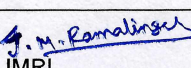
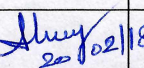


	SPECIFICATION FOR HP PUMP WITH MOTOR & ACCESSORIES	SPEC.NO.ROS:6200
		REV.: 01

**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406**

TECHNICAL SPECIFICATION
FOR
HP PUMP(Vertical) WITH MOTOR & ACCESSORIES
FOR BWRO SYSTEM
MAITREE - 2 x 660 MW

01	20.02.18	SS 	 IMRL	SAV  20/02/18	Document Schedule revised.
00	04.01.18	SS	IMRL	SAV	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

01

	SPECIFICATION FOR HP PUMP WITH MOTOR & ACCESSORIES	SPEC.NO.ROS:6200
		REV.: 01

1.0 SCOPE OF SUPPLY

The intent of this specification is to cover Design, Engineering, Manufacturing, shop testing and supply of **High Pressure Pump with motor & Accessories for 2nd Pass RO System (BWRO)**.

The scope shall include but not limited to the following:

- a) High pressure pump (Vertical) with common base frame for pump & motor assembly along with accessories.
 - b) 1 Set of commissioning spares
 - c) 1 Set of mandatory spares
 - d) 1 Set of recommended spares for 3 years O & M (optional).
- 
- 1.1 Items though not mentioned, but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.
 - 1.2 In case of any deviation, the Bidder shall indicate the same, clause by clause in the deviation schedule. In the absence of the same it will be construed that the bid confirms strictly to the specification.
 - 1.3 The inspection at bidder's / Sub vendor's work before dispatch of all equipment shall be carried out as per agreed QAP. The inspection at bidder's work before dispatch shall be carried out by BHEL / BHEL Authorized agency / Customer / Jointly by Customer & BHEL before dispatch.
 - 1.4 The order of priority of this specification is as follows:
 - Technical requirement / Equipment Specification,
 - General design requirements
 - 1.5 The material shall be dispatched to stores department - BHEL / BAP / Ranipet, Tamil Nadu. The quality plan (QAP) formats will be given by the customer after ordering

Note: The Pump flange drilling standard shall be as per ANSI B 16.5, Cl. # 300. If there is any deviation of flange drilling class (HP pump suction flange, etc,) shall be informed in advance by the bidder.

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2.0 EQUIPMENT SPECIFICATION:

2.1 GENERAL

- 1) Equipment : High Pressure pump with motor and accessories
- 2) Application : Pumping feed water to RO membrane
- 3) Surrounding : Dusty, humid atmosphere
- 4) Installation : Indoor
- 5) Ambient Temperature : 50 Deg.C Maximum & 5 Deg.C Minimum
- 6) Operation : Continuous

2.2 HIGH PRESSURE PUMP:

- 1) Fluid Details
 - Medium handled : RO Permeate Water
 - pH : 3 to 10
 - Specific gravity : 1.00
 - TDS : 500 ppm (Maximum)
 - Chloride : 300 ppm (Maximum)
 - Temperature : 20 to 35 Deg.C
- 2) Design Details
 - Duty point flow : 89 M3/hr.
 - Pump Discharge Head : 140 MWC
 - Suction Head : 1 bar Flooded
 - NPSH Required : Vendor to specify
 - Efficiency : Best possible (Minimum 70%)
 - Speed : < 3000 rpm
 - Operation : The pump shall be suitable for varying speed operation through VFD from 1600- 3000rpm to meet the different duty point condition. Supplier to provide performance curve for the above range to the steps of 200 rpm
- 3) Construction Details
 - Type : Vertical, centrifugal, Multistage
 - Impeller type : Closed
 - Shaft seal : Mechanical seal, API Plan -11
 - Support : Foot
 - Coupling type : Flexible (spacer type)
 - Bearing type : Antifriction (SKF / FAG)

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- Lubrication : Self-lubricated
- Operating range : 30 – 120% of rated flow
- Pump Characteristic : Non-overloading type & stable
- Shut-off head : About 15% more than the rated head

4) Construction Details

- Casing : SS 316
- Impeller : SS 316
- Shaft : SS 316
- Shaft sleeve : SS 316
- All other vetted parts : SS 316
- Fasteners : SS 316
- Shims : SS 316

3.0 ELECTRIC MOTOR:

Refer to Spec No.: **ROS:4212, Rev:00** enclosed separately with this specification

4.0 GENERAL DESIGN REQUIREMENTS

- 1) Only latest revision of standard shall be used
- 2) All the rotating equipment noise level shall be < 85dBA measured at 1 mtr distance from the equipment.
- 3) All fasteners shall be of SS 316.
- 4) Customer's inspection at Bidder's works is applicable for specified components as per the approved QP /spec.

4.1 CENTRIFUGAL PUMPS:

- 1) The maximum efficiency of the pumps shall be preferably within +10% of the rated design flow indicated in the data sheet.
- 2) 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 15 % more than design head.
- 3) Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division.
- 4) Components of identical pumps shall be interchangeable.
- 5) The noise level shall not exceed 85dBA at a distance of 1m from the equipment.
- 6) The pump shall be capable of starting with discharge valve fully open and close condition

	SPECIFICATION FOR HP PUMP WITH MOTOR & ACCESSORIES	SPEC.NO.ROS:6200
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- 7) Continuous motor rating at 50 deg.C ambient shall be at least 10% above the maximum load demand of the pump in the entire operating range to take care of the system frequency variation.
- 8) The critical speed of the pumps shall be well away from the operating speed and in no case less than 130% of the rated speed.
- 9) The vibration level must be within the satisfactory zone as per ISO 10816-3:1998 (E) for machines group : 3 standard for rigid supported base with zone boundary B/ C
- 10) Tolerance on pump guaranteed efficiency and rated head for the rated flow shall be plus or minus 3%.

5.0 PAINTING

5.1 GENERAL

- a) All the Equipment and steel structures shall be protected against external and internal (if any) corrosion by providing suitable painting as described below unless otherwise specified elsewhere. However, the surfaces of stainless steel, Galvanized steel, Gunmetal, brass, bronze, UPVC pipes, HDPE pipes and non-metallic components shall not be applied with any painting.
- b) All painting shall be carried out in conformity with the paint manufacturer's recommendation.
- c) Applicable Codes and Standards:
 - DIN 2403 : Indication of pipe-lines according to flowing material
 - DIN 4762 : Surface roughness
 - ISO 8503 : Surface Roughness
 - DIN 8201 : Part 1-9 tight blasting agents
 - DIN 50976 : Corrosion protection, hot dip batch galvanizing of single parts, requirements and testing.
 - DIN 55928 : Part 1-9 corrosion protection of structural steel work through protective coatings and topcoats.
 - ISO 8501 : Preparation of steel substrates before application of paints and associated products.
 - ISO 12944 : Paints and varnishes-corrosion protection of steel structures by protective paint systems.
 - ISO 8501-1 : Preparation of steel substrates before application of paints and related products.
 - RAL : Colour card
- d) Galvanizing work shall confirm in all respects to ISO 1461 or equivalent standards and shall be performed by the hot dip process unless otherwise specified.
- e) All painting shall be performed according to ISO 12944. The durability of all painting shall be "High" which corresponds to 15 years.

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- f) No painting or filler shall be applied until all repairs, hydrostatic test and final shop inspection are completed.
- g) All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks.

5.2 CLEANING AND SURFACE PREPARATION

Prior to blasting, areas have to be cleaned from oil, grease, paint residues, splatters, welding splashes and welding slag using a suitable aqueous degreaser or solvent for more severe grease contamination. The cleaning should be to provide a "water break free surface"

Sharp edges have to be rounded off.

Contaminations caused by salts, acids and alkali solutions shall be eliminated by rinsing with water up to a pH value of 6-8. Soluble salt contamination is to be tested using universal indicator paper strips prior to continuation with the blasting.

5.3 PROTECTIVE COATING

As soon as the painting items have been cleaned, within four hours of the subsequent drying they will be coated with suitable anti-corrosion protection. Immediately after the protective coating all vessels and pipes will be suitably sealed off by discs or caps or approved alternatives to prevent ingress from the surrounds.

No painting or filler shall be applied until all repairs, hydrostatic test and final shop inspection are completed.

All painting works (including surface preparation) on piping or equipment at site shall be commenced only after the required tests have been completed.

Prior to painting, proper care shall be taken to protect nameplates, lettering, gauges, sight glasses, light fittings and similar such items, to ensure that these are in no way defaced or damaged during the work

All primers shall be well marked into the, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied as per manufacturer's recommendations.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks.

Dry film Thickness: Each coat of paints will be allowed to harden before the next is applied as per manufacturer's recommendation. The requirements for the dry film thickness (DFT) of the paint and materials to be used for different items will be as per the "schedules of finishes indicated below.

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5.4 PAINT COATING SYSTEMS AND SCHEDULE OF FINISHES

Sl. No.	Surface Location	Temp Deg.C	Surface Preparation	Coating System	No.of Coats	Generic Type	DFT per coat (µm)	Total DFT (µm)
1	Structural steel works, piping, vessels, tanks INDOOR	Up to 120	SA 2.5	Primer	1	Zinc - Epoxy	80	160
				Finish	1	Epoxy High Solid	80	
2	Structural steel works, piping, vessels, tanks OUTDOOR	Up to 120	SA 2.5	Primer	1	Zinc - Epoxy	80	290
				Intermediate	1-2	Epoxy High Solid	2 x 80	
				Finish	1	2Component Polyurethane	50	
3	Pumps, motors, other equipment INDOOR	Up to 120	SA 2.5	Primer	1	Zinc - Epoxy	80	180
				Finish	2	Epoxy High Solid	2 x 50	
4	Pumps, motors, other equipment OUTDOOR	Up to 120	SA 2.5	Primer	1	Zinc - Epoxy	80	240
				Intermediate	1	Epoxy High Solid	110	
				Finish	1	2Component Polyurethane	50	
5	Steel surfaces permanently in contact with water also river water splash zone	Up to 60	SA 2.5	Prime and Finish coat in One	1	Glass flake reinforced High Solid Epoxy	500	500
6	Plant / cooling water pipes	GRP or steel lined concrete pipes with cathodic protection and coating according to AWWA C203						

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6.0 PERFORMANCE GUARANTEE

The pump & motor supplied shall be guaranteed for a minimum period of 12 (twelve) months from the date of successful commissioning of the plant (or) 18 months from the date of receipt of all materials at site, whichever is earlier. The date of receipt of last item at site will be reckoned for this purpose.

Any part which proves defective either in design, materials / and / or manufacture within the above guarantee period shall be replaced at free of cost to the owner at site and the provision of this clause shall apply to the portions of the plant so replaced or renewed until the expiration of the guarantee period or from the date of replacement whichever is later.

7.0 SPARES

The bidder shall provide the list of commissioning spares and it shall be delivered along with the main supply well in time before the start-up & commissioning of the plant. The commissioning spares list is indicated in this section. Over and above any if required, are also to be provided by the bidder.

Additional requirements for trouble free commissioning of the equipment / system shall also be included in the list. The price for the commissioning spares shall be included in the main supply and the list shall be provided along with the bid, this price will be included for bid evaluation. Any unutilized commissioning spares shall be handed over to the Customer.

In addition to this, bidder shall provide 3 years recommended O&M spares list with price separately along with the bid. Customer reserves the right to buy any of the recommended spares as considered necessary by them during later stage. The price of recommended spares will not be considered for bid evaluation.

The prices of recommended spares shall be consistent with those of the mandatory spares. The validity of prices for these spares shall be up to 1 year from the date of handing over & taking over of the plant.

7.1 Commissioning Spares:

Sl.No.	Item Description	Qty.	Remarks
1	Mechanical seal for Pumps	1 Sets	For each type / size / rating of pump
2	Spacer coupling with fasteners for HP Pump & Motor	1 Set	
3	Any other specific requirement		Bidder to include

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7.2 Recommended Spares for 3 Years O&M:

The bidder shall indicate the list of recommended O&M spares for the first three years of normal operation as per the format in **Annexure-2**

7.3 Mandatory Spares:

The mandatory spares shall be delivered along with the main supply. The Cost of mandatory spares shall be indicated separately and the same is considered for Bid Evaluation.

The list of spares for the Vertical multistage centrifugal pumps is given below:-

SL. NO.	Name of Items	Unit	QTY.
1)	Impeller with nuts & other accessories	Set	1 set of each type & size
2)	Wearing rings - Impeller (If applicable)	Set	2 set of each type & size
3)	Wearing rings - Casing (If applicable)	Set	2 set of each type & size
4)	Shaft	Set	1 set of each type & size
5)	Shaft Sleeves	Set	2 sets of each type & size
6)	Coupling, spacer coupling between Pump & motor, bushes, pins with all fasteners & coupling guards as applicable	Set	1 sets of each type & size
7)	Pump bearings	Set	1 sets of each type & size
8)	Mechanical seal	Set	1 set of each type & size

8.0 DOCUMENTATION:

The documentation during bid and post order stage shall meet the following requirements.

1. All documents and drawing shall be submitted in English
2. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
3. Hard copies of all documents for approval shall be submitted in triplicate.
4. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
5. Soft copies of all final documents in MS word / MS office in the form of CD –1 set
6. Soft copies of all final calculations in MS excel/ MS officer in the form of CD–1set
7. Soft copies of all final drawings in Auto Cad, latest version in the form of CD-1set

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8.1 DOCUMENTS ALONG WITH BID:

The following drawings / documents are to be enclosed along with the bid for scrutiny.

1. Pump performance curves
2. Filled up data sheets as called in the specification – **Annexure -1**
3. Typical Quality Plan.
4. Details called in LT Motor specification.
5. Deviation schedule duly filled, if any as per **Annexure – 3**.
6. Un priced commercial offer on the scope of supply
7. Un priced commercial offer for the recommended spares list

Note:

In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure - 3**. If there is no deviation “NIL” statement shall be furnished. In the absence of the non-attachment of this **Annexure-3**, it will be construed that the bid confirms strictly to the specification.

8.2 DOCUMENTS AFTER ORDER

The following documents / Drawings and data to be furnished for BHEL / customer approval / information

Phase-I (for approval) within 2 weeks from the date of purchase order receipt:

1. GA drawings of Low Pressure Pumps
2. Foundation Design drawings indicating foundation design, load data, anchor bolt location, pocket details, floor & trenches etc.
3. Filled up datasheets for approval for pump as per **Annexure – 1** & for LT motor
4. LP Pumps performance curves
 - Speed Vs torque curve
 - Flow Vs Head
 - Flow Vs Efficiency
 - Flow Vs Power
 - Flow Vs NPSH
5. Detailed assembly & cross sectional drawings with bill of materials for LP pump with base frame



Phase-II For information & Review:

1. Erection Manual indicating
 - a. Erection / installation instructions of equipment.

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- b. Log sheet containing stage check parameters & clearance
 - c. Log sheets for alignment check of pump & motor
 - d. Field quality checks
2. Performance Test procedure
3. Operation and maintenance manual.
4. Maintenance instruction & assembly
5. Lubrication chart.



9.0 ATTACHMENTS

The following drawings / documents are enclosed is a part of the specification:

1. Electric Motor specification No. ROS: 4212, Rev 00

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Annexure - 1

EQUIPMENT DATA SHEET FOR RO DESALINATION PLANT

1. HIGH PRESSURE PUMPS:

I. TECHNICAL PARAMETERS

- 1) Make :
- 2) Model :
- 3) Fluid details
 - Medium handled :
 - pH range :
 - Specific gravity :
 - TDS/Chloride range ppm :
 - Temperature range deg.C :
- 4) Design flow at rated speed m³/hr :
Mini. / Max. / continuous flow m³/hr :
- 5) Total head developed @ design flow mwc :
- 6) Shut-off head mwc :
- 7) NPSH required (minimum) mwc :
- 8) Design Pressure kg/cm² :
- 9) Hydraulic test pressure kg/cm² :
- 10) Pump efficiency
 - At design point % :
 - At Maximum flow % :
- 11) Pump shaft power reqd.at duty point KW :
- 12) Maximum shaft power required KW :
- 13) Selected Motor KW :
- 14) Rated speed & Critical speed rpm :
- 15) Operating flow range from duty point % :
- 16) Noise level at duty range dbA: at 1 mtr distance
- 17) Vibration level
 - Displacement(peak to peak) mm :
 - Velocity (Peak) mm/sec :
- 18) Balancing quality as per ISO 1940 std :
- 19) Rotation of shaft viewing from drive end :

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20) Tolerance on head & Efficiency at

- Rated Speed : &
- Rated Flow : &

II. CONSTRUCTION DETAILS

1) Orientation (Horizontal / Vertical) :

2) Suction / Discharge nozzle

- Size mm : /
- Rating psi : /
- Flange Drilling Standard : /
- Nozzle Orientation looking from DE : /

3) Material of Construction / Standard / PREN / CF Number

- Pump Casing : / /
- Impeller : / /
- Shaft : / /
- Shaft Sleeve : / /
- wear rings : / /
- Diffuser : / /
- Mechanical seal : / /
- Bearing Housing ; / /
- Fasteners : / /
- Others if any : / /

4) No. of stages :

5) Impeller type :

6) Impeller dia. Trimmed / Untrimmed mm :

7) Bearings

- Type :
- Make :
- Lubrication oil spec. :

8) Mechanical seal

- Type :
- Make :
- Model :
- Drawing No. :

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9) Pump dimension L x W x H :

10) Pump Weight kg :

III. COUPLING

1) Type :

2) Make, Model No. :

3) Coupling guard material :

4) Dimension details with BOM enclosed : Yes / No

5) Weight kg :

IV. BASE FRAME AND ACCESSORIES

1) Material :

2) Dimension detail mm :

3) Weight kg :

4) Foundation Bolt

- Size & Qty mm & Nos. :

- MOC :

V. GENERAL

1) Shipping package dimension mm :

2) Total Assembly weight kg :

3) Total Shipment weight kg :

4) List of Special tools :

5) Accessories details :

6) Pump performance curve Ref. Nos. :

7) Speed Vs Torque curve in discharge valve: :
fully open and closed condition

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Annexure – 2

LIST OF RECOMMENDED SPARES

Sl. No.	Description of the Equipment	Description of Spares	Quantity	Price

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ANNEXURE-3

TECHNICAL DEVIATIONS

Sl. No	Section No.	Clause No.	Page / No.	Specification	Statement of Deviations/variatio	Reason for Deviation	cost of withdrawal

	SPECIFICATION FOR LT MOTOR	SPEC. NO.: ROS 4212
		REV. NO: 00

TECHNICAL SPECIFICATION FOR
LT MOTORS
(Applicable for Maitree project)

00	18.12.17	for MKV	for MKV	VNS	Fresh issue
Rev. No	Date	Prepared	Checked	Approved	Remarks

	SPECIFICATION FOR LT MOTOR	SPEC. NO.: ROS 4212
		REV. NO: 00

1.0.0 Technical specification for low voltage motors

All motors must be designed to meet IP 55 enclosure according IEC60034-5 and rated for design ambient conditions for Electrical Systems prevailing at project site.

- Relative Humidity 88%
- Maximum design temperature (outdoor) 45°C
- Maximum design temperature of the electrical equipment installed indoors non in air conditioned rooms 45°C
- Low Voltage 415 V +/-10 %, 3 Ph, 50 Hz+/-5% ,10 % (Absolute sum)
- Space heater supply 230V+/-10%, 1Ph, 50Hz+/-5%, 10% (Absolute sum)

All motors with rated power (referred to 40 °C ambient temp.) less than 160 KW must be designed as LV motors with premium efficiency class IE3 as per IEC 60034-30.

2.0.0 Design

2.0.1 Constructive features

The following constructive features shall apply:

- Climatic protection provisions for mounting in the open in a humid and hot climate. All insulated winding shall be of copper with Insulation class F. During operation at rated power of the driven machine, the motor insulation must only be stressed in accordance with the requirements of class B insulation.
- Motor parts made of iron internally and externally sandblasted and surface-protected.
- Paint finish resistant to chemicals and seawater. Color shade shall be RAL 6032 and is subject to finalisation during detailed engineering.
- Bolts with adequate corrosion protection.
- All joint faces and gaps sealed.
- Anti-condensation heating provision is to be used when the motor feed circuit is in the 'off' position. Heater supply power 'on' indicating lamp is to be provided. Anti-condensing heating shall be provided for motors of **55 kW** and above.
- Special treatment of windings with resin impregnation plus immersion in varnish. Varnish-insulated laminations. Pressboard material protected by varnishing.
- Totally enclosed fan cooled (TEFC) type/ IC 411 as per IEC 60034-6. For motor ratings the cooling air available at the specific location has to be considered. Motors shall be designed with cooling fans suitable for both directions of rotation. Motors shall not be provided with any electric or pneumatic operated external fan for cooling the motors.
- Condensation outlets to be provided at the lowest point in the housing.

Design and construction of the motors shall comply with IEC 60034-1, 60034-5 or VDE 0530 and DIN 40050.

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2.0.2 Electric features

The following electric features shall apply:

- a. Motor rating to be at least 110% of the maximum required electric power consumption of the driven machine.
- b. Continuous delivery of rated power at voltages of 90 - 110% of the rated voltage and allowable frequency range within the limits of thermal class F.
- c. Rated power output at ambient temperatures existing at the particular site of installation and under continuous running conditions.
- d. All motors shall be designed as 3-phase squirrel-cage motors suitable for direct on line starting. It must be possible, with 100% residual voltage, to switch them on to a large and stable power supply network without incurring damage or deformation. The motors must still be capable of faultless running up to speed with a voltage drop to 80% of rated voltage and rated loading.
- e. Motor starting current must not exceed the voltage drop at direct-on-line starting should be limited to 20% at the motor terminals. However starting of any motor shall not cause tripping of any other consumer. The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage.
- f. The following frequency of starts shall apply
 - i) Two starts in succession with the motor being initially at a temperature not exceeding the rated load operating temperature.
 - ii) Three equally spread starts in an hour the motor being initially at a temperature not exceeding the rated load operating temperature. (not to be repeated in the second successive hour)

For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 3 seconds more than starting time. Minimum permissible starting voltage is 85% of rated voltage for rating below 110KW and 80% of rated voltage for ratings from 110KW to 160KW.

- g. A minimum frequency of starting cycles of 1000 per year must be guaranteed.
- h. In general, motors must be capable of running without overheating when subjected to three consecutive starts within one hour after having run for an extended period on a voltage of 95% nominal voltage. Thereby the second start must be possible immediately after the first start and the third 30 minutes after the second start.
- i. Motors shall withstand the voltage, heavy inrush transient current, mechanical and torque stress developed due to the application of 150% of the rated voltage for at least 1 sec. caused due to vector difference between the motor residual voltage and the incoming supply voltage during occasional auto bus transfer. Motor and driven equipment shafts shall be adequately sized to satisfactorily withstand transient torque under above condition.
- j. **All motors shall be designed as 3-phase squirrel-cage motors suitable for direct on line starting.** The motors must be capable of being switched on to a large and stable network and with phases in opposition. Motors starting current must comply with the starting current specification of IEC 60034. However the motors starting current must not exceed 7.0 times rated current (referred to the motor rating and 40 °C ambient temp).

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Motors that are operated through VFD as per process requirement shall meet IEC 60034-17 and the motor insulation shall be able to withstand the peak voltage, dV/dt and rise time as specified in IEC 60034-17 (for standard motors when controlled by VFD drives). In addition, these motors shall be provided with insulated bearings from motor frame size 160 and onwards on the non-driving end side of the motor. Vacuum Pressure Impregnation (VPI) shall be provided to windings for motors identified with VFD operation. This shall also have no additional cost implication to BHEL.

k. The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GI bolts and washer. An earthing clamp inside the terminal box has to be provided. All cable connecting boxes are to be designed to meet the requirements of IP 55 or IP 58 protection class respectively. The cable connecting boxes are to be installed easily accessible on the motor. The connecting boxes must be capable of being turned by 90° or 180° and of being opened up longitudinally. The connection boxes are to be fitted with a terminal block.

l. Terminals, terminal leads, terminal boxes, windings tails and associated equipment shall be suitable for connection to a supply system having a short circuit level, specified below. Unless otherwise stated, motors of rating including 110 kW and above will be controlled by circuit breaker and below 110 kW by switch fuse-contactor. The terminal box of motors shall be designed for the fault current. Short time rating for terminal boxes below 110 kW (Contactor controlled) shall be 50 KA protected by fuse for 0.25 sec.

m. Unless otherwise specified or approved, phase terminal boxes of horizontal motors shall be positioned on the left hand side of the motor when viewed from the non-driving end.

n. Noise level measurement and vibration measurement as per IEC standards. The peak amplitude of vibration shall be as per IEC 60034-14. Noise level shall be within the limits specified by IEC 60034-09.

3.0 Inspection and Testing

3.1 By BHEL/BHEL authorised agency at vendor works. Inspection shall be as per Contract Quality Requirements (CQR) For LT motor package.

3.2 All motors shall be subjected to routine tests as per Contract Quality Requirements (CQR) For LT motor package.

4.0 Drawings to be submitted after award of contract

a) OGA drawing showing the position of terminal boxes, earthing connections etc.

b) Arrangement drawing of terminal boxes.

c) Characteristic curves:

i) Current vs. time at rated voltage and minimum starting voltage.

ii) Speed vs. time at rated voltage and minimum starting voltage.

iii) Torque vs. speed at rated voltage and minimum voltage.

For the motors with solid coupling the above curves i), ii), iii) to be furnished for the motors coupled with driven equipment.

For motors is driven by VFD, speed vs current, speed vs torque curves.

	SPECIFICATION FOR LT MOTOR	SPEC. NO.: ROS 4212
		REV. NO: 00

- iv) Thermal withstand curve under hot and cold conditions at rated voltage and max. permissible voltage.
- d) Documents as per Contract Quality Requirements (CQR) For LT motor package.

5.0 Sub Vendor List for LT Motors

Makes of LT motor shall be strictly as per Contract Quality Requirements (CQR) for LT motor given with the specification.

	SPECIFICATION FOR LT MOTOR	SPEC. NO.: ROS 4212
		REV. NO: 00

DATASHEET FOR LT MOTORS (A.C.)

(To be filled and submitted for approval upon order)

01. Application : Outdoor
02. Type : Premium efficiency class IE3 as per IEC60034-30
03. Frame size :
04. Manufacturer :
05. Rated output in KW : (referred to design temperature)
06. Duty cycle : Continuous, S1
07. Rated voltage, no. of phases and frequency: 415 V, 3 Ph, 50 Hz
08. Allowed voltage variation : $\pm 10\%$.
09. Allowed frequency variation : $\pm 5\%$
10. Combined voltage and Frequency variation: 10 % (Absolute sum)
11. At rated Voltage and frequency
 - a) Full load current (Amps) :
 - b) Rated speed :
 - c) Full load efficiency :
 - d) Full load power factor :
 - e) Starting torque in % of FLT :
12. Method of starting : DOL
13. Degree of protection : IP 55
14. Method of ventilation : TEFC
15. Class of insulation : "F" (temp.rise limited to cl.B)
16. Stator winding connection (For continuous run) (Delta / Star)
17. Full load torque :
18. Breakdown torque in % of FLT :
19. Pull up torque in % of FLT :
20. Locked rotor current in Amps : As per limits of IEC 60034
21. Motor efficiency and P.F. at 100 % full load :
22. Locked rotor withstand time under hot/cold condition at 110 % Voltage :
23. Maximum permissible starting time:
24. No load current in Amps. :
25. Starting time in seconds with driven equipment coupled at 85 % voltage :
26. Actual temperature rise over an ambient of 40°C when motor is delivering rated output
 - a) By thermometer method :
 - b) By resistance method :
27. Number of successive starts with driven equipment coupled and motor initially at rated load temperature :
28. Minimum voltage required to bring the driven equipment to rated speed: 80% of RV.
29. Resistance per phase in ohms at 20 degree :
30. Direction of rotation viewed from driving end:
31. Make, type and size of bearing
 - a) At drive end :
 - b) At Non drive end :
32. Type of mounting and shaft Orientation:
33. Location of terminal box viewed from driving end: RHS/LHS/TOP
34. Type and number of terminals brought out :
35. Type and size of cable gland entry (type & size will be given during Detail engg)
36. Cable gland entry (Top / Bottom) :
37. Tropical & fungicidal treatment : Yes/No
38. GD2 of the motor :
39. Weight of the motor

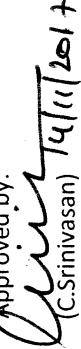
 Ranipet		PROJECT: MAITREE STPP (2 X 660MW), RAMPAL,Dist: Bagerhat Bangladesh - EXPORT ORDER CONTRACTOR: BHEL CONTRACT NO.: NOA no: BIFPCL/EPC – Main Plant on Turn Key Basis NOA/2016/215 dt 31 01 2016 PACKAGE Name: BIFPCL/EPC- MAIN PLANT BOUGHT OUT ITEMS: ELECTRICAL and C&I - BHEL, RANIPET)			EXPORT ORDER Annexure – II CONTRACT QUALITY REQUIREMENTS (CQR) for BIFPCL MAITREE (2X660MW) (BHEL CUST No: R676,R677 & R4N2)		DOC. NO: CQR: ELE: R676, R677 & RN2 REV. NO. : 01 DATE : 05 11 2017 Page 11 of 28	
SL. NO.	ITEM	NTPC APPROVED VENDORS	PLACE	QP CATEGORY	NTPC Type Test Requirements & Quality Plan/Check Lists Requirement	Remarks		

07	LT MOTORS	1. KEC 2. Siemens 3. CGL 4. BBL 5. ABB 6. Marthon 7. Jyoti 8. LHP 9. NGEF	Bangalore/Hubli Mumbai Ahmednagar Mumbai Faridabad/ Bangalore Kolkata Vadodara Solapur Hubli	Cat-II	BAP/QR/ R676, R677 & R4N2: LTM:012 Rev NO: 00 dt 14 10 2017	
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Dy. Engineer/QA

Dy. Manager/QA & System
(Sheela.S)

Reviewed by: 
K.C. Ganesh Parimalam
DGM /QA

Approved by: 
(C. Srinivasan) 14/11/2017
DGM /QA&QC (Proc)

 Ranipet		PROJECT: MAITREE STPP (2 X 660MW), RAMPAL,Dist: Bagerhat Bangladesh - EXPORT ORDER CONTRACTOR: BHEL CONTRACT NO.: NOA no: BIFPCL/EPC – Main Plant on Turn Key Basis NOA/2016/215 dt 31 01 2016 PACKAGE Name: BIFPCL/EPC- MAIN PLANT BOUGHT OUT ITEMS: ELECTRICAL and C&I - BHEL, RANIPET)			EXPORT ORDER Annexure – II CONTRACT QUALITY REQUIREMENTS (CQR) for BIFPCL MAITREE (2X660MW) (BHEL CUST No: R676,R677 & R4N2)		DOC. NO: CQR: ELE: R676, R677 & RN2 REV. NO. : 01 DATE : 05 11 2017 Page 28 of 28	
SL. NO.	ITEM	NTPC APPROVED VENDORS	PLACE	QP CATEGORY	NTPC Type Test Requirements & Quality Plan/Check Lists Requirement	Remarks		

- MQP(VQP)= Manufacturing Quality Plan (Vendor Quality Plan)
- RQP= Reference Quality Plan
- PS=Purchase Specification; Drg= BHEL/BHEL approved drgs

11. QP Categorization:

CAT-I = For those items the Quality Plans are approved by BIFPCL and final acceptance will be physical inspection witness by BIFPCL

CAT-II = For those items the Quality Plans are approved by BIFPCL. However, no physical inspection shall be done by BIFPCL. The final acceptance by BIFPCL shall be on the basis of review of documents.

CAT-III= For those items Main supplier approves Quality Plans. The final acceptance by BIFPCL shall be on the basis of Certificate of Conformance by main supplier.

12. No deviation on BHEL / Customer- BIFPCL and Consultant- Fitchner, Germany inspection and Testing Requirement and hence all executing agencies are required to meet all the contractual conditions in totality.

13. In case of any further clarifications are required by user departments can approach the following QA-Electrical officials followed by furnishing all the documents/evidence through cycle timer for immediate resolution.

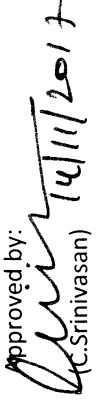
Sl no:	Name of the QA officials	Mobile no	Land Line No	Email id	Remarks
1	CH.ANILSINGH/Dy.Engg/QA	--	04172284604	anilsingh@bhelrpt.co.in	
2	S.SHEELA/DY.Mgr/QA & System	9994869806	04172284838	ssheela@bhelrpt.co.in	
3	K.C.GANDHI PARIMALAM DGM/QA	9943960880	04172284943	gandhi@bhelrpt.co.in	
4	C.SRINIVASAN DGM/QA & QC(PROC)	9443346861	04172284570	csrini@bhelrpt.co.in	

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DGM /QA

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C. Srinivasan
DGM /QA&QC (Proc)

PROJECT: MAITREE STPP(2 X 660MW)) CONTRACTOR: BHEL - RANIPET CONTRACT NO: BIFPCL/EPC-MAIN PLANT/NOA/2016/215		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTOR MAITREE STPP(2 X 660MW)) EPC PACKAGE (BHEL CUST No: R 676, R677 & R4N2)	DOC.NO: BAP/QR/ R 676, R677 & R4N2 LTM007 Rev NO.: 02 PAGE : Page 1 of 2 DATE : 02 12 2017	##Enquiry No: ##Supplier Name: ##Offer reference: ##Date:
Sl. NO.	DESCRIPTION	BHEL/BIFPCL/FITCHNER Requirements		## Specific confirmations by the vendor

ITEM: LT Motor

01	Type Test Requirements	1. Vendor shall submit the type test reports of all the type tests as listed in SL NO:4 and carried out with in 5 years from the data of BIFPCL bid opening (22.09.2015). These reports should be for the test conducted on the similar motor to those proposed to be supplied under this enquiry and test(s) should have been either conducted at an independent laboratory (or) should have been witnessed by TPI/BHEL/BIFPCL/FITCHNER	
		2. However, if vendor is not able to submit the similar 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/BIFPCL/FITCHNER either at third party lab (or) own lab in the presence of TPI/BHEL/ BIFPCL/FITCHNER and submit the reports for approval.	
		3. Type Test reports review and approval by BHEL/BIFPCL/FITCHNER is a must.	
		4. Type tests (each motor type) shall be in line with IEC 60034 and following Type tests are to be ensured. <u>Type tests</u> - Dimensions measurements as per approved Drawing. - Measurement of resistance of winding of stator. - No load test to determine input current, Power and speed. - Reduced Voltage running up test at no load (Up to 37 KW) - Locked rotor readings Voltage, Current, Power input at torque at suitable reduced voltage. - Full load test to determine the efficiency, Power factor and slip. - Temperature rise test. - Momentary over load test. - Insulation resistance test. - High voltage test. - Test for vibration severity of Motor. - Test for Noise level of Motor. - Degree of Protection (IP 55). - Over speed test for Motor.	
		5. The type Test reports shall also be given as PDF file with index sheet & page control through Email (The attached File size is to be lesser than 6MB due to E'mail server limitation).	

PROJECT: MAITREE STPP(2 X 660MW)) CONTRACTOR: BHEL - RANIPET CONTRACT NO: BIFPCL/EPC-MAIN PLANT/NOA/2016/215		CONTRACT QUALITY REQUIREMENTS (CQR) for LT MOTOR MAITREE STPP(2 X 660MW)) EPC PACKAGE (BHEL CUST No: R 676, R677 & R4N2)	DOC.NO: BAP/QR/ R 676, R677 & R4N2 LTM007 Rev NO.: 02 PAGE : Page 2 of 2 DATE : 02 12 2017	##Enquiry No: ##Supplier Name: ##Offer reference: ##Date:
Sl. NO.	DESCRIPTION	BHEL/BIFPCL/FITCHNER Requirements		## Specific confirmations by the vendor
ITEM: LT Motor				
02	Quality Plan Requirements	1. Being an export order, <i>MQP shall be submitted by the vendor in Customer/BIFPCL MQP format only (Copy attached)</i> in line with specifications/approved data sheet/Drgs meeting various international standards / codes for BHEL/BIFPCL/Fichtner for review and approval. 2. All routine tests Including oscillographic measurement for starting current, , over speed and Vibration test shall be clearly indicated in MQP and reference standard shall be relevant IEC. This is in addition to reference documents of Specification, approved drawings and Data sheet. 3. During review and approval of MQP, in case BIFCL/Fitchner raises any clarification/Query on MQP, Vendor shall agree to visit BIFPCL/Consultant office for finalization and approval of MQP. 4. Submission of all Internal inspection report for BHEL/Third party Inspector review before undertaking inspection. 5. BHEL/Third party inspection agency (TPI) and Customer/BIFPCL inspection is applicable at vendor works 6. Inspection clearance for dispatch is to be obtained from BHEL Quality department prior to dispatch of Motors.		
		Specific confirmation for Document Package in the event of an order (2 hard copies + 2 CDs in Pdf file) is to be given containing the following with proper linkages (.) a. Index Sheet b. Approved MQP c. Final Inspection Report issued by BHEL/TPI d. Compliance certificate/report for any Nonconformance or observation made by BHEL/TPI agencies during inspection at vendor works. e. Test certificates/internal reports for Verification portion as given in MQP. f. Approved Data sheet, Spec & Drg g. BHEL Inspection clearance for dispatch. h. BOM with actual make used with customer approved drgs.		
03	Painting Requirements	1) Surface preparation: SA 2.5 2) Thickness of painting for Outdoor Application Motors: Zinc-Epoxy primer, 1 Coat, DFT 80 µm. Intermediate 1 coat of Epoxy high solid, DFT 110 µm. Finish 1 coat, 2-Comp.Polyurethane, DFT 50 µm. Total thickness = 240 µm. 3) Colour shade: Shall be as per BHEL/BIFPCL/FICHTNER approved specifications, Drgs and Data sheet.		
04	Packing	Sea Worthy Packing shall be ensured as per Sea Worthy Packing specification No.PE-TS-888-100-A001 which is referred in Enquiry Specifications/ Drgs and Data sheet.		
05	Important Note	No Chinese Material are to be used in this Items/Assy of export contract		

Supplier signature with seal

Necessarily to be filled up by the vendor at the time of offer itself otherwise the offer may not be considered w.r.t Quality Requirements being customer specific requirements and also being an EXPORT ORDER.

MFGR.'s LOGO		MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN				PROJECT : PACKAGE : CONTRACT NO. : MAIN-SUPPLIER:						
		CHARACTERISTICS		CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS
						M	C/N			9.	D*	M	C	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.				

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



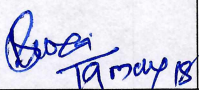
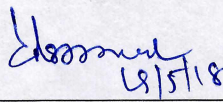
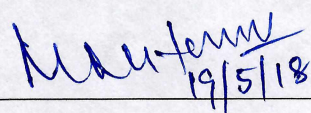
	BHEL: BAP: RANIPET Water System Pre-Qualification Requirement for HP Pump (Vertical) 2 nd Pass BWRO & acc.	Ref: RWT70597 :HP Pump BWRO
		Dt: 19 May 18
		Rev : 00

The Qualification requirements for High Pressure Pumps (Vertical) -2nd Pass BWRO and Accessories are listed below and bidders should meet the same. Offers of bidders who do not meet qualification requirement will not be considered.

1. Bidder should have designed, manufactured and supplied at least 2 No. of High Pressure Pumps of same type and have offered two or more brackish water reverse osmosis plants for power plant / industrial / municipal application.
2. The pumps supplied to the reference plant should have capacity more or equal to 60m³/ hr @ Suction head not less than 1 bar with discharge 10 bar. At least one pump with the specified capacity and rating or more shall be of SS316 material should have been supplied.
3. The pumps supplied to the reference plant should have in successful operation for not less than 2 years as on date of techno- commercial bid opening.
4. Bidder shall submit two performance certificate obtained from two different end users as a proof of satisfactory operation of referred pumps. The certificate shall clearly indicate pump make, Model, type capacity, Qty, application, MOC, date of commissioning as minimum. In addition to the above, bidder shall fill up the details as per **Annexure-I**. The final acceptance is subject to customer approval.

General Conditions:

1. Bidders who defaulted, in any of the previous tenders floated by BHEL are not permitted to respond. Such offers, if found later, will not be considered for evaluation.
2. After receipt of offers, during scrutiny, if any vendor found to have been banned by BHEL, then their offer will be summarily rejected at any stage.
3. Bidder to make provision in case BHEL decides to visit the reference plant furnished by the bidder for meeting the PQR requirements.

Prepared by  19 May 18	Checked by  19/5/18	Approved by  19/5/18
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BHEL: BAP: RANIPET

Water System

Pre-Qualification Requirement for HP Pump (Vertical)

2nd Pass BWRO & acc.

Ref: RWT70597 :HP Pump BWRO

Dt: 19 May 18

Rev : 00

Annexure-I

Qualification Requirement Datasheet

A. Customer details: -

- a. Name :
b. Designation :
c. Mobile :
d. Land line :
e. Fax :
f. Email id :
g. Postal address :

B. Plant Details:-

Date of Supply :

Date of commissioning:

Sl. No.	Parameters	Unit	Value
01	No of HP Pumps (reference given)	Nos	
02	HP Pump Flow Design	M ³ /hr	
03	Discharge Head	Bar(g)	
04	MOC of Pumps	m3/hr	
05	PREN Number		
06	End use of the Plant		

Signature of the Vendor

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	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 1	OF 52

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
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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.

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

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
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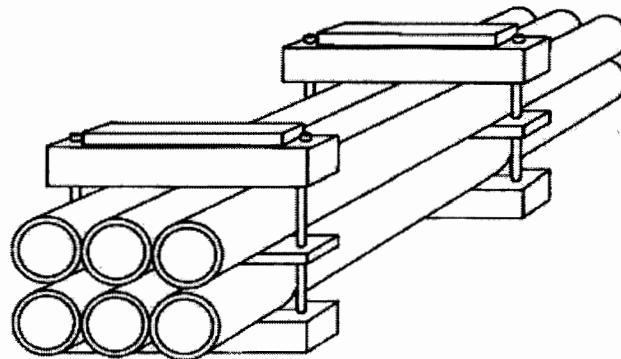
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long bolting to secure the load.

8.2 Bundling – Packing Category I

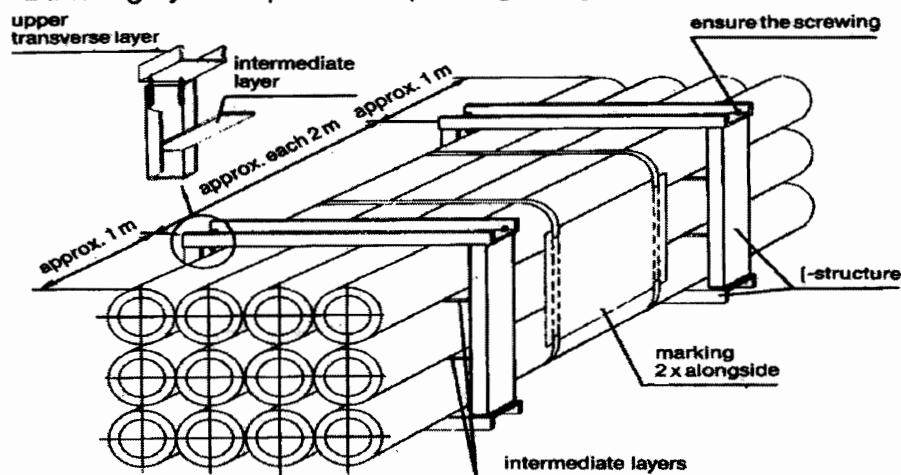
8.2.1 Type of Equipment

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)

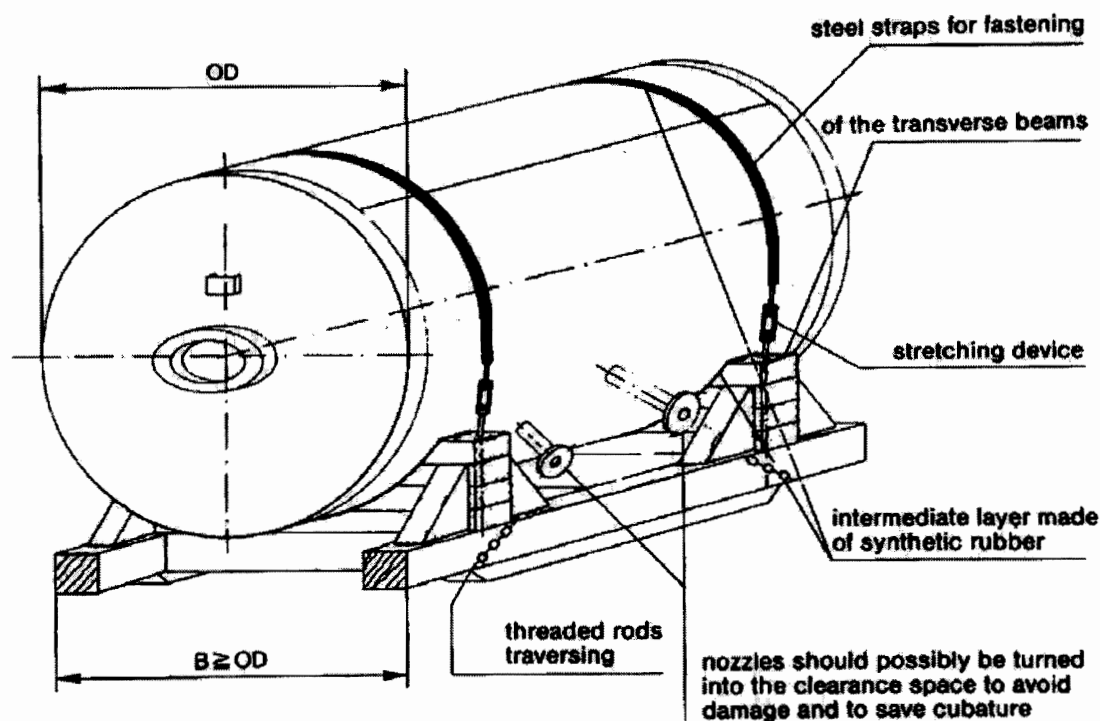
8.3.1 Type of Equipment

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

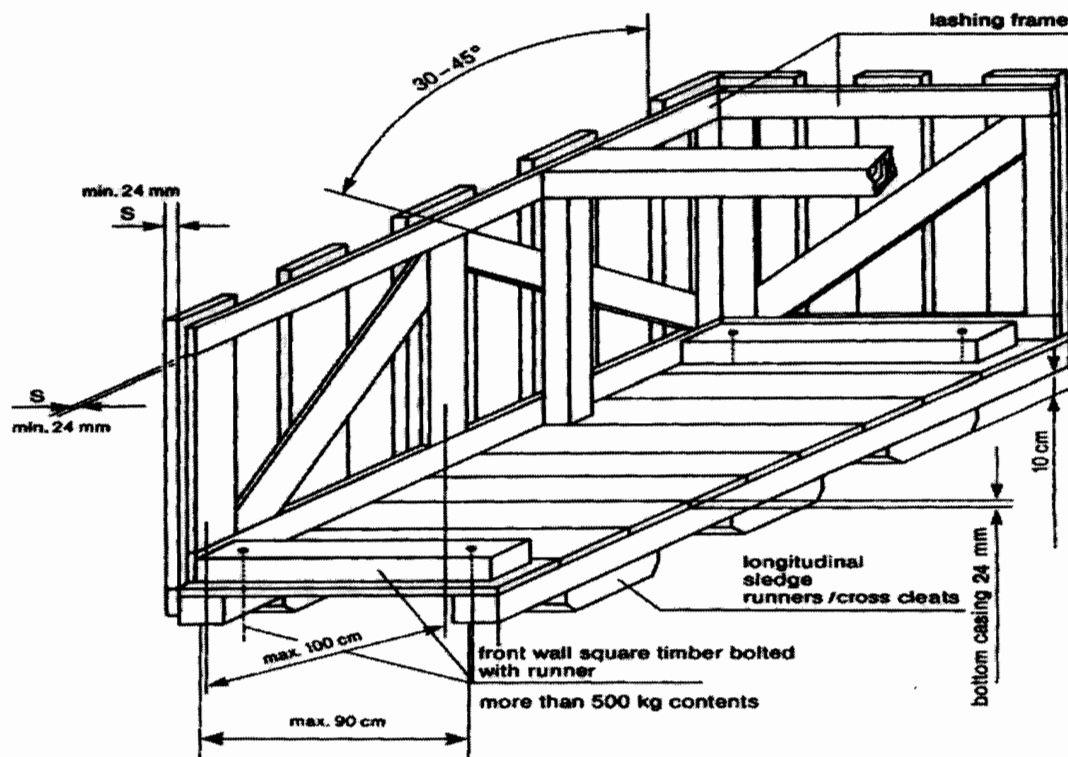
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

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

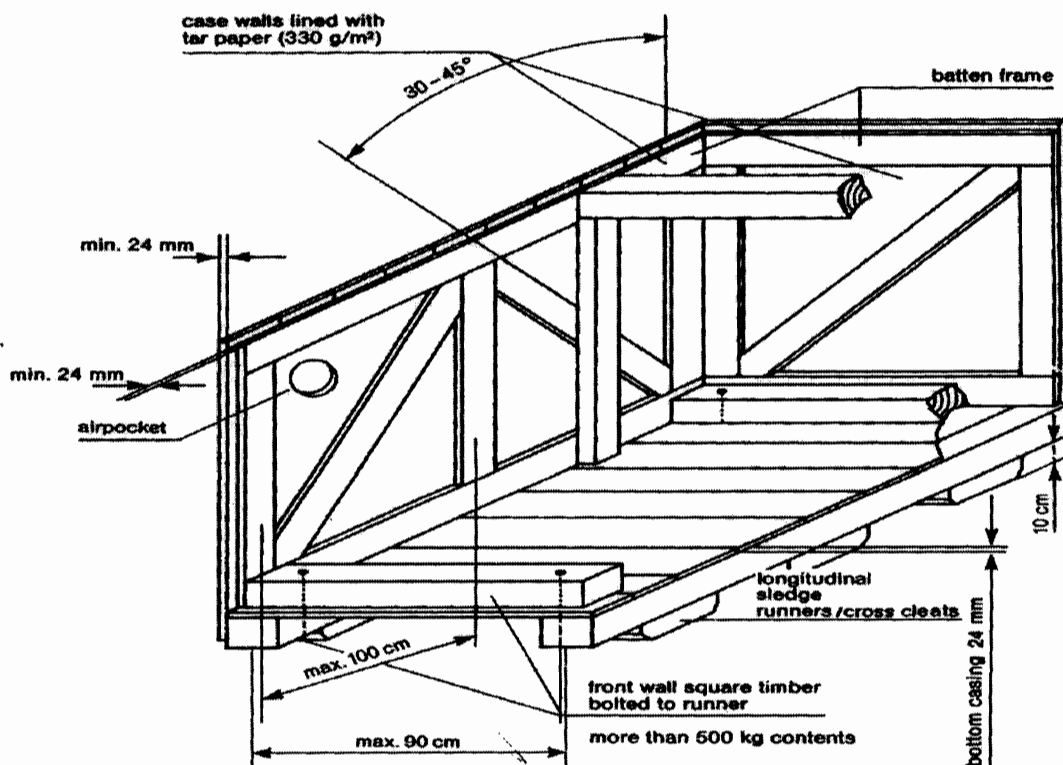
8.4.2.1 Type of Equipment

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.

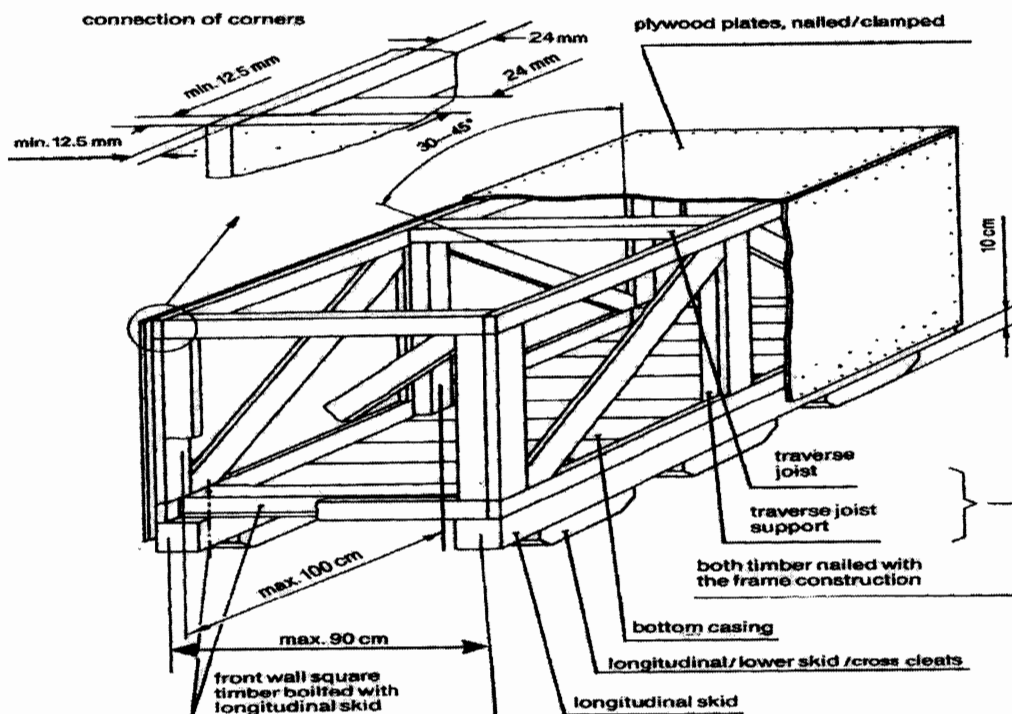
Packing Category IV



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.

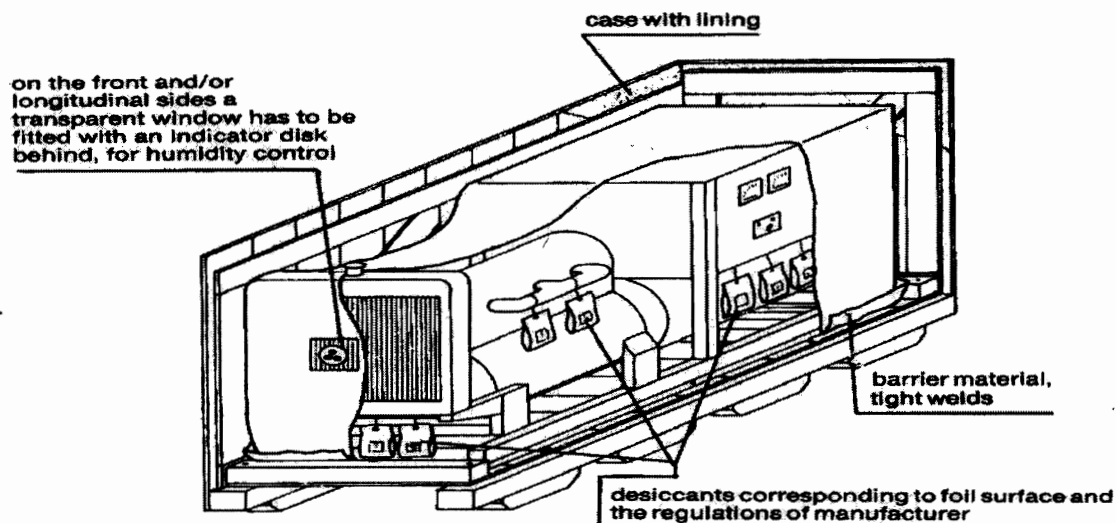
8.4.5.2 Type of Construction

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, cracks, 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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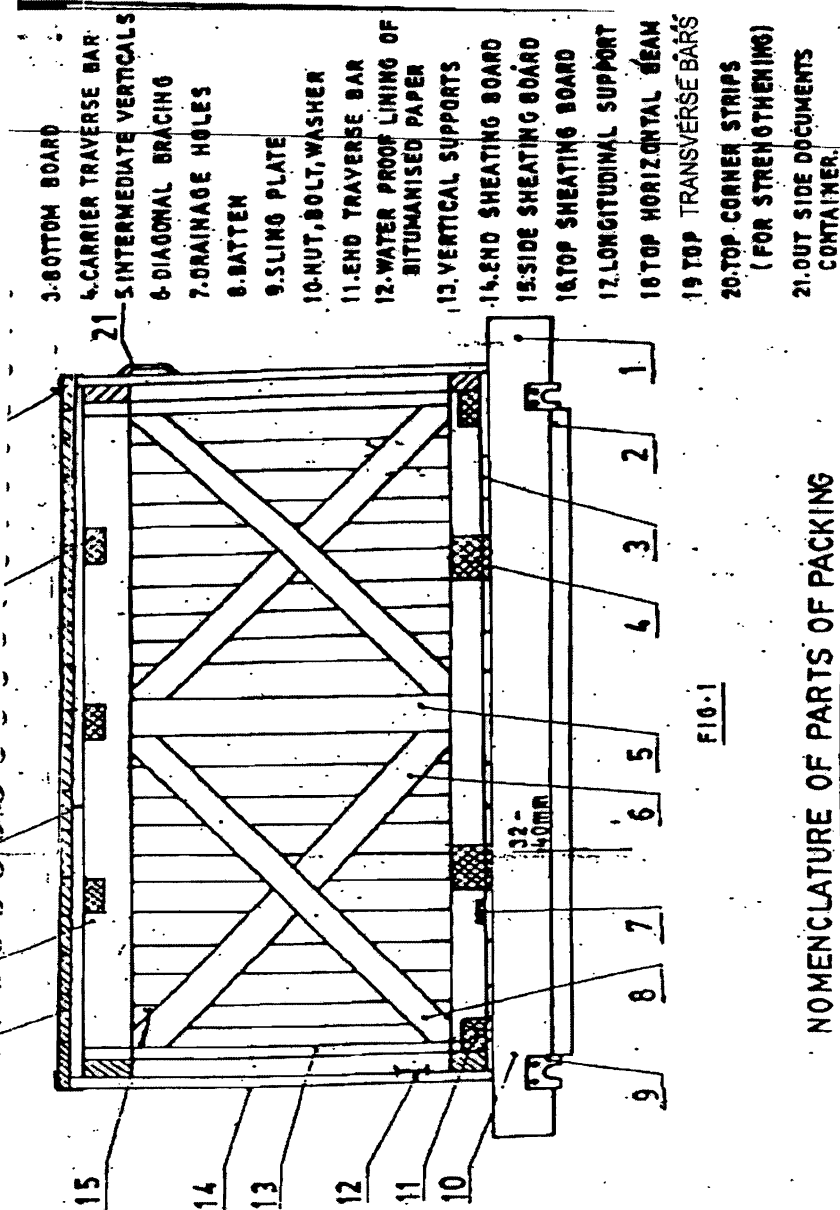


FIG-1

NOMENCLATURE OF PARTS OF PACKING

CASES

FIG-1

1 SLIDE
2 UNDER SLIDE BOARD

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BOTTOM FRAME ARRANGEMENTS

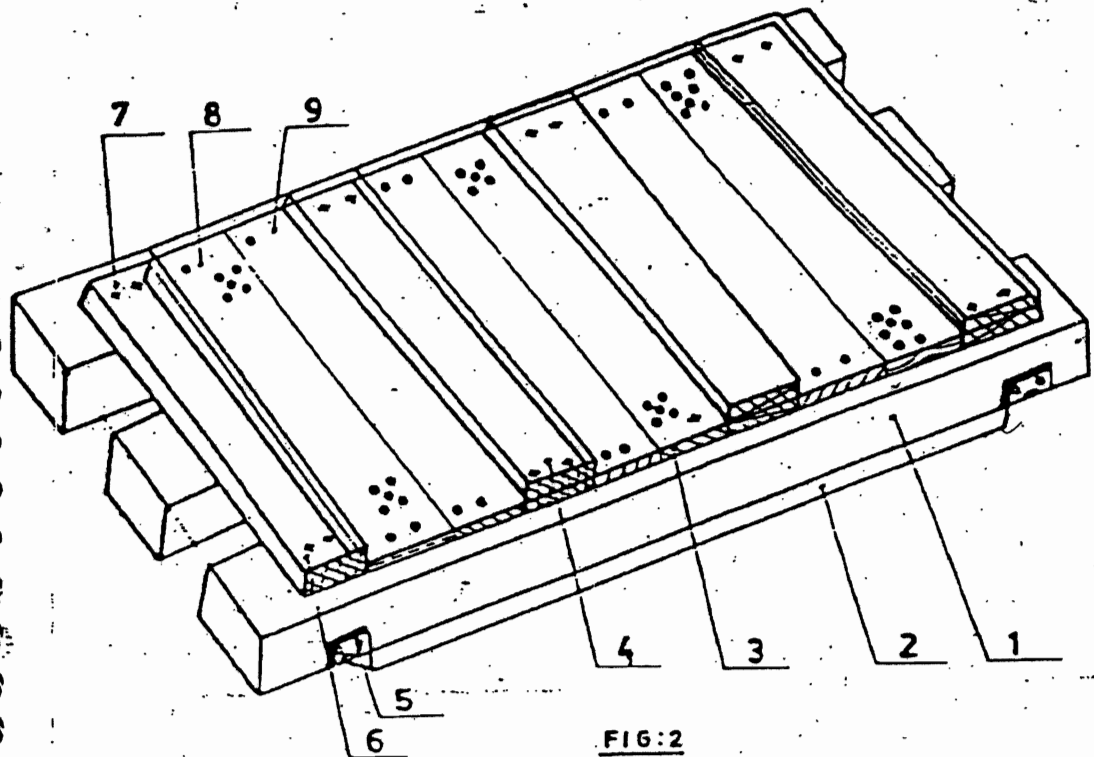


FIG:2

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

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TOP FRAME ARRANGEMENT

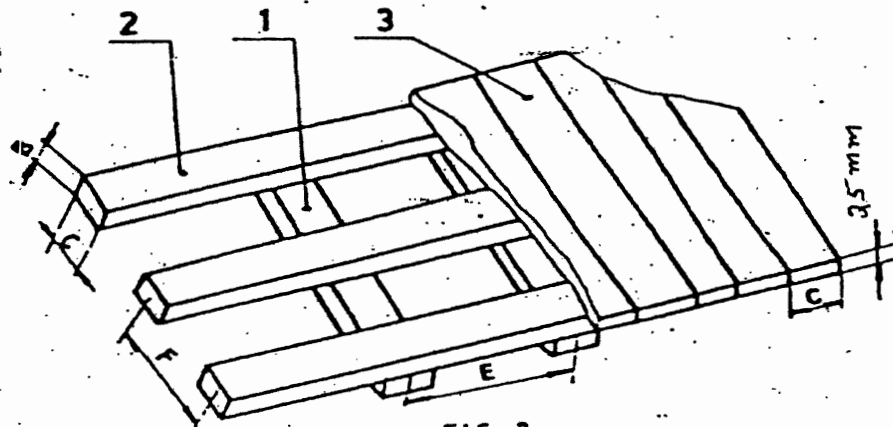
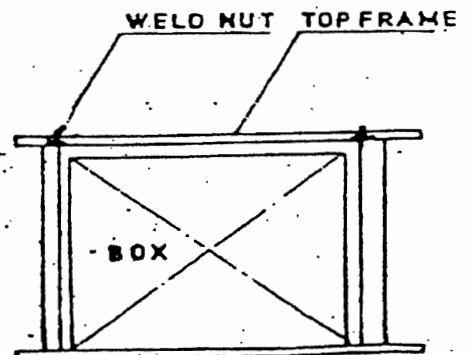
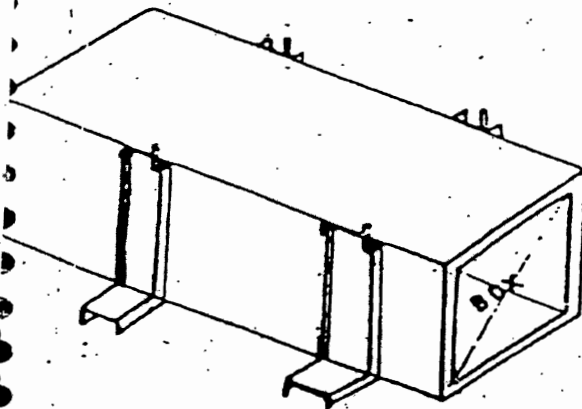


FIG-3

F : 700 to 1000 mm
E : 500 to 900 mm
30 x 100 mm.

- 1 - Traverse Bars
- 2 - Horizontal Soans
- 3 - Top Board

ARRANGEMENT OF C-CLAMPS AROUND CASES



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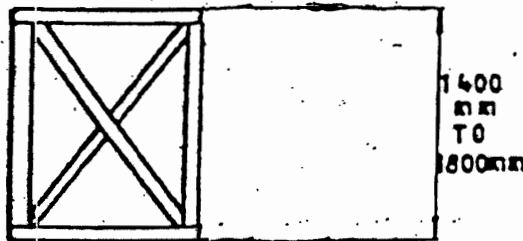
**ARRANGEMENT OF DIAGONAL BRACING AND
HORIZONTAL SUPPORT**

FIG: 6

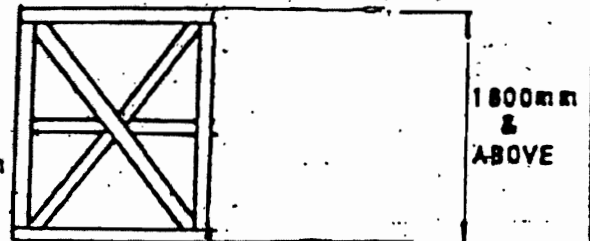


FIG: 8

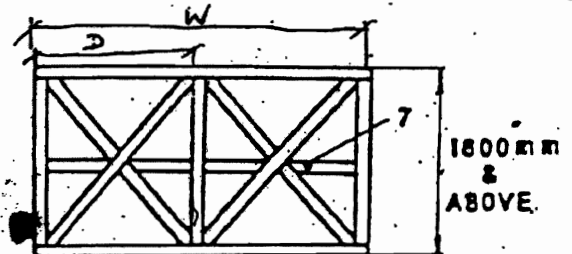


FIG: 7

7- Middle Horizontal Support

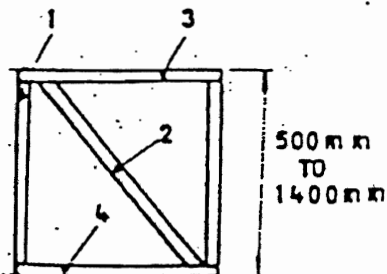


FIG: 5

1- Vertical Support

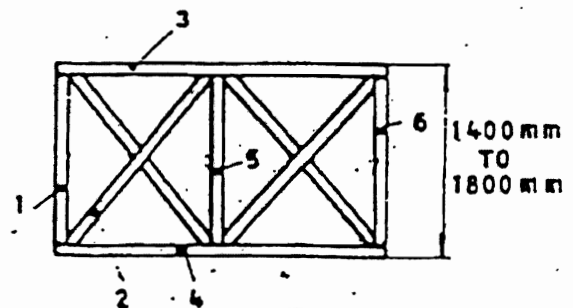


FIG: 7

1, 5, 6 - Vertical Support

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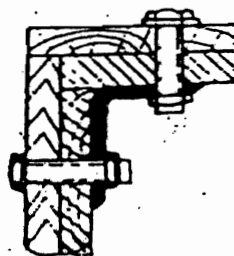
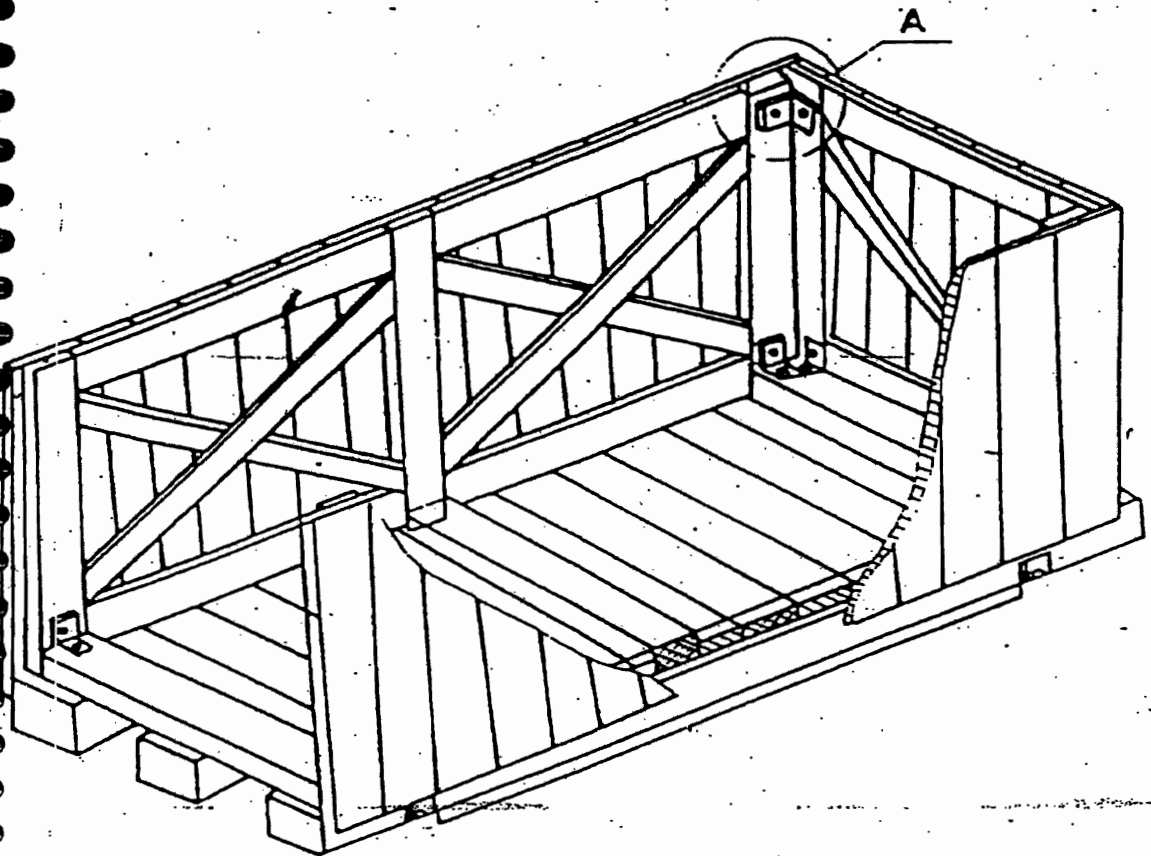
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ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

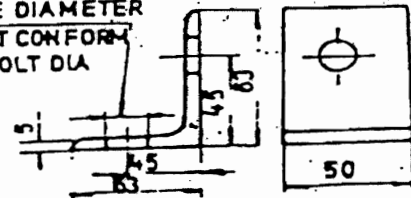


FIG:10

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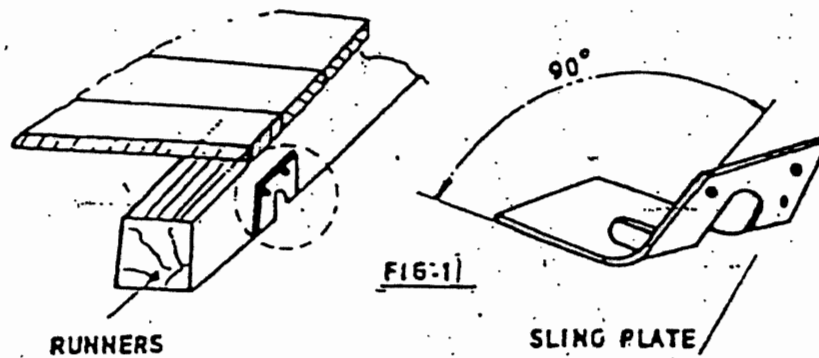
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**ARRANGEMENT OF SLING & PLATE ON
CASES**

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TABLE-1

LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c				c b		
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

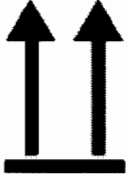
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Table-2

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
		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-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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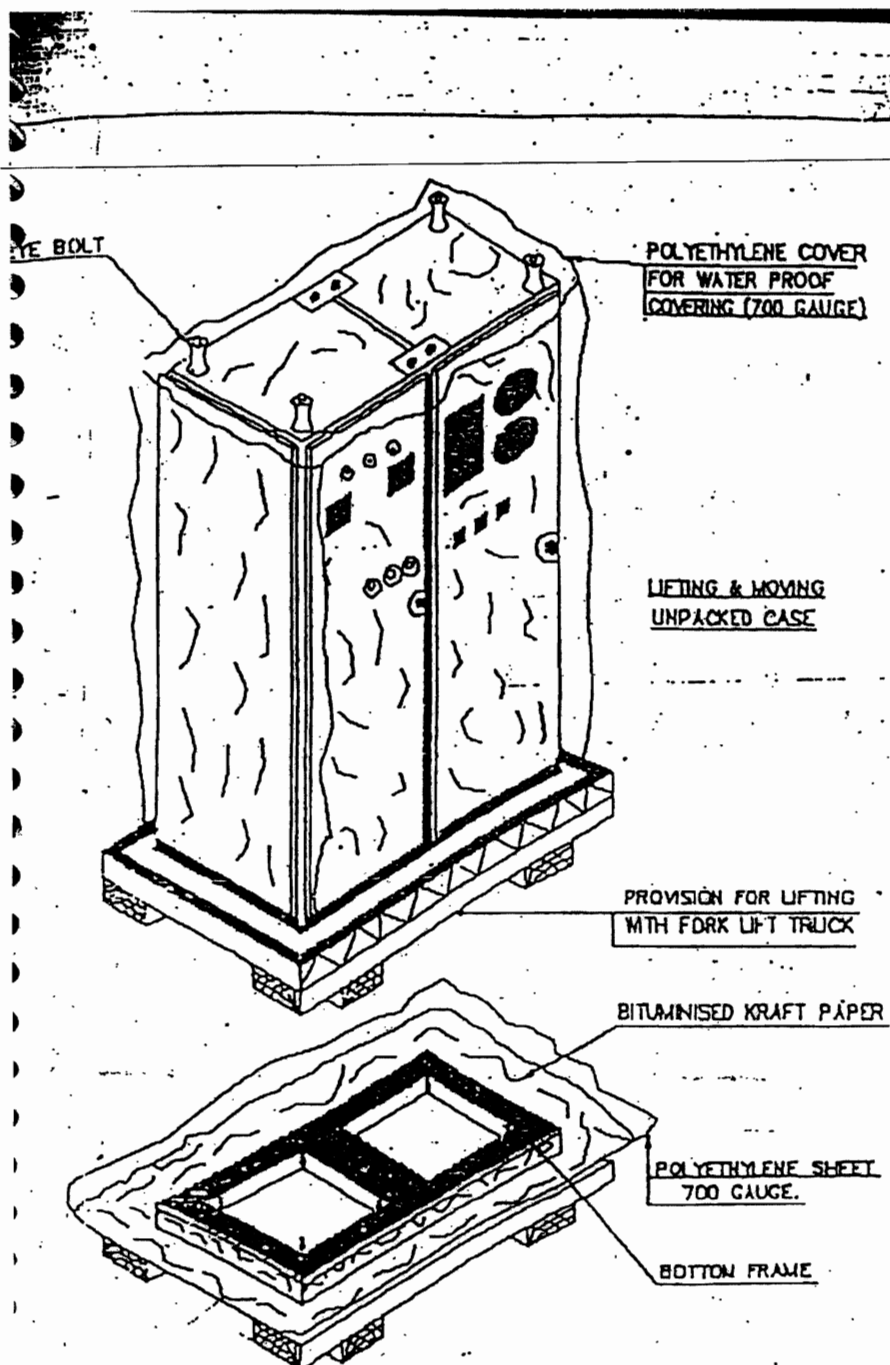


FIGURE-14



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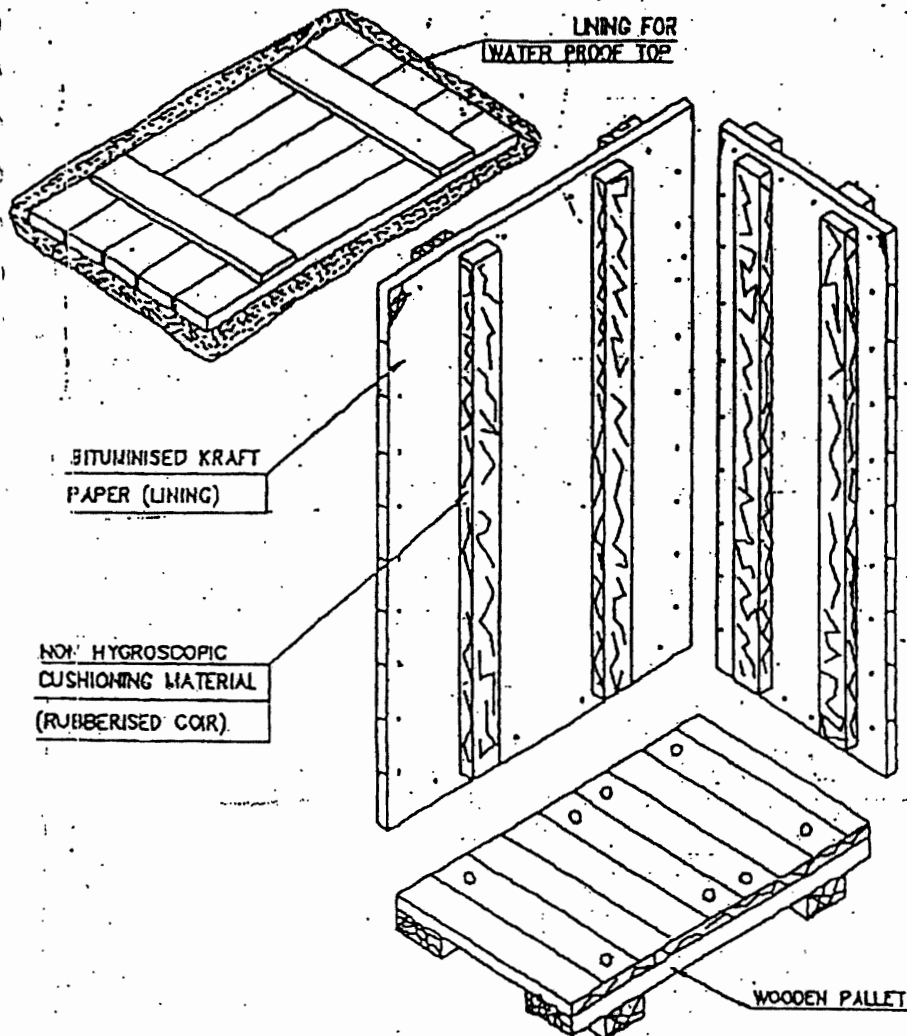


FIGURE-15

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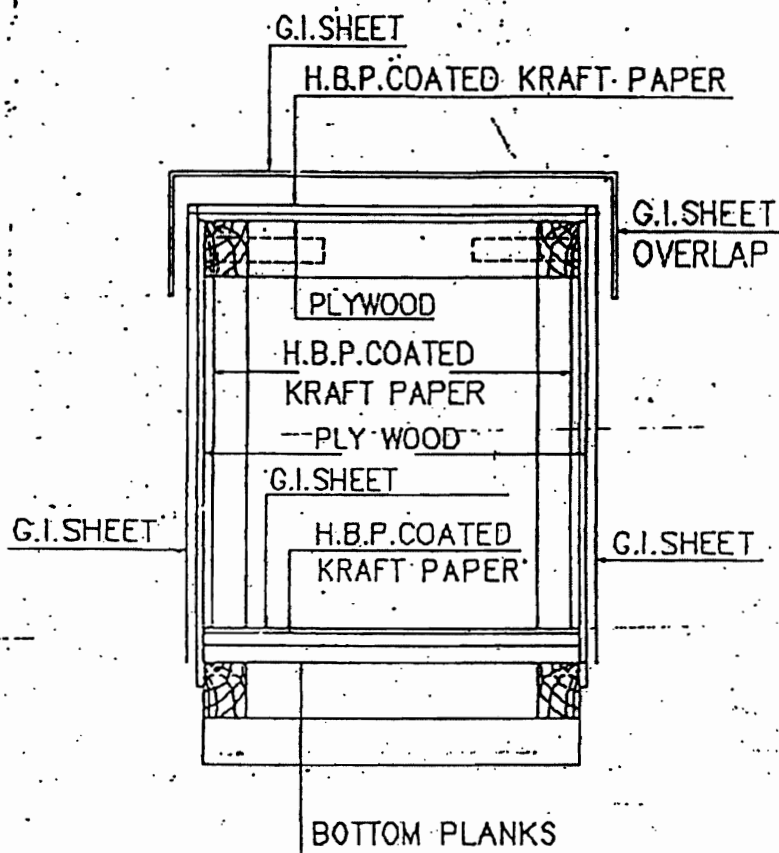


**FIG-16 : CLOSED PACKING CASE WITH G.I.SHEET
SHOWING LAYERS OF PACKING MATERIALS.**

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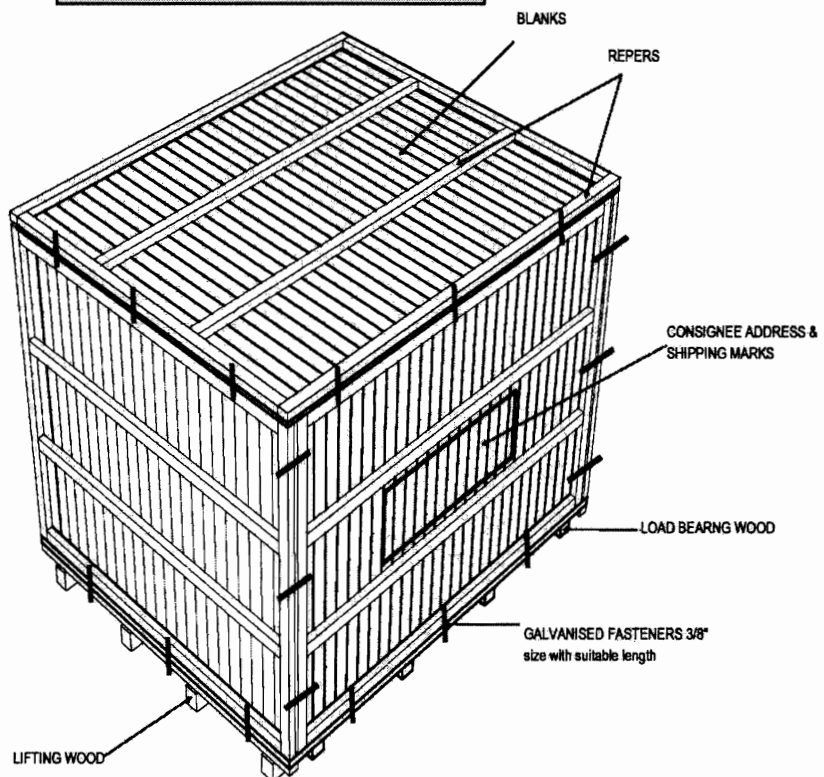
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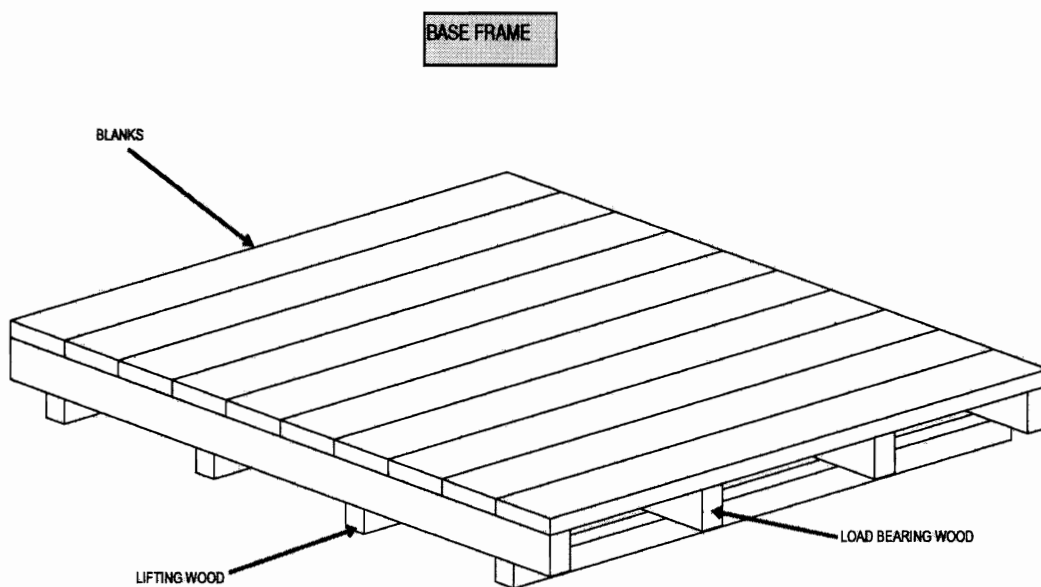
MODEL: FASTNERS TYPE (BASE, SIDE & TOP
ATTACHED WITH BOLT, NUT & WASHER)

This Type of case to be used for
following items:

1. BALL SEPERATOR
2. BALL COLECTOR SKID



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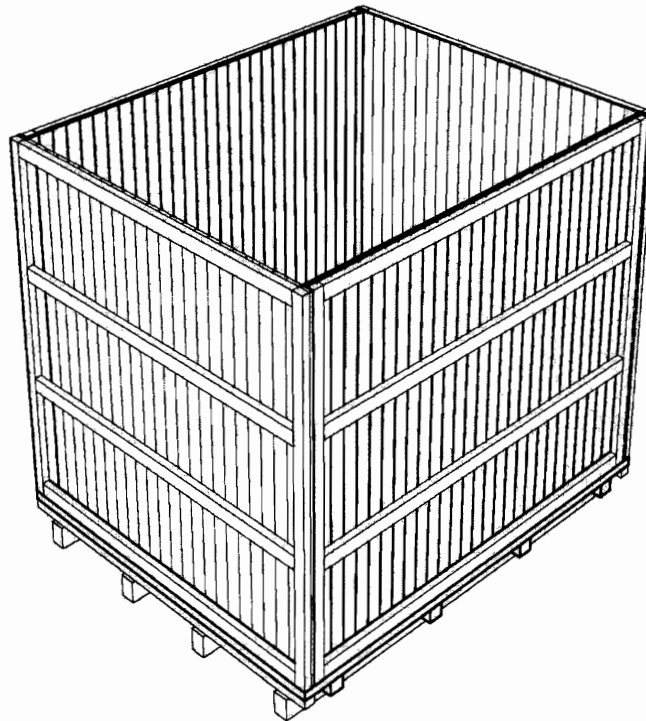
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MODEL: FASTNERS TYPE - WITHOUT TOP





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MODEL: NAILING TYPE
(FRAME & INSIDE REEFER NAILED)

THIS TYPE OF CASE TO BE USED FOR THE
FOLLOWING ITEMS:

1. PUMP SKID
2. CONTROL PANEL
3. LOOSE ITEMS, TOOLS & TACKLES
4. DPMS, BRM
5. SPARES
6. CLEANING BALLS
7. CABLES & ACCESSORIES

Shipping marks & Consignee
Address

BLANKS

LIFTING WOOD

BLANKS

REEPERS

BLANKS

REEPERS

LOAD BEARING WOOD

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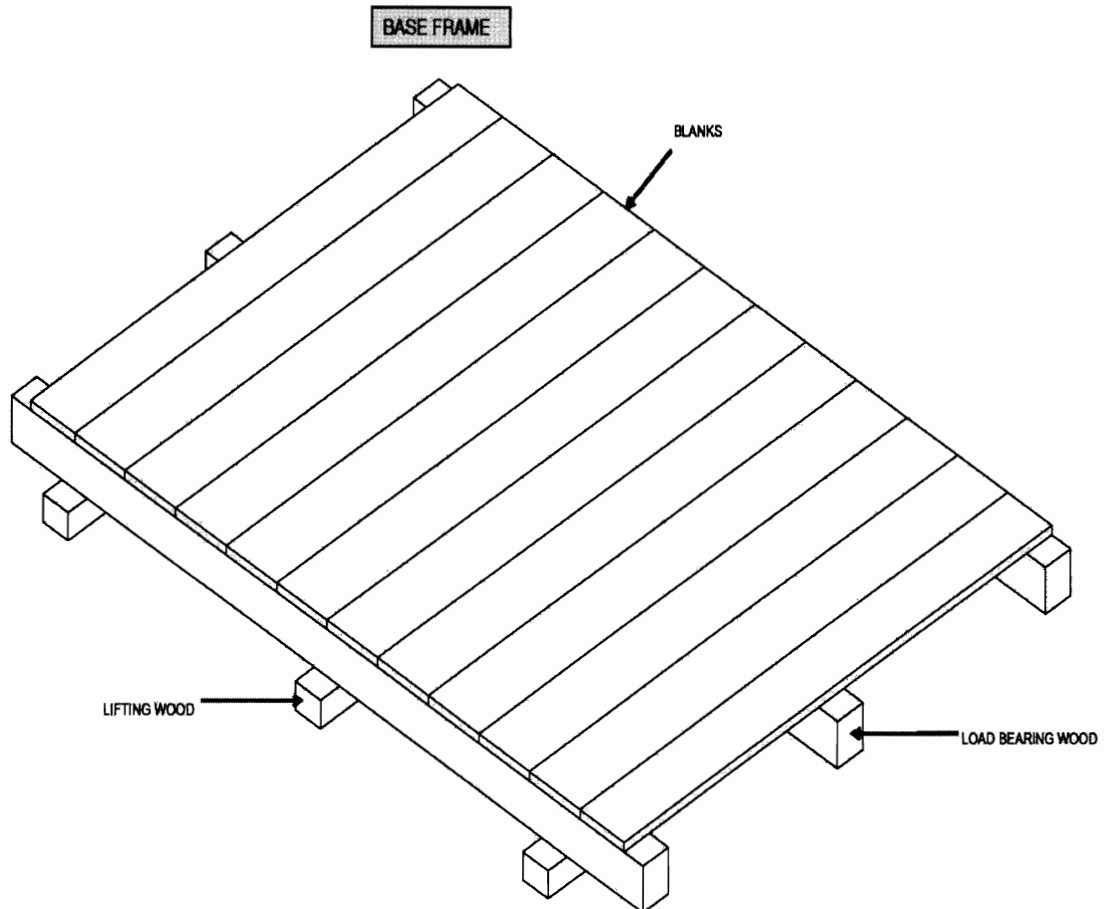
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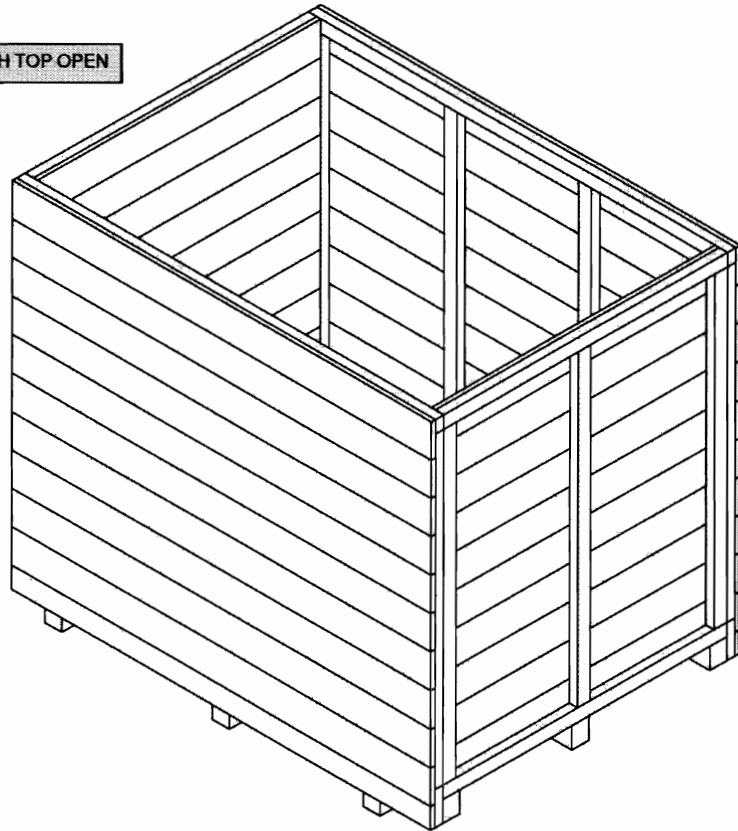
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10.4 PACKING OF LOOSE ITEMS

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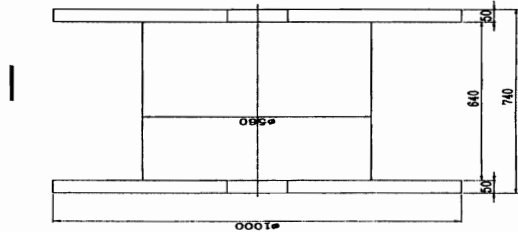
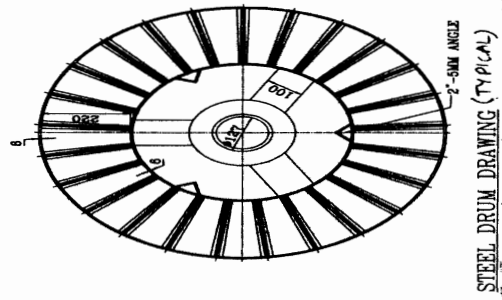
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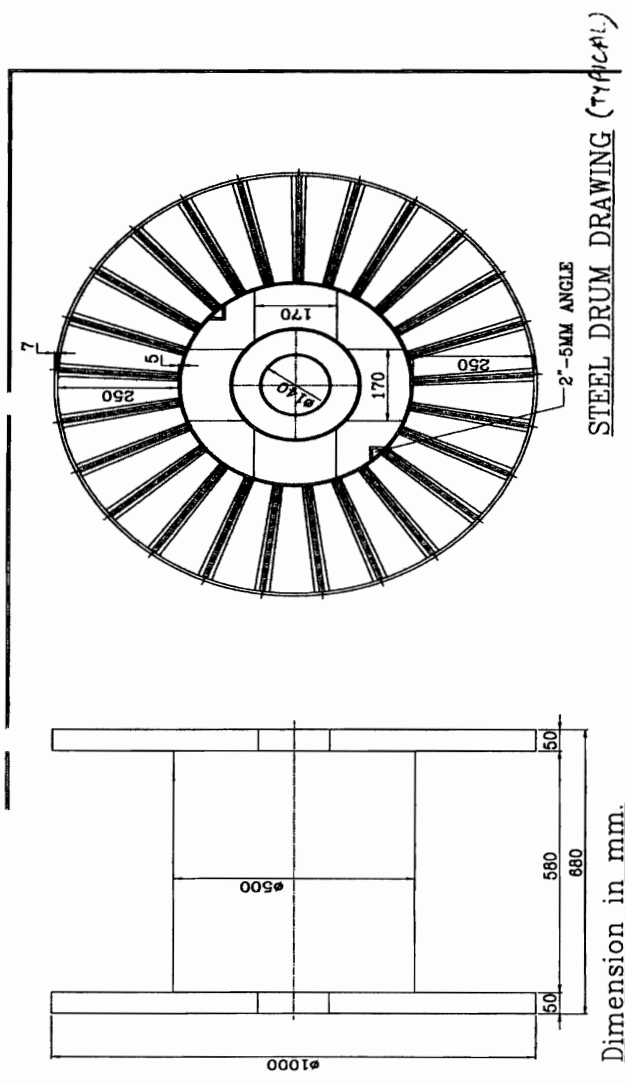
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11.2 PACKING OF CABLE TRAYS & ACCESSORIES AND CABLE TRAY SUPPORT MATERIAL

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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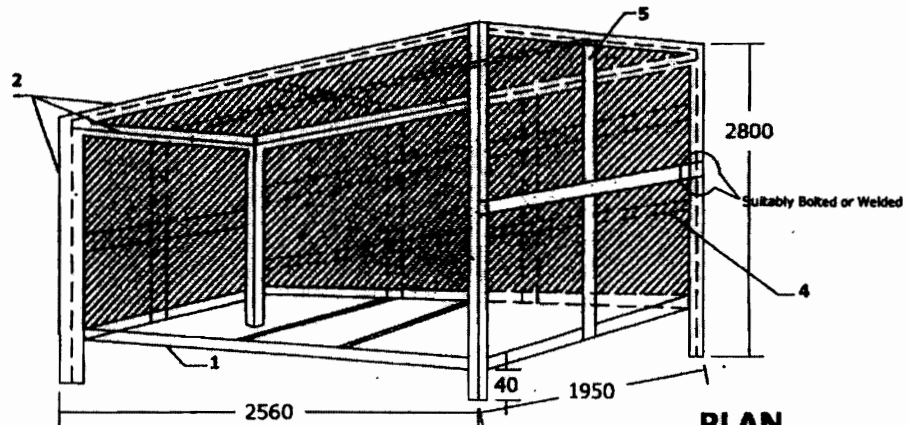
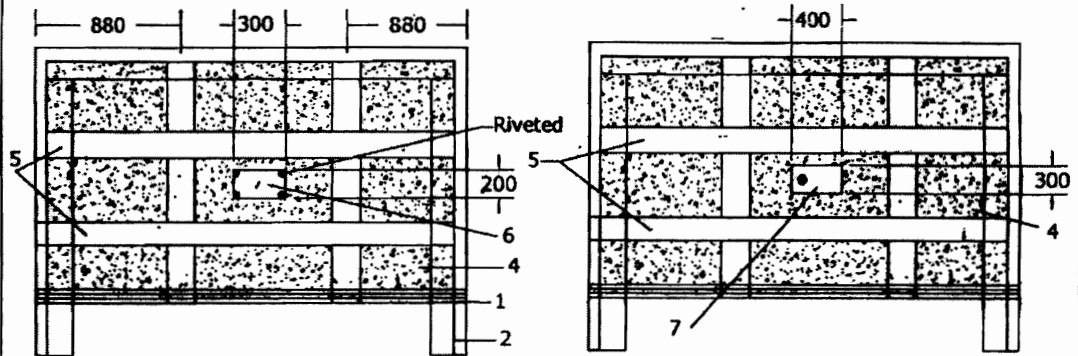
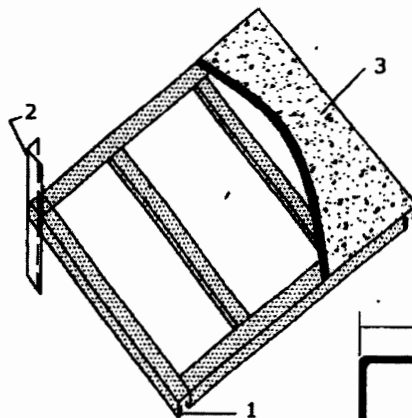
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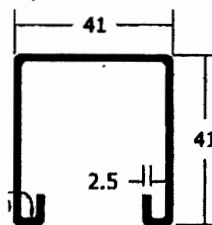
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STEEL PACKING (TYPICAL DETAILS)**PLAN****FRONT SIDE OF BOX****BACK SIDE OF BOX****BOTTOM FRAME ARRANGEMENT****Note:**

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.

**DETAILS OF "C" CHANNEL**

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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 DIATRIBUTION 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 COMMIOSSIONING SPARES, RECOMMENDED SPARES , ERECTION MATERIAL AND CONSUMBALES

- 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

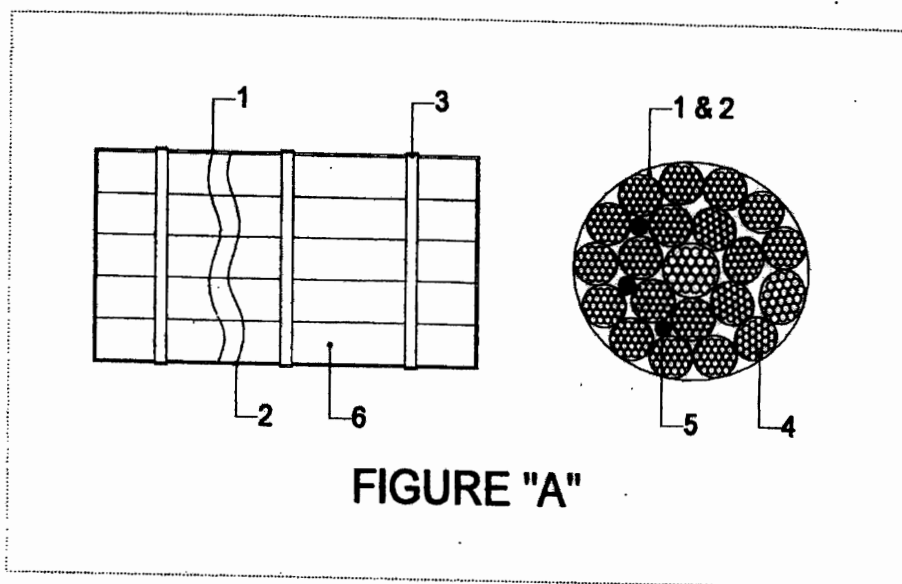
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Structural steel will be different sizes and shapes. Hence it will be packed as per Figure No. B and described as following :

- 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



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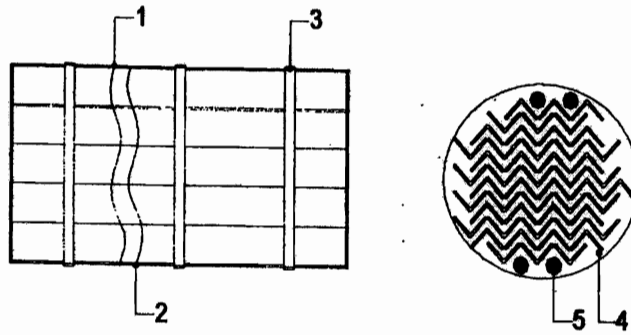
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PACKING PROCEDURE FOR STRUCTURAL STEEL**FIGURE "B"**

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



TITLE

TECHNICAL SPECIFICATION
FOR SEAWORTHY PACKING
FOR EXPORT JOBS

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

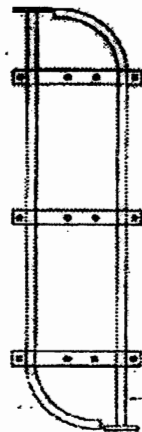
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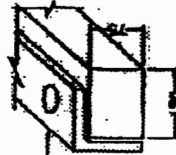
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packing procedure for poles



POLES WRAPPED WITH POLYTHENE SHEET &
EXTRUDING COATED HESSIAN CLOTH



TOP WOODEN BATTEN TO BE
FIXED WITH 150x80x8 MM ON TOP
OF IT FOR TIEING THE ROD
25 MM DIA



BOTTOM WOODEN BATTEN TO BE
FIXED ON 150x80x8 MM ANGLE

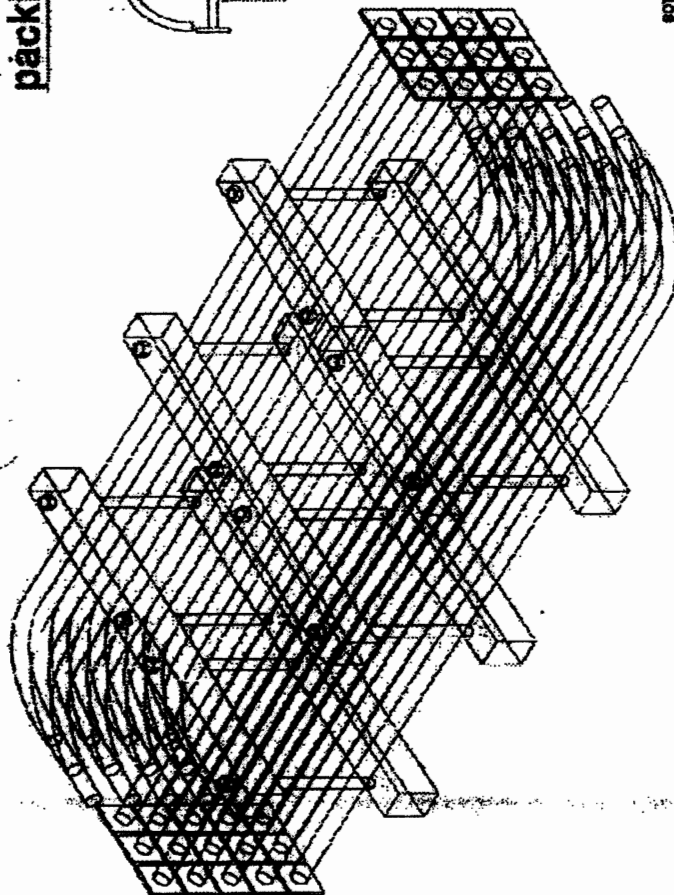


FIGURE "C"

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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.



Name of the proposed Equipment / Item / Process with Model / Type / Rating / Capacity / Size / Tonnage etc. (As applicable):

1. **Name of Proposed Sub-Supplier:** _____

Website: _____

2. **Address of Regd. Office:**

Details of contact person:

Name _____

Mobile no. _____

Desig. _____

E-mail: _____

Country of Head Office

☐ **Field of activitie**

3. **Address of Works where Item is being manufactured**

Details of contact person:

Name _____

Mobile no. _____

Desig. _____

E-mail: _____

4. **Branch / Liaison office in Dhaka**

Details of contact person:

Name _____

Mobile no. _____

Desig. _____

E-mail: _____



SUB-SUPPLIER QUESTIONNAIRE

FICHTNER

5. Details of Proposed Works:

- a. Year of Establishment of present works: _____
- b. Year of Commencement of: _____
Manufacturing at the above works
- c. Details of change in works address in past, if any : _____
- d. Total Covered Area : _____
- e. Details of covered area like no. of sheds, : _____
Area of each shed etc.
- f. Electric power- Connected load: _____
Electric power- Stand by load & system: _____

6. **Annual Turnover & Profit in past three years** : _____
: _____

7. Do you have in-house Department for

- a) Design Yes / No
- b) Research & Development Yes / No
- c) Quality control/Inspection Yes / No
- d) After Sales Service Yes / No

If any of these items answered with “No”, an explanation shall be provided.

8. **Shift works per day** One / Two / Three
Weekly day off

9. Present Manpower Status:

Division Status	Graduate		Diploma	Skilled	Un-Skilled	Remarks
	Technical	Non-Technical				
Design						
Production						
Quality Control / Inspection						
After Sales Service						



SUB-SUPPLIER QUESTIONNAIRE

FICHTNER

- a. Enclose organization chart of the proposed works (Y / N) _____
- b. Enclose Organization chart of QA / QC Deptt. (Y / N) _____
- c. Enclose List of Qualified Welders with process etc. (Y / N) _____
- d. Enclose List of Qualified NDT personnel with area of specialization (Y / N) _____

10. **Trade Name of Product (if any)** _____

11. **Brief details of items manufactured:**

Sl. No.	Item & Material (Type / Size / Rating / Model / Tonnage, as applicable)	Installed Capacity	Annual Production Capacity	Annual Production for last Three years		
				I	II	III

12. **Details of foreign Collaboration, if any:**

Sl. No.	Product	Name & Address of Collaborator	Collaboration		
			Scope	Year	Valid upto



13. **Furnish Type Test report for the proposed product (if applicable).**
-
14. **Approval/Certification by National/International standards/accredited agency applicable for the proposed product (if applicable).**
-
15. **Furnish statutory/mandatory certification for proposed product (if applicable).**
-
16. **Furnish supply Experience list of the proposed product.**
List shall include Item description (Type / Size / Rating / Model / Tonnage, as applicable), Customer name, Quantity, Year of Supply, and Year of commissioning.
-
17. **Enclose End User's operational feedback certificate for the proposed product.**
-
18. **Enclose list of equipment & machinery specific to the proposed product.**
This should include name of equipment, capacity & nos. etc.:
-
19. **Enclose Process Flow Diagram indicating in-house & outsourced process.**
-



SUB-SUPPLIER QUESTIONNAIRE

FICHTNER

20. General manufacturing facilities available:

Sl. No.	Description of machine	Inhouse		Outsourced	
		Capacity	No.	Capacity	No.
a)	Material Handling Mobile Crane Fork Lift Over Head Cranes				
b)	Metal Cutting & Bending				
c)	Casting				
d)	Forging				
e)	Fabrication				
f)	Welding				
g)	Machining				
h)	Heat Treatment				
i)	Surface & Cleaning Sand Blasting Shot Blasting Pickling				
j)	Painting				
k)	Metal Coating				
l)	Packing				
m)	Other, if any				

21. Enclose Testing & Inspection facilities specific to the proposed product:

- a. In-house
b. Outsourced

22. Storage of finished goods (covered / open).



- 23 **Enclose list of the source / make with location of major raw material, bought out items and out sourced process** _____
24. **Furnish details regarding local service support and spare parts availability in Bangladesh. process** _____
25. **Quality management**
- 25.1 General
- 25.1.1 Work Instruction for different processes available. (Y / N) _____
if yes, furnish list.
- 25.1.2 Evaluation system for raw material / bought out item's supplier is available. (Y / N) _____
- 25.1.3 Records generated during inspection maintained & available for review? (Y / N) _____
- 25.1.4 Statistical quality control techniques used? (Y/N) If yes please furnish details. (Y / N) _____
- 25.1.5 ISO certificate for the works available? (Y / N) _____
If yes, enclose copy of the certificate.
- 25.1.6 Quality & HSE Manual for the works available (Y / N) _____
If yes, enclose copy of the manual.
- 25.2 Corrective action
- 25.2.1 Specifically confirm whether System for identifying & disposition of Non Conformity in the process / product is available (Y / N) _____
- 25.2.2 Specifically confirm whether System for Customer complains & their satisfactory disposal is available. (Y / N) _____
- 25.3. Documentation Control
- 25.3.1 Procedure available for documentation control (Y / N) _____
- 25.4. Control of Inspection, measuring & testing equipments.
- 25.4.1 Procedure for calibration of testing & measuring instrument available. (Y / N) _____



27. Certification of sub-supplier

I CERTIFY THAT THE INFORMATION SUPPLIED HEREIN (INCLUDING ALL PAGES ATTACHED) IS CORRECT.

SEAL

SIGNATURE _____

NAME _____

M/S. _____

DESIGNATION _____

PLACE _____

MOBILE NO _____

EMAIL _____

DATE _____

LIST OF ENCLOSURE:

28. Certification by Main Supplier:

ABOVE INFORMATION HAVE BEEN VERIFIED AND FOUND IN ORDER TO COMPLY WITH TECHNICAL SPECIFICATION AS PER EPC-CONTRACT.

Name: _____ **Designation:** _____ **Signature:** _____ **Date:** _____

NOTE:

- 1. COLUMN SHALL NOT BE LEFT UNFILLED. IN CASE OF NOT APPLICABLE / NOT AVAILABLE, THE SAME SHALL BE INDICATED IN THE PROVIDED SPACE.**
- 2. IN CASE PROVIDED SPACE IS NOT ADEQUATE, INFORMATION SHALL BE PROVIDED AS AN ATTACHMENT.**
- 3. PRODUCT CATALOGUE FOR THE PROPOSED EQUIPMENT / ITEM / PROCESS, IF AVAILABLE, SHALL BE ENCLOSED**