

2 X 660 MW MAITREE STPP, BANGLADESH

TECHNICAL SPECIFICATION FOR ULTRASONIC FLOWMETER

VOLUME II-B

SPECIFICATION No: PE-TS-421-145-I916



**BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT DIVISION
NOIDA, INDIA**



TECHNICAL SPECIFICATION
FOR
ULTRASONIC FLOWMETER

2 X 660 MW MAITREE STPP, BANGLADESH

SPEC NO.: PE-TS-421-145-I916

VOLUME II B

SECTION A

REV. NO. 00

DATE 16.03.18

SECTION – A
SCOPE OF ENQUIRY



**TECHNICAL SPECIFICATION
FOR
ULTRASONIC FLOWMETER**

SPEC NO.: PE-TS-421-145-I916

VOLUME II B

SECTION A

REV. NO. 00

DATE : 16.03.18

2 X 660 MW MAITREE STPP, BANGLADESH

SCOPE OF ENQUIRY

1.0 SCOPE

- 1.1 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Ultrasonic flow meter with accessories as mentioned in different sections of this specification for 2 X 660 MW Maitree Super Thermal Power Plant, Bangladesh
- 1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.
- 1.3 Scope of supply shall be Ultrasonic flow meter along with accessories. as indicated in specification.
- 1.4 Following formats to be signed, stamped with company seal and submitted :
a) Complete offer including calculation sheets, catalogues etc.
b) Quality Plan
c) Datasheets A & B, duly filled
d) Provenness certificate

2.0 GENERAL TECHNICAL INSTRUCTIONS

- 2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.
- 2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.
- 2.3 BHEL's/Customer's representative shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.
- 2.4 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL/ Customer.



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ULTRASONIC FLOWMETER

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SECTION C

REV. NO. 00 DATE 16.03.18

SECTION-C
SPECIAL TECHNICAL REQUIREMENT



**TECHNICAL SPECIFICATION
FOR
ULTRASONIC FLOWMETER**

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SECTION A

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SPECIFIC TECHNICAL REQUIREMENTS

The technical requirements in this section are specific for this project and shall override the specification under Section-D in case of any contradiction.

- 1.0 Bidder to furnish necessary credentials & performance certificate of 2 years for successful operation in any industry with similar flow requirements. Further, Bidder to furnish filled format for proveness criteria, attached in the specification.
- 2.0 Bidder to note that duly filled up Data sheet-B Quality Plan & Provenness Certificate, Format enclosed in Section-D of Volume IIB, to be signed and stamped and submitted with the bid.
- 3.0 Bidder Presence is required for 2 days for each Ultrasonic Flowmeter for Supervision of Erection & Commissioning and any other site support requirement. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

4.0 DOCUMENTATION:

(A) **Along with the bids:** No separate documentation required at the time of bids except the Catalogue, Provenness certificate, duly filled Datasheets & Stamped QAP

B) **After the award of contract:** The following documents to be enclosed along with the contract documents for approval:

- a) Datasheet C completely filled-up.
- b) Quality plan duly signed and stamped.
- c) Calculation Sheet.
- d) Assembly dimensional drawings.
- e) GA Drawing.

C) **Final documentation:** Unless agreed otherwise, five (5) hard copies and three (3) sets of electronic copies of all documents are to be submitted in the English language. In addition, operation and maintenance manuals shall be translated into Bangla and provided as paper copies and in electronic format. Electronic Copies shall be submitted in primary original data format (e.g. DOC, XLS, DWG) as well as in a printable non-proprietary document format (e.g. PDF). The documentation as listed below shall be submitted as a part of final documentation.



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1. Approved final drawings/data sheets,
2. All Test certificates
3. Operation & Maintenance Manuals for Ultrasonic flow meter
4. Assembly drawings and QP
5. "As built" drawings

- 5.0 In case during erection/commissioning of the Ultrasonic flow meter, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the vendor without any implication.
- 6.0 All labels, nameplates, instruction and warning plates shall be securely fixed to items of Plant and equipment with stainless steel rivets, plated self-tapping screws or other approved means. The use of adhesives will not be permitted.
- 7.0 Nameplates for equipment identification and record purposes shall be manufactured from stainless steel or aluminium with a mat or satin finish, and engraved with black lettering of a size which is legible from the working position.
- 8.0 Sea worthy Packing schedule is part of this specification and same shall be followed.
- 9.0 All Ultrasonic Flowmeters shall comply with the relevant international standards such as DIN, BS. Indian & Chinese codes & standards are not acceptable.
- 10.0 In case of any discrepancy in Specific Technical Requirement and Equipment specification, Specific Technical Requirement shall prevail.



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SPEC NO.: PE-TS-421-145-I916

VOLUME II B

SECTION B

REV. NO. 00 DATE : 16.03.18

SECTION – D

- **EQUIPMENT SPECIFICATION**
- **DATA SHEETS – A & B**
- **QUALITY PLAN**
- **BILL OF QUANTITY**
- **PROVENESS CERTIFICATE**
- **PACKING SPECIFICATION**



TECHNICAL SPECIFICATION FOR ULTRASONIC FLOW METER

SPEC NO.: PE-SS-999-145-I027

VOLUME II B

SECTION D

REV. NO. 00

DATE : 08.04.2019

SHEET 1 OF 3

1.0 SCOPE

This specification covers the Design, Manufacture, Calibration, Inspection and Testing at the manufacturer's works, proper packing for transportation and delivery to site of Ultrasonic Flow Meter for use in Utility/Captive Power Station/Combined Cycle Station.

2.0 CODES AND STANDARDS

- 2.1 All the equipments specified herein shall comply with the requirements of the latest issue of the relevant National and International standards. Indian and Chinese codes are not acceptable. Chinese material is also not acceptable.
- 2.2 The Ultrasonic Flow Meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. The Design and Materials used for the components shall also comply with the relevant National and International standards.

3.0 TECHNICAL REQUIREMENT

The Ultrasonic Flow Meters and the accessories shall be suitable for continuous operation under an ambient temperature of 0-55°C and Relative Humidity of 0-95% unless specified otherwise in volume IIB, Section-D or Section-C.

All accessories required for mounting/erection of these instruments shall be furnished as necessary for completeness of the system.

3.1 Flow measurement

The Ultrasonic Flow Transmitter shall be based on transit-time flow measurement technique which uses a pair of transducers with each transducer sending and receiving coded ultrasonic signals through the fluid. When the fluid is flowing, signal transit-time in the downstream direction is shorter than in the upstream direction; the difference between these transit times is proportional to the flow velocity. The Ultrasonic Flow Transmitter measures this time difference and uses programmed pipe parameters to determine flow rate and direction. Ultrasonic Flow Transmitters are classified as either wetted or non-wetted (clamp-on). Clamp-on transducers are clamped onto the outside of the pipe and never come into contact with the process fluid. Wetted transducers are mounted into the pipe or flow cell in direct contact with the process fluid. Hart Compatibility for the transmitter shall be provided

3.2 Accessories:

All mounting hardware like clamping fixtures, mechanism to remove the sensors on line, interconnecting screened cables between Transducer & Transmitter, Cable Glands etc. is required to be supplied. Weather canopy for protection from direct sunlight and direct rain shall also be offered. Material of all fittings shall be SS-316L or Duplex steel.

4.0 GUARANTEE AND PERFORMANCE

The guarantee of flow measuring assembly shall be 18 months from the date of dispatch or 12 months from commissioning whichever is earlier.



TECHNICAL SPECIFICATION FOR ULTRASONIC FLOW METER

SPEC NO.: PE-SS-999-145-I027

VOLUME II B

SECTION D

REV. NO. 00

DATE : 08.04.2019

SHEET 2 OF 3

5.0 TEST & INSPECTION

- 5.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.
- 5.2 The Quality Plan shall be discussed and finalized with the technically accepted bidders before opening the price bid. The stages where the purchaser would like to be associated for witnessing or verification would be indicated by the purchaser in the Quality Plan before approval.
- 5.3 Inspection will be conducted by BHEL/Customer and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Tests shall be arranged at the Vendor's works in the presence of BHEL/Customer and/or their authorized representatives or in independent Test House/Laboratory approved by BHEL.

6.0 SPARES AND CONSUMABLES

6.1 Commissioning Spares and consumables

The bidder shall supply all commissioning spares and consumables required during Start-up, as part of the main equipment supply,

6.2 Recommended Spares

The bidder shall furnish a list of Recommended Spares along with the normal service expectancy period and frequency of replacement; quantities recommended for 3 years' operation along with unit rate against each item to enable BHEL/BHEL's Customer to place a separate order later, if required.

6.3 Special Tools & Tackles

The bidder shall furnish a list of Special Tools & Tackles included in the bid.

7.0 DRAWINGS & DOCUMENTS

7.1 The offer shall include the following in 4 copies each.

- i. Technical data sheet for each flow measuring device assembly in the Pro forma enclosed under Data Sheet-B.
- ii. Catalogue/Technical Literature.
- iii. Assembly drawing with dimensional details.

7.2 4 copies each of the following along with 2 CDs to be furnished after award of contract for owner approval.

- i. Technical Data Sheet-C.
- ii. Sizing Calculations.
- iii. Assembly drawing with dimensions.
- iv. Installation drawing.

8.0 FOR INFORMATION



TECHNICAL SPECIFICATION FOR ULTRASONIC FLOW METER

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SECTION D

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8.1 Storage and Commissioning Instruction

8.2 O&M are to be supplied as specified.

9.0 PACKING & MARKING

9.1 Each item shall be properly packed with adequate protection against friction, stresses, vibration & shock during transportation. Each packing box shall have marking as per Purchase Order. **The packing shall be Sea Worthy.**

9.2 Each assembly shall be identified with the following information.

- Tag No.
- Service.
- Line size & thickness.
- Direction of flow.

10.0 APPLICABLE DATA SHEETS

This document shall be read in conjunction with following data sheets.

1. Data Sheet - A & B: Data sheet no. PES-145-27-DS1-0



**TECHNICAL SPECIFICATION FOR
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2 X 660 MW MAITREE STPP, BANGLADESH

SPEC NO.: PE-TS-421-145-I916

VOLUME II B

SECTION D

REV. NO. 00

DATE 16.03.18

SECTION-D

DATA SHEETS - A&B

SPEC NO.: PE-TS-421-145-I916

REV. NO.

00

DATE : 30.03.19

SHEET

1

OF 7

[illegible]



**DATA SHEET FOR ULTRASONIC FLOW METER
2 x 660 MW BANGLADESH TPS**

SPEC NO.: PE-TS-421-145-I916

REV. NO. 00 DATE : 30.03.19

SHEET 2 OF 7

GENERAL TECHNICAL REQUIREMENTS FOR ULTRASONIC FLOW METERS:

1. EACH ULTRASONIC FLOW METER SHALL BE OF TRANSIT TIME CLAMP ON TYPE WITH DUAL PATH AND WITH TWO SETS OF SENSORS.
2. ALL ACCESSORIES i.e. CABLE GLAND, TRANSDUCER CABLE, ALL MOUNTING HARDWARE AND SS NAMEPLATE SHALL BE PROVIDED WHICH ARE REQUIRED FOR THE COMPLETENESS OF THE SYSTEM.
3. MATERIAL OF ALL FITTINGS SHALL BE SS-316L or Duplex Steel.
4. CABLE GLAND, AS APPLICABLE SHALL BE OF SS316L or Duplex Steel and DOUBLE COMPRESSION TYPE.
5. EACH ASSEMBLY SHALL BE IDENTIFIED WITH THE FOLLOWING INFORMATION: TAG NO., SERVICE, LINE SIZE & THICKNESS AND DIRECTION OF FLOW.
6. THE DATA SHEETS SHALL BE USED BY THE VENDOR AS INPUTS FOR DESIGNING ULTRASONIC FLOW METER ASSEMBLIES.
7. ULTRASONIC FLOW METER ASSEMBLIES SHALL UNDERGO TESTS AS PER BHEL STANDARD QUALITY PLAN, PROJECT DOC NO. PE-QP-421-145-I011.
8. ULTRASONIC FLOW METER ASSEMBLIES DRAWING / DOCUMENT / DATASHEETS OF THE SUCCESSFUL BIDDER SHALL BE SUBMITTED FOR APPROVAL AND RECORD AFTER COMPLETION OF ENGINEERING AND BEFORE SUPPLIES OF UFM.



DATA SHEET FOR UTRASONIC FLOW METER 2 x 660 MW BANGLADESH TPS

SPEC NO.: PE-TS-421-145-I916

REV. NO.

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DATE : 30.03.19

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Tag No.: 01PAB11BP001, 02PAB11BP001

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT TAG NO. QUANTITY SERVICE: MAKE : MODEL	2 X 660 MW BANGLADESH TPS 01PAB11BP001, 02PAB11BP001 TWO (02) CW HEADER TO CONDENSER Bidder to indicate	
TECHNICAL	TYPE FLOW MEASUREMENT OUTPUT ACCURACY REPEATABILITY RANGEABILITY RESPONSE TIME LOAD RESISTANCE HART COMPATIBILITY CONTACT RELAY OUTPUT DISPLAY/INDICATION OPERATING VOLTAGE PROTECTION CLASS ENCLOSURE MATERIAL MOUNTING ELECTRICAL CONNECTION COMMUNICATION PORTS SOFTWARE DIAGNOSTIC FEATURE RECORDING /LOGGING SEA WORTHY PACKING	☒ TRANSIT TIME CLAMP-ON ☒ DUAL PATH ☒ 2 SETS OF SENSORS PER UFM ☒ Instantaneous Flow Rate ☒ Totalized Flow ☒ Velocity Isolated 4-20 mA DC linear output ± 0.5% ± 0.2% of calibration span 400:1 ≤ 20 msec MIN. 500 OHM ☒ YES 2 NO + 2 NC Flow meter with LCD screen backlight based local display & keypad. ☒ 230V AC ☒ 24 VDC IP-67 ☒ COMPATIBLE FOR COASTAL AREA SS316L Chain or Strap Including Fittings ☒ PLUG-IN SOCKET ☒ CABLE GLAND RS 485 ☒ YES ☒ YES ☒ YES ☒ YES	
PROCESS DATA	RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C) PIPE LOCATION	NORMAL : 81340 TPH MAXIMUM: 97610 TPH 2.7 Kg/cm2(g) 6.0 Kg/cm2(g) 34.0 Deg C 60.0 Deg C ☒ UNDERGROUND ☐ OVERGROUND	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	3336 x 18 CARBON STEEL AS PER SA134-A283 GRD/SA515 GR 60 WITH PU (POLYURETHANE) COATING INTERNALLY WITH MINIMUM 2 MM DFT AS PER AWWA-C-222 UPSTREAM : 10D DOWNSTREAM : 5D	



DATA SHEET FOR UTRASONIC FLOW METER 2 x 660 MW BANGLADESH TPS

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Tag No.: 01PCB10BP100, 02PCB10BP100

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT TAG NO. QUANTITY SERVICE: MAKE : MODEL	2 X 660 MW BANGLADESH TPS 01PCB10BP100, 02PCB10BP100 TWO (02) ACW SUPPLY HEADER Bidder to indicate	
TECHNICAL	TYPE FLOW MEASUREMENT OUTPUT ACCURACY REPEATABILITY RANGEABILITY RESPONSE TIME LOAD RESISTANCE HART COMPATIBILITY CONTACT RELAY OUTPUT DISPLAY/INDICATION OPERATING VOLTAGE PROTECTION CLASS ENCLOSURE MATERIAL MOUNTING ELECTRICAL CONNECTION COMMUNICATION PORTS SOFTWARE DIAGNOSTIC FEATURE RECORDING /LOGGING SEA WORTHY PACKING	☒ TRANSIT TIME CLAMP-ON ☒ DUAL PATH ☒ 2 SETS OF SENSORS PER UFM ☒ Instantaneous Flow Rate ☒ Totalized Flow ☒ Velocity Isolated 4-20 mA DC linear output ± 0.5% ± 0.2% of calibration span 400:1 ≤ 20 msec MIN. 500 OHM ☒ YES 2 NO + 2 NC Flow meter with LCD screen backlight based local display & keypad. ☒ 230V AC ☒ 24 VDC IP-67 ☒ COMPATIBLE FOR COASTAL AREA SS316L Chain or Strap Including Fittings ☒ PLUG-IN SOCKET ☒ CABLE GLAND RS 485 ☒ YES ☒ YES ☒ YES ☒ YES	
PROCESS DATA	RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C) PIPE LOCATION	NORMAL : 4070 TPH MAXIMUM: 5291 TPH 5.0 Kg/cm2(g) 7.5 Kg/cm2(g) 34.0 Deg C 60.0 Deg C ☐ UNDERGROUND ☒ OVERGROUND	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	813.0 x 9.53 CARBON STEEL AS PER SA134-A283 Gr. D/SA515 Gr.60 WITH RUBBER LINED UPSTREAM : 9D DOWNSTREAM: 4D	



DATA SHEET FOR ULTRASONIC FLOW METER 2 x 660 MW BANGLADESH TPS

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Tag No.: 01PAB41BP100, 02PAB41BP011

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT TAG NO. QUANTITY SERVICE: MAKE : MODEL	2 X 660 MW BANGLADESH TPS 01PAB41BP100, 02PAB41BP011 TWO (02) CW BLOWDOWN FLOW Bidder to indicate	
TECHNICAL	TYPE FLOW MEASUREMENT OUTPUT ACCURACY REPEATABILITY RANGEABILITY RESPONSE TIME LOAD RESISTANCE HART COMPATIBILITY CONTACT RELAY OUTPUT DISPLAY/INDICATION OPERATING VOLTAGE PROTECTION CLASS ENCLOSURE MATERIAL MOUNTING ELECTRICAL CONNECTION COMMUNICATION PORTS SOFTWARE DIAGNOSTIC FEATURE RECORDING /LOGGING SEA WORTHY PACKING	☒ TRANSIT TIME CLAMP-ON ☒ DUAL PATH ☒ 2 SETS OF SENSORS PER UFM ☒ Instantaneous Flow Rate ☒ Totalized Flow ☒ Velocity Isolated 4-20 mA DC linear output ± 0.5% ± 0.2% of calibration span 400:1 ≤ 20 msec MIN. 500 OHM ☒ YES 2 NO + 2 NC Flow meter with LCD screen backlight based local display & keypad. ☒ 230V AC ☒ 24 VDC IP-67 ☒ COMPATIBLE FOR COASTAL AREA SS316L Chain or Strap Including Fittings ☒ PLUG-IN SOCKET ☒ CABLE GLAND RS 485 ☒ YES ☒ YES ☒ YES ☒ YES	
PROCESS DATA	RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C) PIPE LOCATION	NORMAL : 1058.5 TPH MAXIMUM: 1376 TPH 2.4 Kg/cm2(g) 6.0 Kg/cm2(g) 34.0 Deg C 60.0 Deg C ☐ UNDERGROUND ☒ OVERGROUND	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	406.4 x 9.53 CARBON STEEL AS PER SA134-A283 Gr. D/SA515 Gr.60 WITH RUBBER LINED UPSTREAM : 10D DOWNSTREAM : 5D	



DATA SHEET FOR UTRASONIC FLOW METER 2 x 660 MW BANGLADESH TPS

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REV. NO.

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DATE : 30.03.19

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Tag No.: 00GAC11BP001, 00GAC15BP001

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT TAG NO. QUANTITY SERVICE: MAKE : MODEL	2 X 660 MW BANGLADESH TPS 00GAC11BP001, 00GAC15BP001 TWO (02) RAW WATER DISCHARGE HEADER Bidder to indicate	
TECHNICAL	TYPE FLOW MEASUREMENT OUTPUT ACCURACY REPEATABILITY RANGEABILITY RESPONSE TIME LOAD RESISTANCE HART COMPATIBILITY CONTACT RELAY OUTPUT DISPLAY/INDICATION OPERATING VOLTAGE PROTECTION CLASS ENCLOSURE MATERIAL MOUNTING ELECTRICAL CONNECTION COMMUNICATION PORTS SOFTWARE DIAGNOSTIC FEATURE RECORDING /LOGGING SEA WORTHY PACKING	☐ TRANSIT TIME CLAMP-ON ☐ DUAL PATH ☐ 2 SETS OF SENSORS PER UFM ☐ Instantaneous Flow Rate ☐ Totalized Flow ☐ Velocity Isolated 4-20 mA DC linear output ± 0.5% ± 0.2% of calibration span 400:1 ≤ 20 msec MIN. 500 OHM ☐ YES 2 NO + 2 NC Flow meter with LCD screen backlight based local display & keypad. ☐ 230V AC ☐ 24 VDC IP-67 ☐ COMPATIBEL FOR COASTAL AREA SS316L Chain or Strap Including Fittings ☐ PLUG-IN SOCKET ☐ CABLE GLAND RS 485 ☐ YES ☐ YES ☐ YES ☐ YES	
PROCESS DATA	RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C) PIPE LOCATION	NORMAL : 3226 TPH MAXIMUM: 4194 TPH 3.5 Kg/cm2(g) 7.0 Kg/cm2(g) 34.0 Deg C 60.0 Deg C ☐ UNDERGROUND ☒ OVERGROUND	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	711 X 9.53 CARBON STEEL AS PER SA134-A283 GRD/SA515 GR 60 WITH RUBBER LINED UPSTREAM : 10D DOWNSTREAM : 5D	



DATA SHEET FOR UTRASONIC FLOW METER 2 x 660 MW BANGLADESH TPS

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REV. NO.

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DATE : 30.03.19

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Tag No.: 00GAA11CF001

DATA SHEET – A & B

DATA SHEET – A			DATA SHEET – B (TO BE FILLED BY VENDOR)
GENERAL	PROJECT TAG NO. QUANTITY SERVICE: MAKE : MODEL	2 X 660 MW BANGLADESH TPS 00GAA11CF001 ONE (01) DESILTING CHAMBER O/L FLOW (SILT LOADED SEA WATER) Bidder to indicate	
TECHNICAL	TYPE FLOW MEASUREMENT OUTPUT ACCURACY REPEATABILITY RANGEABILITY RESPONSE TIME LOAD RESISTANCE HART COMPATIBILITY CONTACT RELAY OUTPUT DISPLAY/INDICATION OPERATING VOLTAGE PROTECTION CLASS ENCLOSURE MATERIAL MOUNTING ELECTRICAL CONNECTION COMMUNICATION PORTS SOFTWARE DIAGNOSTIC FEATURE RECORDING /LOGGING	☒ TRANSIT TIME CLAMP-ON ☒ DUAL PATH ☒ 2 SETS OF SENSORS PER UFM ☒ Instantaneous Flow Rate ☒ Totalized Flow ☒ Velocity Isolated 4-20 mA DC linear output ± 0.5% ± 0.2% of calibration span 400:1 ≤ 20 msec MIN. 500 OHM ☒ YES 2 NO + 2 NC Flow meter with LCD screen backlight based local display & keypad. ☒ 230V AC ☒ 24 VDC IP-67 ☒ COMPATIBEL FOR COASTAL AREA SS316L Chain or Strap Including Fittings ☒ PLUG-IN SOCKET ☒ CABLE GLAND RS 485 ☒ YES ☒ YES ☒ YES	
PROCESS DATA	RATE OF FLOW (T/HR) UPSTREAM WORKING PRESS (Kg/cm2g) DESIGN PRESS (Kg/cm2g) NORMAL TEMP (Deg C) MAXIMUM TEMP (Deg C) PIPE LOCATION	NORMAL : 33 TPH MAXIMUM: 43 TPH 3.3 Kg/cm2(g) 7.0 Kg/cm2(g) 33.0 Deg C 50.0 Deg C ☐ UNDERGROUND ☒ OVERGROUND	
PIPE LINE DATA	PIPE SIZE (OD x THK) mm PIPE MATERIAL AVAILABLE PIPE STRAIGHT LENGTH	114 X 3.05 DUPLEX SS SA790 AS PER SCH. 10S. UPSTREAM : 10D DOWNSTREAM : 5D	

**TECHNICAL SPECIFICATION FOR****ULTRASONIC FLOWMETER****2 X 660 MW MAITREE STPP, BANGLADESH****SPEC NO.: PE-TS-421-145-I916****VOLUME II B****SECTION D****REV. NO. 00****DATE : 16.03.18****SECTION-D****BILL OF QUANTITY**

BOQ OF UFM FOR 2 X 660 MW BANGLADESH PROJECT REV 00 DATED 28.03.19

Sl no.	Service Description	KKS number	Total Quantity For 2 Units
1	CW Header to Condensor	01PAB11BP001	1
2		02PAB11BP001	1
3	ACW Supply Header	01PCB10BP100	1
4		02PCB10BP100	1
5	CW Blowdown Flow	01PAB41BP100	1
6		02PAB41BP011	1
7	RAW Water Discharge Header	00GAC11 BP001	1
8		00GAC15 BP001	1
9	Desilting Chamber O/L Flow	00GAA00CF001	1
10	MANDAYS(2 PER UNIT)		4

EPC
FOR INFORMATION ONLY

Date: 04-Jan-2018

*Approval doesn't absolve the EPC
Contractor of it's responsibility as
specified in the Contract.

QUALITY PLAN FOR ULTRASONIC FLOW METER

02					
01					
00	14.11.17	PS/SS	RKR	SSB	Document 1st submission.
	DATE	ALTERED	CHECKED	APPROVED	NOTE
PROJECT 2x660MW MAITREE SUPER THERMAL POWER PROJECT, RAMPAL, BANGLADESH (EPC MAIN PLANT PACKAGE)					
OWNER CONSULTANT: FICHTNER M/s FICHTNER GmbH & Co KG, Stuttgart,GERMANY			OWNER: BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED, BANGLADESH		
DRAWN BY			DATE	NAME	 BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NOIDA
DESIGN BY			14.11.17	PS/SS	
CHECKED BY			14.11.17	RKR	
APPROVED BY			14.11.17	SSB	
SUPERSEDES:			TITLE		
SUPERSEDED BY:			QUALITY PLAN FOR ULTRASONIC FLOW METER		
SYSTEM:			SIZE:	PROJECT NO.:	421
			ANNEX:	DRAWING NO.:	Maitree-00-CF-QA-123011-PEM-0 REV-0

FIO
FOR INFORMATION ONLY

Date: 04-Jan-2018

*Approval doesn't absolve the EPC
contractor of it's responsibility as
specified in the Contract.

MFGR.'s LOGO	MANUFACTURER'S NAME AND ADDRESS		MANUFACTURING QUALITY PLAN						PROJECT: 2 X 660 MW MAITREE STPP, RAMPAL, BANGLADESH PACKAGE: ULTRASONIC FLOW METER CONTRACT NO. : 421 MAIN-SUPPLIER: BHEL					
			ITEM : ULTRASONIC FLOW METER		QP NO.: Maitree-00-CF-QA-123011-PEM-0									
			SUB-SYSTEM:		REV. NO.: 00 DATE: 14.11.17 PAGE: 2 OF 2									
SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANC E NORMS	FORMAT OF RECORD	AGENCY			REMARKS	
					M	C / B				M	C	B		
1.	2.	3.	4.	5.	6.		7.	8.	9.	D *	** 10.		11.	
1	Standard Certificates	Certificate of Compliance, Warranty Certificate	Major	Visual	100 %	As applica ble	Technical Catalogue/ Approved documents	Technical Catalogue/ Approved Documents	Technical Catalogue/ Approved Documents	-	P	V	-	
2	Visual Check	Mechanical	Major	Visual	100 %	100 %	Technical Catalogue/ Approved documents	Technical Catalogue/ Approved documents	Technical Catalogue/ Approved Documents	-	P	W	-	
3	Functional test & power ON	Electrical	Major	Visual	100 %	100 %	Functional test report for meter & transducer	Approved Documents	Technical Catalogue/ Approved Documents	✓	P	W	V	

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





Technical specification for
ULTRASONIC FLOWMETER
2 X 660 MW MAITREE STPP,
BANGLADESH

SPECIFICATION NO. **PE-TS-421-145-1916**

VOLUME **IIB**

SECTION

REV. NO. 00

DATE: 16.03.18

Provenness Compliance Sheet

Name of Item/ Package:

Name of Vendor:

#	Name of Reference Project	Plant Rating	Years of Successful operation as on 22.09.2013	Certificate Attached	Remarks
1.					
2.					
3.					
4.					
5.					
6.					
7.					

VOLUME IIB

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

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



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

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

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

2.0 SCOPE

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

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

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

3.0 Application

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

4.0 Definitions

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

5. General Information

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

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

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

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

6.0 Criteria for Selection of Packaging

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

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

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

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

Materials can be classified in following categories

- Hazardous Material
- Non-Hazardous Material
-

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

6.1 Hazardous Materials

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

6.2 Non-Hazardous GOODS

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

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7.0 Marking Instructions & Despatch details, Storage Code

7.1 Marking Instructions & despatch details

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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7.2 Storage Code

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

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

8.0 GUIDELINES FOR PACKING GOODS

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

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

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

IMPORTANT NOTE:

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

8.1.2 Pipe

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

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

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

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

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

8.1.3 Pipe Fittings, Flanges and Valves

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

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

8.1.4 Structural Steel

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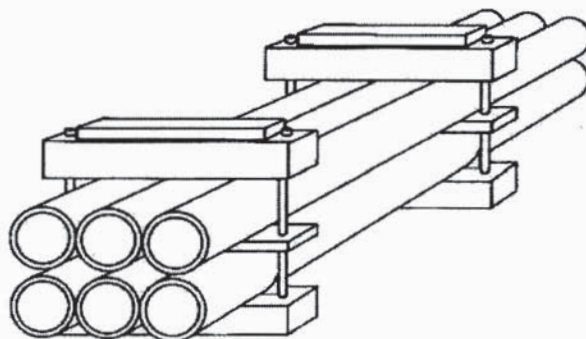
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

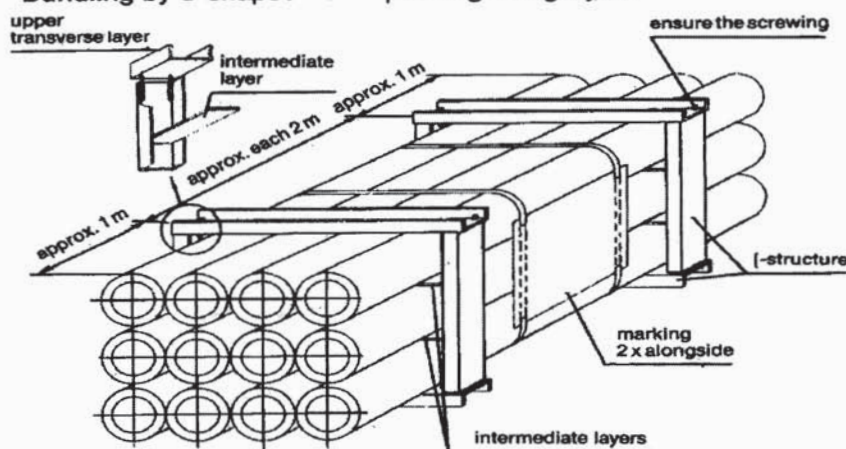
8.2.1 Type of Equipment

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

Packing category I



Bundling by U-shaped iron – packing category I A



8.2.2 Type of Construction

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

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

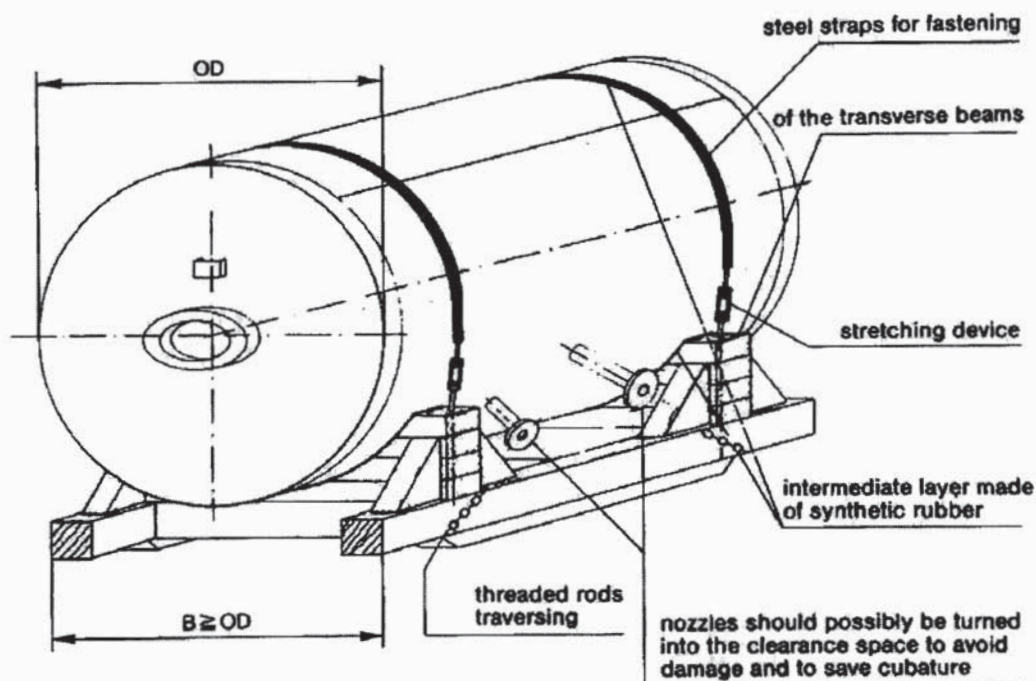
8.3.1 Type of Equipment

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

8.3.2 Type of Construction

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

PACKING CATEGORY-II



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8.4 Packing of GOODS in Wooden Crates/Cases/Boxes

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

8.4.1 Packing Category III

8.4.1.1 Type of Equipment

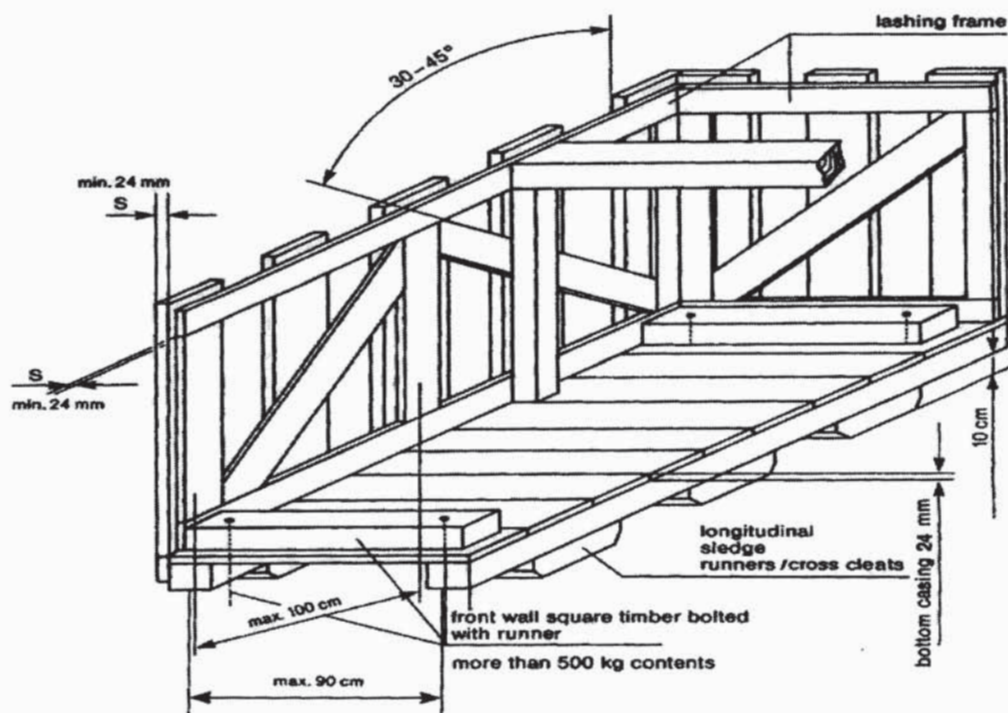
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

8.4.1.2 Type of Construction

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

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

Packing Category III



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8.4.2 Cases with Lining – Packing Category IV

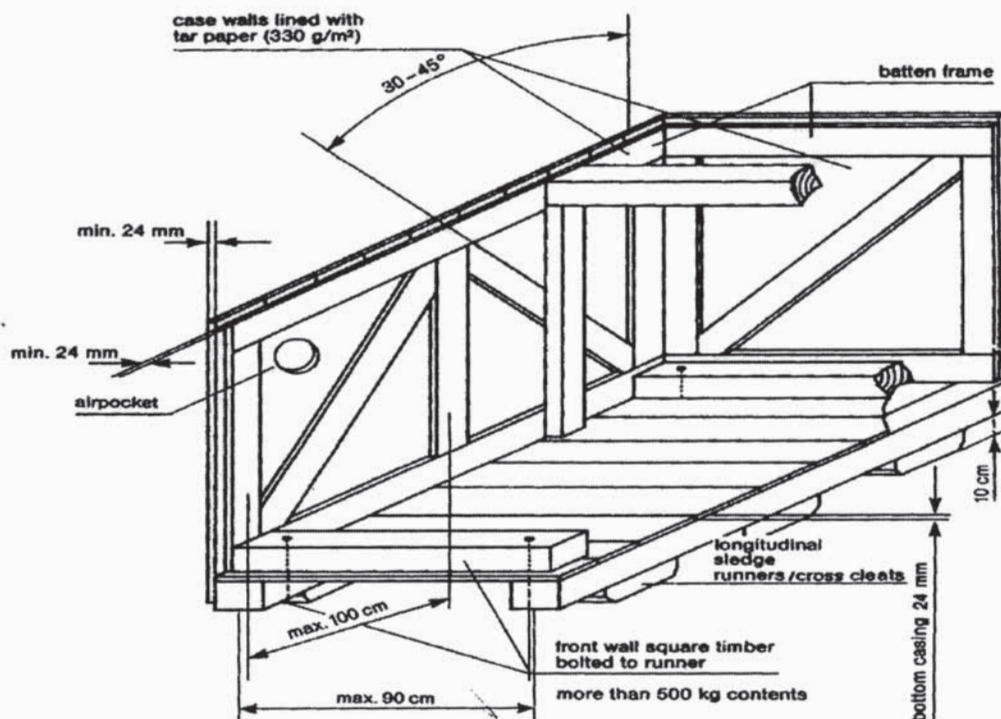
8.4.2.1 Type of Equipment

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

8.4.2.2 Type of Construction

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

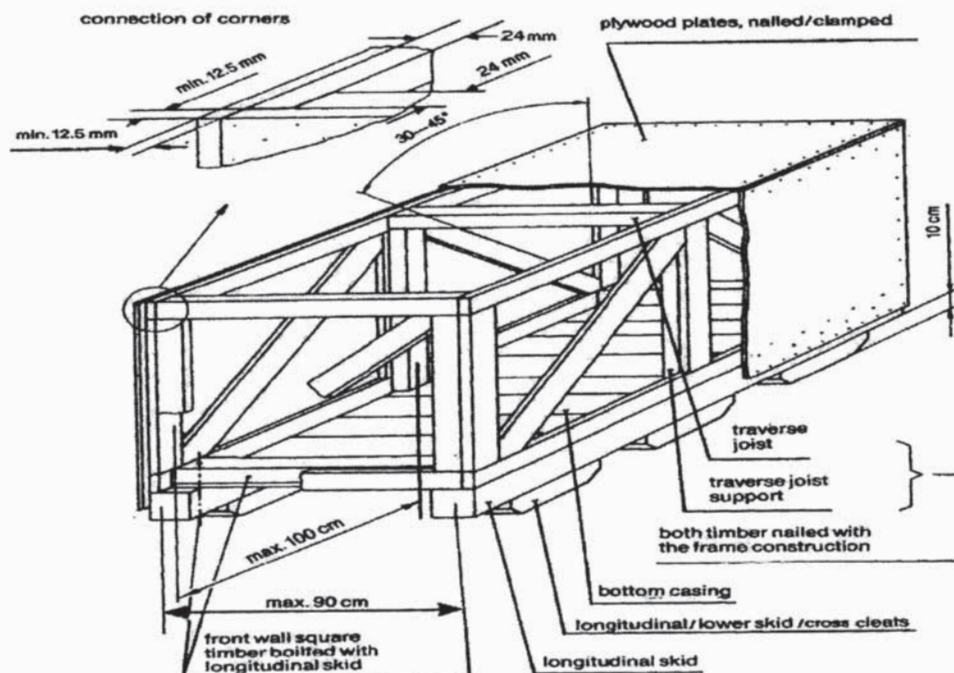
Packing Category IV



8.4.3 Cases with Alternative Surface Materials

8.4.3.1 Plywood Box – Packing Category IV A

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

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

8.4.4.1 Type of Equipment

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

8.4.4.2 Type of Construction

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

Additional marking:

- Case with desiccants.

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

8.4.5.1 Type of Equipment

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

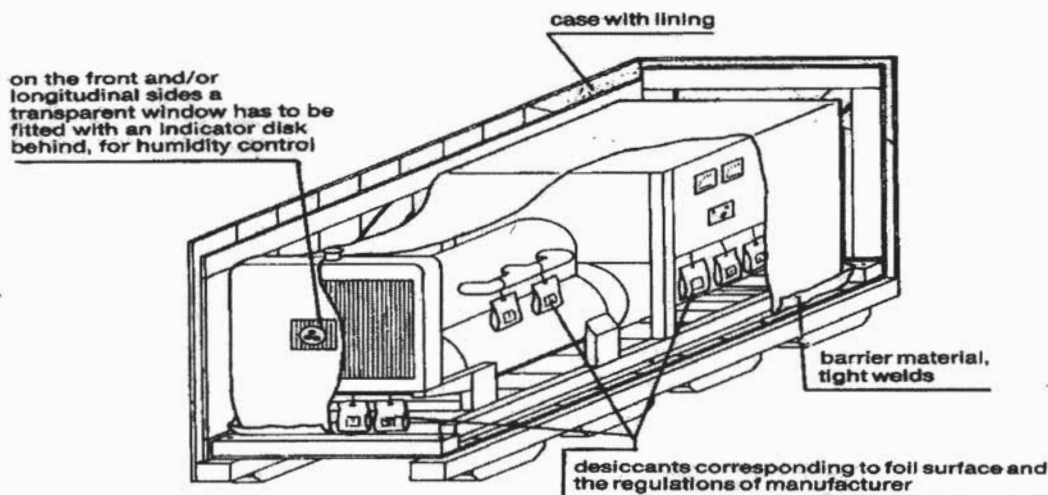
8.4.5.2 Type of Construction

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

Additional marking:

- Case with desiccants.

Packing Category V/VI



8.4.6 Double Case – Packing Category VII

8.4.6.1 Type of Equipment

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

8.4.6.2 Type of Construction

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

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8.4.7 Cable Drum – Packing Category VIII

8.4.7.1 Type of Equipment

All type of cables, wires, ropes, hoses.

8.4.7.2 Type of Construction

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

8.4.8 Hazardous Materials – Packing Category IX

8.4.8.1 Type of Equipment

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

8.4.8.2 Type of Construction

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

8.4.9 Wooden Floor as a Transport Support – Packing Category X

8.4.9.1 Type of Equipment

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

8.4.9.2 Type of Construction

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

8.5 Air Transport Packing

8.5.1 General

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

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

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8.5.2 Type of Packing

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

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

8.5.3 Dimensions

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

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

9.0 Detailed specification for Wooden Crates/Boxes/Cases and other packing materials

9.1 Technical specification for wood

The wood shall be Fir, Chir, Silver Oak (Gravillea Robusta), chemically treated mango and Pinewood with moisture content not exceeding 50%. The wood shall have flexural and compressive strength, stiffness, shock absorption and nail retention properties. The wood shall be free from common defects such as warp, bone, twist, knot, 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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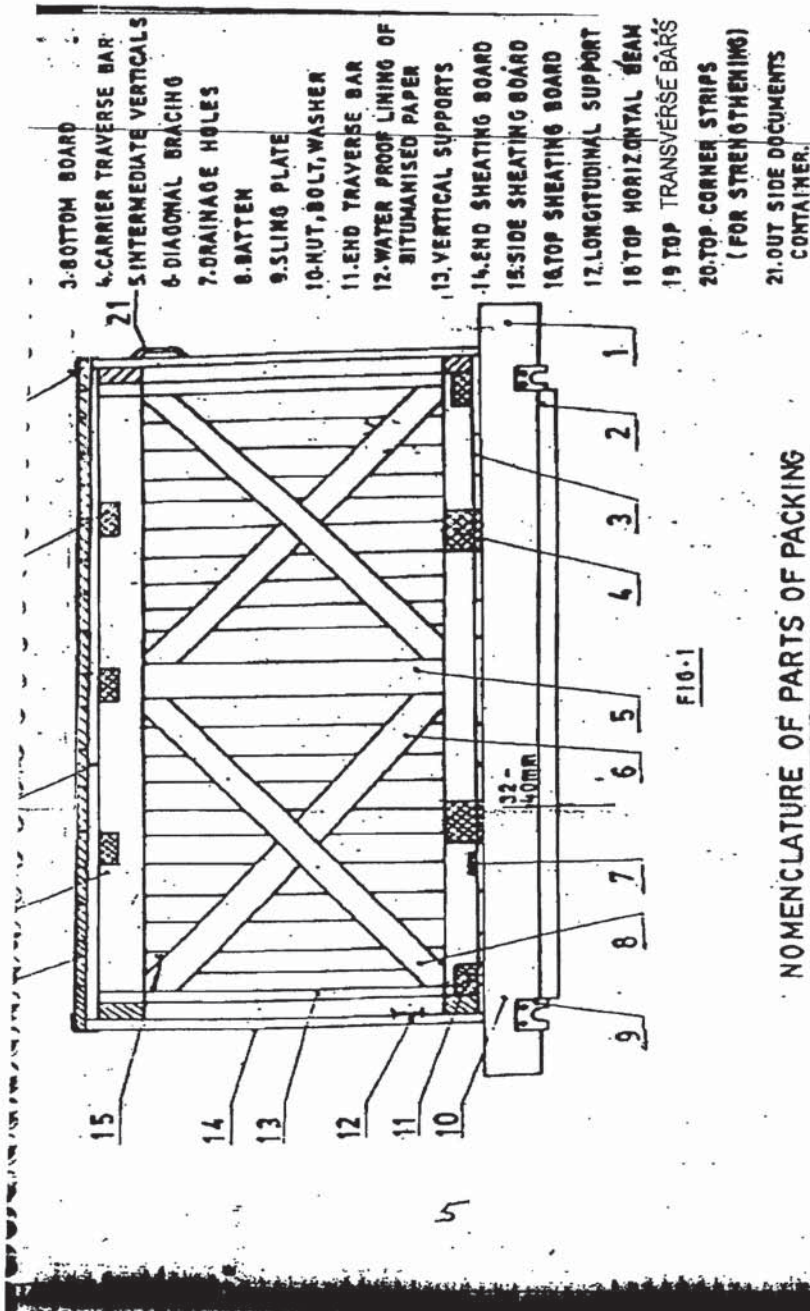
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BOTTOM FRAME ARRANGEMENTS

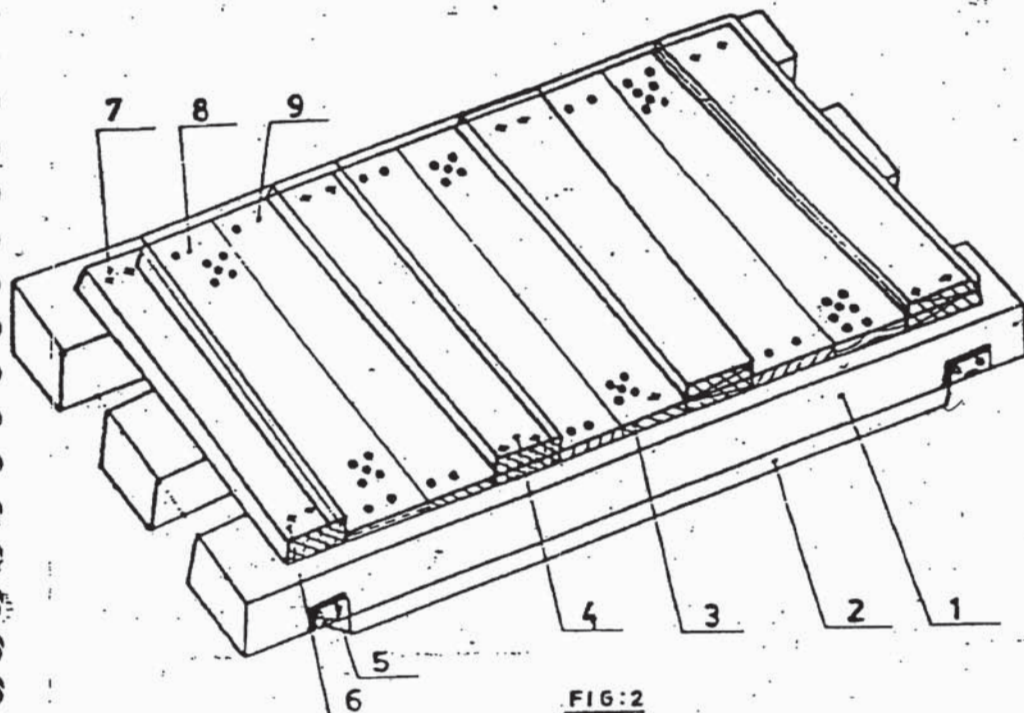


FIG:2

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 transverse bar; 100x100 mm.
(minimum)

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

027



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TOP FRAME ARRANGEMENT

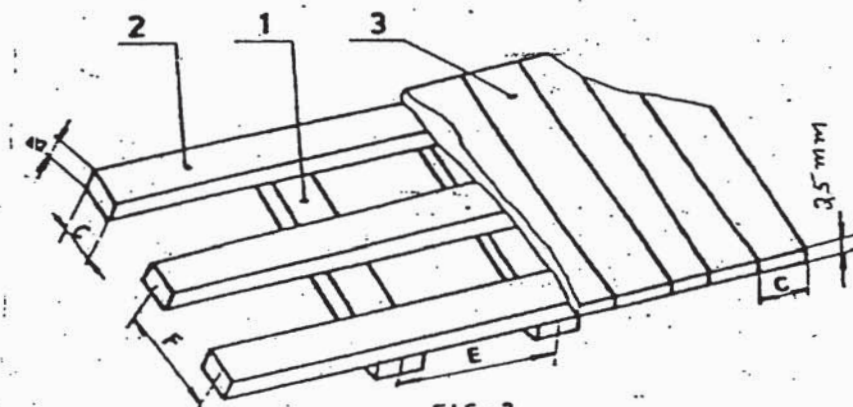
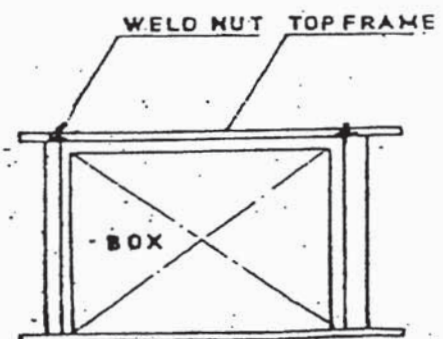
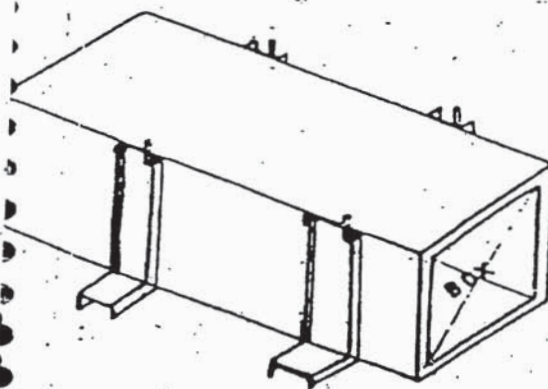


FIG-3

F : 700 to 1000 mm
E : 500 to 900 mm
30x100 mm.

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

ARRANGEMENT OF C-CLAMPS AROUND CASES



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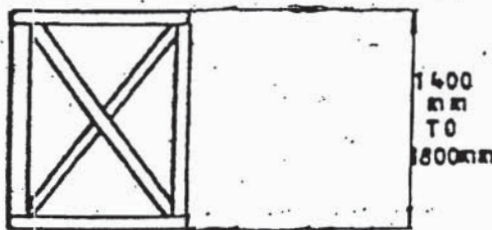
**ARRANGEMENT OF DIAGONAL BRACING AND
HORIZONTAL SUPPORT**

FIG: 6

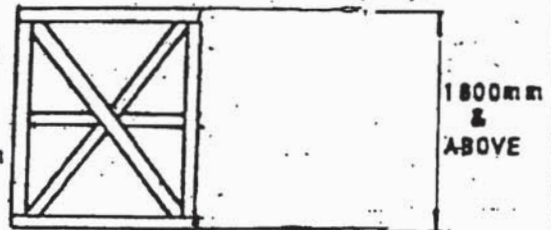


FIG: 8

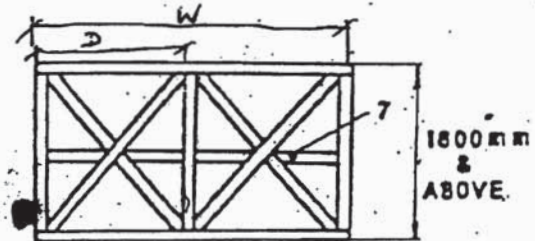


FIG: 9

7- Middle Horizontal Support

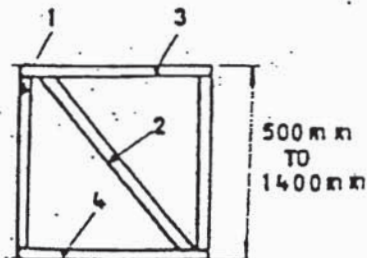


FIG: 5

1- Vertical Support

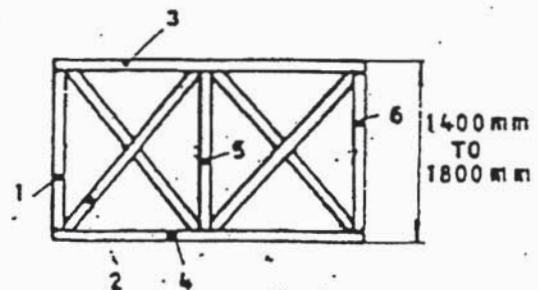


FIG: 7

1, 5, 6 - Vertical Support



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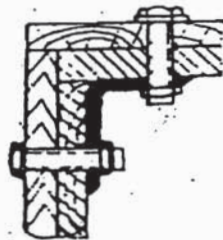
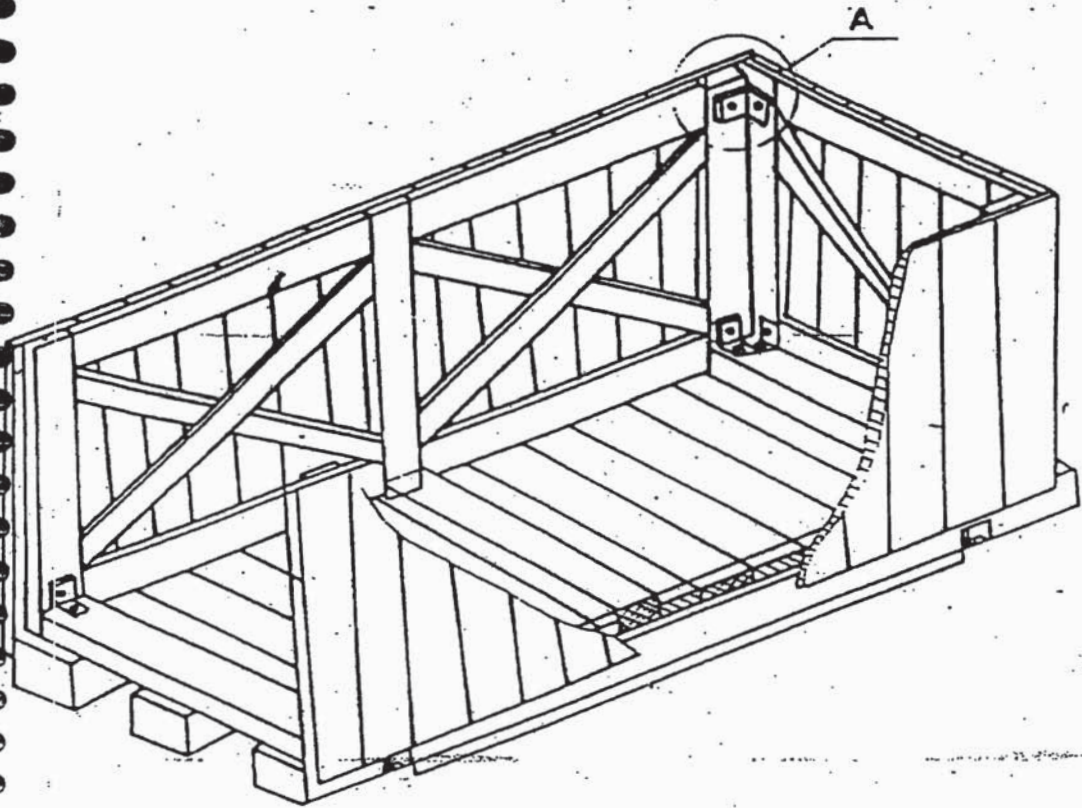
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ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

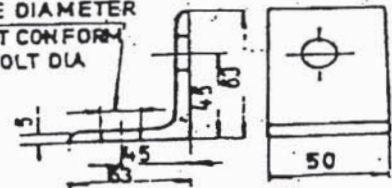


FIG:10

030

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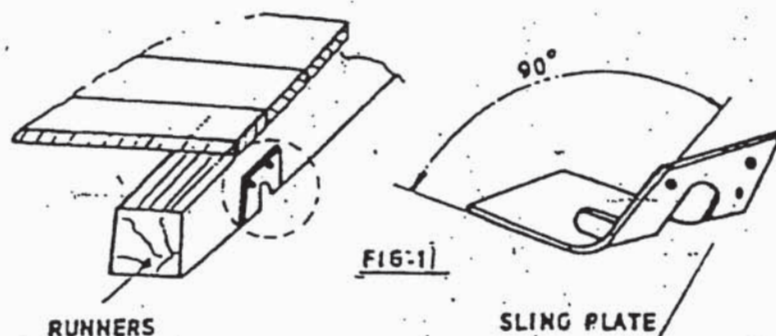
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**ARRANGEMENT OF SLING & PLATE ON
CASES**



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TABLE-1

LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c						
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	30
		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 ADVISE NOTE NO.	CASE NO.
DIMENSIONS(MM) L X B X H	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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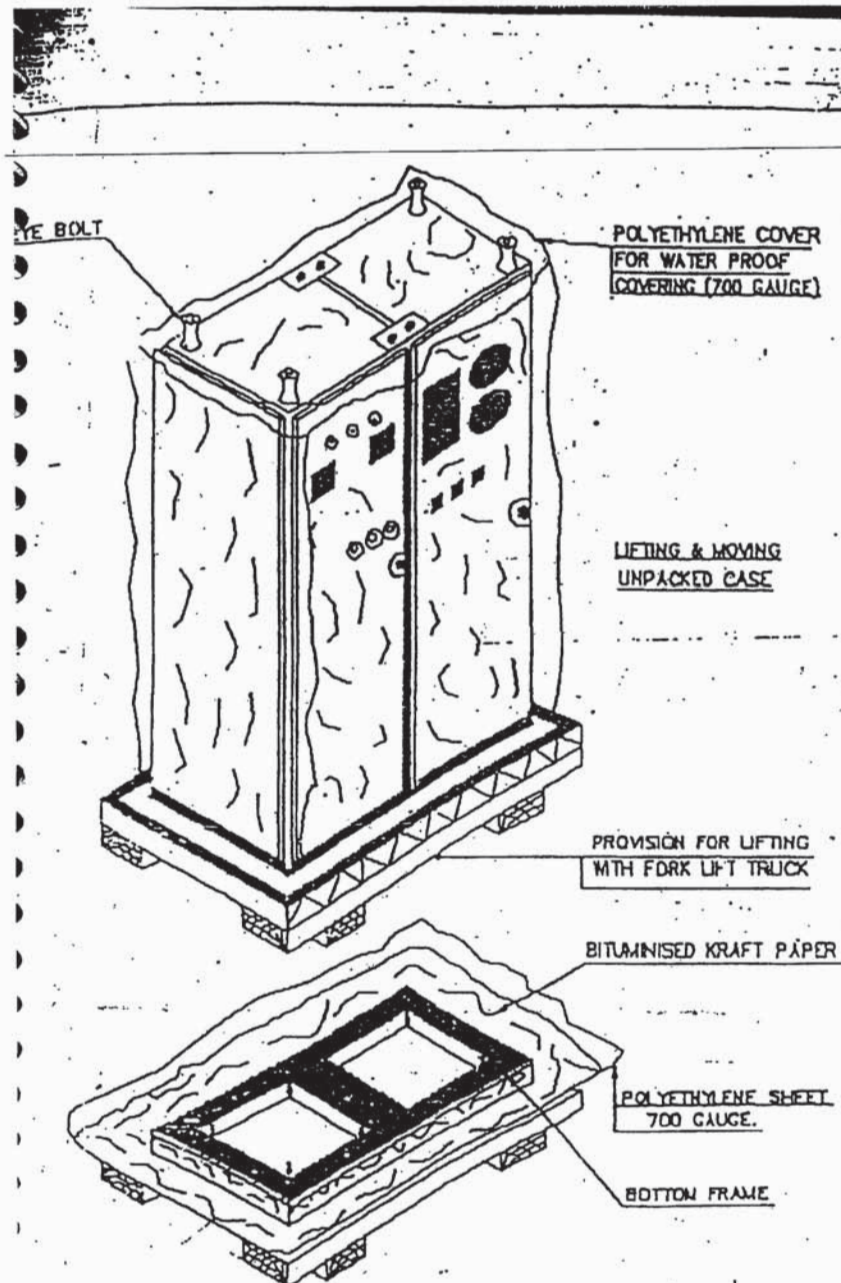


FIGURE-14



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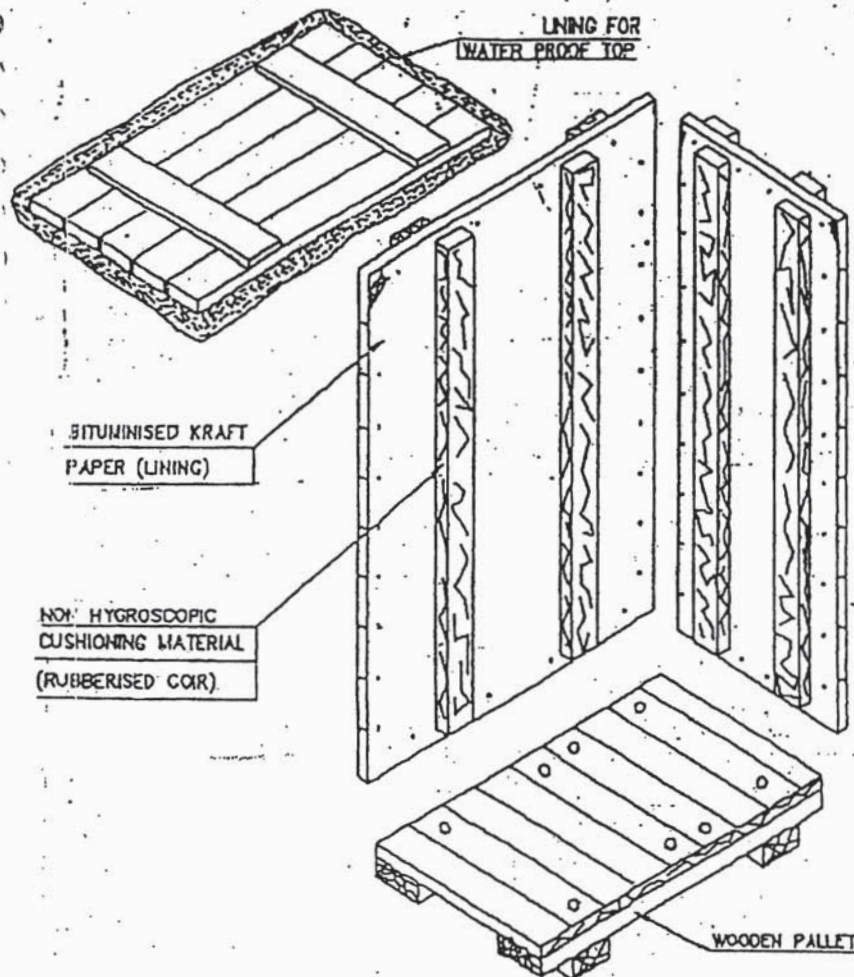


FIGURE-15

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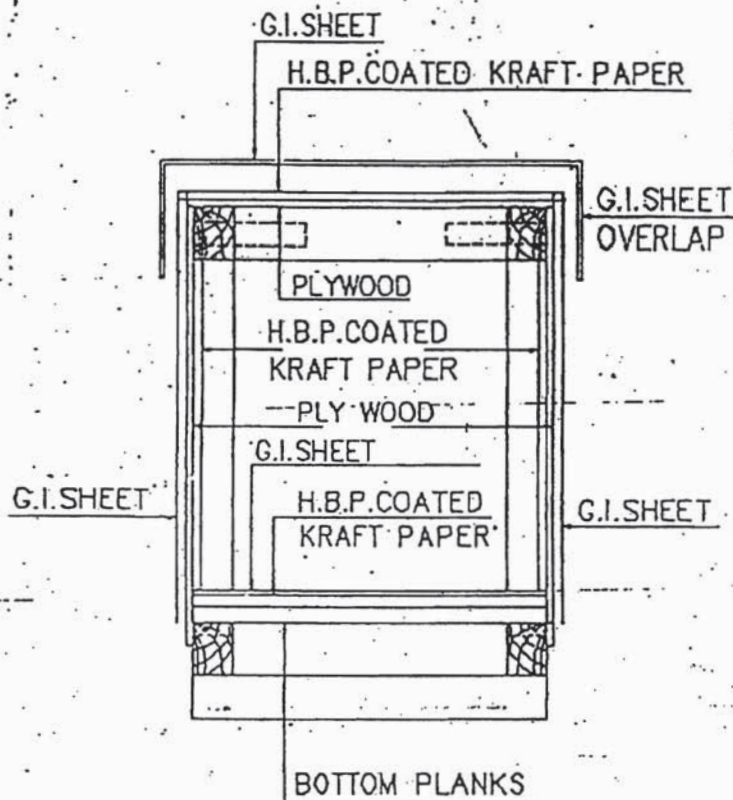


FIG-16 : CLOSED PACKING CASE WITH G.I.SHEET
SHOWING LAYERS OF PACKING MATERIALS.

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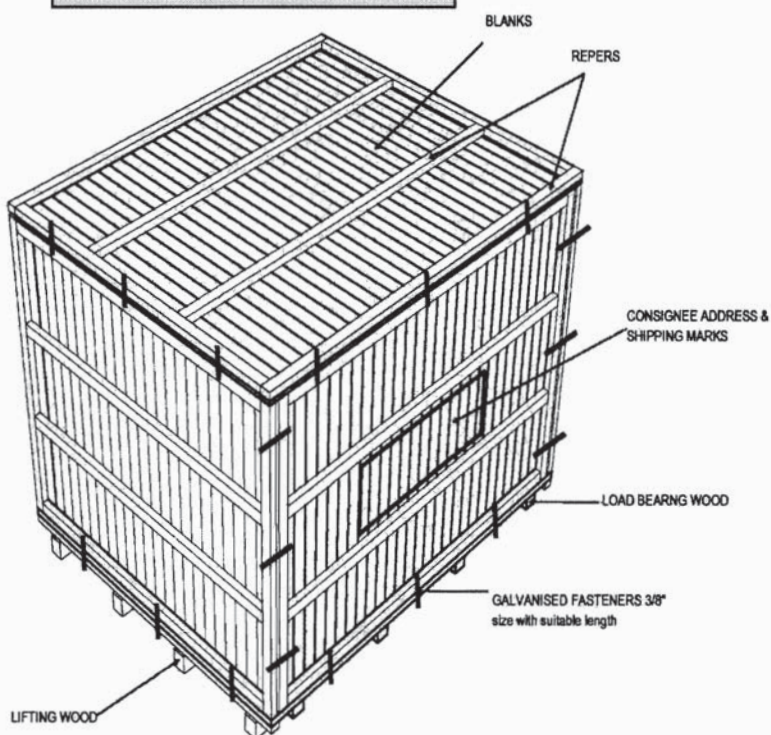
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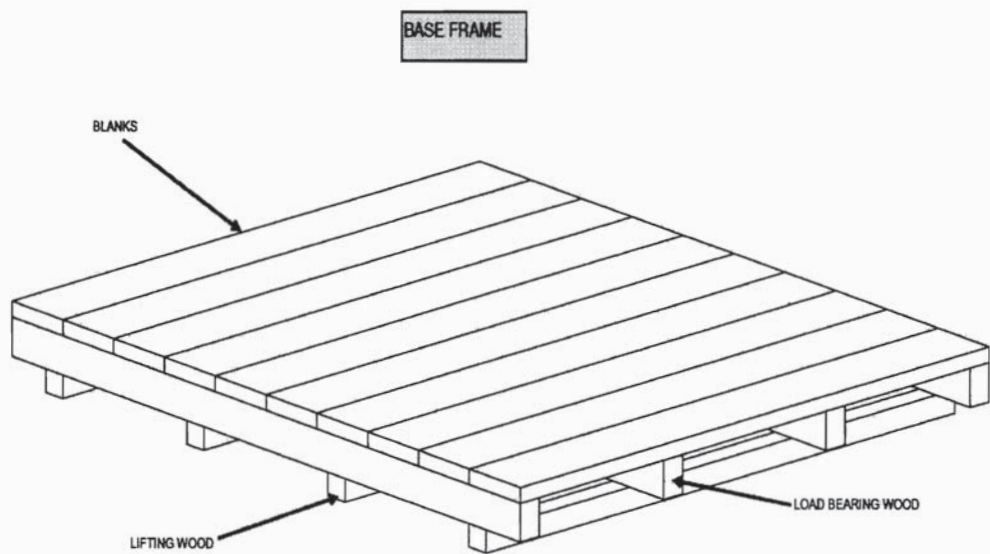
**MODEL: FASTNERS TYPE (BASE, SIDE & TOP
ATTACHED WITH BOLT, NUT & WASHER)**

This Type of case to be used for
following items:

1. BALL SEPARATOR
2. BALL COLECTOR SKID



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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, DRN
 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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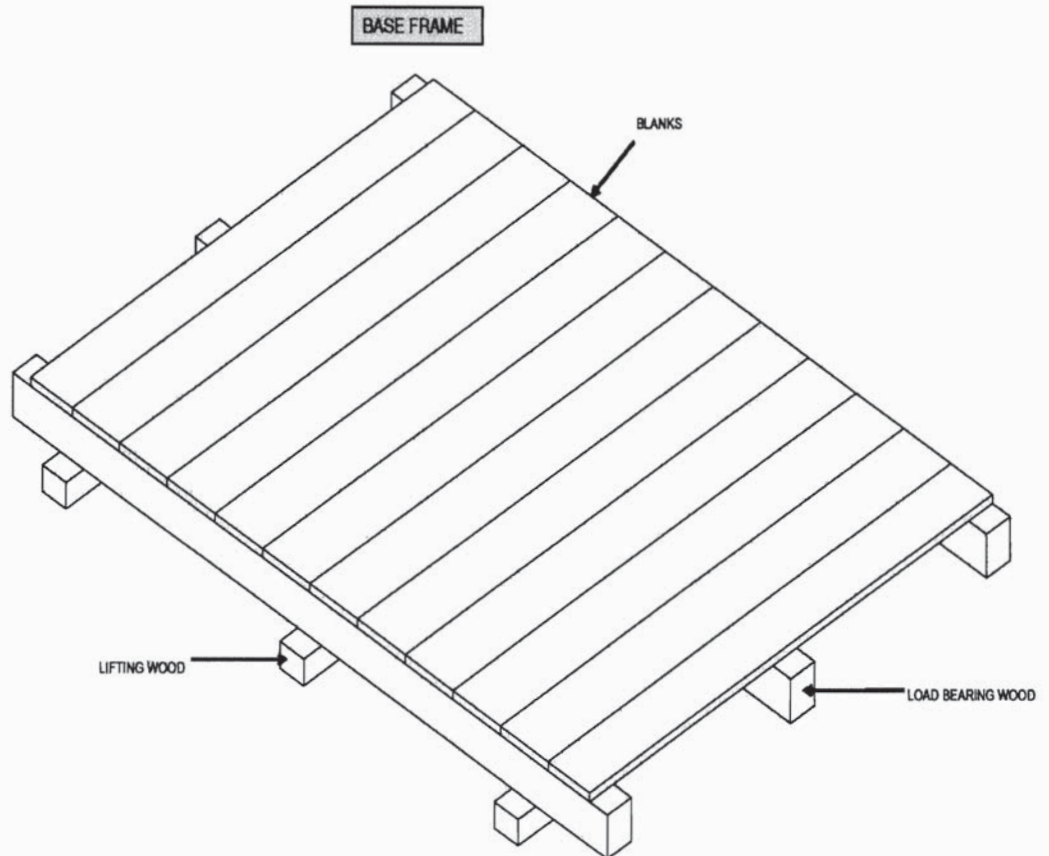
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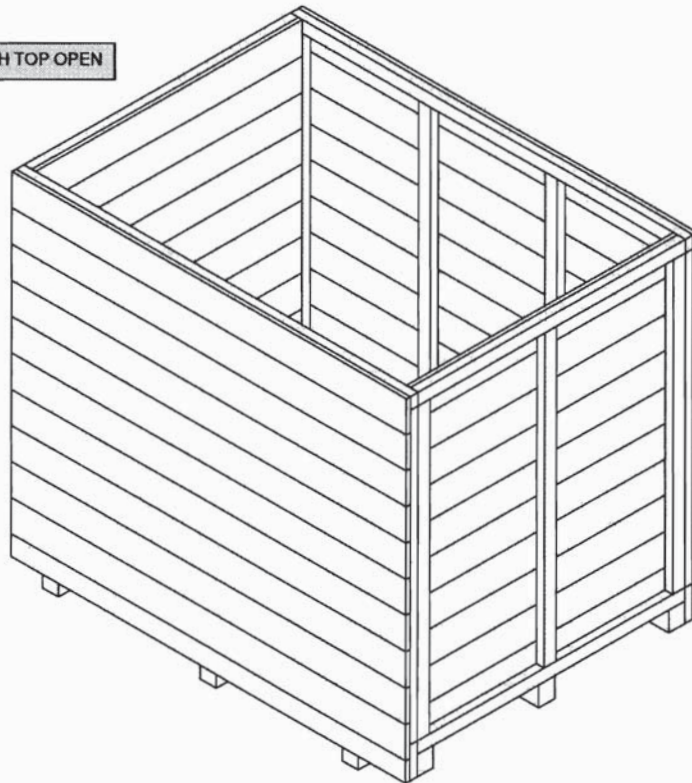
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NAILING TYPE MODEL WITH TOP OPEN



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10.4 PACKING OF LOOSE ITEMS

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

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

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

11.0 PACKING OF ELECTRICAL ITEMS

11.1 CABLES

11.1.1 Type of Equipment

All type of cables..

11.1.2 Type of Construction

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



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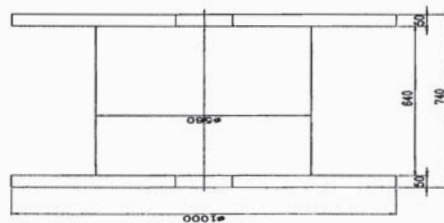
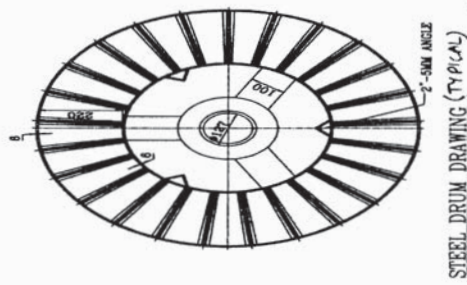
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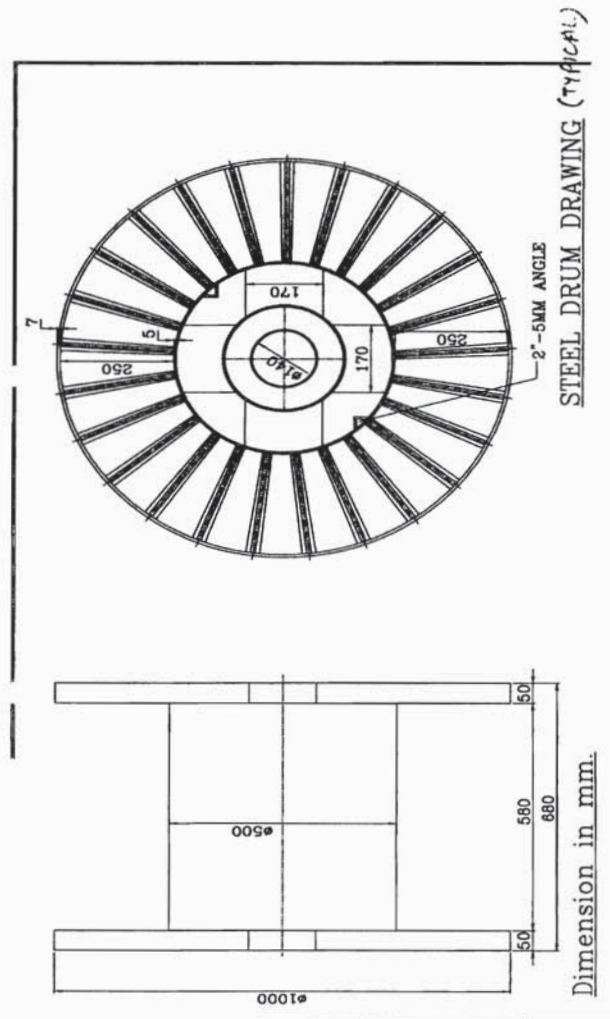
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Dimension in mm.

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

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

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

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

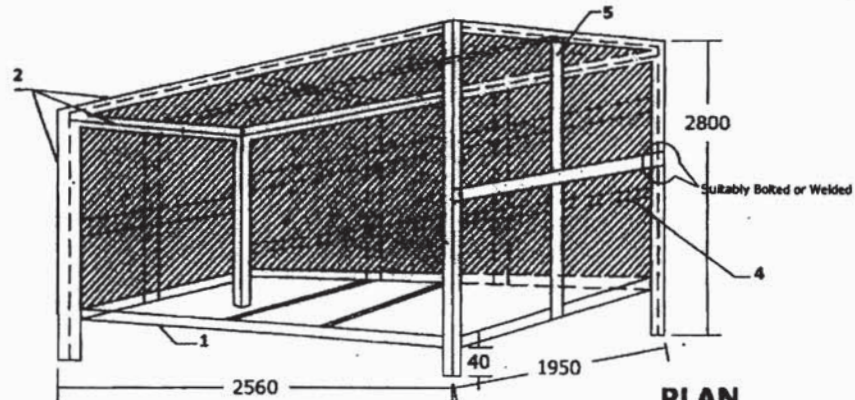
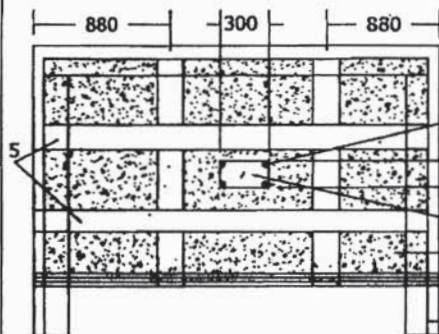
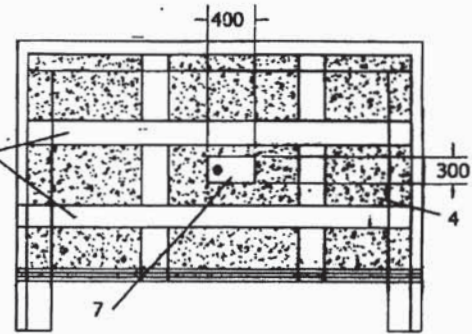
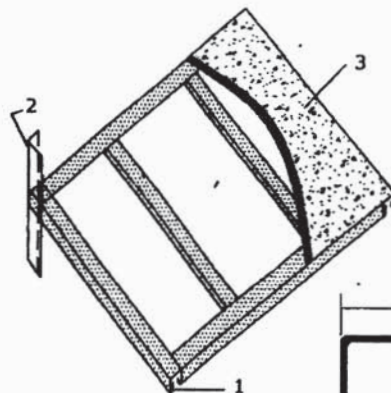
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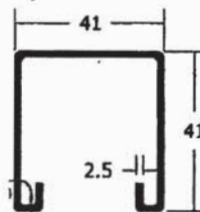
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STEEL PACKING (TYPICAL DETAILS)**PLAN****FRONT SIDE OF BOX****BACK SIDE OF BOX****BOTTOM FRAME ARRANGEMENT****Note:**

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

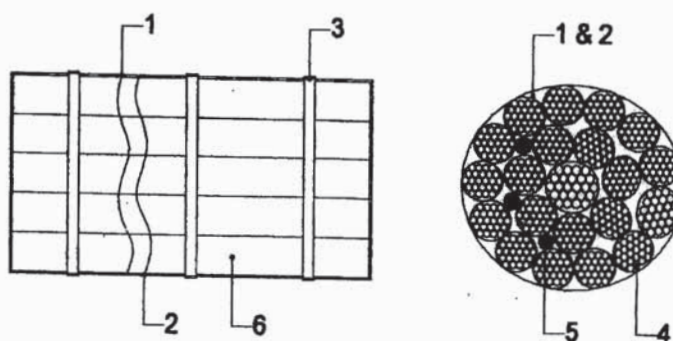
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Structural steel will be different sizes and shapes. Hence it will be packed as per Figure No. B and described as following :

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

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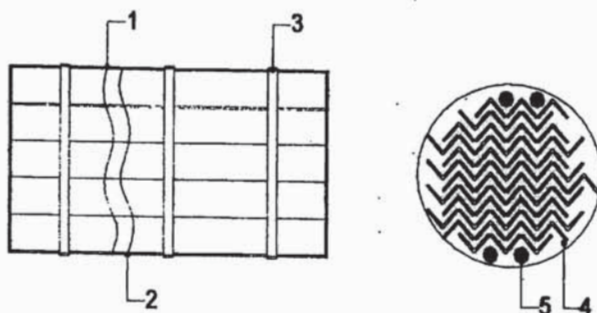
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PACKING PROCEDURE FOR STRUCTURAL STEEL**FIGURE "B"**

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



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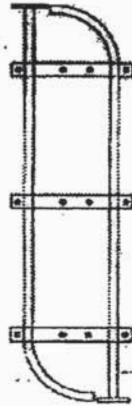
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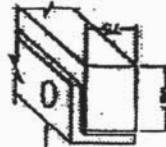
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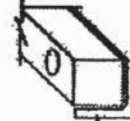
packing procedure for poles



POLES WRAPPED WITH POLYTHENE SHEET &
STAINLESS COATED HESSIAN CLOTH



TOP WOODEN BATTEN TO BE
FIXED WITH LOGGING LAM ON TOP
OF IT FOR TIGHTENING THE BATTEN
25 MM DIA



BOTTOM WOODEN BATTEN TO BE
FIXED ON LOGGING LAM ANGLE

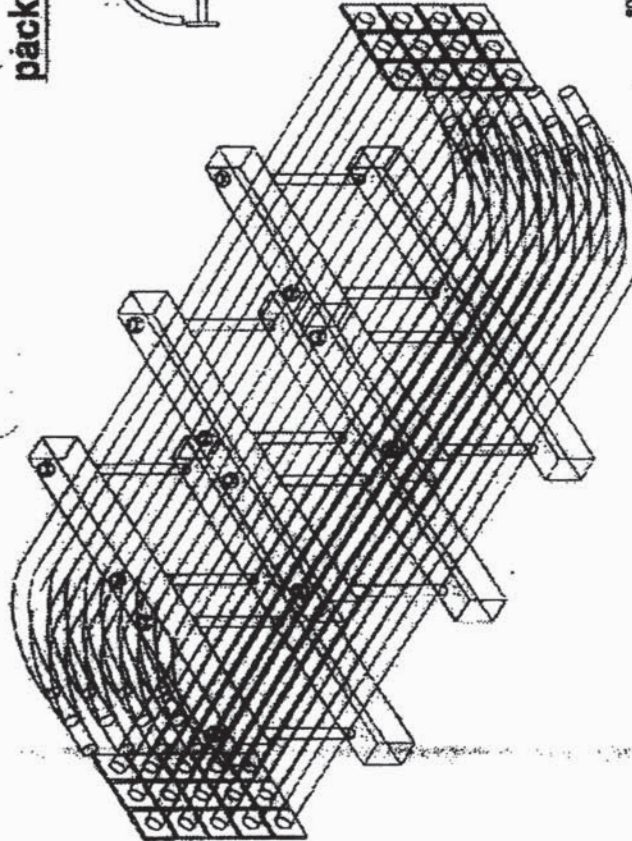


FIGURE "C"

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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 ≥ 0.175 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.