		
a.	Lagging	:	Bidder to Provide
b.	Lagging thickness	:	Bidder to Provide
iv)	Rubber for lagging		
a.	Type	:	Bidder to Provide
b.	Hardness	:	Bidder to Provide
c.	Elongation	:	Bidder to Provide
d.	Strength	:	Bidder to Provide
e.	Abrasion Loss	:	Bidder to Provide
f.	Specific Gravity	:	Bidder to Provide
g.	Adhesion Strength	:	Bidder to Provide
v)	Bearings for Pulleys		
a.	Type	:	Bidder to Provide
b.	Casing	:	Bidder to Provide
c.	Sealing	:	Bidder to Provide
d.	Lubrication	:	Bidder to Provide
e.	Pulley Material	:	Bidder to Provide
f.	Shaft Material	:	Bidder to Provide
4.9	Chutes and Hoppers		
a.	Minimum Valley Angle	:	Bidder to Provide
b.	Material :	:	Bidder to Provide
	i) Chute work	:	Bidder to Provide
	ii) Sliding zones & adjacent sides	:	Bidder to Provide
	iii) No striking/ Non sliding zones	:	Bidder to Provide



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	iv) Chute with valley angle 80 degree and above	:	Bidder to Provide
	v) In the zone of magnetic field	:	Bidder to Provide
	vi) In the zone of flap gates	:	Bidder to Provide
	vii) Discharge Hoods overhead pulleys	:	Bidder to Provide
c.	Inspection Doors	:	Bidder to Provide
d.	Chute Construction	:	Bidder to Provide
	i) Corners	:	Bidder to Provide
	ii) Joints Bolted	:	Bidder to Provide
	iii) Bolt size	:	Bidder to Provide
	iv) Bolts spacing	:	Bidder to Provide
	v) Fixing Arrangement	:	Bidder to Provide
4.9.	Skirt Boards		
a.	Length	:	Bidder to Provide
b.	Height	:	Bidder to Provide
c.	Width	:	Bidder to Provide
	Side plate		
4.9	Secondary (Waste Water) Hydrocyclone	:	Bidder to Provide
	i) Stage	:	Bidder to Provide
	ii) Manufacturer	:	Bidder to Provide
	iii) Number of Hydrocyclone	:	Bidder to Provide
	iv) Diameter of Hydrocyclone	:	Bidder to Provide
	v) Diameter of Vortex Finder	:	Bidder to Provide
	vi) Diameter of Apex Valve	:	Bidder to Provide
	vii) Diameter of Feed Inlet	:	Bidder to Provide
	viii) Design Pressure	:	Bidder to Provide
	ix) Working Pressure	:	Bidder to Provide
	x) Feed Flow rate	:	Bidder to Provide
	xi) Overflow Rate	:	Bidder to Provide
	xii) Underflow Rate	:	Bidder to Provide
	xiii) Mesh of separation (50% Removed)	:	Bidder to Provide
	xiv) Solid content of feed slurry	:	Bidder to Provide



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	xv) Solid content in underflow of Hydro-cyclones	:	Bidder to Provide
	xvi) Solid content in Overflow of Hydro-cyclones	:	Bidder to Provide
	xvii) Type of cyclone	:	Bidder to Provide
	a. Cyclone Dia/Height (mm)	:	Bidder to Provide
	b. Required Liquid Feed Pressure	:	Bidder to Provide
	c. Cyclone Connection Number/Dia. (mm)	:	Bidder to Provide
	d. Feed	:	Bidder to Provide
	e. Overflow	:	Bidder to Provide
	f. Underflow	:	Bidder to Provide
	g. Rf Value (Underflow Slurry (m ³ /hr/Feed Slurry (m ³ /hr)	:	Bidder to Provide
	h. Material	:	Bidder to Provide
	i. Shell	:	Bidder to Provide
	j. Internal Structure Part	:	Bidder to Provide
	k. Lining	:	Bidder to Provide
	l. Particle Size Distribution	:	Bidder to Provide
	m. Weight	:	Bidder to Provide



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LIST OF COMMISSIONING SPARES

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LIST OF COMMISSIONING SPARES

S.N.	ITEMS	QUANTITY