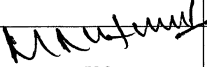


	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.**

**TECHNICAL SPECIFICATION
FOR
RO MEMBRANES**

00	24.02.09	 MSM	 MN	 KSK	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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1.0 EQUIPMENT SPECIFICATIONS

1.1 GENERAL

- a. Equipment : Reverse Osmosis (RO) Membrane Element
- b. Application : For the production of permeate water.
- c. Surrounding : Dusty, humid atmosphere.
- d. Installation : Indoor

1.2 TECHNICAL REQUIREMENTS

- a. Type of membrane : Spiral wound
- b. Material of Construction : Composite Polyamide.
- c. Size of membrane element : 8" Diameter x 40" Length
- d. Additional technical details & requirements } : Enclosed as a separate **Annexure – A**
} : for this specification.

1.3 General Requirements

- a. Price split for membrane elements, Accessories, commissioning assistance etc., shall be offered.
- b. Supervisory assistance at site for assembly of membrane/erection shall be offered as optional, separately along with the bid and will not be considered for evaluation.

2.0 Documents along with Bid

The following information / documents shall be submitted along with the offer for each type of membrane offered.

- a. Guaranteed Membrane projections for design TDS & at design temperature.
 - i. At start up (0th year).
 - ii. At the end of 3 years.
 - iii. At the end of membrane life.

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- b. Guaranteed Membrane projection for design TDS at the end of membrane life.
 - i. At minimum temperature.
 - ii. At maximum temperature.
- c. Membrane projection with 25% Salt Passage Increase Factor (SPIF)/Year at the end of membrane life.
- d. Guaranteed System performance curves for start-up and end of membrane life considering the design TDS and temperature range of 15 to 40 deg. C.
 - i. Feed Temperature Vs Feed Pressure.
 - ii. Feed Temperature Vs Permeate TDS.
- e. Enclosed data sheet duly filled for guaranteed permeate quality as per **Annexure-1**.
- f. Enclosed data sheet duly filled as per **Annexure-2**.
- g. Membrane guarantee document.
- h. Membrane specification data sheet and standard test condition, indicating dimensional details etc..
- i. Commissioning spares list with price as called.
- j. Recommended spares list for 3 years operation with price.
- k. Reference list of plants using the offered membrane in similar feed water characteristics.
- l. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure 3**.

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 non attachment of this **Annexure 3**, it will be construed that the bid confirms strictly to the specification. Acceptance or rejection of the offer with or without deviations (either fully or

	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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partially) is sole discretion of the purchaser without seeking further clarification from the bidder.

NOTE:

Bidders to note that failing to submit the above documents, the bid shall be considered as incomplete and liable for rejection.

3.0 Documents after order

The following information / documents shall be submitted in the event of order for customer's review/approval for each type of membrane offered.

- a. Enclosed data sheet duly filled as per **Annexure 1&2** for approval.
- b. Signed Membrane guarantee document **from the manufacturer** for approval.
- c. Membrane performance test certificate for each element at standard test condition.
- d. Membrane Projection as called in **2.a, 2.b,2.c & 2.d**.
- e. Membrane element data sheet.
- f. Detailed assembly & cross sectional drawings indicating dimensional details of offered membrane element.
- g. Recommended preservation and storage procedure for Membrane.
- h. Recommended cleaning procedure for Membrane.
- i. Installation, Assembly and membrane removal/ replacement procedure.
- j. Operation & Maintenance manuals.
- k. Latest version of membrane selection program in CD form.
- l. RO Normalization programme in CD form, for membrane performance evaluation.

NOTE: Bidder to confirm in their offer that these will be provided.

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4.0 Documentation:

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

- a. All documents and drawings shall be submitted in English.
- b. Hard copies of all documents and drawings during bid stage to be submitted in duplicate
- c. Hard copies of all documents for approval to be submitted in triplicate.
- d. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
- e. Soft copies of all final documents in MS office in the form of CD-1 set.
- f. Soft copies of all final drawings in AutoCAD, latest version in the form of CD-1 set.

5.0 Inspection

By BHEL or BHEL's authorized agency at vendor's works.

	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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ANNEXURE - 1

BHEL ENQUIRY / P.O. Reference No. & Date :

BHEL ENQUIRY / P.O. Material Code No. :

GUARANTEED RO PERMEATE QUALITY : STAGE No.

Design Temperature: °C

Feed water TDS : ppm

Sl. No.	Parameters	Unit	During Start-up	End of 3 rd year	End of membrane life
1	PH				
2	Conductivity	μS./cm			
3	Total Dissolved Solids (TDS)	mg/l			
4	Carbon di Oxide as CO ₂	ppm			
5	Silica as SiO ₂	ppm			
6	Sodium as Na	ppm			
7	Potassium as K	ppm			
8	Calcium as Ca	ppm			
9	Magnesium as Mg	ppm			
10	Bicarbonate as HCO ₃	ppm			
11	Chloride as Cl	ppm			
12	Sulphate as SO ₄	ppm			
13	Nitrate as NO ₃	ppm			
14	Flouride as F	ppm			
15	Boron	ppm			

NOTE: Use separate sheet for each stage and type of membrane

	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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ANNEXURE-2

BHEL ENQUIRY / P.O. Reference No. & Date :

BHEL ENQUIRY / P.O. Material Code No. :

DATA SHEET

- | I. RO-MEMBRANE ELEMENT | Membrane Type# |
|---|--|
| a. Make | : |
| b. Model | : |
| c. Type/Material | : |
| d. Quantity offered per stream | : |
| e. Quantity offered as total | : |
| f. Array | : |
| g. Life of membrane | Years : |
| h. Recommended membrane replacement rate per year for guaranteed life | % 1 st year :
2 nd year:
3 rd year:
4 th year:
5 th year: |
| i. Total Recovery | % : |
| j. Feed temperature | Design/Min/ Max : / / |
| k. Feed TDS | Design/ Min/ Max : / / |
| l. Feed pressure for design TDS | |
| - Start-up Design temperature | Deg. C bar(g) : |
| - End of membrane life | Deg. C bar(g) : |
| m. Maximum allowable pr. to Membrane | bar(g) : |
| n. Feed Flow rates Min./ Max. | Cu.M/hr : / |
| o. Brine Flow rates Min./ Max. | Cu.M/hr : / |
| p. Maximum permitted pressure drop for the above operating conditions | : bar |
| q. Maximum permeate back pressure | Normal : bar
Maximum : bar |
| r. Maximum permitted temperature for membrane | Deg.C : / |



**SPECIFICATION FOR
RO - MEMBRANES**

SPEC.NO.ROS:415

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- s. Minimum permitted temperature Deg.C : /
for membrane
- t. Average flux rate Design/Maximum l/m²/hr : /
- u. Lead element flux rate Design/Max. l/m²/hr : /
- v. Salt Rejection-Minimum/Nominal % : /
- w. Standard Test Conditions :
- x. Operating pH range :
- y. Allowable SDI Maximum SDI₁₅ :
- z. Maximum allowable organic loading
- TOC ppm :
- BOD ppm :
- COD ppm :
- aa. Flux decline coefficient/year % :
- bb. Salt passage increase Factor(SPIF)/Year :
- cc. Membrane projections-Reference :
- dd. Guarantee document-Reference :
- ee. Weight per element Kgs :
- ff. Recommended pressure-vessel make :
- gg. Recommended pressure rating (psi) :

NOTE: Use separate data sheet for each membrane model/ system offered.

	SPECIFICATION FOR RO - MEMBRANES	SPEC.NO.ROS:415 REV: 00
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FORM FOR TECHNICAL DEVIATIONS (if any)

Annexure-3

Sl. No	SEC / CLAUSE NO.	Specification	Statement of Deviations/variations	Reason for deviation	Cost of withdrawal

Date:

Signature & seal of the Bidder



ADDITIONAL REQUIREMENTS FOR RO - MEMBRANES

Annexure A (Rev:00 Dt:27.03.18)
For ROS:415; Rev:00

1.0 MATERIAL CODE : RWT70632

2.0 ADDITIONAL TECHNICAL DETAILS

2.1 RO MEMBRANE ELEMENTS:

1st Pass SWRO

- | | |
|--|--|
| a. Material code | : RWT706320001 & RWT706320004 |
| b. No. of Streams | : 3 (2 working + 1 stand-by) |
| c. Permeate output capacity per stream | : 367 m ³ /hr for design TDS. |
| d. Area per element | : 400 sq.ft Max |
| e. Membrane characteristics | : Sea water membrane with high salt rejection property. |
| f. Required plant recovery | : 40% at design feed TDS |
| g. Feed water temperature Min/ Max | : 20 / 34 °C |
| h. RO Feed SDI ₁₅ | : 3 (max) |
| i. Preferred RO feed pH | : 7-7.5 |
| j. Acid for pH adjustment | : 30% HCl |
| k. Average Flux | : <16 l/m ² /hr |
| l. Flux Decline Coefficient / Year | : 7 % |
| m. Salt passage increase factor (SPIF) | : 10% per Year |
| n. No. of elements / vessel | : 7 |
| o. Recommended array of pressure vessel per stream | : 90×7 |
| p. Permeate back pressure | : 1 bar (g) |
| q. Life of membrane | : Minimum 3 years |
| r. Membrane Replacement rate | : Prorated replacement for the guaranteed membrane life. |
| s. Inlet & outlet water quality | : Refer cl. 4.0 & 5.0 |
| t. Accessories required | : Interconnectors with 'O' ring 1set per membrane element. |
| u. No. of elements per set | : Bidder to specify. ** |

Note:

** - Bidder to carryout membrane projection for the permeate capacity specified for each stream using the above parameters and finalize the quantity of membrane elements required. This quantity shall be offered as one set as called in BHEL Enquiry against the material code specified above, along with accessories.

Vendor to submit projections for 500ppm, 1000ppm, 5000ppm, 10000 ppm 15000ppm & 25000 ppm raw water TDS.

	ADDITIONAL REQUIREMENTS FOR RO - MEMBRANES	Annexure A (Rev:00 Dt:27.03.18) For ROS:415; Rev:00
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3.0 SPARES:

The bidder shall provide commissioning spares and the commissioning spares shall be delivered along with main supply. The commissioning spares list is indicated in this section. Over and above any additional requirements for trouble free commissioning of the equipment / system shall 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.

Bidder to provide 3 years recommended O&M spares list with price along with the bid. The purchaser reserves the right to buy any of the recommended spares as considered necessary by him during later stage.

Mandatory Spares as per the Contract to end Customer is listed in Cl.3.3 which shall be supplied as per the instructions of BHEL as a separate consignment.

3.1 COMMISSIONING SPARES

Sl.No	Spares Description	Unit	Quantity for all 3 streams	Price
A	Inter connector for membrane elements for 1 st Pass SWRO (BHEL material code:RWT706320002)	Nos	25	
B	Brine seal (BHEL material code:RWT706320003)	Nos	25	

3.2 RECOMMENDED SPARES FOR 3 YEARS O&M: Bidder to specify

Sl.No	Spares Description	Unit	Quantity for all 3 steams	Price

3.3 MANDATORY SPARES

Sl.No	Spares Description	Unit	Quantity for all 3 streams	Price
A	Membrane Elements for 1 st Pass SWRO Each set Membrane Consists of Membrane -1 No. Interconnector with "o" rings – 1 No. Brine seal – 1 No. (BHEL material code:RWT706320005)	ST	10% of installed total Qty	



ADDITIONAL REQUIREMENTS FOR RO - MEMBRANES

Annexure A (Rev:00 Dt:27.03.18)
For ROS:415; Rev:00

4.0 RAW WATER QUALITY FOR 1st Pass SWRO

Sl.No	Description	Unit	Value (Min)	Value (Max)
1.	General			
a)	pH	---	6.8	8.3
b)	Conductivity	$\mu\text{S} / \text{cm}$	270	40600
c)	Temperature range	Deg C	20	34
d)	SDI		< or = 3.	< or = 3.
e)	TDS	mg/l	112	26000
f)	Free residual chlorine	mg/l	1.0	1.0
2.	Cations			
a)	Calcium (as ion)	mg/l	26.75	296
b)	Magnesium (as ion)	mg/l	8.7	737
c)	Sodium (as ion)	mg/l	29.11	8505
d)	Potassium (as ion)	mg/l	3.9	204
e)	Ammonia (as ion)	mg/l	0	0.3
f)	Barium (as ion)	mg/l	0.107	0.165
g)	Aluminium (as ion)	mg/l	0.2 (refer note-3)	0.962 (refer note-3)
h)	Manganese (as ion)	mg/l	< 0.1	< 0.1
i)	Total Iron (as ion)	mg/l	< 0.1 (refer note-3)	< 0.1 (refer note-3)
j)	Ammonical Nitrogen (as ion)	Mg/l	0	0.2
k)	Total Kjeldahl nitrogen (as ion)	Mg/l	0	1.5
3.	Anions			
a)	Chloride (as ion)	mg/l	49	9724
b)	Sulphate (as ion)	mg/l	3	1840
c)	Nitrate (as ion)	mg/l	0.1	128
d)	Nitrite (as ion)	mg/l	0	0.016
e)	m-alkalinity (as CaCO_3)	mg/l	36	160
f)	p-alkalinity	mg/l	0	0
g)	Fluoride (as ion)	mg/l	0	0.1
h)	Phosphate (as ion)	mg/l	0.1	10
i)	Total Silica (as SiO_2)	mg/l	0	15.6
j)	Reactive Silica (as SiO_2)	Mg/l	0	7.1
4.	Other Heavy Metals / Ions (As, Hg, Cd, Co, Cu, Cr, Mo, Ni, Ti, V, Zn, B, Br, Pb, Sr.)		Nil	Nil

	ADDITIONAL REQUIREMENTS FOR RO - MEMBRANES	Annexure A (Rev:00 Dt:27.03.18) For ROS:415; Rev:00
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Sl.No	Description	Unit	Value (Min)	Value (Max)
5	BOD ₅	mg/l	0.7	5
6	COD	mg/l	6	20
7	TOC	mg/l	2	4
8	Dissolved Oxygen	mg/l	3	6

NOTE:

1. When the water quality is less than 500ppm the SWRO system will be bypassed.
2. 2% Leakage of brine to feed is to be assumed for arriving the feed TDS ppm due to the usage of Pressure Exchanger as ERD.
3. Pressure control to membrane will be achieved through HP pump Variable speed drive and Feed control valve (FCV).
4. The above water quality is treated sea water in a Pre-treatment system consisting of clarifier and submerged UF system.

5.0 GUARANTEED PERMEATE WATER QUALITY

Guaranteed Permeate water quality at the end of membrane life is for the design TDS and for entire range of temperature.

Sl.No	Description	Unit	Value
1	pH		5.5 to 6.5
2	Total Dissolved Solids	mg/l	≤ 350

NOTE: Bidder to specify the “Zero” year permeate TDS value also.

6.0 Membrane Warrantee:

1st Pass SWRO membranes are warrantied for 3 years (pro-rata). The warranty will start 6 months from the date of dispatch or from the date of commissioning of RO system, whichever is earlier.

7.0 Membrane Delivery Requirement:

7.1 Lot-1 : 1st Pass SWRO membranes for 1 Stream & commissioning spares are to be dispatched initially.

7.2 Lot-2 : 1st Pass SWRO membranes for other 2 streams and mandatory spares are to be dispatched after 6 to 8 months after Lot-1 dispatch.

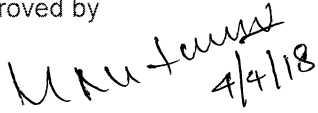
	BHEL: BAP: RANIPET Water Business Pre-Qualification requirement for 1st pass SWRO Membranes & acc.	Ref:	RWT70632:SWRO
		Dt:	04.04.18
		Rev :	00

The Qualification requirements for 1st pass SWRO membranes and accessories are listed below and bidders should meet the same:

1. Bidder should be a SWRO membrane manufacturer (or) Direct dealer of SWRO membrane manufacturer with OEM's authorization and OEM's undertaking for supply, services, guarantee etc.
2. The offered make & model of SWRO membranes should have proven track record with satisfactory operation in a SWRO desalination plant/s for power plant / municipal / industrial use with the following details:
 - a. The permeate capacity per each stream of the referred SWRO plant/s should not be less than 180 m³/hr.
 - b. The outlet water quality of SWRO membranes in the referred SWRO plant/s shall not be more than 500 ppm TDS.
 - c. Bidder should have supplied minimum 2 SWRO streams of capacity as referred in sl.no(a) either in a single plant (or) multiple plants.
3. The SWRO streams (referred by the bidder under above Sl. No. 2) should have been in operation for a period of minimum two years prior to techno-commercial bid opening date.
4. Bidder shall furnish necessary documentary evidence in original / notarized copy as a proof of meeting the qualifying criteria for review by BHEL. In addition to the above, bidder shall fill up the details as per **Annexure-I**. The final acceptance is subject to customer approval.

General:

5. 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.
6. 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.

Prepared by 	Checked by 	Approved by  7/4/18
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Annexure – I (to RWT70632:SWRO)
Qualification data sheet - 1st pass SWRO Membranes & acc.

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	Design	Actual
01	SWRO plant capacity	m ³ /hr.		
02	Each stream capacity	m ³ /hr.		
03	Number of streams	Nos.		
03	Feed water quality to SWRO a. pH b. Conductivity c. Total Dissolved Solids(TDS)	 μS/cm ppm		
04	Output water quality after SWRO a. pH b. Conductivity c. TDS	 μS/cm ppm		
05	Type of membrane:			
06	Membrane model no:			
07	Area of membrane	ft ²		
08	End use			

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	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 2	OF 52

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

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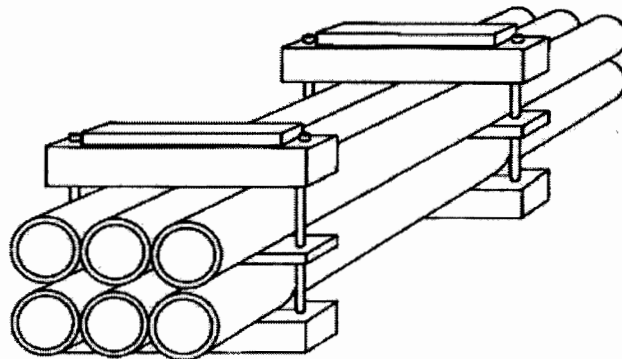
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

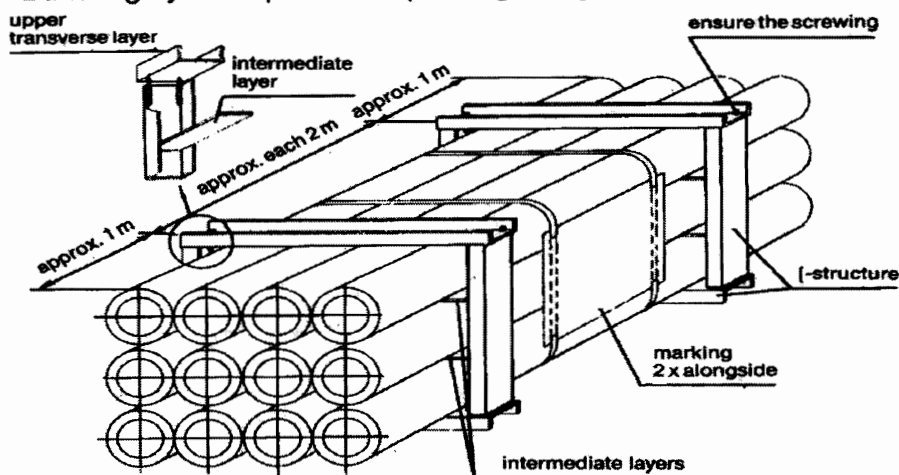
8.2.1 Type of Equipment

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)

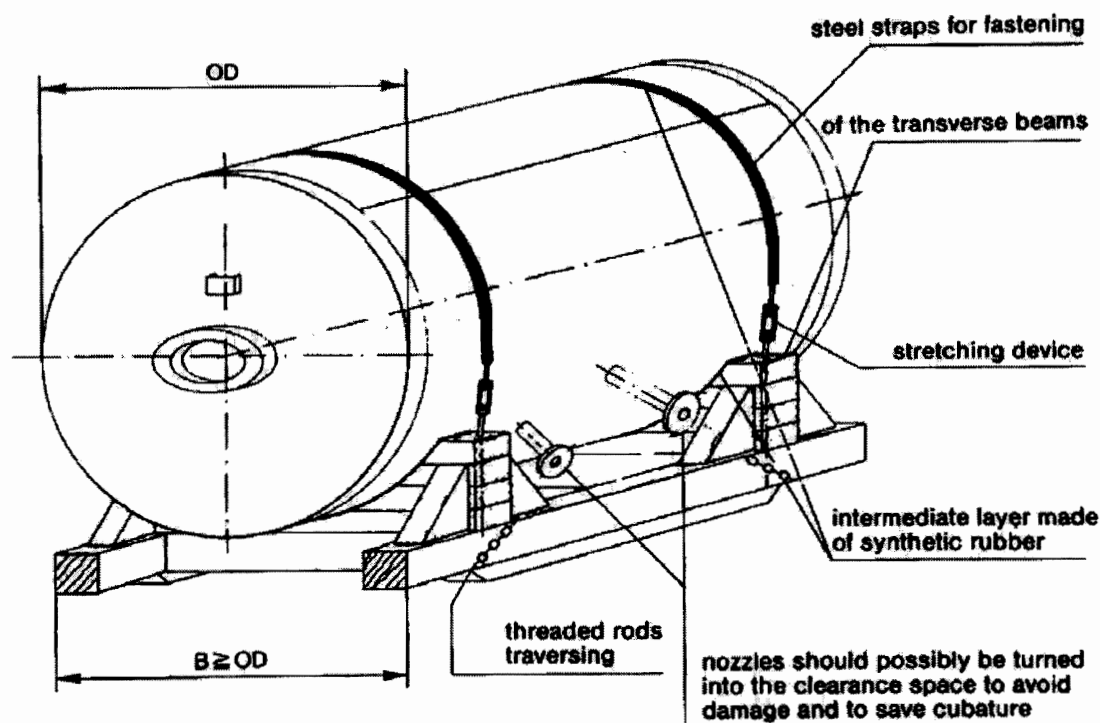
8.3.1 Type of Equipment

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

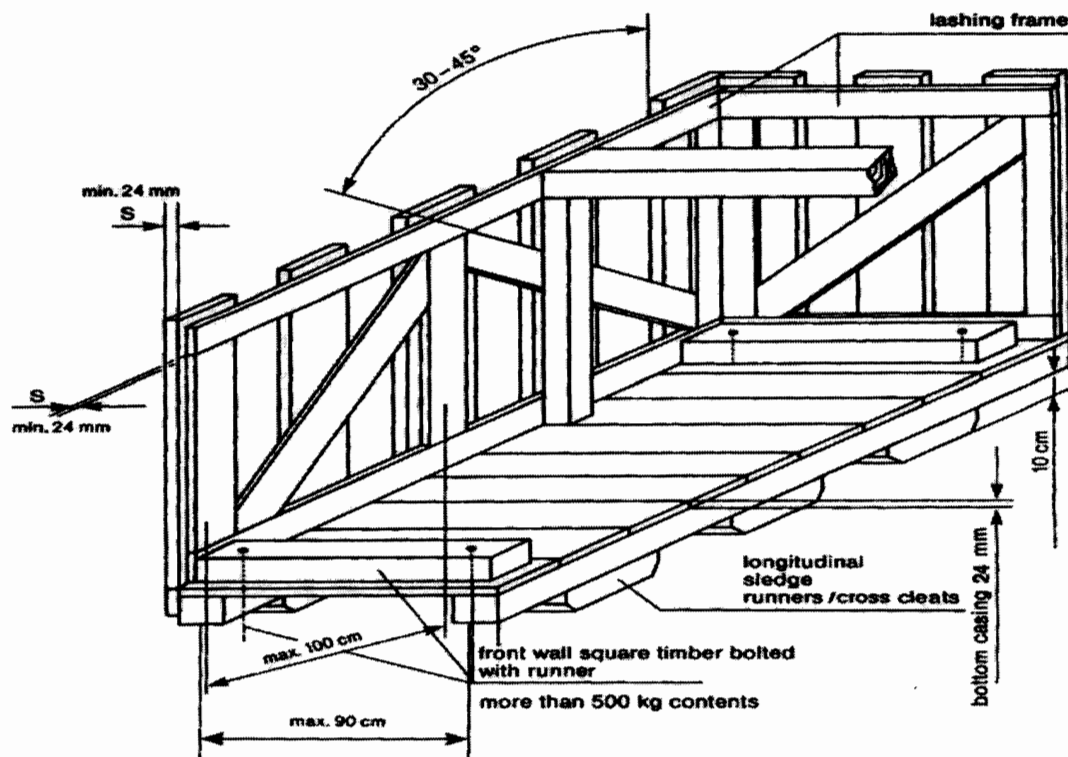
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

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

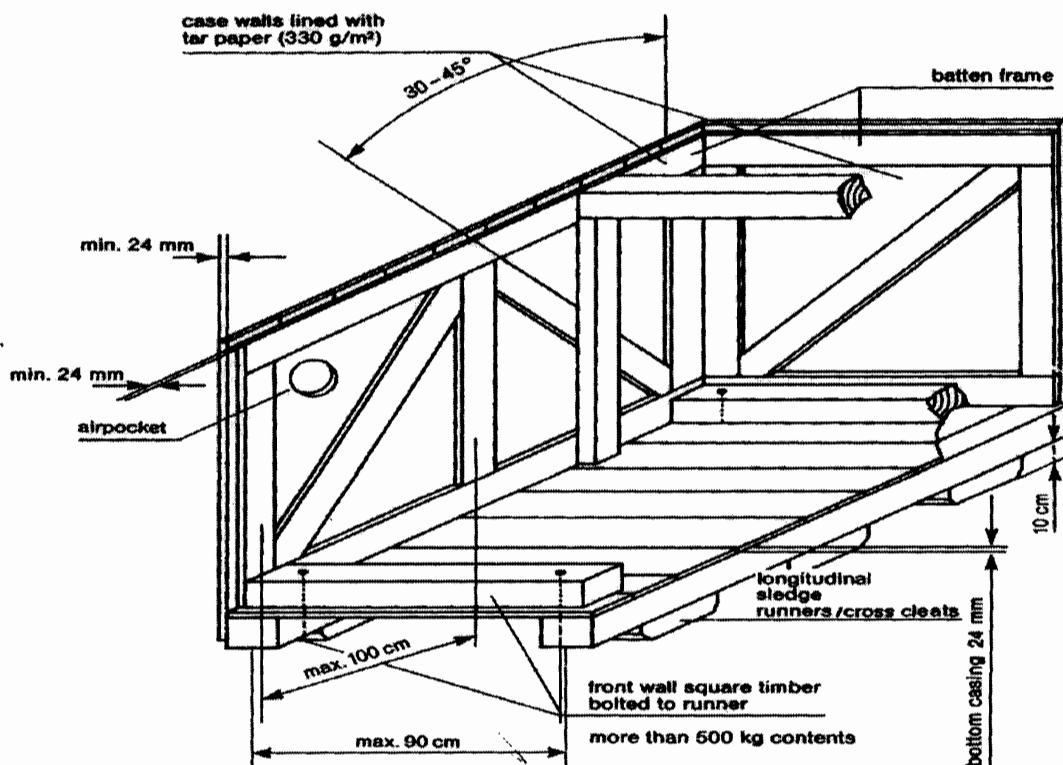
8.4.2.1 Type of Equipment

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.

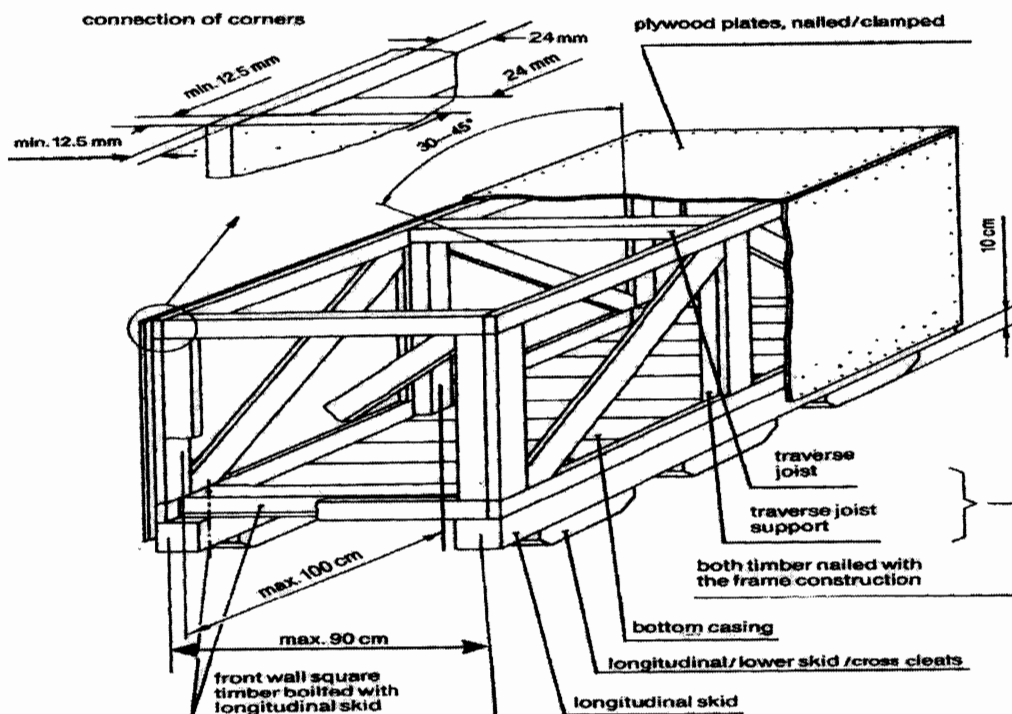
Packing Category IV



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.

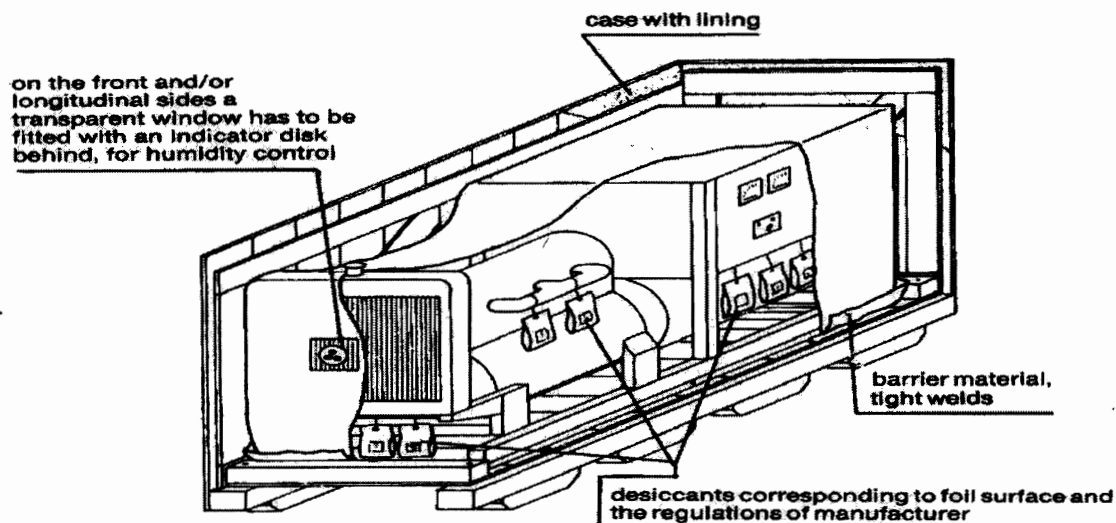
8.4.5.2 Type of Construction

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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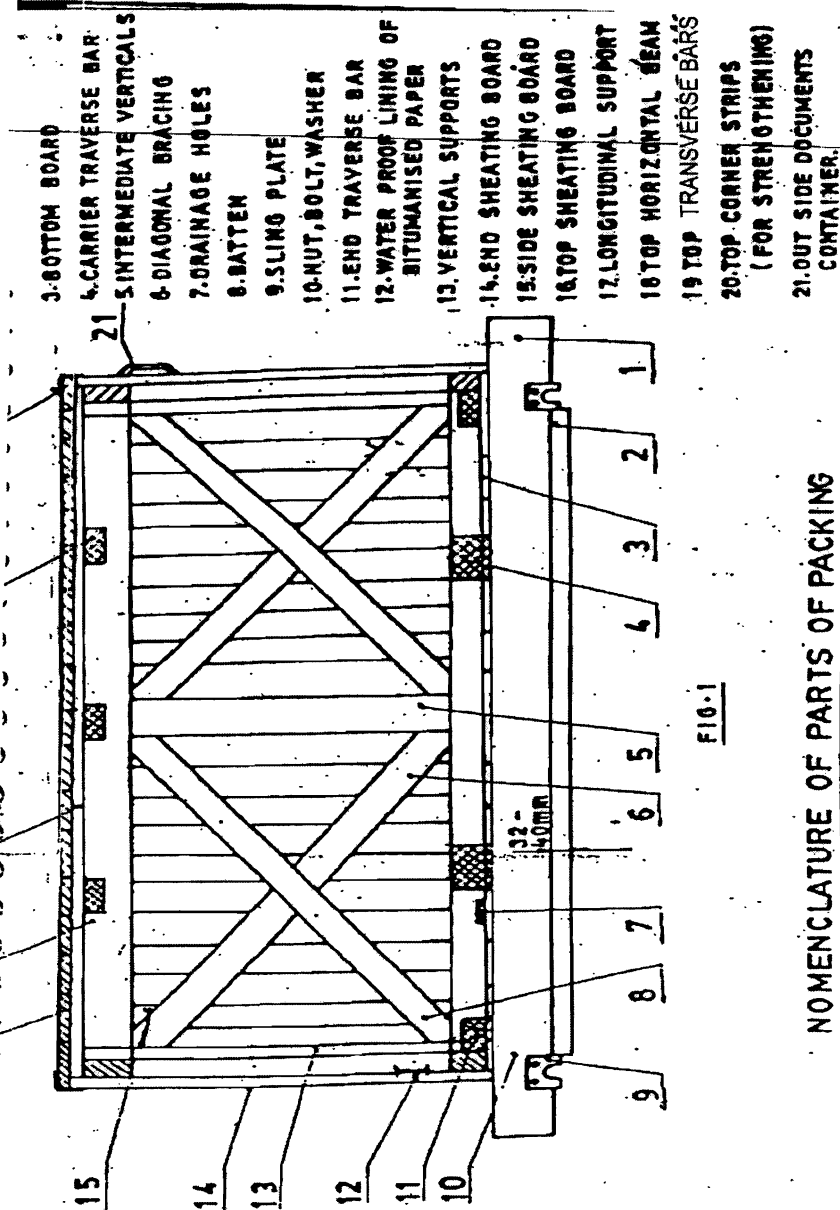


FIG-1

NOMENCLATURE OF PARTS OF PACKING

CASES

FIG-1

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BOTTOM FRAME ARRANGEMENTS

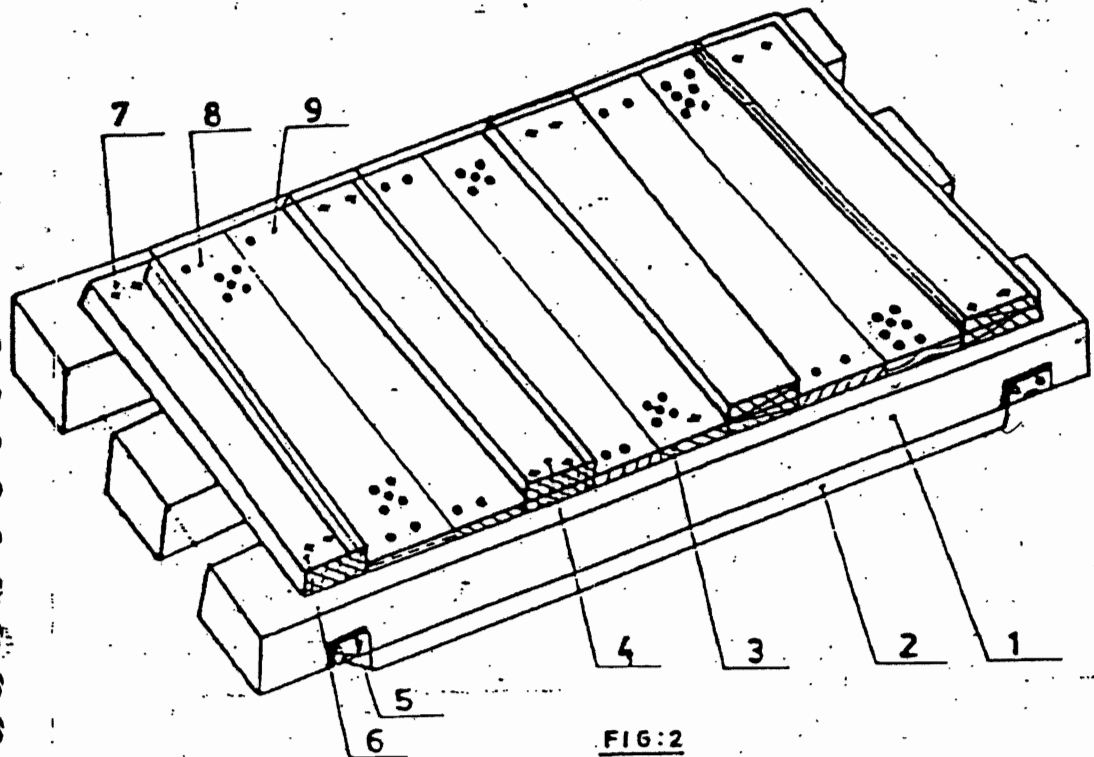


FIG:2

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; 100 x 100 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

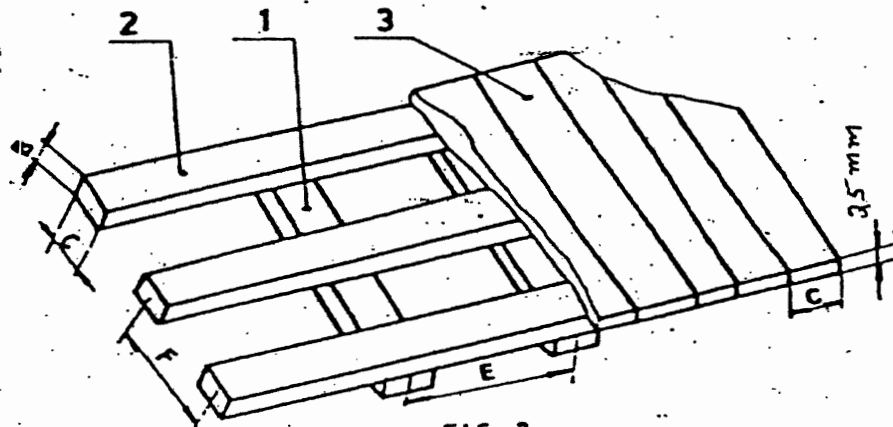
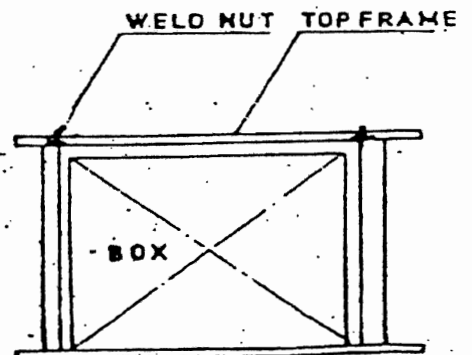
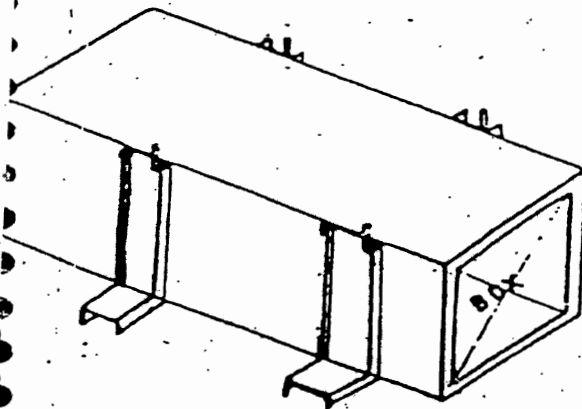


FIG-3

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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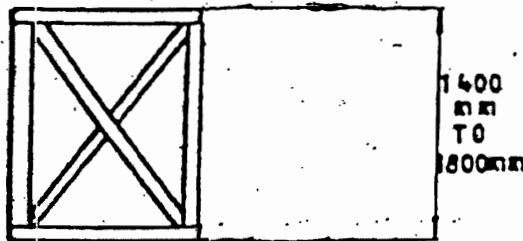
**ARRANGEMENT OF DIAGONAL BRACING AND
HORIZONTAL SUPPORT**

FIG: 6

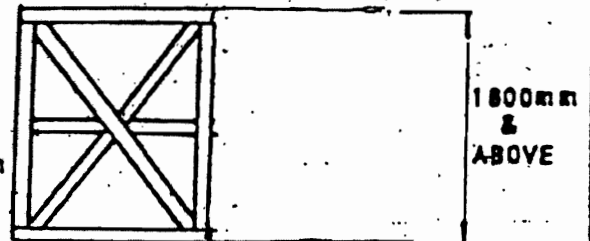


FIG: 8

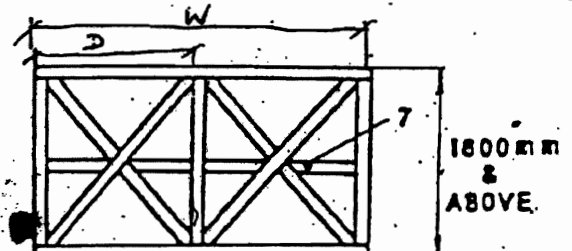


FIG: 7

7- Middle Horizontal Support

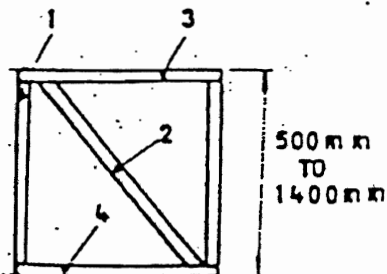


FIG: 5

1- Vertical Support

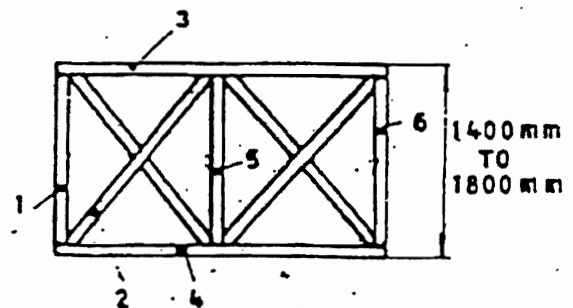


FIG: 7

1, 5, 6 - Vertical Support

**TITLE**

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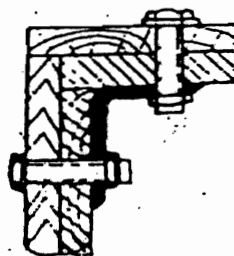
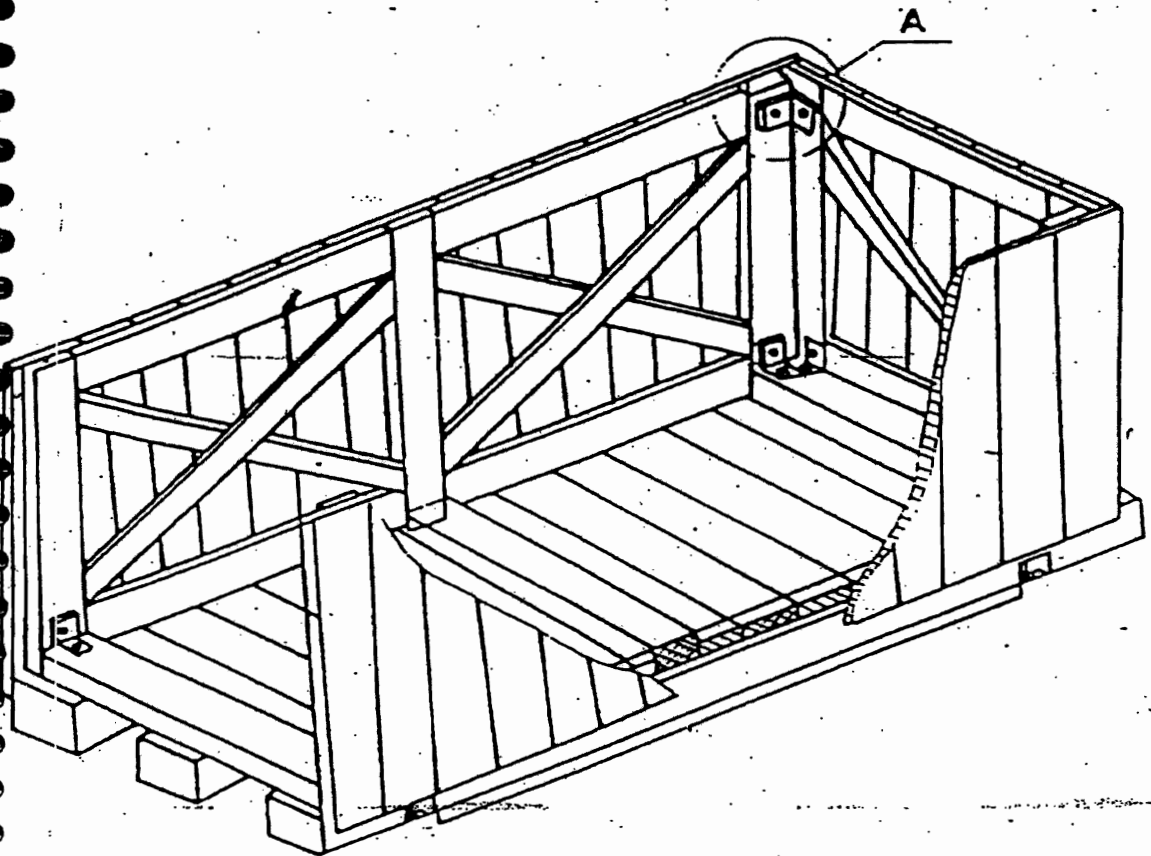
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ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

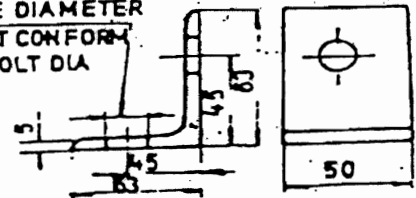


FIG:10

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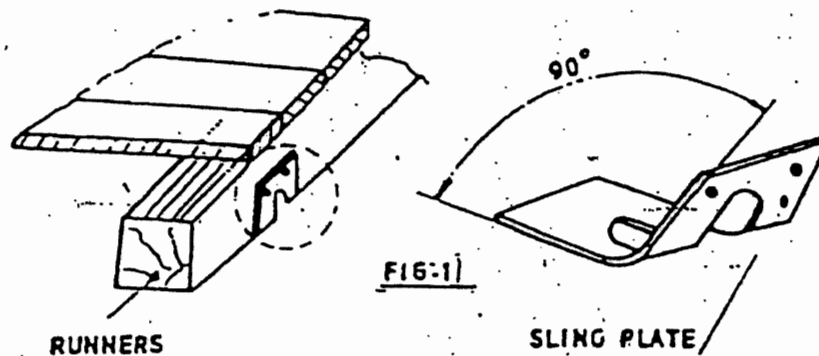
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**ARRANGEMENT OF SLING & PLATE ON
CASES**

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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

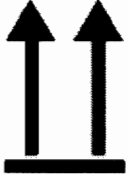
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Table-2

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
		30	30	30	30	30	30	30
	1601 to 2000	X	X	X	X	X	X	X
		130	130	130	130	130	130	130
	2001 to 3000	30	30	30	30	30	30	40
		X	X	X	X	X	X	X
	3001 to 4000	130	130	130	130	130	130	150
		40	40	40	40	40	40	40
		X	X	X	X	X	X	X
		150	150	150	150	150	150	150

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INDICATION MARKS ON CASES/BOXES/CRATES

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

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

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

FIG-12

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BHEL-PEM-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



TITLE

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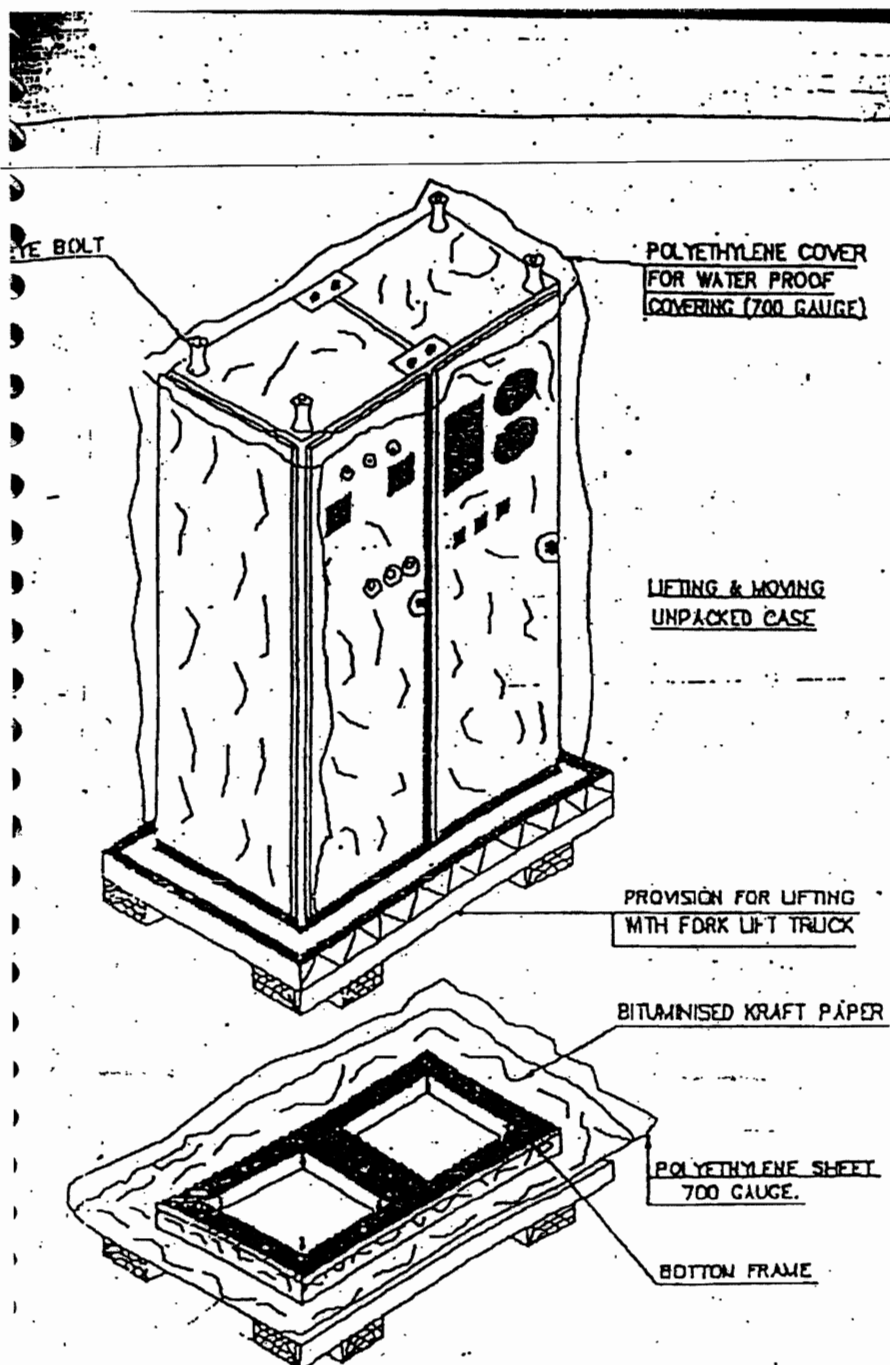


FIGURE-14



TITLE

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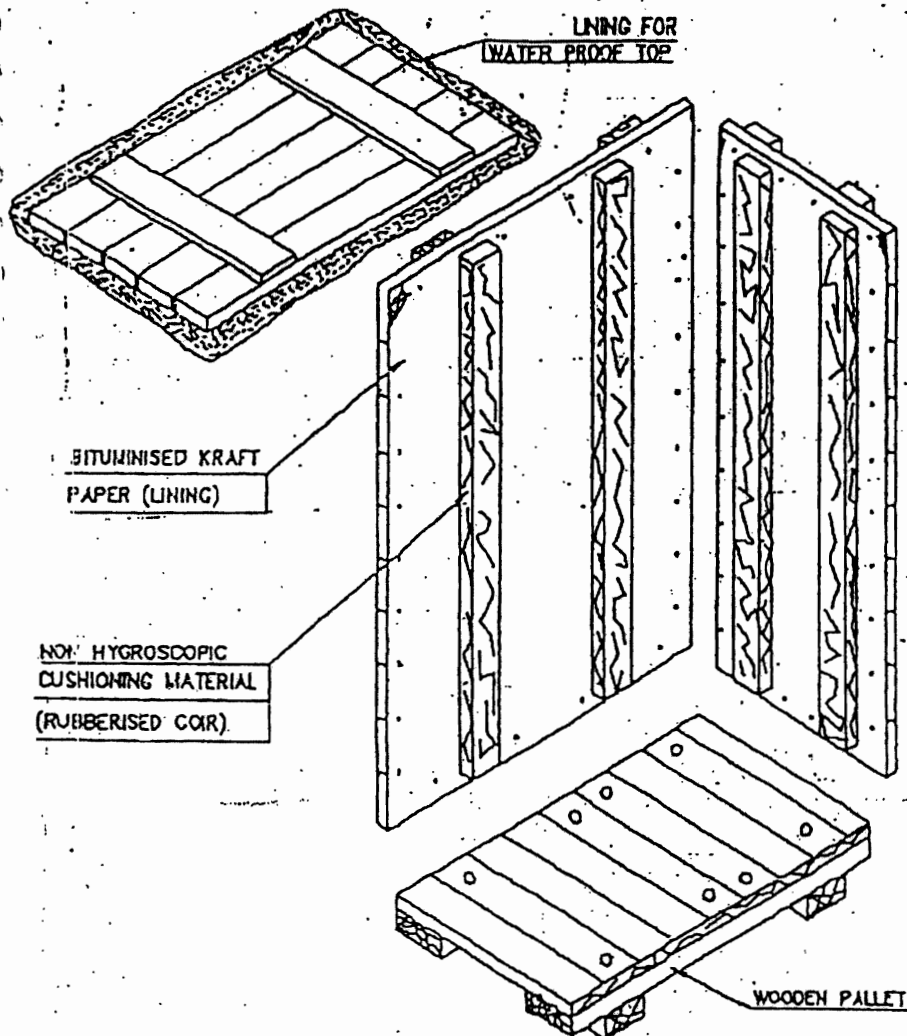
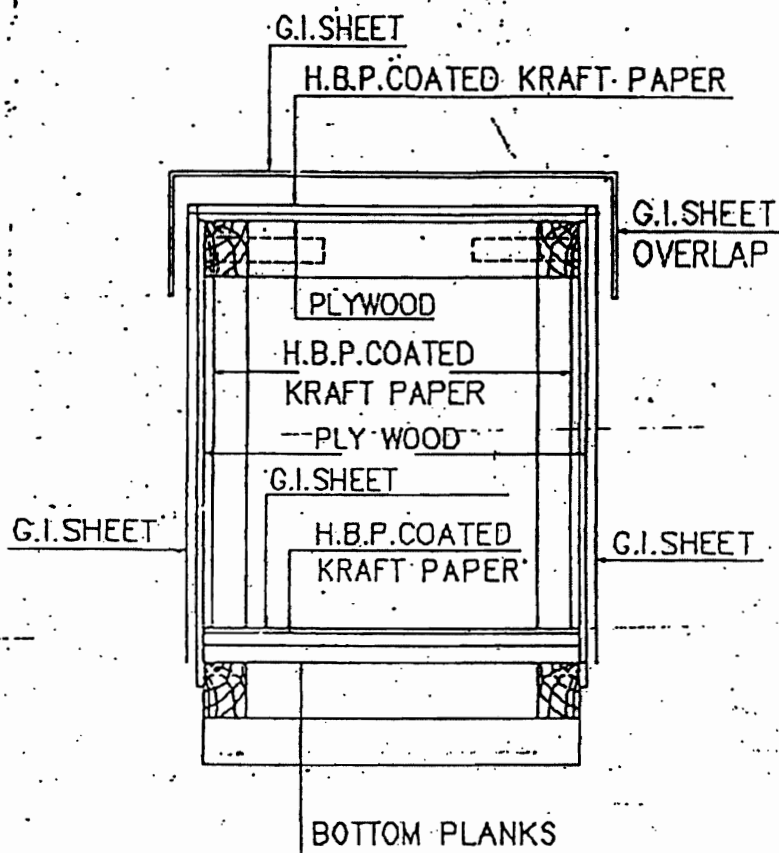


FIGURE-15

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

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10.0 TYPICAL PACKING DETAILS/PROCEDURE FOR MECHANICAL ITEMS

10.1 INSULATION MATERIAL (MINERAL WOOL MATTRESSES)

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

10.1.1 TYPE OF CONSTRUCTION

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

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

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

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

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

10.2 INSULATION MATERIAL (ALUMINIUM COIL)

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

10.2.1 Type of construction for Eye to Sky packaging

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

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

10.2.2 Type of construction for Eye to Eye packaging

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

10.3 Packing Procedure for Online Tube Cleaning System and accessories

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

10.3.1 Packing details:

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

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



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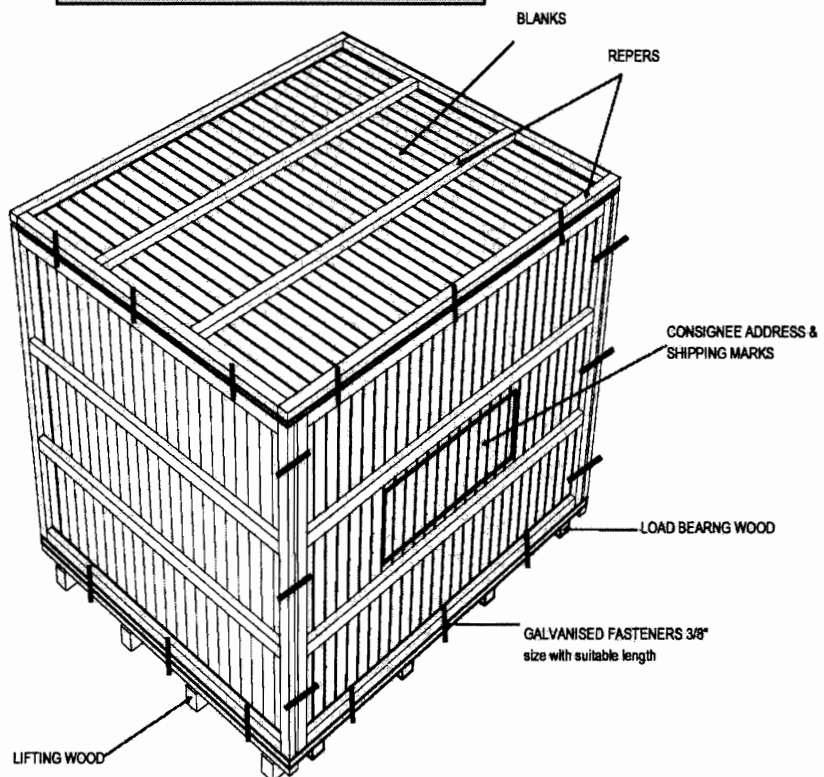
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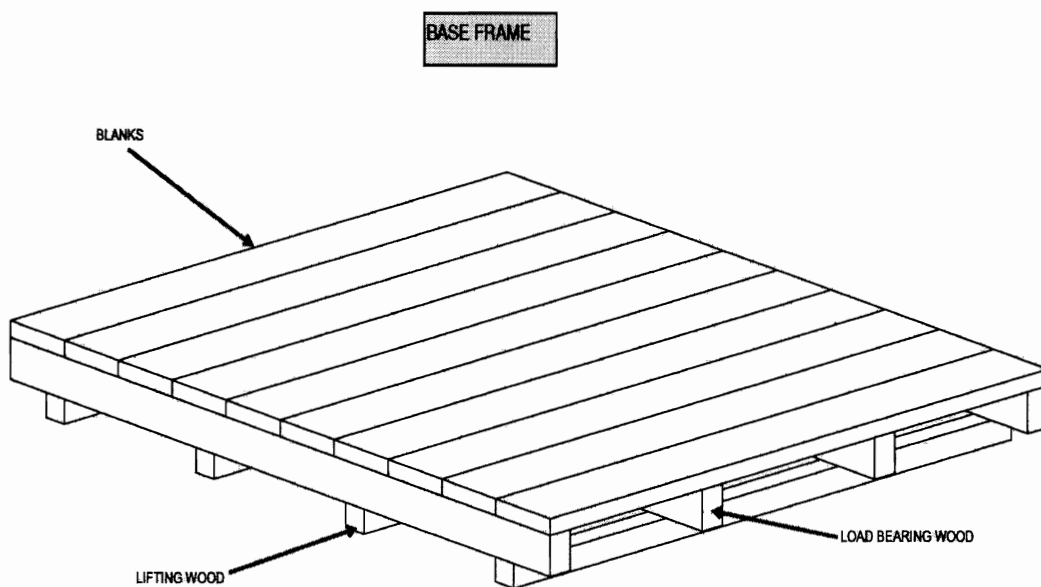
MODEL: FASTNERS TYPE (BASE, SIDE & TOP
ATTACHED WITH BOLT, NUT & WASHER)

This Type of case to be used for
following items:

1. BALL SEPERATOR
2. BALL COLECTOR SKID



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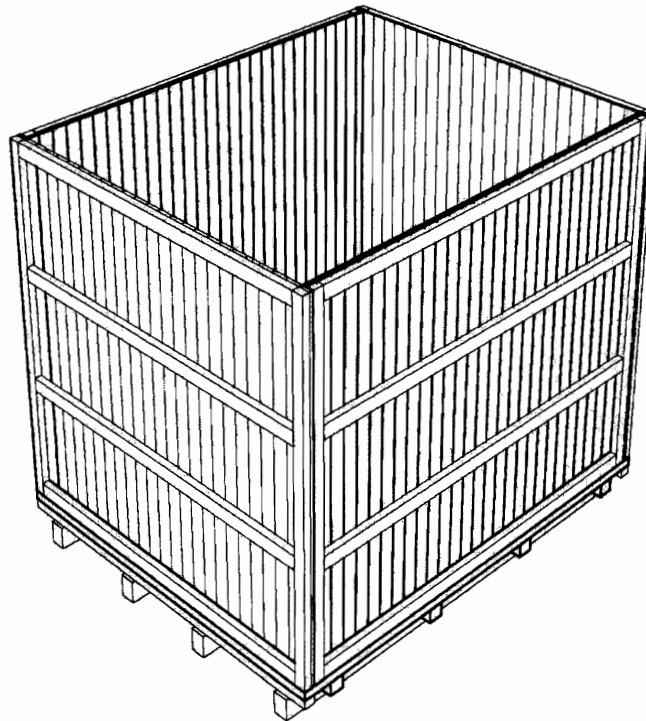
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MODEL: FASTNERS TYPE - WITHOUT TOP





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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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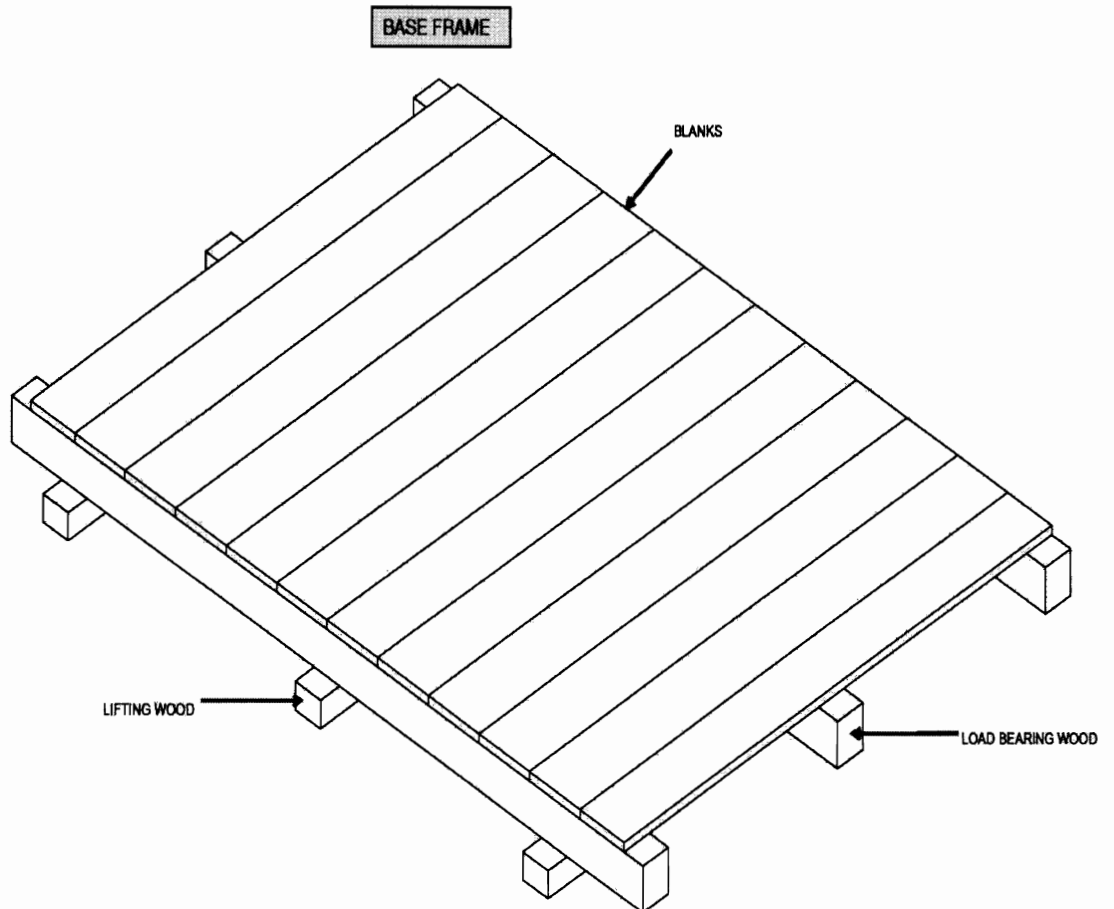
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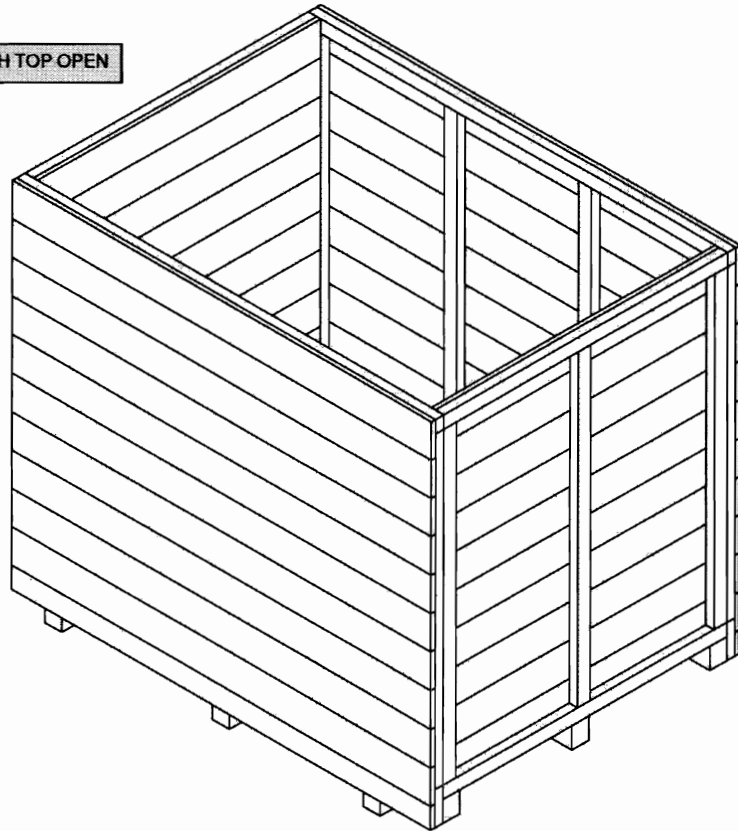
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10.4 PACKING OF LOOSE ITEMS

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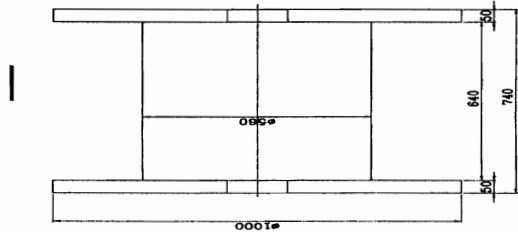
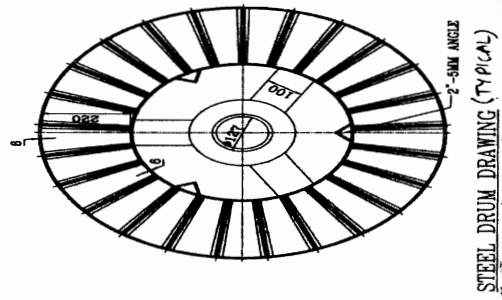
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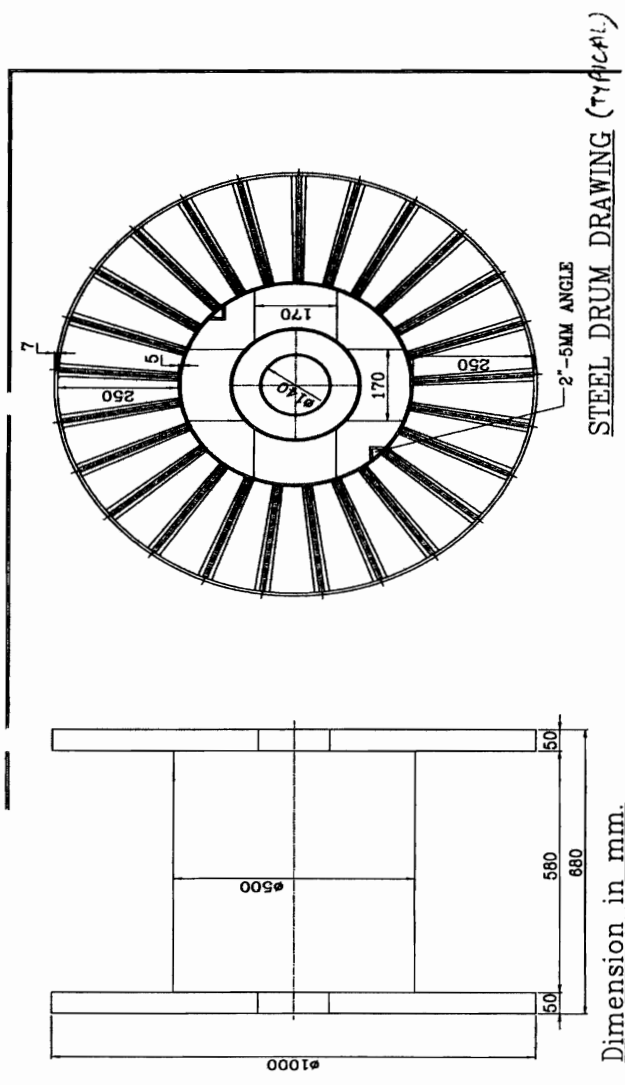
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11.2 PACKING OF CABLE TRAYS & ACCESSORIES AND CABLE TRAY SUPPORT MATERIAL

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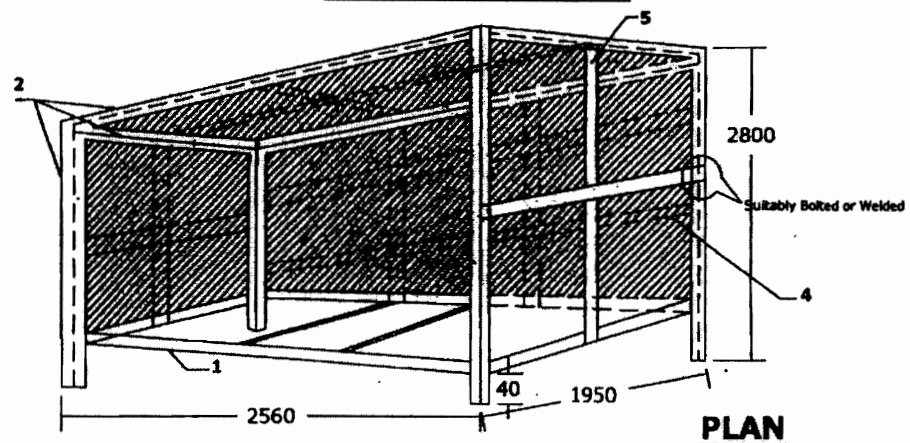
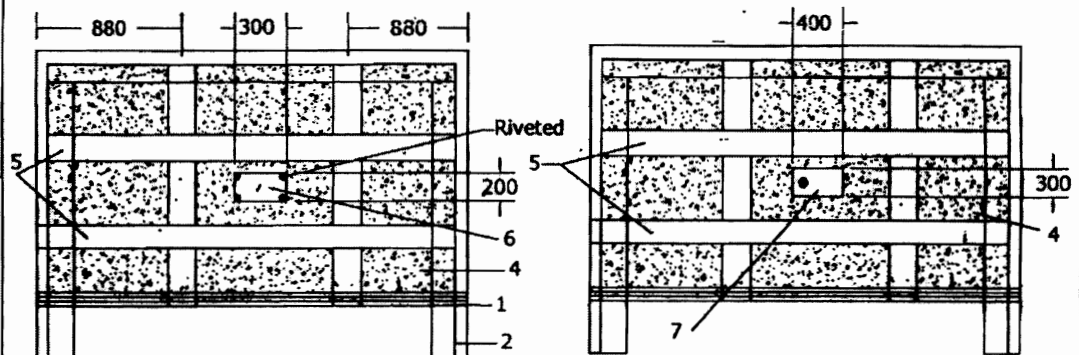
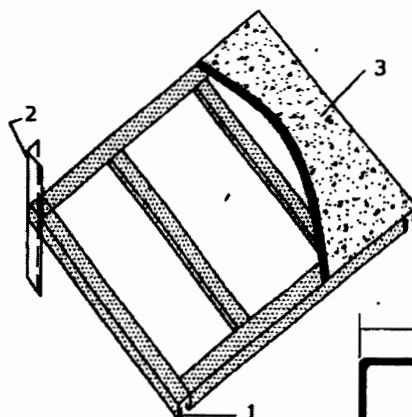
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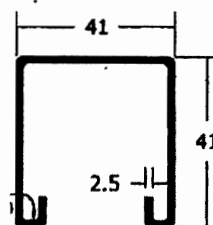
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STEEL PACKING (TYPICAL DETAILS)**PLAN****FRONT SIDE OF BOX****BACK SIDE OF BOX****BOTTOM FRAME ARRANGEMENT****Note:**

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

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

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

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

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

11.3.3 For CONDUIT PIPE

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

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

11.3.4 For POLES

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

11.3.5 For STRUCTURAL STEEL

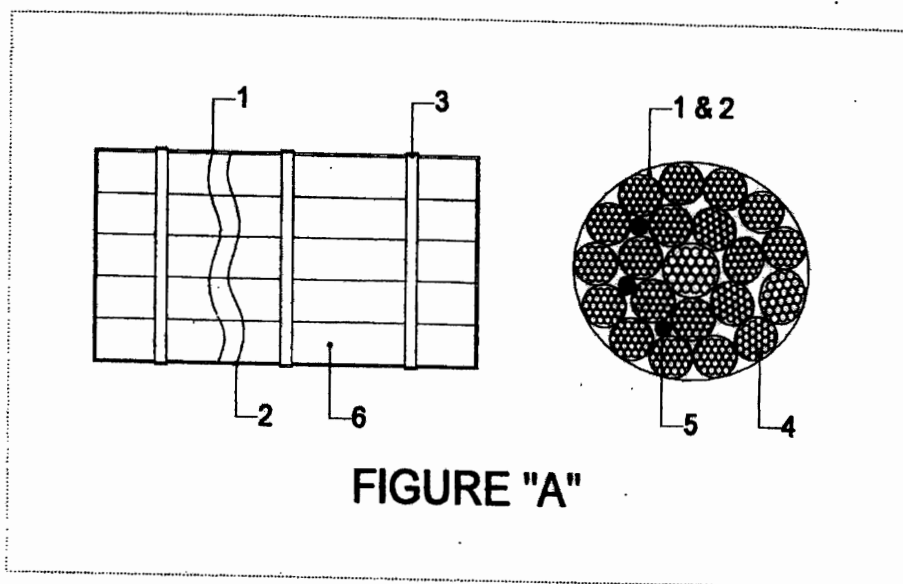
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Structural steel will be different sizes and shapes. Hence it will be packed as per Figure No. B and described as following :

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

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PACKING PROCEDURE FOR CONDUIT PIPE



- 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.

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

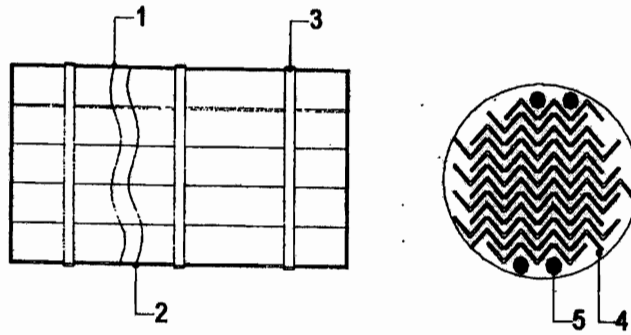
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PACKING PROCEDURE FOR STRUCTURAL STEEL**FIGURE "B"**

- 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

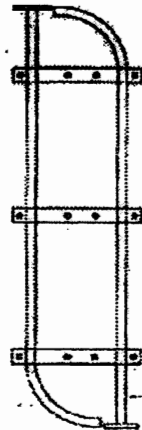
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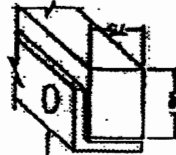
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packing procedure for poles



POLES WRAPPED WITH POLYTHENE SHEET &
EXTRUDING COATED HESSIAN CLOTH



TOP WOODEN BATTEN TO BE
FIXED WITH 150x80x6 MM ON TOP
OF IT FOR TIEING THE ROD
25 MM DIA



BOTTOM WOODEN BATTEN TO BE
FIXED ON 150x80x6 MM ANGLE

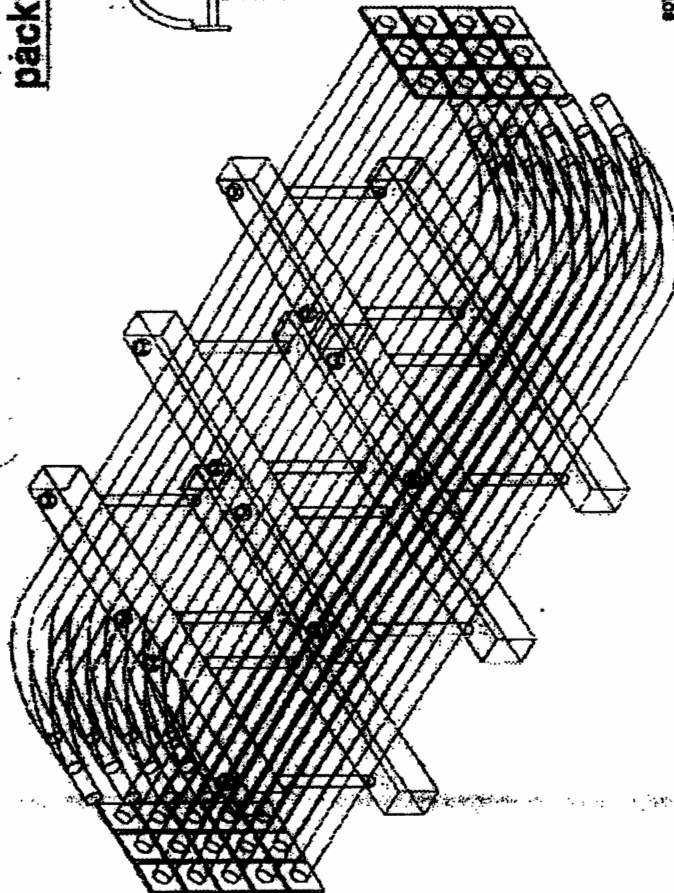


FIGURE "C"

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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**