TECHNICAL SPECIFICATION FOR

ADDITIONAL BUTTERFLY VALVE

CONFIDENTIAL

CUSTOMER : M/s. BIFPCL Bangladesh
PROJECT : Maitree 2X660MW
APPLICATION : FLUE GAS DESULPHURIZATION SYSTEM
Spec REF : MAI- ADD-BFV REV 00

BHARAT HEAVY ELECTRICALS LIMITED
(A GOVT OF INDIA UNDERTAKING)
Flue Gas Desulphurization Group
Ranipet

Prepared	Checked	Approved
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R00 dated 28-11-2019		

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1.0 PROJECT INFORMATION:

a.	Owner	BIFPCL (BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (PVT.) LIMITED), Bangladesh
b.	Buyer	BHEL, Ranipet
c.	Process/Application	Flue Gas Desulphurization

Bangladesh-India Friendship Power Company (Pvt.) Ltd. (BIFPCL) is a 50: 50 Joint Venture Company of Bangladesh Power Development Board, Bangladesh (BPDB) and NTPC Limited, India (NTPC), incorporated under the laws of Bangladesh. BPDB is a statutory body constituted under the Bangladesh Water and Power Development Board Order 1972, and is vested with a significant portion of the generation and distribution of electricity in Bangladesh. NTPC Limited is a Maharatna company incorporated under the Indian Companies Act, and as India's largest power company, has a diversified portfolio covering the entire value chain of the power generation business. Pursuant to the implementation agreement dated April 20, 2013, as entered into between the Government of the People's Republic of Bangladesh, and BIFPCL, and the power purchase agreement also dated April 20, 2013, as entered into between BIFPCL and BPDB, BIFPCL has entrusted BHEL the development of the Coal fired 2x660 MW Maitree Super Thermal Power Project on Turnkey Basis at Rampal, Dist.-Bagerhat, Bangladesh, on the bank of river Possur, Bangladesh, for the purposes of supply and sale of electric power to BPDB. Wet Limestone FGD System is also envisaged by customer in this project to control SO_2 Emissions from the power plant. For the purposes of setting up the Wet Limestone FGD System for 2x660 MW Coal fired Power project at Rampal, BHEL is inviting bids from suitably qualified Bidders for Wet Dry Washing System, pursuant to and in accordance with these bidding documents.

A) SITE CONDITIONS

1.	**Ambient Temperature and Relative Humidity**		
a.	**Average Site Condition ASC**		
	Ambient Temperature	:	27.3 deg C
	Ambient Humidity	:	87%
	Ambient Pressure	:	1007.6 mbar
b.	**Summer Site condition SSC**		
	Ambient Temperature	:	36.9 deg C

	Ambient Humidity	:	60%
	Ambient Pressure	:	1007.9 mbar
c.	**Winter Site condition WSC**		
	Ambient Temperature	:	12.2 deg C
	Ambient Humidity	:	100 %
	Ambient Pressure	:	1017.2 mbar
d.	**Reference Site condition RSC**		
	Ambient Temperature	:	31 deg C
	Ambient Humidity	:	88%
	Ambient Pressure	:	1007 mbar
2.	**Design ambient conditions for Electrical Systems**		
a.	Maximum Design temperature (outdoor)	:	45 deg C
b.	Maximum daily average ambient shade temperature	:	38 deg C
c.	Maximum monthly average temperature (in the shade)	:	34.6 deg C
d.	Maximum annual average temperature (in the shade)	:	27.3 deg C
e.	Maximum design temperature of the electrical equipment installed indoors in air conditioned rooms	:	40 deg C
f.	Maximum design temperature of the electrical equipment installed indoors in non-air conditioned rooms	:	45 deg C
g.	Minimum design temperature	:	0 deg C
3.	**Plant Elevation**	:	+5.0 m above sea level
4.	**Wind Load**	:	As per Bangladesh National Building code-2012, Part-6, Chapter 2.4

a.	Basic Wind speed, three-second gust at 10m above ground in exposure C, having a return period of 50 years	:	73 m/s, Exposure category-"C"
5.	**Seismic Load**	:	Seismic Zone 1 as determined by Bangladesh National Building code (BNBC-2012)

Note:

1. Reference site conditions shall apply for the Guarantee Values
2. Equipment and Material must be suitable for the range of ambient site conditions. In particular, the saline atmosphere has to be considered.

B) PROJECT LOCATION AND APPROACH

a.	State/Division	**Khulna**
b.	District	Bagerhat district
c.	Place	Moithara Village, Rampal Upazila
d.	Location	Latitude- 22 deg 37" 0" to 22 deg 34" 30"N Longitude- 89 deg 32'0"E to 89 deg 34'5"E

C) APPROACH TO SITE:

The nearest town Khulna is at a distance of 23 km from project site. The site is connected by road from Mangla- Khulna Highway. Nearest Domestic airport is Jessor, Bangladesh at a distance of about 107 KM and international airport is Dhaka at a distance of 263 KM, Bangladesh. The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given above is for general guidance and shall not be contractually binding on the Owner. Bidders shall obtain clarifications/ information, if any, before submitting their offers, regarding scope of work, facilities available at sites, etc. No additional claim shall be entertained by BHEL in future, on account of non-acquaintance of above. All relevant site data/ information as may be necessary shall have to be obtained/ collected by the Bidder.

2.0 INTENT OF SPECIFICATION

This specification together with the attendant Technical Data Sheet and other specifications/attachments to inquiry / order defines the minimum requirements for butterfly valves along with their accessories /auxiliaries for use in the process of Flue gas Desulphurization (FGD) system handling flue gas and oxidation air. Bidder shall make all possible efforts to comply strictly with the requirements of this specification and other specifications/attachments to inquiry/order.

In case, deviations are considered essential by the Bidder (after exhausting all possible efforts), these shall be separately listed in the Bidder's proposal under

separate section, titled as "List of Deviations/Exceptions to the Enquiry Document (Annexure)". Deviation shall be listed separately for each document with cross reference to Page No./Section/Clause No./Para etc. of the respective document supported with proper reasons for the deviation for purchaser's consideration. Any deviation, not listed under the above section, even if reflected in any other portion of the proposal, shall not be considered applicable. No deviation or exception shall be permitted without the written approval of the purchaser.

The design, material, construction, manufacture, inspection, testing and performance of valves shall comply with all currently applicable statutes, regulations and safety codes in the locality where the valves will be installed. The valves shall conform to the latest editions of applicable codes and international standards as mentioned elsewhere. Nothing in this specification shall be construed to relieve the Bidder of his responsibility. Compliance to this specification shall not relieve the Bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

In case the Bidder considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, he shall recommend the same along with reasons in a separate section along with his proposal and include the same in his scope of supply. The Bidder shall offer only proven design in successful operation.

3.0 STANDARDS AND CODES

The valves shall conform to the latest editions of applicable codes and international standards as mentioned elsewhere Valves in general shall conform to the requirements of the following standards:

- Design code: Double flanged/ wafer type of low Leakage rate confirming to AWWA C-504 Class 150 B/ EN 593 Class PN 10.
- Valves inspection test: AWWA C-504 Class 150 B (Bubble tight) /EN 12266 Rate A (No visible weeping or formation of drops or bubbles).
- Valve flanges shall conform to ANSI B 16.5 CL 150.(in case of EPDM lining valve is to be designed with Flat faced
- Valve shall accommodate any (manual gear box, pneumatic or electric) actuator , vendor to design valve with actuator mounting flange dimension as per ISO 5211

4.0 SPECIFICATION FOR DESIGN / CONSTRUCTION / MATERIAL PARTICULARS

4.1. All valves shall be suitable for the service conditions i.e flow, temperature and pressure at which they are required to operate.

4.2. The valves as well as all accessories shall be designed for easy disassembly and maintenance.

4.3. Valves to be installed outside shall be required to have the stem properly protected against atmospheric corrosion

4.4. The valves supplied shall be suitable for process water, limestone slurry, gypsum slurry, clarified water and air application and the operating and design conditions are provided in valve list enclosed.

4.5. The valves shall be designed for the design pressure/temperature of the system on which it is installed and in accordance with AWWA-C-504, ASME B 16.34 or any other approved equivalent international standard latest edition.

4.6. The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disk shall be continuous type and easily replaceable.

4.7. For all types of valves, the design with shaft eccentric to the disc is preferred. The shaft shall be solid type and shall pivot on bushings. Bushings/sleeve type bearings shall be contained in the hub of valve body. The bearing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on water and on valve components.Bearing should not be exposed to slurry medium.

4.8. The design of the shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft and any key (taper pin etc.) for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However, the shaft diameter shall not be less than the minimum shaft diameter specified in relevant code. Necessary Torque Calculation and the torque class selected on the basis of the same shall be furnished to the Employer for information.

4.9. The disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration. The operating mechanism shall be mounted directly on or supported from the valve body.

4.10. All valves shall be complete with: position indicator (located in a visible place), arrow indicating the flow direction; adjustable mechanical stop limiting devices to prevent over travel of valve disc in open/close position; all valves shall be "tight shut off" and with locking device open/close position.

4.11. Valves-200 NB and above shall also be provided with gear operator arrangement suitable for manual operation. Manual operation of valve shall be through worm & worm wheel gear arrangement having totally enclosed gearing with hand wheel diameter and gear ratio designed to meet the required operating torque (35kgm max at handwheel). It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. Adjustable stops shall be provided to prevent over travel in either direction.

4.12. Limit and torque switches (wherever applicable) shall be enclosed in water tight enclosures along with suitable space heaters for motor actuated valves, which may be either for On-Off operation or inching operation with position transmitter.

4.13. Valves supplied for vent application shall be of full body design.

4.14. All valves shall be provided with embossed name plate giving details such as tag number, type, size etc. Bidder has to provide valve tag as per Valve KKS coding as per Annexure- Plant and equipment Identification. Valve KKS/ tag no. shall be provided by BHEL during design stage.

4.15. The actuator-operated valves shall be designed on the basis of the following :

(1) The internal parts shall be suitable to support the pressure caused by the actuators;

(2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc.

(3) All actuator operated valves shall be provided with manual override. When force on handwheel exceeds 35 kgm, suitable gearing mechanism shall be provided.

(4) All actuators operated valves shall open/ close fully within time required by the process but not later than 10 seconds after actuators starts.

4.16. The maximum temperature to be considered for the valve design is 100°C

4.17. Valve shall be provided with locking arrangement (with locks) in open or close condition. Further, butterfly valves of size 200 mm & above shall be provided with worm/worm wheel reduction unit.

5.0 SCOPE OF SUPPLY

a) Valves mounted with pneumatic/electric actuator, manual override, Limit switch, solenoid valve, Air filter regulator fitted with all tubing & fittings, Limit switch & solenoid valve wired with terminal Junction box as per specification.

b) Actuator as per the specification.

c) Limit switch – 2 Nos. for each Pneumatic/Electric actuaor valves as per the spec.

6.0 MATERIAL OF CONSTRUCTION

Material of Butterfly valves per enclosed Valve Datasheets or its equivalent. Material for counter flanges shall be the same as for the piping.

7.0 END CONNECTIONS

End connection for Butterfly valves shall be as datasheets/enquiry**.**

8.0 PROOF OF DESIGN TEST (TYPE TEST) FOR BUTTERFLY VALVES

Proof of Design (P.O.D.) test certificates shall be furnished by the bidder for all applicable size-ranges and classes of Butterfly valves supplied by him, in the absence of which actual P.O.D. test shall be conducted by the bidder in the presence of Employer's representative. All valves that are designed and manufactured as per AWWA-C-504 shall be governed by the relevant clauses of P.O.D test in AWWA-C-504. For Butterfly valves designed and manufactured to EN-593 or equivalent, the P.O.D. test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirements of P.O.D. test of AWWA-C-504.

9.0 SPECIFICATION FOR ELECTRICAL ACTUATOR

A) Type : Electrical actuator
B) Make : Rotork/Antrieb/Auma/ Limit torque
C) Failure position (power failure) : stay put
D) Local Position Indicator : To be provided.
E) Hand wheel for manual opn : Required
F) Actuator torque : Vendor to specify
G) Actuator Protection Class : IP-68
H) Actuator Thrust : Vendor to specify
I) Actuator travel time for 90 +10 degree: Vendor to specify
J) Power supply : 415 V, 3Phase-50 HZ
K)Working current of actuator : Vendor to specify
L)Stall current of actuator : Vendor to specify
M)Torque switch / rating : Vendor to specify
N)Limit switch for open/close feed back : 2 NOS, 2 NO+2NC contacts suitable for 24V DC/230V AC, min 5A for 24 V DC
O)Control box (3ϕ) : Integral starter required with PLC, remote manual operation from operator work stn.

Electric actuators with integral starters along with associated accessories etc shall be supplied on as required basis compatible for Valves to meet the functional and the other specification requirements. The actuators shall be totally enclosed weatherproof with IP-68 degree of protection. All actuator settings including torque,limit shall be possible without opening the actuator cover and LCD indication for actuator alarms, status, valve position indication and diagnostic information shall be available integral to actuator body.
415 V, 3 phase 3 wire power supply shall be given to the actuator from switch board as applicable through a switch fuse unit. The motor shall be squirrel cage induction motor, class F insulated suitable for Direct On Line (DOL)starting. Single Phasing Protection, Over heating protection through Thermostat (as applicable) and wrong phase sequence protection shall be provided over and above other protection features standard to bidder's design.The Position/ Limit measurement shall be done using absolute encoders which will give information of position/ limit in both the directions. Electronic measurement of torque shall be provided. Open/Close command, open/ close status and disturbance monitoring signal (common contact for Overload, Thermostat, control supply failure, L/R selector switch at local & other protections operated) shall be provided hardwired.

Also refer enclosed Annexure for specification of LT Electric Actuator, FGD 4229.

As far as applicable the above “Technical conditions for low voltage motors” shall apply.
In addition, all actuators for valves, dampers etc are to be fitted with socket and plug of well-established make to IEC 60309 or equivalent for the power cable connection. For the control cable connection separate socket and plug shall be provided.
Self-cooling at respective ambient temperature conditions is mandatory. Fan cooling is not accepted.
Actuators shall have integrated starters. Regulation type shall be continuous modulation type (min. 3000 starts per minutes).

LIMIT SWITCHES:

a) Quantity /valve : 2 nos for close / open indication
b) No. of Contacts : DPDT (2NO+2NC contacts)
c) Contact Rating : 24V DC / 230V AC
d) Protection : Weather proof IP 65.
e) Limit Switch Box : Limit Switch terminals shall be brought out to a Terminal Box

SPECIFICATION FOR PNEUMATIC ACTUATOR (Open/close)

a) Type : Rotary actuator (Quarter turn) Pneumatic (spring return/ Double acting)
b) Make : Rotex/Elomatic/Virgo/flowserve Bray/Any renowned make
c) MOC : As per International standard only.

	Single acting spring return		
		NC	NO
d)	Air Action	open	close
e)	Air failure	close	open

f) time of operation : less than 10 seconds
g) cylinder design air Pressure : 4 Kg/sq.cm
h) Air Connection :As per enclosed data sheet
i) Local Position Indicator : To be provided.
j) Hand wheel for manual opn : Required
k) Actuator travel time : Vendor to specify
l) Actuator Protection Class : IP-65 (Min)
m) Actuator Thrust : Vendor to specify
n) Spring range (kg/cm2) : Vendor to specify
o) Speed adjustment for actuator operation : To be provided to facilitate speed adjustments both during opening &closing by means of flow control valve
p) Solenoid valve type : 3/2 way or 5/2 way, 24V DC power supply, ex. proof, 3/8" NPT pneumatic connection, 3/8" NPT Electrical connection. Solenoid Valve Energised as per the requirement.
q) Air filter regulator with auto drain : Size of filter shall be 25 Micron, Filter material shall be sintered bronze/ equivalent, Body shall be aluminium, and 3/8" NPT Pneumatic connection shall be envisaged.

LIMIT SWITCHES:

a) Quantity /valve : 2 nos DPDT
b) No. of Contacts : DPDT (2NO+2NC contacts)
c) Contact Rating : 24V DC / 230V AC
d) Protection : Weather proof IP 65.
e) Limit Switch Box : Limit Switch and solenoid valve with suitable cable gland & wiring shall be brought out to a Terminal / Junction Box IP 55.

JUNCTION BOX (IP55):

Min 24 terminals with proper lugs & 7nos of suitable metallic cable glands
4NOS OF 4 PAIR X 0.5 and 3 nos. of 3 coreX2.5sqmm (SINGLE COMPRESSION)

All Tubings,solenoid valve,speed control valve,filter regulator,air lock device are pre-assembled at vendor works.
All Wirings,limit switch,solenoid valve & JB with proper cable gland are pre-assembled at vendor works.

10.0 PAINTING OF VALVES:

The detailed painting procedure is enclosed in **Annexure-I**

11.0 DOCUMENTS / DETAILS ALONG WITH BID

The following information / documents shall be submitted along with the offer

a. Duly filled up data sheets along with seal and sign shall be submitted in the enclosed format**.** Then only offer shall be considered for evaluation.
b. Detailed assembly drawing with overall dimensions.
c. Valve cross sectional drawings with Bill of Material including the material specifications.
d. Valve drawings of each drive (Pneumatic,Electrical,Manual) for maximum size to be submitted along with the offer.
e. Valve Regulation Characteristic Curve.
f. POD test certificate.
g. Cv calculation.
h. List of applicable standards for shop test.
i. Reference list of projects wherever the offered model supplied.
j. Typical Quality plan for supply of the above equipments.
k. Annexure for Plant and Equipment Identification, duly sealed and signed by bidder.
l. Valves Catalogues.
m. List of commissioning spares.
n. Recommended spares list for 3 year O&M along with item wise price. Recommended spares shall not be considered for L1 evaluation.
o. Any deviation shall be specifically mentioned in the enclosed deviation format **Annexure.** In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure**. If there is no deviation "**NIL**" statement shall be furnished, in absence of which it will be construed that the bid confirms strictly to the specification. Acceptance or rejection of the offer with or without deviations (either fully or partially) is sole discretion of the purchaser without seeking further clarification from the bidder.

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

12.0 DOCUMENTS / SERVICE AFTER ORDER

12.1. The following documents are to be submitted for BHEL's approval.

- Duly filled up data sheet in the enclosed format.
- Detailed assembly drawing with overall dimensions.
- Valve cross sectional drawings with Bill of Material including the material specifications.
- C_v Calculation
- Quality plan
- Actuator Data sheet to be submitted after P.O

12.2. The following are to be submitted to BHEL's review and acceptance.

- Material test certificate
- Hydraulic & Leak test certificates
- Performance guarantee certificate
- Erection manual
- O&M manuals

13.0 DOCUMENTATION

a. The documentation during bid and post order stage shall meet the following requirements.
b. All documents and drawings shall be submitted in English.
c. Unless agreed otherwise, Ten (10) hard copies and five (05) sets of electronic copies

of all documents are to be submitted in the English language. In addition, One (1) copy of 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).

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

14.0 ELIGIBILITY

Bidders who are having manufacturing facility of Butterfly valves are eligible to quote. Previous Inspection/ test reports of the same have to be submitted along with offer.

15.0 INSPECTION

The valves shall be inspected at Vendor's works by BHEL/ BHEL's Authorised agency as per the procedure submitted by the Vendor.

16.0 WARRANTY:

The warranty period shall begin on the date of issuance of the provisional acceptance certificate for the unit – 1 (23.08.2020) and for the unit – 2 (23.02.2021) and shall end after twenty-four (24) months respectively. Provided that the successful bidder shall extend the provisions of this warranty to cover all repaired and replacement parts furnished under the warranty obligations hereunder, subject to the warranty period for the same being for a period of 24 months from the date on which replacement or renewal work is completed.

In case of failure of the equipment to meet the guarantee, BIFPCL/BHEL reserves the right to reject the equipment. However, BIFPCL/BHEL reserves the right to use the equipment until new equipment supplied by bidder meets the guaranteed requirement.

17.0	**PACKING AND FORWARDING**
1.	Packing shall be as per relevant clause of product packing specification **-PE:TS: 888:100:A001 (Sea worthy packing)-8.4-Packing of Goods in Wooden crates/cases/Boxes-8.4.2- Cases with Lining-Packing Category IV**
2.	Cardboard containers shall be enclosed in a solid wooden container.
3.	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.
4.	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in contact with water shall be coated

	with suitable grease and wrapped in heavy asphalt or tar impregnated paper.
5.	Crates and packing material used for shipping will become the property of owner.(BIFPCL)
6.	Packaging or shipping units shall be designed within the limitations of the unloading facilities of the receiving ports and the ship will be used. It shall be the bidder's responsibility to investigate these limitations and to provide suitable packaging and shipping to permit transportation to site.
7.	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.
8.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: a. Destination b. Package Number c. Gross and Net Weight d. Dimensions e. Lifting places f. Handling marks and the following delivery marking
9.	Each package or shipping units shall be clearly marked or stenciled on at least two sides as follows. **BANGLADESH-INDIA FRIENDSHIP POWER COMPANY (Pvt) LIMITED** **2X660 MW MAITREE SUPER THERMAL POWER PROJECT** **BANGLADESH** **EPC CONTRACTOR: BHARAT HEAVY ELECTRICALS LIMITED, INDIA"** In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.
10.	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.
11.	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping papers shall clearly indicate in which packages the technical documents are contained.
12.	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.
13.	Wherever necessary besides usual inscriptions the cases shall bear special indication such as

	"Top", "Do not turn over", "Care" , "Keep Dry" etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks)
14.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: a. Upright position b. Sling position and center of Gravity position c. Storage category d. Fragile components (to be marked properly with a clear warning for safe handling)
15.	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.
16.	**The packing slip shall contain the following information: -** Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of equipment/item, BHEL item Code, Gross Weight and Net weight of Supplied items.
17.	Prior to transport from manufacturer's work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.
18.	All necessary painting, corrosion protection & preservation measures shall be taken as specified in painting schedule. Supplier shall consider the coastal environment zone which is defined as "very severe" during final finishing/shipping.
19.	Successful bidder shall furnish the detail packing /shipment box details with information like packing box size, type of packing, weight of each consignment, sequence no. of dispatch, no. of consignment for each deliverable item against each billing break up units/ billable blocks. Without these details the BBU shall not be approved during detail engineering. Also, complete billing break-up with above mentioned details shall be submitted within 10days of LOI.
20.	All items/equipment shall be dispatched in properly packed condition (i.e. no item shall be dispatched in loose condition such that it becomes difficult to store/identify its location at site at a later stage).
21.	Cases which cannot be marked as above shall have metal tags with the necessary markings on them. The metal tags shall be securely attached to the packages with strong steel binding wire. Each piece, Skid, Case or package shipped separately shall be labelled or tagged properly.

18.0 All pages to be duly signed by bidder with seal & date

ANNEXURE-I
PAINTING PROCEDURE

Color/Shade Codes

Surface preperation	Primer Coat		Intermediate Coat		Finish coat			Total DFT µm (min)
	Paint	No of Coats /DFT	Paint	No of Coats	Paint	No of Coats	Shade	
Blast cleaning SA2.5	Zinc Epoxy Primer	1 Total DFT = 80 µm	Epoxy high Solid	1-2 Total DFT= 160 µm	2-Comp Polyurethane	1 Total DFT= 50 µm	As per medium handled	290

SL NO	DESCRIPTION ALONG WITH MEDIUM	BASE	BAND/ RING	LETTERING
1	PIPING- Non-flammable liquids & solids (like ash, slurry application)	Signal brown, RAL 8002	Signal black, RAL 9004	Signal White, RAL 9003
2	PIPING- Water	Signal green, RAL 6032		Signal White, RAL 9003
3	PIPING-AIR	Signal White, RAL 9003		Signal Black, RAL 9004

Date: ***Signature & seal of the Bidder***

ANNEXURE-II

FORM FOR TECHNICAL DEVIATIONS (If any)

SL. NO	SEC / CLAUSE NO.	SPECIFICATION	STATEMENT OF DEVIATIONS/VARIATIONS	REASON FOR DEVIATION	COST OF WITHDRAWAL

Date: ***Signature & seal of the Bidder***

ANNEXURE-III

DATA SHEET (TYPICAL) FOR ELECTRIC ACTUATOR

1) ACTUATOR

A	Make					
b)	Model					
c)	Type					
d)	Torque rating					
F)	Operating time for opening					
	Operating time for closing					
g)	Accessories offered					
a)	Type of stay put					
i)	Actuator torque					
j)	Actuator Protection Class					
k)	Actuator Thrust					
l)	Actuator travel time for 90					
m)	Power supply					
n)	Working current of actuator					
o)	Stall current of actuat					

2) LIMIT SWITCH

a)	Make					
b)	Type					
c)	Quantity					
d)	Contact rating					
e)	Reset type					

NOTE:

Vendor should fill up the "Vendor's Confirmation column" and submit a signed copy of this specification with his offer.

Vendor's Signature & Seal

ANNEXURE-IV

DATA SHEET (TYPICAL) FOR PNEUMATIC ACTUATOR

1) ACTUATOR

a)	Make					
b)	Model					
c)	Type					
d)	Torque rating					
e)	Air consumption					
f)	Operating time for opening					
	Operating time for closing					
g)	Accessories offered					
h)	Type of stay put					
i)	Air Connection					

2) LIMIT SWITCH

a)	Make					
b)	Type					
c)	Quantity					
d)	Contact rating					
f)	Reset type					

Date: ***Signature & seal of the Bidder***

ANNEXURE-V

PLANT & EQUIPMENT IDENTIFICATION

B0.6.3 Plant and equipment identification

The Contractor shall apply a plant identification system showing the name and number of each item of Plant and its respective arrangement drawing number and add any additional items necessary to fully identify the Plant.

All design submissions shall include a detailed labelling list indicating the label text, size of the lettering and fixing details for the approval of the Employer or its representative.

The identification and numbering of equipment, systems, items, etc. of supply, as well as of all documents and drawings shall be in accordance with the VGB guideline RDS-PP (Reference Designation System for Power Plants - KKS system).

There is to be only one approved description for any one item of Plant and this must be used consistently for Plant, electrical and instrumentation designations throughout.

The Contractor shall supply all labels (Plant and Equipment Identification Plates), nameplates, manufacturer's equipment nameplate, instruction and

warning plates necessary for the identification and safe operation of the Plant, and all inscriptions shall be in the English language and Bangla language.

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.

Nameplates for Plant and 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.

Warning plates shall be manufactured from stainless steel or aluminium engraved red lettering on a white background and sited in the position where they afford maximum safety of personnel.

All equipment within panels and desks shall be individually identified by satin or mat finish stainless steel or aluminium labels.

Each circuit breaker panel, electrical control panel, relay panel, etc. shall have a circuit designation label on the front as well as on the rear panels engraved with black lettering in accordance with the circuit designation system. Circuit designations must be precise and convey complete information. There should be no doubt whatsoever for the operation as to which area of the Plant a particular feeder is supplying with power. Labels such as interconnector 1 or feeder 2 are not acceptable. Corridor type panels shall in addition have circuit designation labels within the panels.

Pipework systems shall be identified with a colour identification systems in conformity with the colours according to the Employer's specification, with colours at the nameplates and, if necessary by colour bands and with KKS numbering and plain language. The direction of flow shall be shown.

Each valve/instrument shall be fitted with a stainless steel or aluminium nameplate indicating the valve/instrument service and reference number in accordance with the approved equipment coding system.

Where possible valve nameplates shall be circular and shall be fitted under the handwheel captive nut. They have to be of such a diameter that there is no danger for persons operating the valve or that they do not prevent lock-off of this valve; on check valves and small valves the Contractor may provide rectangular nameplates fitted to brackets on the valve or attached to a wall or steelwork in a convenient position adjacent to the valve.

B0.6.4 Marking and labelling

Each crate or package is to contain a packing list in a waterproof envelope. All items of material are to be clearly marked for easy identification against the packing list.

All cases, packages, etc. are to be clearly marked on the outside to indicate the total weight, where the weight is bearing and the correct position of the slings and are to bear an identification mark relating them to the appropriate shipping documents.

All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.

B0.6.5 Corrosion protection, coating and galvanizing

This specification shall be used for the corrosion protection of steel structures, components, pipings and equipment in general which are installed in confined areas (indoors) or outdoors.

Surface preparation, as well as protective coatings and coating systems are based on this specification in order to assure that structural parts of different suppliers will get a corrosion protection of similar and high quality.

Coating material shall only be supplied by manufacturers with international experience and their products can be obtained internationally.

Regarding maintenance work (storage), application and supervision of coating work, choice of coating suppliers should be minimized. At any rate, similar parts of structures/components (such as structural steel, containers, piping, etc.) shall only be coated with products of one individual manufacturer.

The materials and equipment used, the methods of application and the quality of work shall at all times be subject to the inspection and approval of the Employer or his Representative.

To mitigate crevice corrosion, the designs and construction of structures and equipment shall ensure that no collection of water occurs in crevices which could lead to crevice corrosion.

It is the responsibility of the Contractor to ensure that, for all supplied equipment (including that from sub suppliers):

- The protection system is perfectly suitable for the Site conditions and for the specific purpose.
- The shop paints provide a sufficient protection during transport, storage and erection.

- The shop paints are suitable for handling and erection conditions (slinging, Site welding works etc.) and are compatible with the Site finishing coats
- All necessary precautions are taken in order to prevent damage to paints during storage, handling, welding.
- The necessary repairs are carefully executed as soon as possible.
- The colour RAL number of the finishing coat has been approved by the Employer, including identification code for piping.
- Standardised equipment will be painted according to the manufacturer's standard.
- All corrosion protection and coating on site shall be done in a workshop specifically for the purpose of the application of corrosion protection and coating.

Codes and standards
Applicable standards are:

- Product data of coating manufacturer
- DIN 2403 Indication of pipe-lines according to flowing material
- DIN 4762 Surface roughness
- ISO 8503 Surface roughness
- DIN 8201 Part 1-9 tight blasting agents
- DIN 50976 Corrosion protection, hot dip batch galvanizing of single parts, requirements and testing
- DIN 55928 Part 1-9 corrosion protection of structural steel work through protective coatings and topcoats
- ISO 8501 Preparation of steel substrates before application of paints and associated products
- ISO 12944 Paints and varnishes – corrosion protection of steel structures by protective paint systems
- RAL Colour card
- ISO 8501-1 Preparation of steel substrates before application of paints and related products
- SSPC Vol. 1 and 2 Steel structure painting council

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

Sharp edges have to be rounded off.

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

ANNEXURE- VI

TECHNICAL SPECIFICATION FOR

LT ELECTRIC ACTUATORS- OPEN CLOSE DUTY

(Maitree project)

1.0.0 SPECIFICATION FOR LT ELECTRIC ACTUATORS- OPEN CLOSE DUTY

1.1.0 Design conditions

All motor actuators must be designed to meet IP 55 enclosure according IEC60034-5 and rated for design ambient conditions for Electrical Systems prevailing at project site. All motor actuators shall be chosen for non-hazardous SAFE area application.

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

All electric motor actuators shall be furnished in accordance with this general specification and the accompanying driven equipment specification. All the electrical actuators shall be INTEGRAL STARTER type only.

All electrical equipments shall conform to the latest international standards only.

For open-close service, the actuator shall be rated for three successive open-close Operation of the valve.

2.0.0 Construction

The actuator shall essentially comprise the drive motor, control circuit components, local/remote selection, open/close push buttons, torque/ limit switches, gear train, clutch, hand wheel, in-built thermostat for over load protection, space heater and internal wiring.

The actuator enclosure shall be totally enclosed, dust tight, weather-proof suitable for outdoor use without necessity of any canopy. Degree of protection of enclosure for motor actuator shall be IP-55 as per IEC 60529.

All electrical equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

The actuator shall be designed for mounting in any position without any lubricant leakage or operating difficulty.

The drive motor shall be three phase, squirrel cage, induction machine with minimum class B insulation and IP-55 enclosure, designed for high torque and reversing service. Canopy shall be provided for outdoor service.

Self cooling at respective ambient temperature is mandatory. Fan cooling is not accepted.
The motor shall be designed for full voltage direct on-line start, with starting current limited to 6 times full-load current.
Earthing terminals shall be provided on either side of the motor. All terminals must be suitable for 2.5 sq.mm wires.

In addition, all actuators for valves are to be fitted with 9 Pin socket and plug, 3 Nos of well-established make to IEC 60309 or equivalent for the power cable connection. For the control cable connection separate socket and plug shall be provided.

2.0.1 Limit Switches

Each actuator shall be provided with following limit switches: -
2 position limit switches, one for each direction of travel, each adjustable at any position from fully open to fully closed positions of the valve.

2.0.2 Hand Wheel

Each actuator shall be provided with a hand wheel for emergency manual operation. The hand wheel shall declutch automatically when the motor is energized. The maximum hand wheel force of 500N must not be exceeded. For limiting hand wheel forces, for operation purposes it may be necessary to install appropriate gears.

2.0.4 Control from Remote DCS

The following controls can be provided as a part of the Electric actuated valves- Open Close duty.
1. Commands for Open, Close
2. Limit switch Feedbacks for Open, Close at any position within 0-100%, OTS, CTS.

2.1.0 VENDOR LIST

Makes of electric actuators shall be strictly as per Contract Quality Requirements (CQR).
- Auma Germany/Bangalore
- Limitorque USA/Faridabad
- Rotorq UK
- Rotork Chennai/Bangalore
- Dhermo Germany
- As per BHEL Trichy approved vendor list also to be considered.

ANNEXURE-VII

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	SPECIFICATION NO. **PE-TS-888-100-A001**
	TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	VOLUME II B
		SECTION D
		REV. NO. 0 DATE 10/08/2010
		SHEET 1 OF 52

1.0 Purpose

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

2.0 **SCOPE**

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

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

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

3.0 Application

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

4.0 Definitions

"BHEL" : Main EPC vendor

"OWNER" : Customer for a particular export project.

"VENDOR" : Company(ies)/VENDOR(s) to whom the BHEL has placed Purchase Order for GOODS/ items/system/package.

"GOODS": means all or part of the articles, material, equipment supplies including technical documentation, as described in the Purchase Order, to be supplied by VENDOR.

"PACKER": Packaging Company to whom VENDOR intends to sub-contract the packing in case they do not have own packing capability/facilities .

"FREIGHT FORWARDER" : Means the Company responsible for performing freight forwarding activities.

5. General Information

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.

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.

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

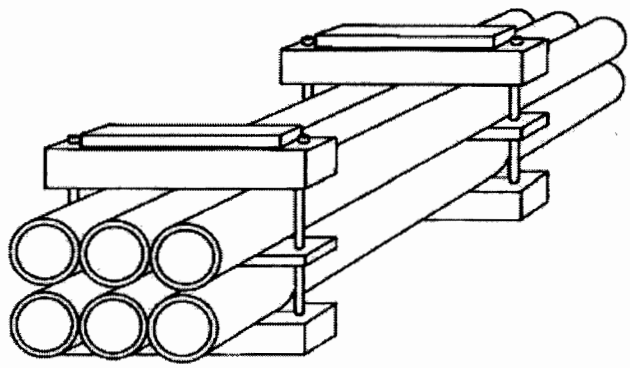
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

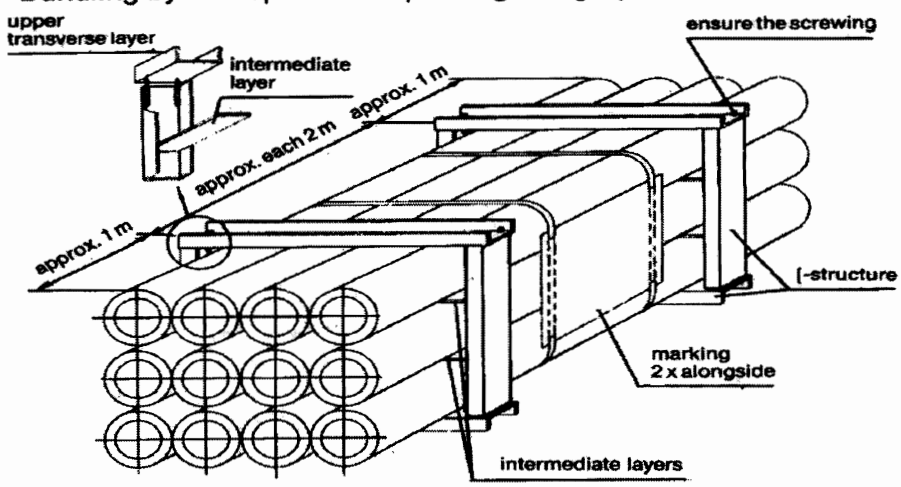
8.2.1 Type of Equipment

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

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)

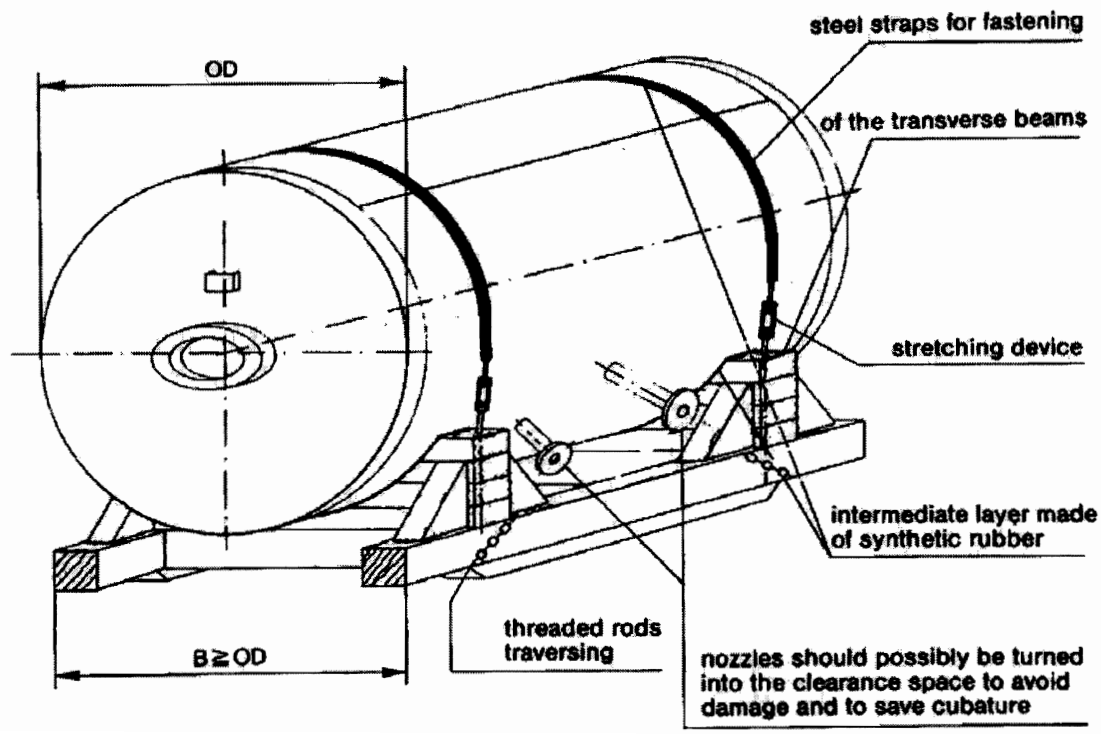
8.3.1 Type of Equipment

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



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

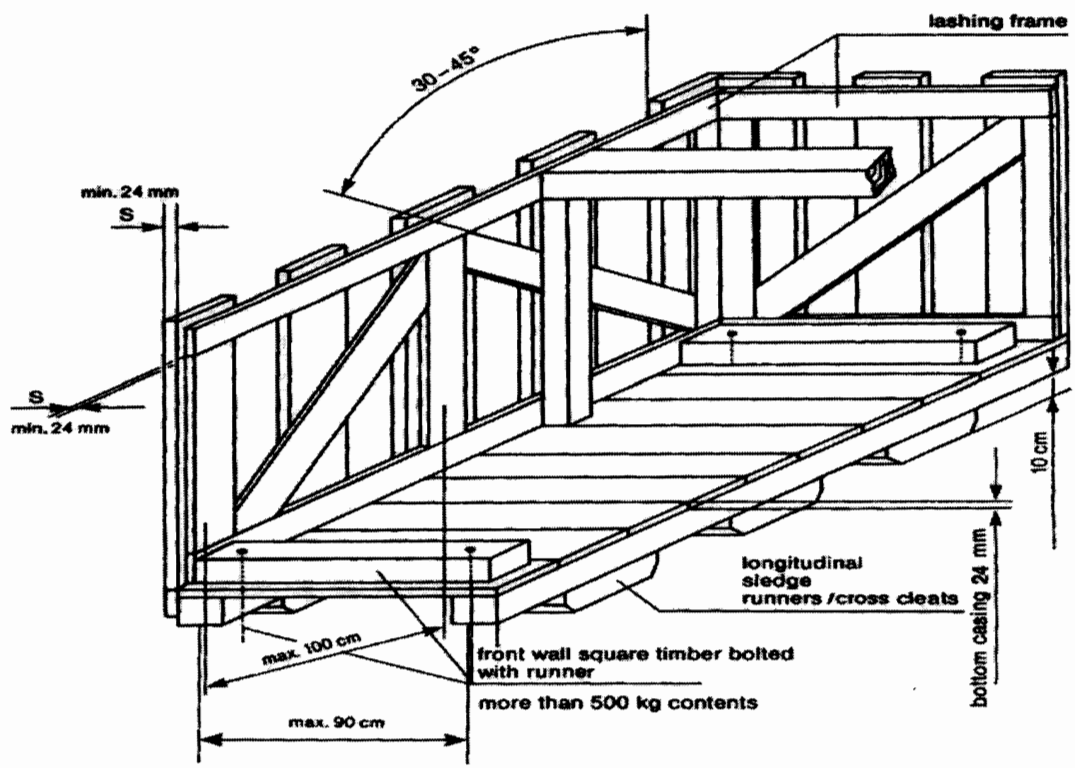
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

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



8.4.2 Cases with Lining – Packing Category IV

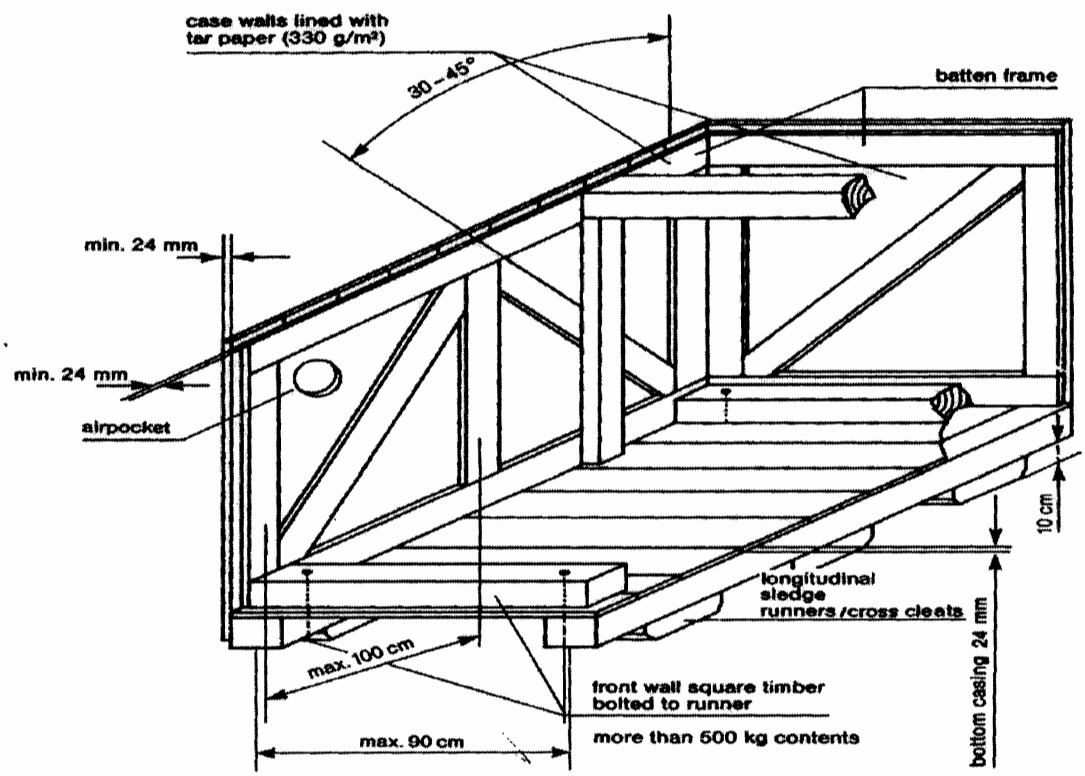
8.4.2.1 Type of Equipment

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

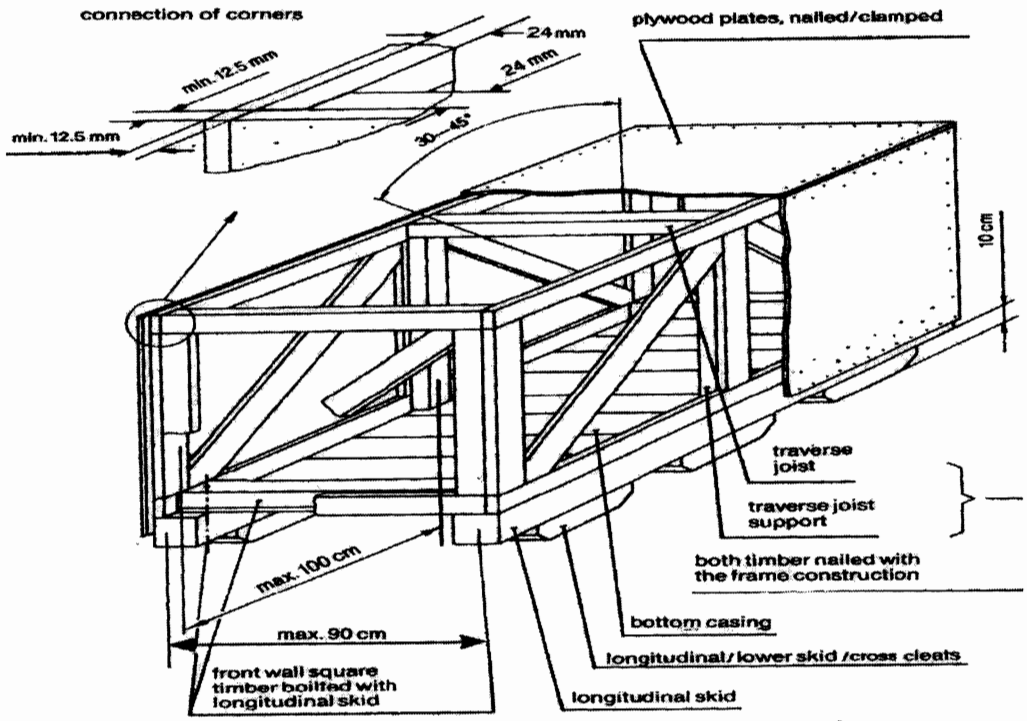
The same type of construction as article 8.4.1.2, but with all sides completely boarded without space between the boards. Sides to be provided with waterproof lining; fabric-reinforced waterproof tar paper or polyethylene-foils resistant to ultraviolet rays can be used. Polyethylene-foil shall be fixed 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



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

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

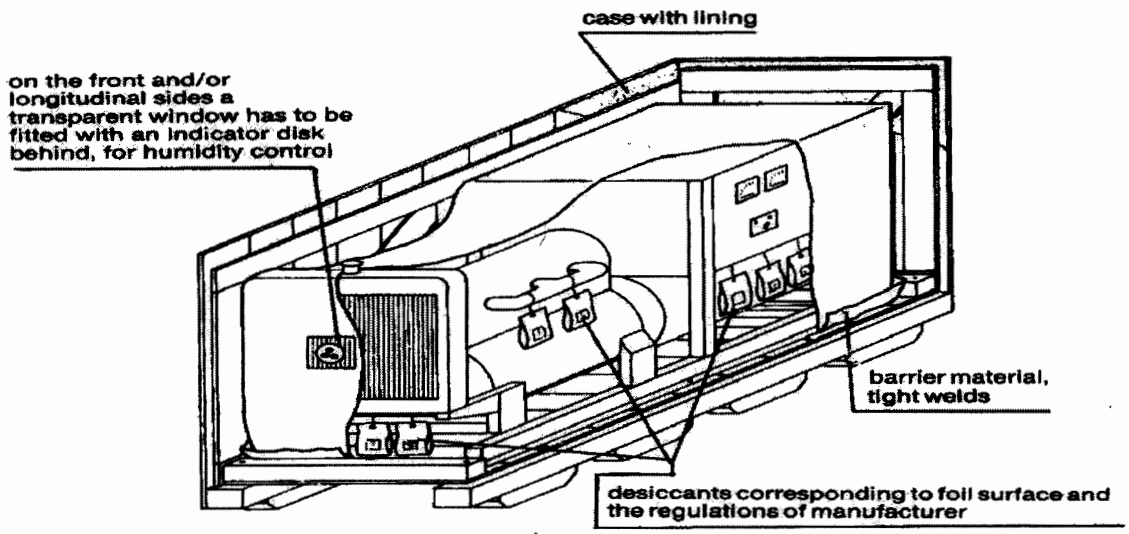
8.4.5.2 Type of Construction

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).

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.

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 <u>Detailed specification for Wooden Crates/Boxes/Cases and other packing materials</u>

9.1 Technical specification for wood

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

9.2 Chemical Treatment of Wood:

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

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:

9.3.1 PACKING OF EQUIPMENTS

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

9.3.1.1 Bottom Frame

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

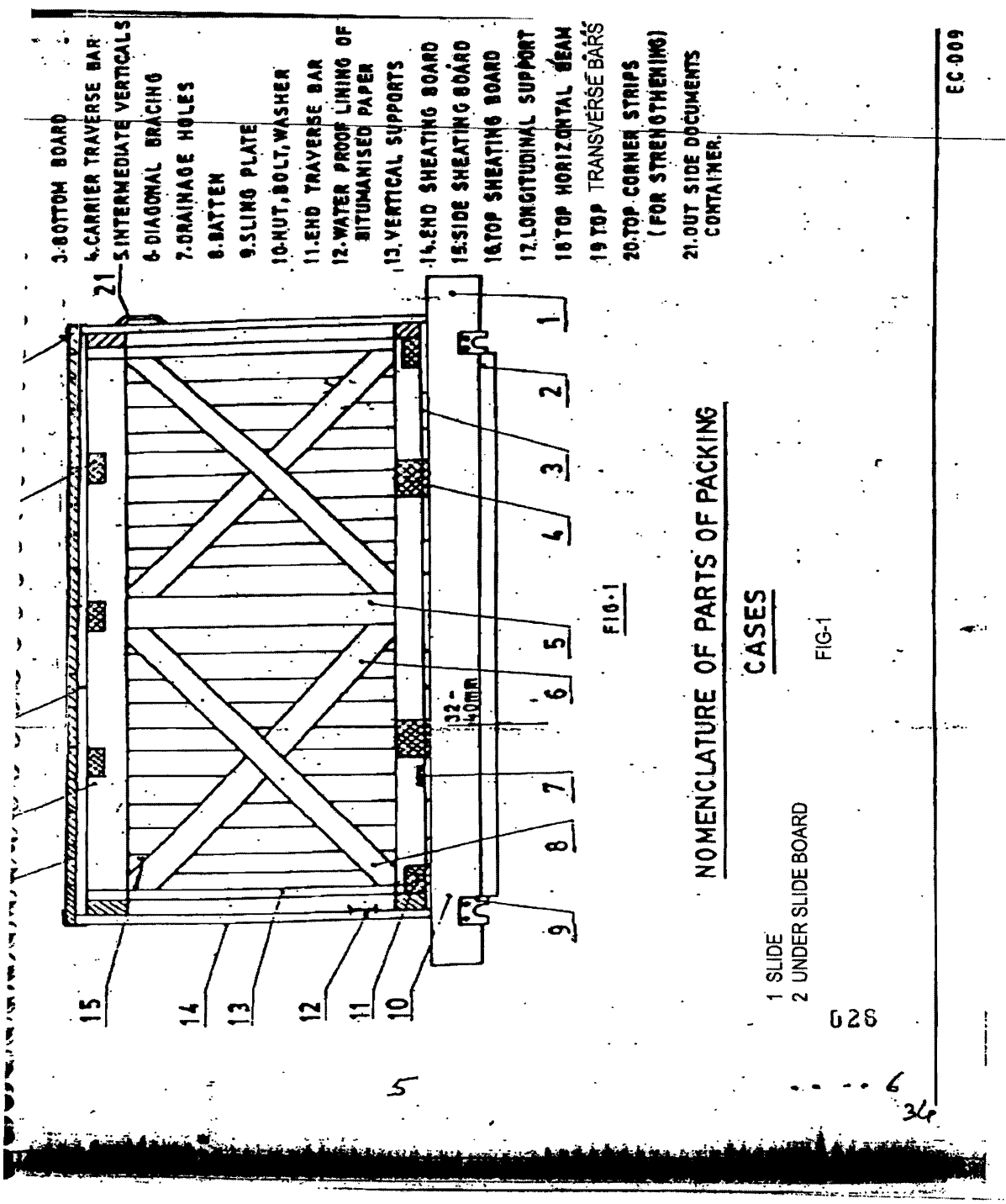
shall be filled with rubberized coir with distance between consecutive supports less than 500 mm (ref fig15). For other equipment suitable support from sides of the casing shall be provided.

- 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.


3.BOTTOM BOARD
4.CARRIER TRAVERSE BAR
5.INTERMEDIATE VERTICALS
6.DIAGONAL BRACING
7.DRAINAGE HOLES
8.BATTEN
9.SLING PLATE
10.NUT,BOLT,WASHER
11.END TRAVERSE BAR
12.WATER PROOF LINING OF BITUMANISED PAPER
13.VERTICAL SUPPORTS
14.END SHEATING BOARD
15.SIDE SHEATING BOARD
16.TOP SHEATING BOARD
17.LONGITUDINAL SUPPORT
18.TOP HORIZONTAL BEAM
19.TOP TRANSVERSE BARS
20.TOP CORNER STRIPS (FOR STRENGTHENING)
21.OUT SIDE DOCUMENTS CONTAINER.
EC-009
F10-1
NOMENCLATURE OF PARTS OF PACKING
CASES
FIG-1
1 SLIDE
2 UNDER SLIDE BOARD
132-140mm

BOTTOM FRAME ARRANGEMENTS

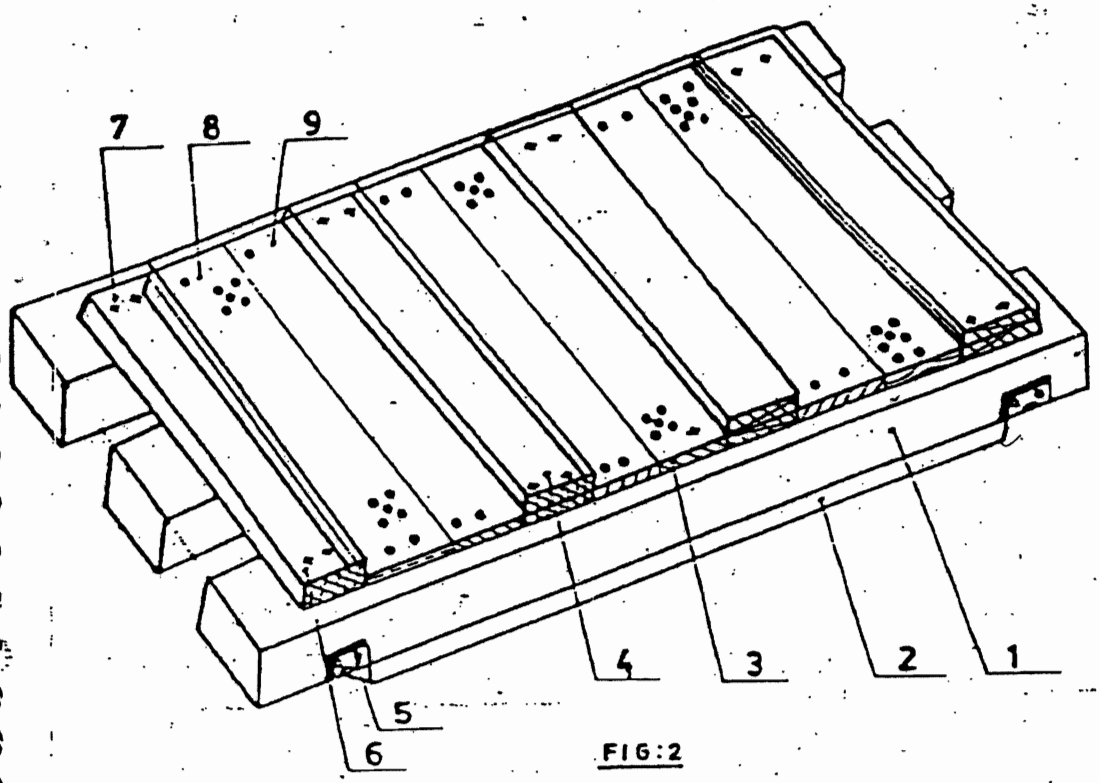


FIG:2

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

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

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TOP FRAME ARRANGEMENT

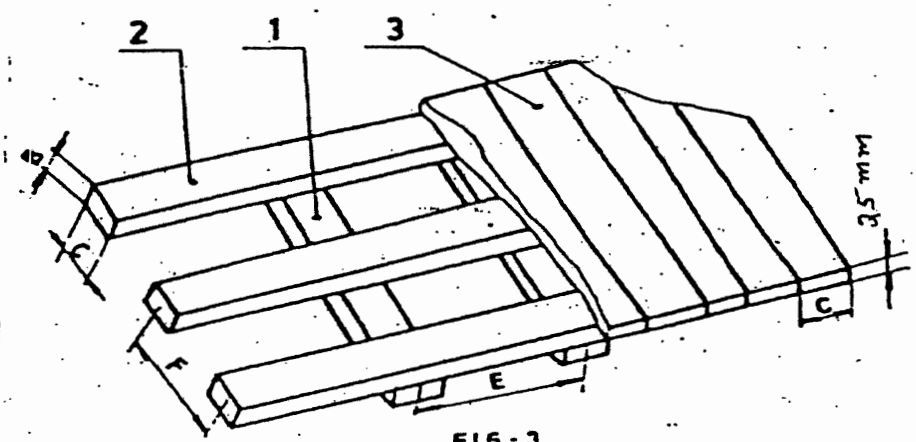
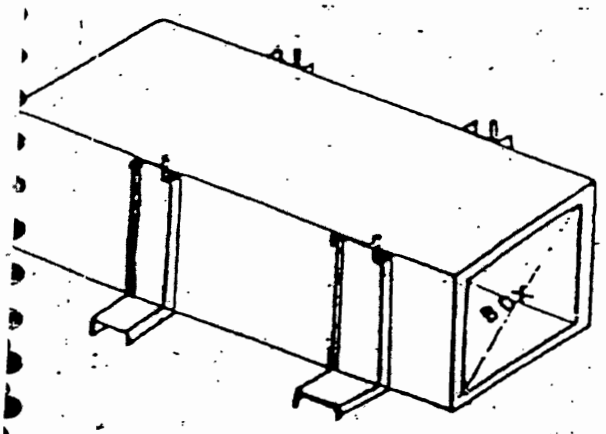


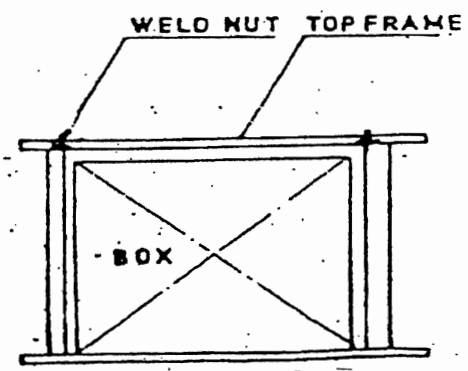
FIG-3

F : 700 t 1000 mm
E : 500 t 900 mm
: 30×100 mm.

1 - Treverse Bers
2 - Horizontal Boans
3 - Top Board

ARRANGEMENT OF C-CLAMPS AROUND CASES





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ARRANGEMENT OF DIAGONAL BRACING AND HORIZONTAL SUPPORT

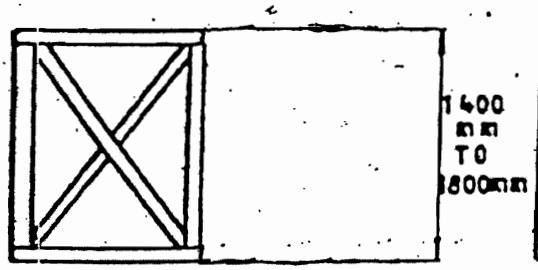


FIG:6

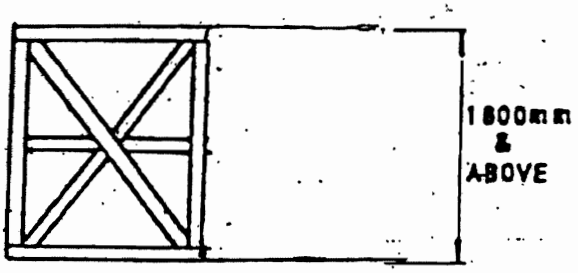


FIG:8

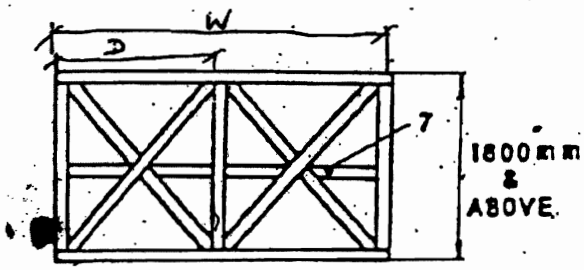


FIG:9

7- Middle Horizontal Support

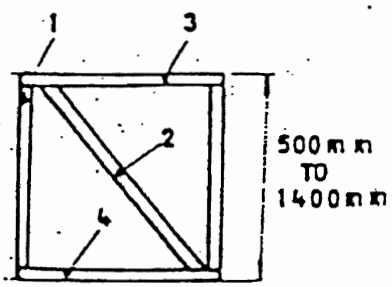


FIG:5

1- Vertical Support

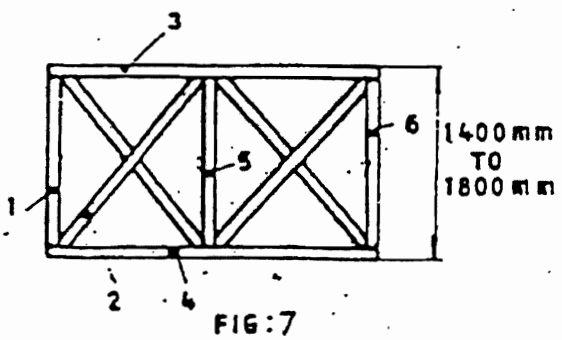
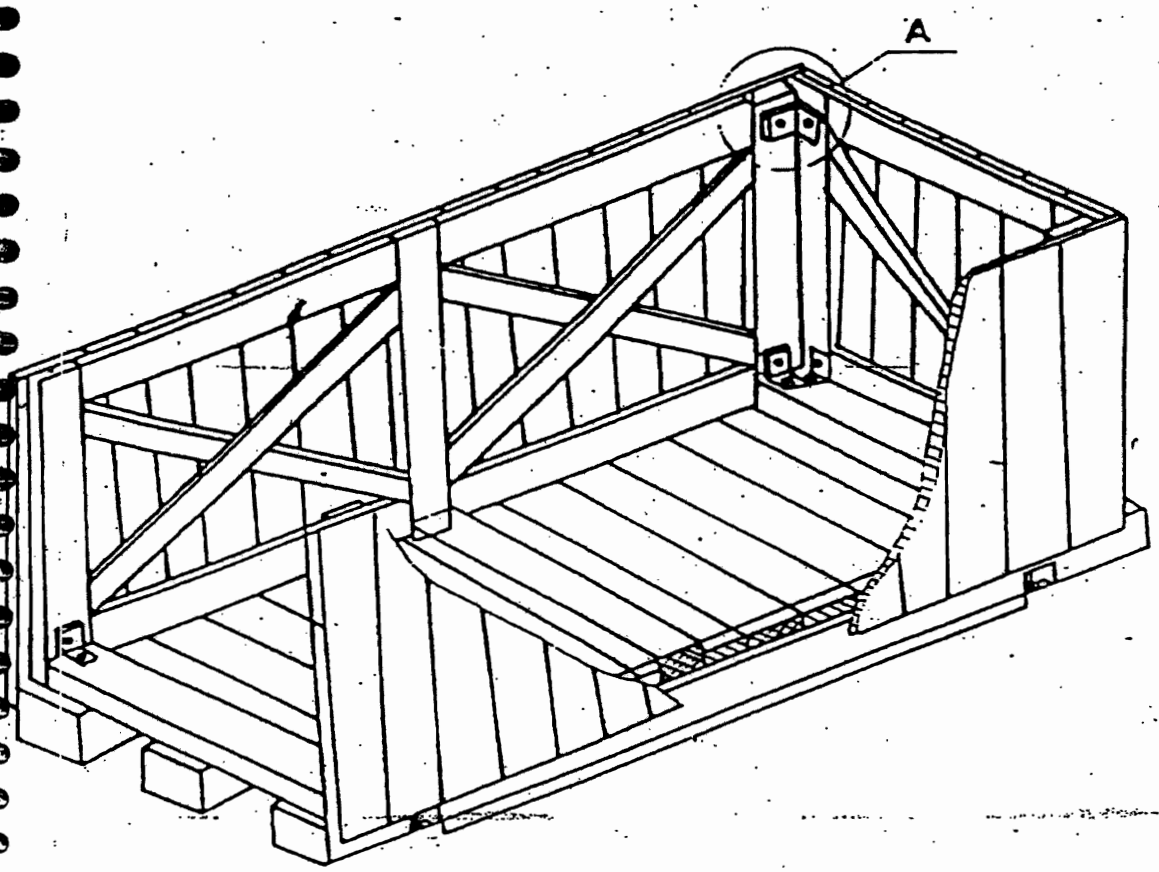
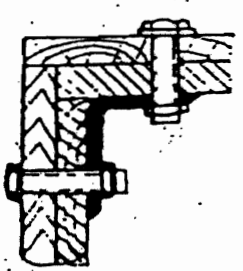


FIG:7

1, 5, 6 - Vertical Support

ARRANGEMENT OF PACKING CASE





DETAIL-A

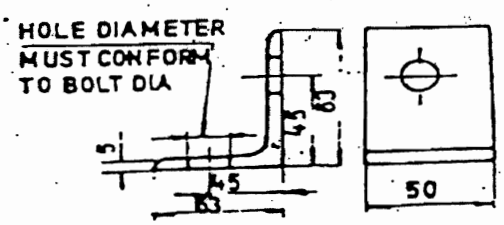


FIG:10

ARRANGEMENT OF SLING PLATE ON CASES

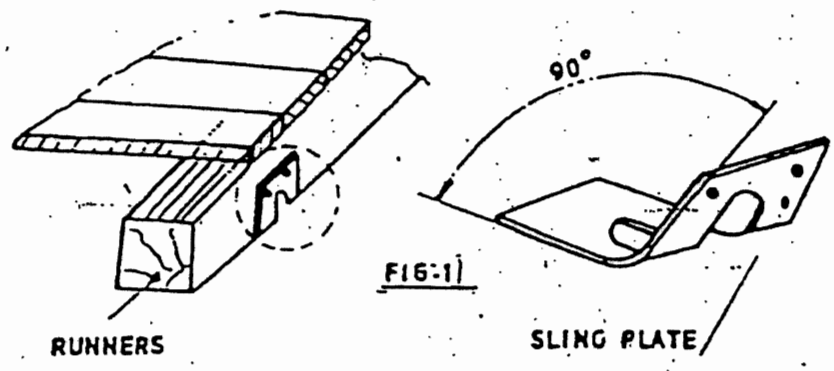


FIG:1

TABLE-1

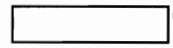
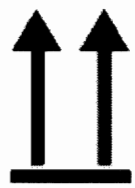
LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c						
500	50 X 100	50 X 100	50 X 100	50 X 100	75 X 100	75 X 100	100 X 100
800	50 X 100	50 X 100	75 X 100	75 X 100	75 X 100	75 X 100	100 X 100
1000	75 X 100	75 X 100	75 X 100	100 X 100	100 X 100	100 X 110	100 X 150
1500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

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 X 100	30 X 100	30 X 100	30 X 130	30 X 130	30 X 130	30 X 130
	1201 to 1600	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130
	1601 to 2000	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130
	2001 to 3000	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	30 X 130	40 X 150
	3001 to 4000	40 X 150	40 X 150	40 X 150	40 X 150	40 X 150	40 X 150	40 X 150

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.

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.

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

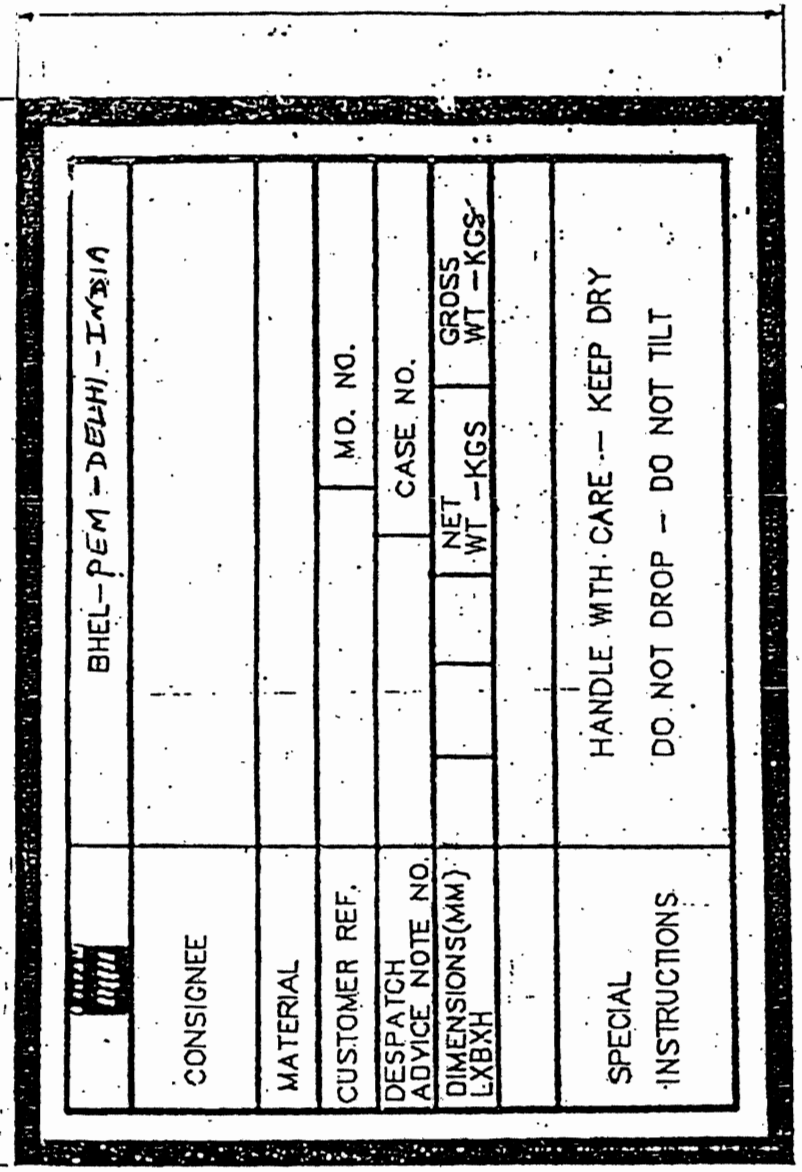
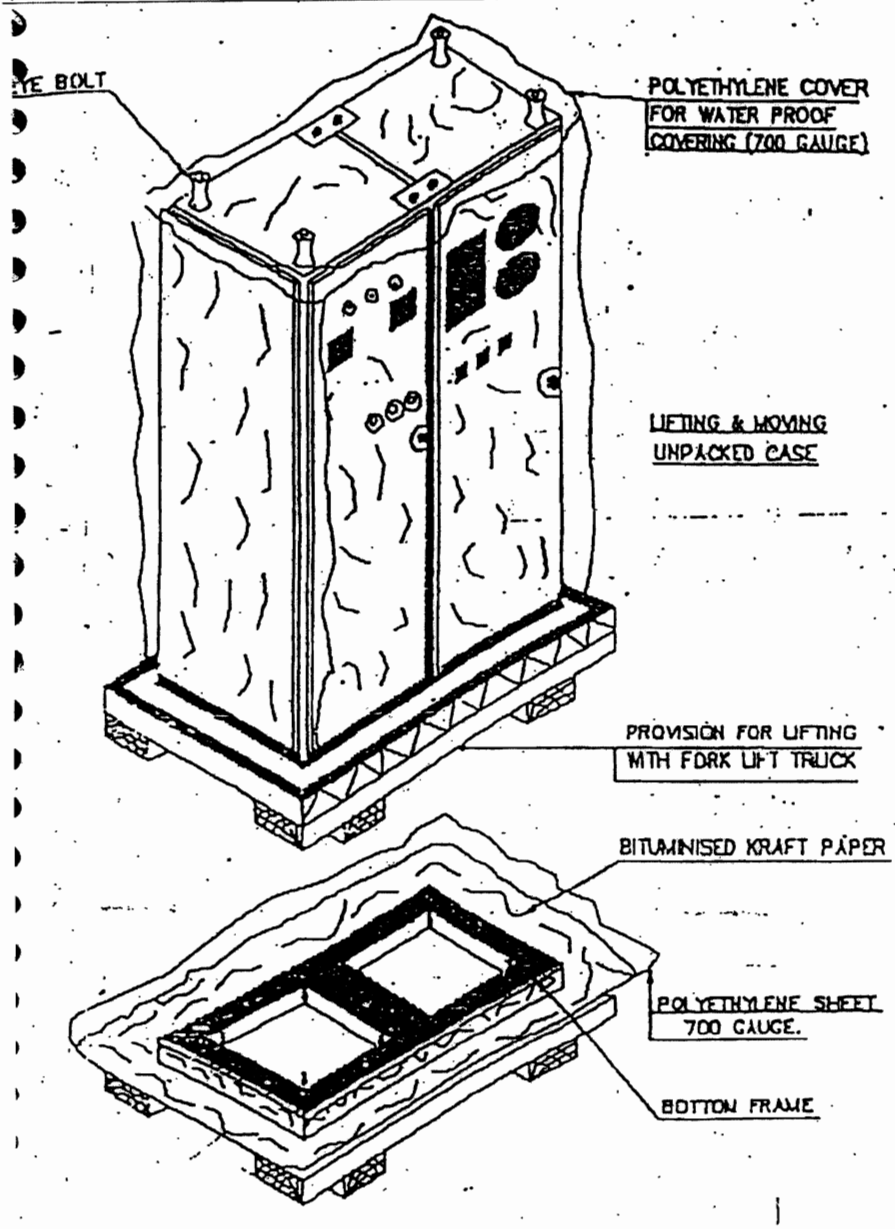


FIG-13: MARKING PLATE


EYE BOLT
POLYETHYLENE COVER FOR WATER PROOF COVERING (700 GAUGE)
LIFTING & MOVING UNPACKED CASE
PROVISION FOR LIFTING WITH FORK LIFT TRUCK
BITUMINISED KRAFT PAPER
POLYETHYLENE SHEET 700 GAUGE.
BOTTON FRAME

FIGURE–14

Sht 16 of 17

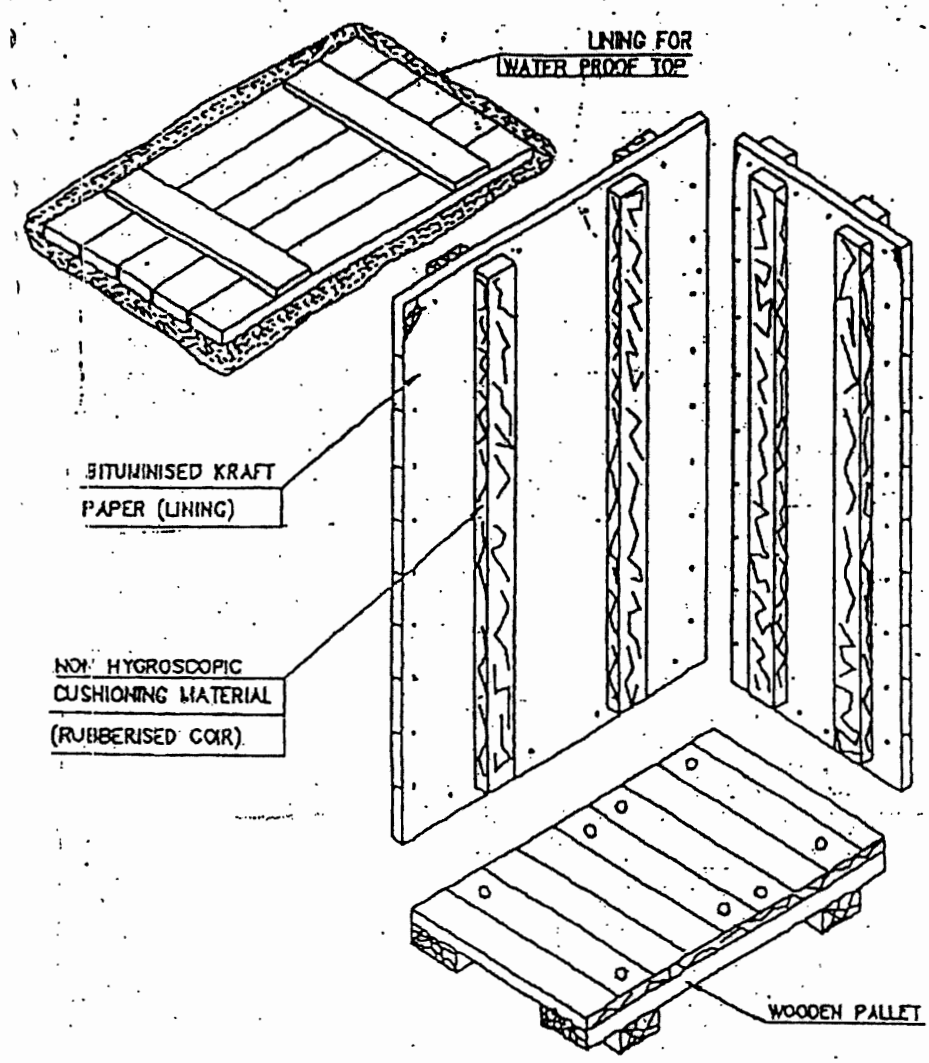


FIGURE-15

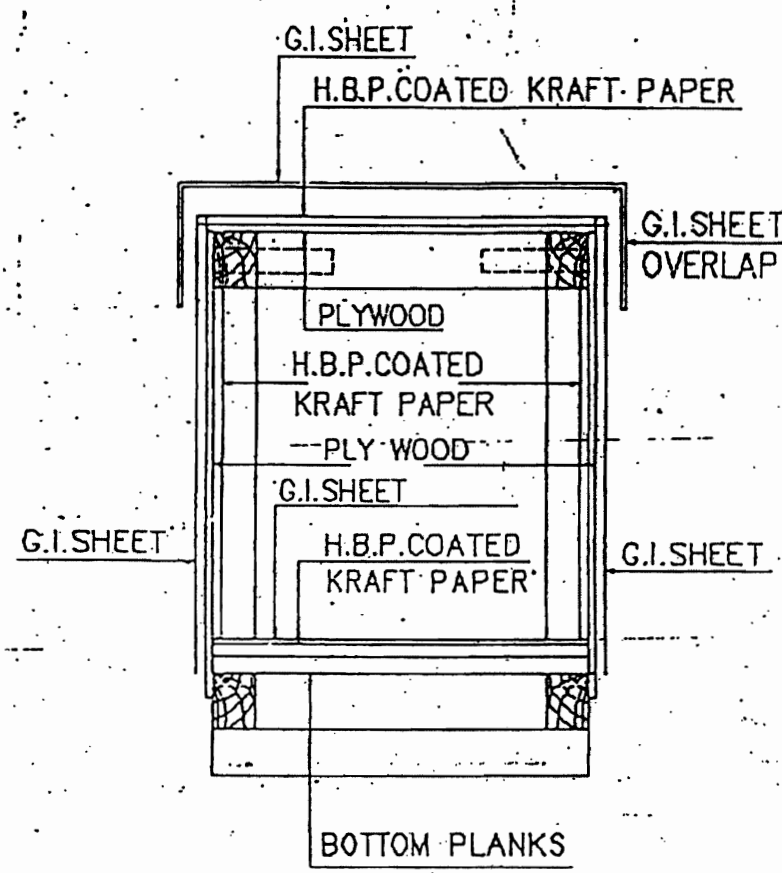


FIG-16 : CLOSED PACKING CASE WITH G.I.SHEET SHOWING LAYERS OF PACKING MATERIALS.

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.

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.

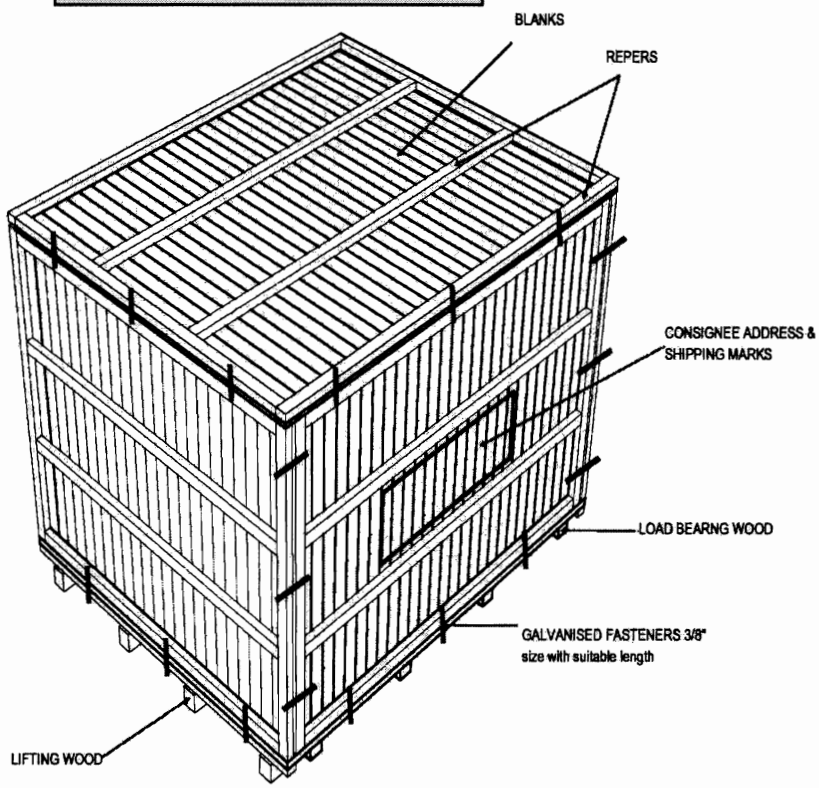
10.3.1 Packing details:

- 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.

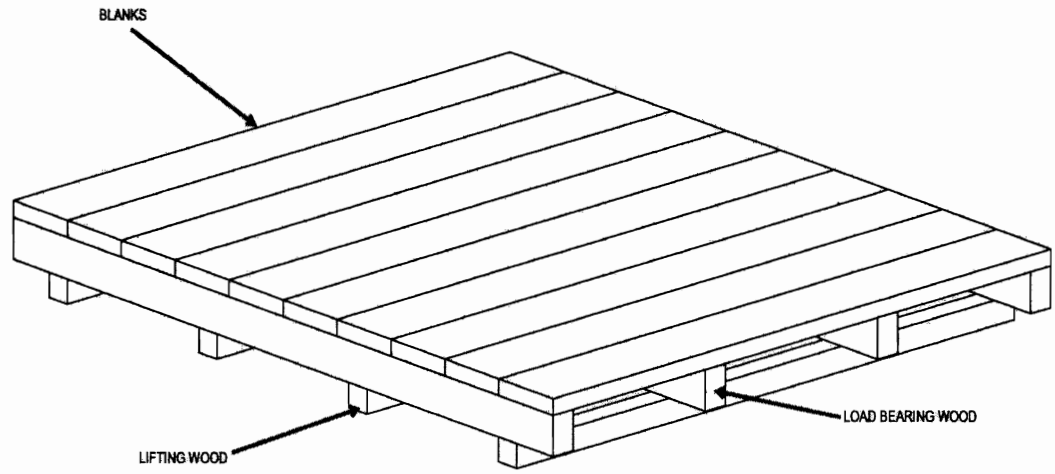
- Thermocol packing shall be made for glass items like Ball vessel sight glass, Vpiece
- sight glass & pressure gauge.
- Silica gel desiccants shall be kept inside of each case to absorb the moisture.
- A Packing list covered in a polythene envelope shall be fixed inside and outside of each packing case.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

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

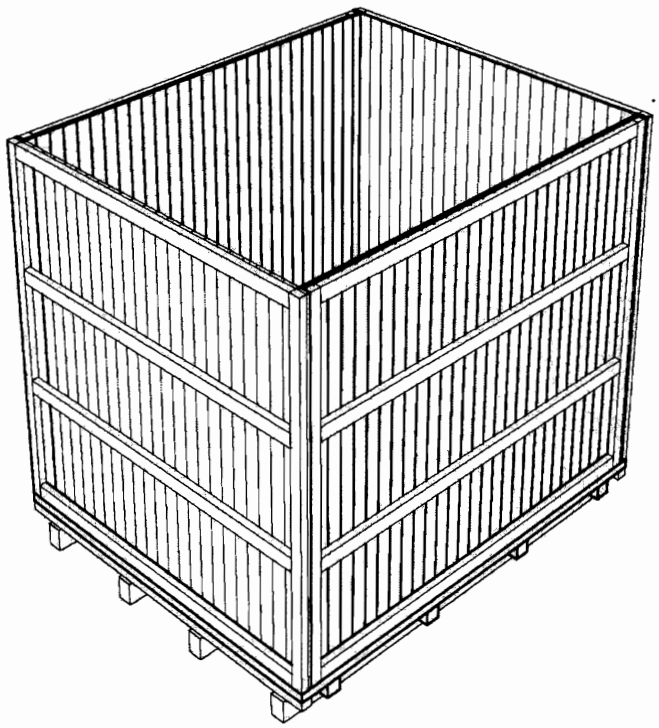
This Type of case to be used for following items:
1. BALL SEPERATOR
2. BALL COLECTOR SKID

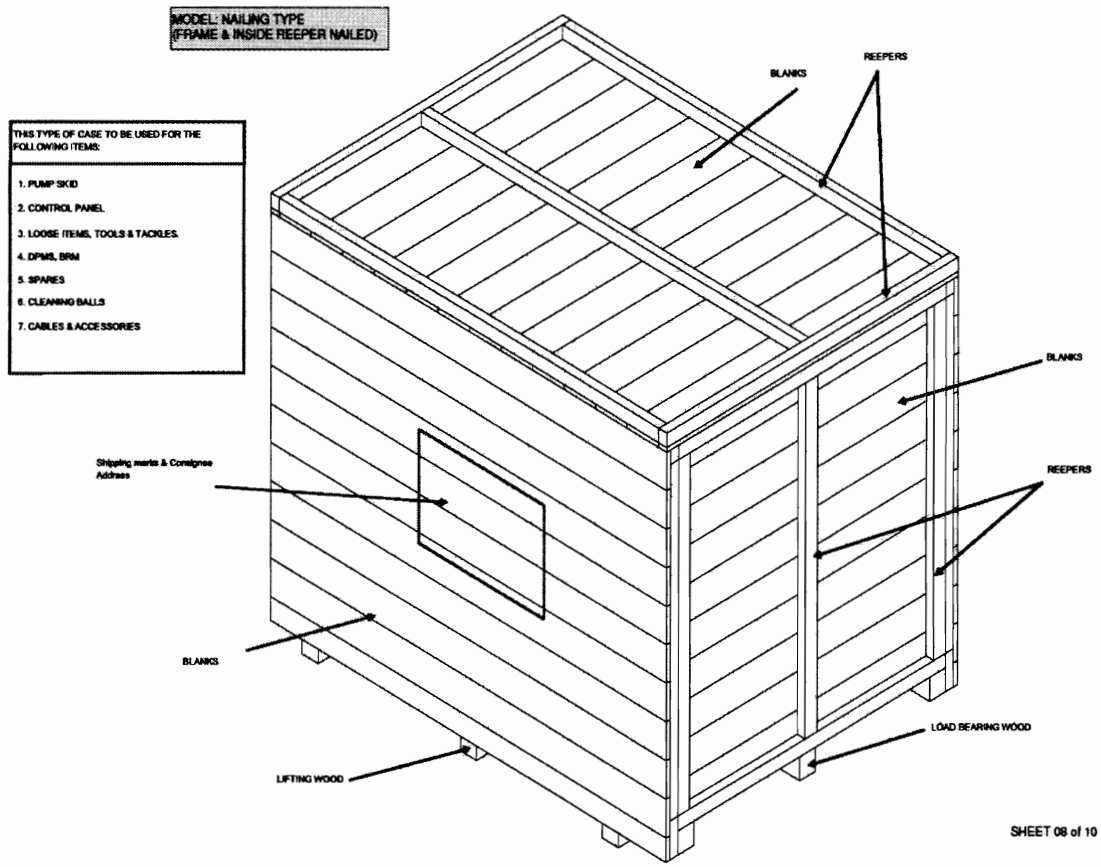


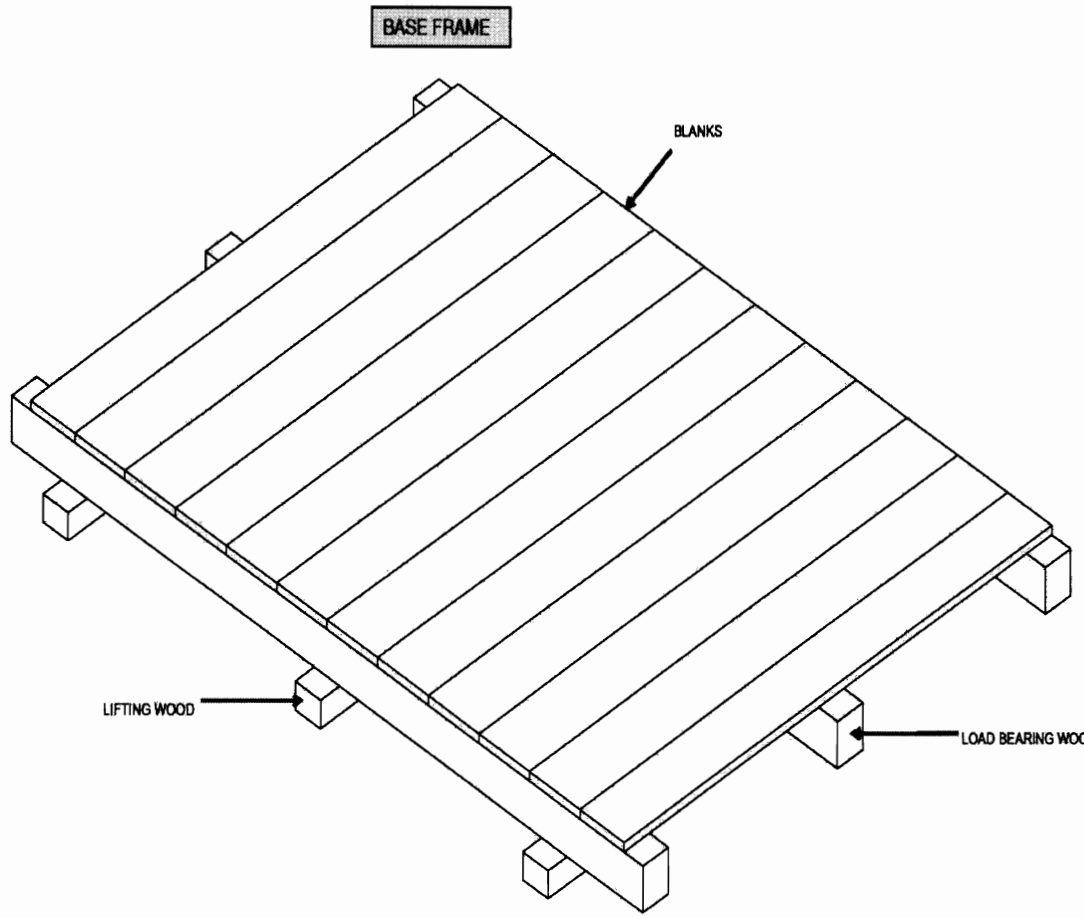
BASE FRAME



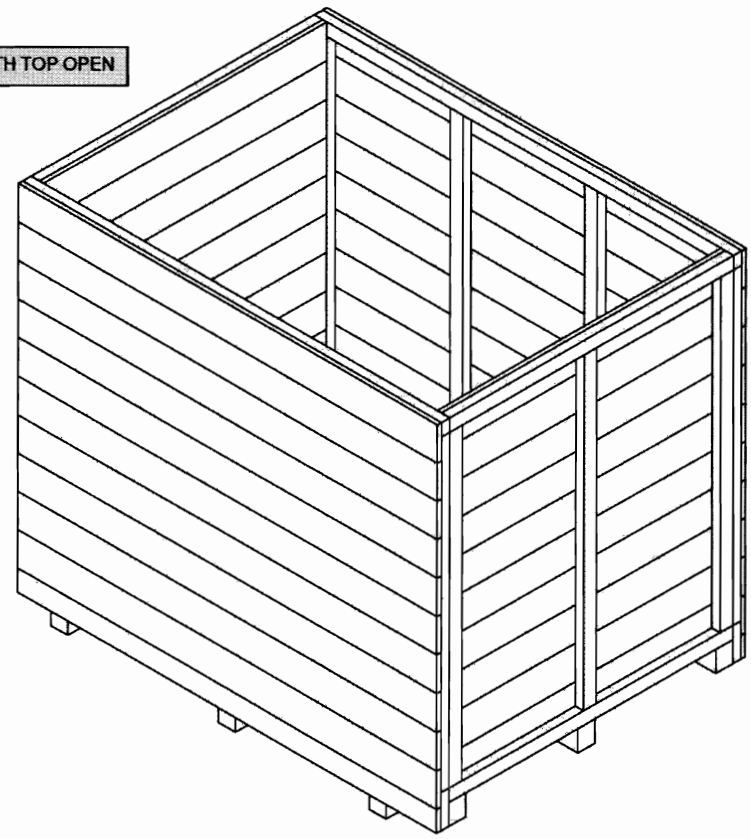
MODEL: FASTNERS TYPE - WITHOUT TOP




MODEL: NAILING TYPE
(FRAME & INSIDE REEPER NAILED)
THIS TYPE OF CASE TO BE USED FOR THE FOLLOWING ITEMS:
1. PUMP SKID
2. CONTROL PANEL
3. LOOSE ITEMS, TOOLS & TACKLES.
4. DPMS, BRM
5. SPARES
6. CLEANING BALLS
7. CABLES & ACCESSORIES
BLANKS
REEPERS
BLANKS
REEPERS
Shipping marks & Consignee Address
BLANKS
LOAD BEARING WOOD
LIFTING WOOD
SHEET 08 of 10


BASE FRAME
BLANKS
LIFTING WOOD
LOAD BEARING WOOD

NAILING TYPE MODEL WITH TOP OPEN



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.

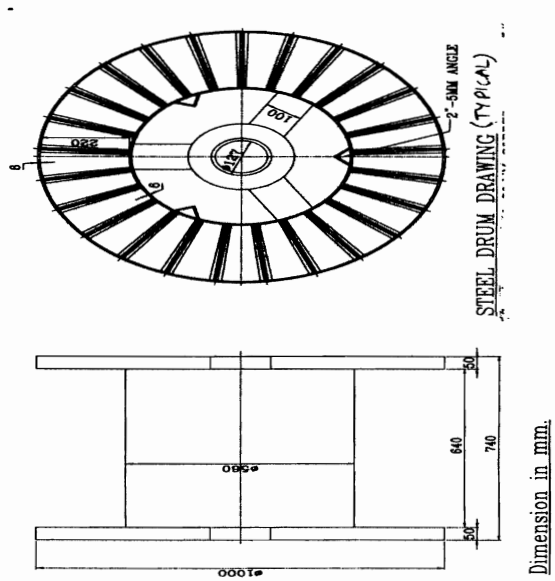
11.0 PACKING OF ELECTRICAL ITEMS

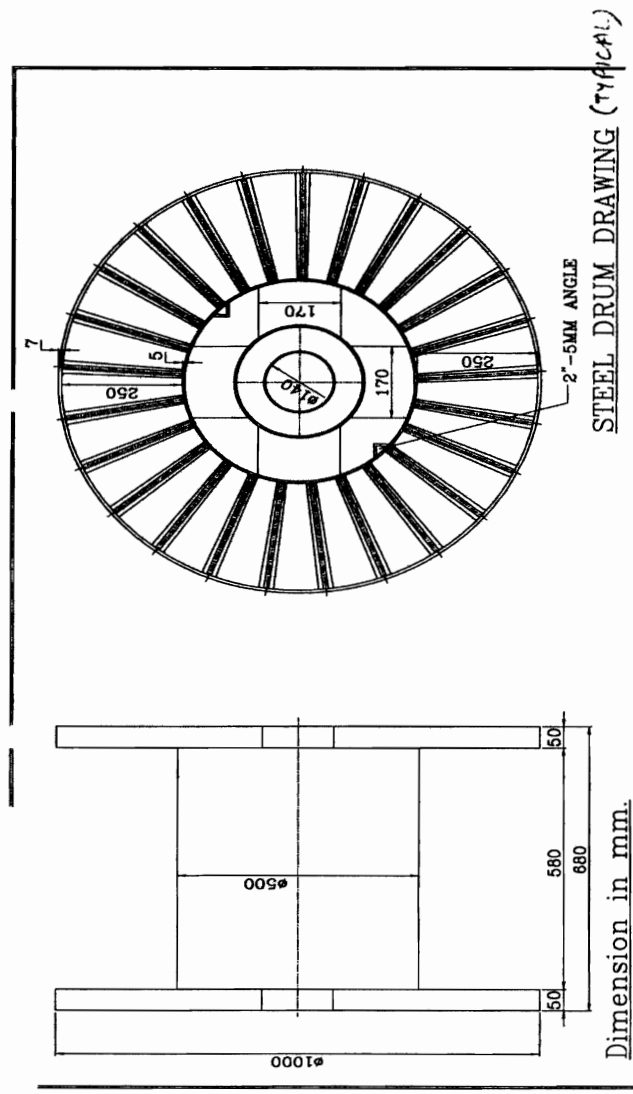
11.1 CABLES

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).


2"-5MM ANGLE
STEEL DRUM DRAWING (TYPICAL)
50
640
740
50
Dimension in mm.



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.

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

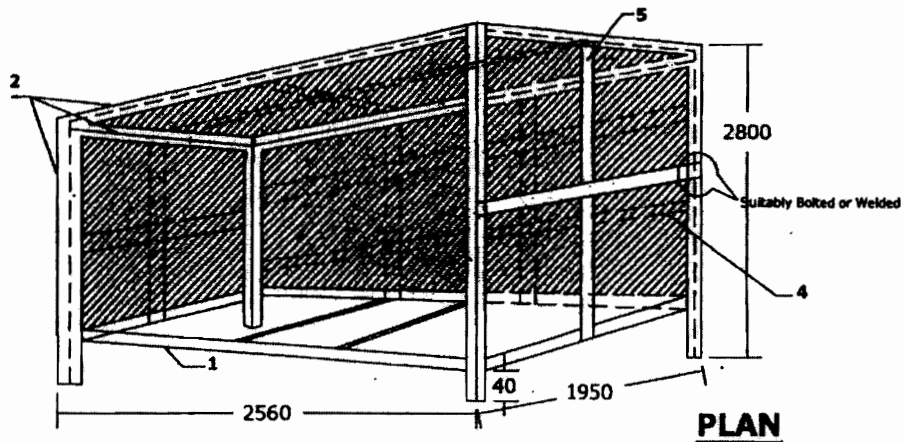
8) One copy of packing slip wrapped in polythylene bag covered with suitable aluminium .packing slip holder to be nailed on the external surface of the box. One more copy 9f the packing Slip wrapped in polythylene bag to be kept inside the box at the prominent place.

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.

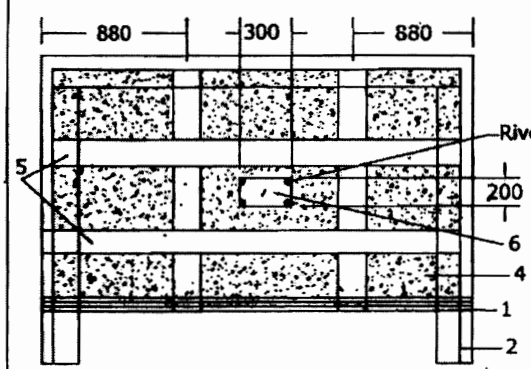
10) Each item as mentioned in BOQ shall be packed & supplied as a set comprising of required numbers of associated fasteners & hardware etc

	TITLE	SPECIFICATION NO. **PE-TS-888-100-A001**
	TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	VOLUME II B
		SECTION D
		REV. NO. 0 DATE 10/08/2010
		SHEET 43 OF 52

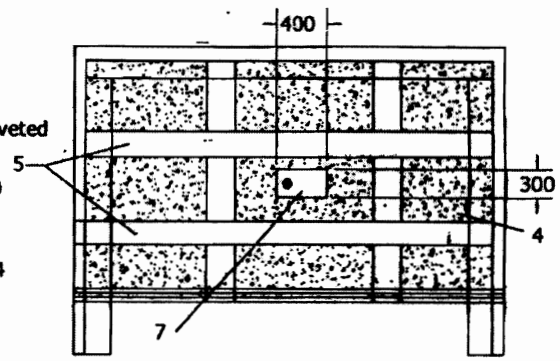
STEEL PACKING (TYPICAL DETAILS)



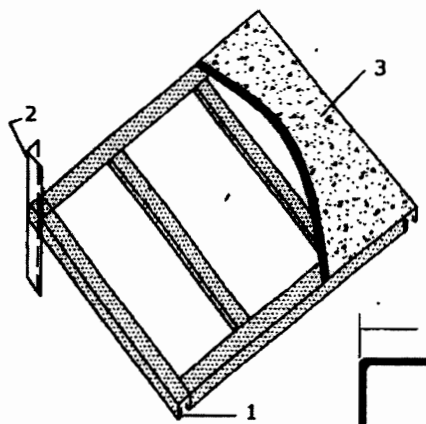
PLAN



FRONT SIDE OF BOX



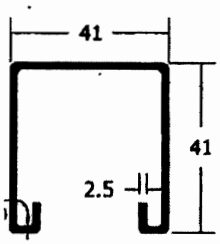
BACK SIDE OF BOX



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 Alluminium Plate for Marking.
7. Hinged Inspection Window.



DETAILS OF "C" CHANNEL

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,

a) Construction of packing case for LIGHTING DIATRIBUTION BOARDS, LIGHTING PANELS, TRANSFORMER . shall be EITHER as per FIGURE 1,2,3,5,6,7,8,9,10,11 OR FIGURE 14,15,16.
b) Each Panel/Transformer shall be individually covered with double polythene sheet of thickness 175 microns minimum.
c) 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 .

d) 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.
e) Silica get packed in cotton bags shall be placed at different positions inside the packing.
f) Packing case shall be finally covered with GI sheet of thickness 0.4mm minimum.

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

a) Construction of packing case for THE ABOVE MATERIAL shall be as per FIGURE 1to11.
b) Items placed inside the case shall be covered with double polythene sheet of thickness 175 microns minimum.
c) 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.
d) 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:

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.

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

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.

PACKING PROCEDURE FOR CONDUIT PIPE

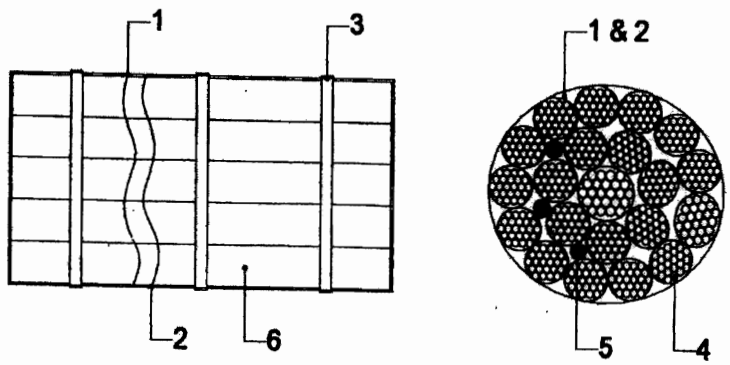


FIGURE "A"

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

PACKING PROCEDURE FOR STRUCTURAL STEEL

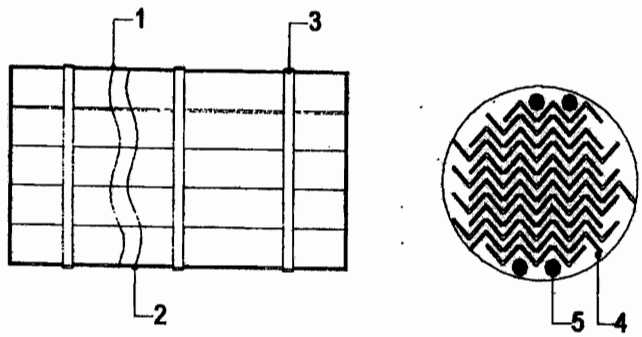


FIGURE "B"

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

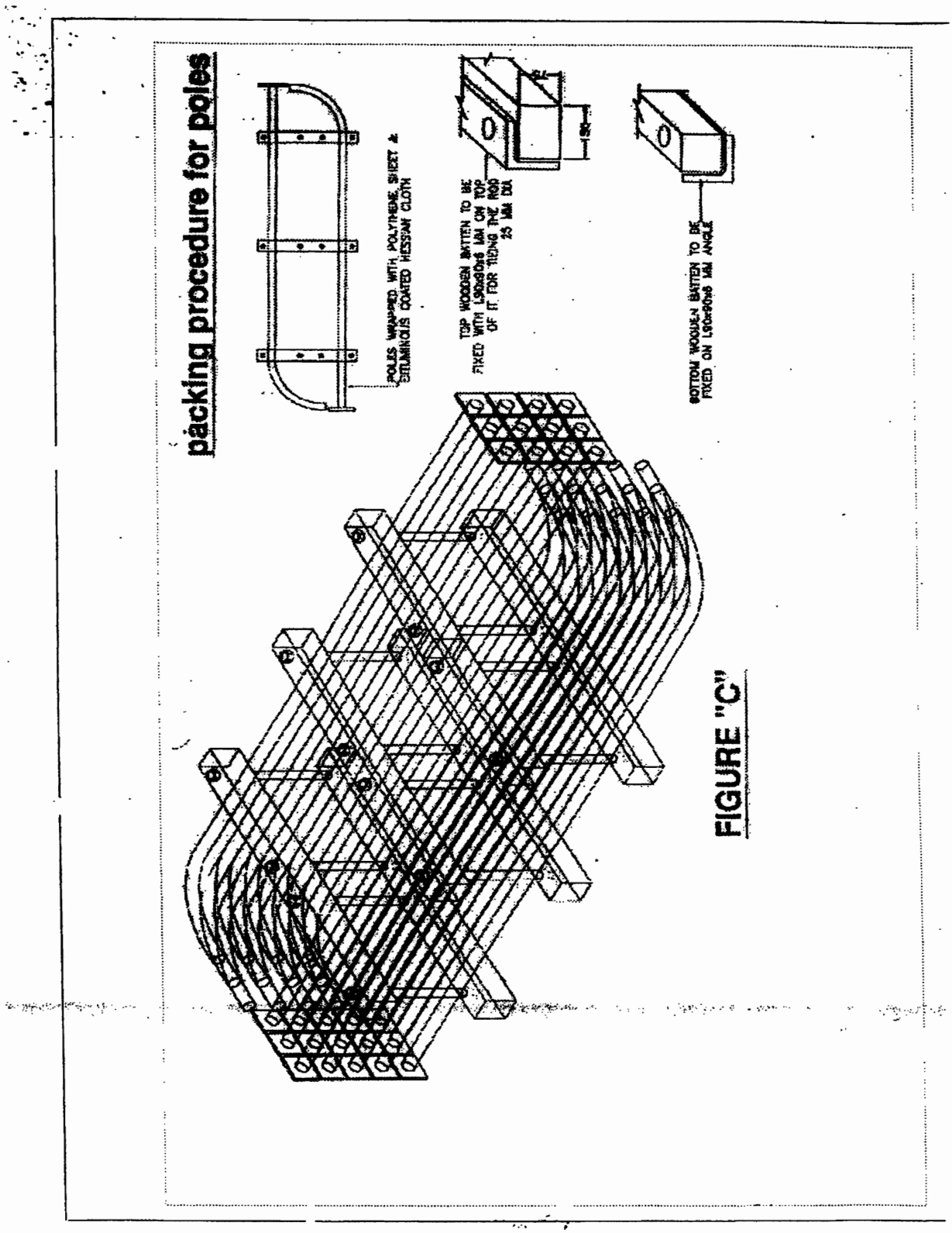

packing procedure for poles
POLES WRAPPED WITH POLYTHENE SHEET & SYNTHETIC COATED HESSIAN CLOTH
TOP WOODEN BATTEN TO BE FIXED WITH L50x50x6 MM ON TOP OF IT FOR TYING PVC ROD 25 MM DIA
BOTTOM WOODEN BATTEN TO BE FIXED ON L50x50x6 MM ANGLE

FIGURE "C"

11.4 PACKING FOR DC BATTERY

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

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

a) The packing boxes shall be made up of plywood boxes (thickness 9mm min.) with blocks at the bottom of the box for provision for handling the boxes using the forklift. The packing boxes sizes are generally standardized to half-euro size (capable of handling equipment's weight).

b) Rubberized coir of 25mm thickness shall be provided as cushioning material at the bottom and thermocole of 20mm shall be provided inside on all four sides. Other than this polyethylene film wrap or cover also will be provided. Left out spaces to be filled with rubberized coir/ thermocol to get cushioning effect.

c) Silica gel in dust free air permeable cotton/paper bag shall be placed in the packing boxes for storage period of 1 year as per IS 304 (1979)

d) While packing the cells, transit caps (polypropylene) of red and blue shall be used for big size cells for ensuring that cells does not get damaged during the transport due to vibrations etc.

e) The battery accessories shall be packed with suitable precautions as follows:

i) Copper connectors shall be packed after making bunches with lead wire seals to avoid misplacement.

ii) Hardware items shall be packed in polyethylene bags (Thickness $\geq$ 0.175mm) 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

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:

- 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

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.

Data sheet for Maitree Butterfly Valve Manual operation																																						
Sl no	Materialcode	Butterfly Valve Size (NPD)	Operation/ Actuation	Body Matl (only international standards shall be accepted)	TRIM (Disc)- only international standards shall be accepted	Stem/ Shaft- only international standards shall be accepted	End Conn Wafer/Double Flange Flat Faced	Lining (minimum 4 mm thick)	Working Pressure in bar	Body Test Pressure in bar	Seat Test Pressure in bar	Hydrostatic Test Duration for body & seat	Leakage class as per AWWA C-504 Class 150 B (Bubble tight) /EN 12266 Rate A (No visible weeping or formation of drops or bubbles)	Qty in Nos	Minimum face to face dimension in mm (including rubber thickness) as per AWWA C504 Class 150B	Vendor to fill up the below mentioned details, otherwise offer shall not be considered for evaluation:																									
																material of body seat ring	material of Disc seal clamping ring	material of Seal mounting & other fasteners in the flowpath shall be of same material as Disc- vendor to confirm	Solid Shaft Dia as per AWWA C 504	body Shell thickness as per AWWA C504 Class 150B	Disc thickness	valve flange drilling ,thickness ,PCD as per ASME 16.5 CL 150	CV	Worm & Worm wheel Gear box Make & Model No.	Weight of valve including Gear box and Handwheel	Valve Mounting	Position Indicator & Locking Arrangement				Fasteners	Raw Material	Paint	Documents
																								valve mounting orientation shall be Horizontal/ inclined/ 360°orientation - Vendor to confirm	valve shall be provided with position indicator - Vendor to confirm	valve shall be provided with flow directionindicator - Vendor to confirm	valve shall be provided with locking device in open & close position -Vendor to confirm	over travel stopper, if applicable shall be provided -Vendor to confirm	All fasteners shall be of ISO / international standard -Vendor to confirm	All Ferrous materials A29/A36/A283 (only international standards acceptable)- Vendor to confirm	Painting shall be as per enclosed specification: - Blast Cleaning SA2.5. One coat of Zinc Epoxy, 80 micron per coat. One/two coats of epoxy high solid, total dft of 160 micron. One coat of 2-component polyurethane paint, 50 micron per coat. Total film thickness 290 micron - Vendor to confirm	GA of valve assembly with sectional view & BOM along with enquiry to be submitted in PDF & Auto CAD format -Vendor to confirm
1	RFW906230001	100	Manual	A216-WCB	13CR	13CR	WAFER	EPDM	10	15	11	5min	zero	2									-														

Data sheet for Maitree Butterfly Valve along with Electric Actuator

Vendor to fill up the below mentioned details, otherwise offer shall not be considered for evaluation:

			Sl.No.	
			Materialcode	
			Butterfly Valve Size (NPD)	
			Operation/ Actuation	
			Body Matl (only international standards shall be ccepted**)**	
			TRIM (disc) -only international standards shall be accepted	
			Stem/ Shaft- only international standards shall be accepted	
			End Connection	
			Lining (minimum 4mm thick)	
			Working Pressure in bar	
			Body Test Pressure in bar	
			Seat Test Pressure in bar	
			Hydrostatic Test Duration for body & seat	
			Leakage class as per AWWA C-504 Class 150 B (Bubble tight) /EN 12266 Rate A (No visible weeping or formation of drops or bubbles)	
			Qty in No	
			Minimum face to face dimension in mm (including rubber thickness) as per AWWA C504 Class 150B	
			valve Torque at the shaft	
			Actuator Torque with minimum 1.25 safety factor	
			actuator output torque	
			material of body seat ring	
			material of Disc seal clamping ring	
			material of Seal mounting & other fasteners in the flowpath shall be of same material as Disc- vendor to confirm	
			Solid Shaft Dia as per AWWA C 504	
			body Shell thickness as per AWWA C504 Class 150B	
			Disc thickness	
			valve flange drilling ,thickness ,PCD as per ASME 16.5 CL 150	
			CV	
			fail safe/ stay put	
			Weight of valve along with actuator	
			Actuator model	
			Actuator motor power	
			Manualoverride gear box	
			limit switch 2NO/ 2NC	
			valve mounting orientation shall be Horizontal/ inclined/ 360°orientation - Vendor to confirm	**Valve Mounting**
			valve shall be provided with position indicator - Vendor to confirm	**Position Indicator & Locking**
			valve shall be provided with flow direction indicator - Vendor to confirm	
			valve shall be provided with locking device in open/ close position -Vendor to confirm	
			over travel stopper, if applicable shall be provided -Vendor to confirm	
			1) For power cable - plug & socket arrangement required -Vendor to confirm **2) For control cable - 9 pin connector, 3nos required - Vendor to Confirm**	**Terminals**
			All fasteners shall be of ISO / international standard -Vendor to confirm	**Fasteners**
			All Ferrous materials A29/A36/A283 (only international standards acceptable)- Vendor to confirm	**Raw Material**
			Painting shall be as per enclosed specification: - Blast Cleaning SA2.5. One coat of Zinc Epoxy, 80 micron per coat. One/two coats of epoxy high solid, total dft of 160 micron. One coat of 2-component polyurethane paint, 50 micron per coat. Total film thickness 290 micron -**Vendor to confirm**	**Paint**
			GA of valve assembly with sectional view & BOM along with enquiry to be submitted in PDF & Auto CAD format -Vendor to confirm	**Documents**
3	2	1		
RFW90623004	RFW90623003	RFW90623002		
50	100	100		
ELECTRIC MOTOR WITH LIMIT SWITCH	ELECTRIC MOTOR WITH LIMIT SWITCH	ELECTRIC MOTOR WITH LIMIT SWITCH		
A126-B	A126-B	A216-WCB		
HASTELLOY-C (C22 / C276)	HASTELLOY-C (C22 / C276)	13CR		
SUPER DUPLEX 2507	SUPER DUPLEX 2507	13CR		
WAFER	WAFER	WAFER		
EPDM	EPDM	EPDM		
10	10	10		
15	15	15		
11	11	11		
5min	5min	5min		
zero	zero	zero		
2	4	2		

Data sheet for Maitree Butterfly Valve along with Pneumatic Actuator

Vendor to fill up the below mentioned details, otherwise offer shall not be considered for evaluation:

				Sl.No.		
				Materialcode		
				Butterfly Valve Size (NPD)		
				Operation/ Actuation		
				Body Matl (only international standards shall be accepted)		
				TRIM (disc) -only international standards shall be accepted		
				Stem/ Shaft- only international standards shall be accepted		
				End Connection		
				Lining (minimum 4mm thick)		
				Working Pressure in bar		
				Body test Pressure in bar		
				Seat test Pressure in bar		
				Hydrostatic Test Duration for body & seat in seconds		
				Leakage class as per AWWA C-504 Class 150 B (Bubble tight) /EN 12266 Rate A (No visible weeping or formation of drops or bubbles)		
				Qty in Nos		
				Minimum face to face dimension in mm (including rubber thickness) as per AWWA C504 Class 150B		
				Default valve position		
				Air action/ S olenoid valve energise		
				valve Torque at the shaft	**Actuator**	
				Actuator Torque with minimum 1.25 safety factor		
				actuator output torque		
				material of body seat ring		
				material of Disc seal clamping ring		
				material of Seal mounting & other fasteners in the flowpath shall be of same material as Disc- vendor to confirm		
				Solid Shaft Dia as per AWWA C 504		
				body Shell thickness as per AWWA C504 Class 150B		
				Disc thickness		
				valve flange drilling ,thickness ,PCD as per ASME 16.5 CL 150		
				CV		
				fail safe		
				Weight of valve along with actuator		
				Actuator make & model		
				Actuator Cylinder Bore selected for required torque with 4 kg/ sqcm (minimum) air pressure (gauge)		
				Actuator Cylinder Stroke		
				Spring tension adjustment/ stroke adjustment, if any in the actuator		
				Time of open /close (less than 10 seconds)		
				Actuator Drive type (Scotch yoke/ Rack & Pinion)		
				Cylinder port size minimum 3/8 inch NPT (ensure time of open/ close with 10 seconds)		
				Quick exhaust valve minimum 3/8 inch NTP (time of open/ close with 10 sec exhaust)		
				Manual override provision - hydraulic or gear box with hand wheel		
				Manual override torque on rim of wheel- max 35 kgm		
				Cylinder made up of (Metallic only) (FRP not acceptable)		
				Seal for actuator cylinder shall be of viton		
				Actuator mounting flange as per ISO 5211		
				Instrument air required for actuator (m3/hr)		
				valve mounting orientation shall be Horizontal/ inclined/ 360°orientation - Vendor to confirm	**Valve Mounting**	
				valve shall be provided with position indicator. -Vendor to confirm	**Position Indicator & Locking**	
				valve shall be provided with flow direction indicator -Vendor to confirm		
				valve shall be provided with locking device in open/ close position -Vendor to confirm		
				over travel stopper, if applicable shall be provided -Vendor to confirm		
				Pneumatic piping SS 304 or PVC sheathed copper tube (minimum 3/8 inch) -Vendor to confirm	**Pneumatic fittings (Min 3/8 inch) - vendor may allowed to increase fitting of all item, if required to achieve 10 sec opening / closing time**	
				Air filter regulator (maximum filter element 25mincron bronze filter) (minimum 3/8 inch)- Metal bowl with mechanical Auto drain -Vendor to confirm		
				Solenoid valve (minimum 3/8 inch)- 24 V DC -Vendor to confirm		
				Speed control valve with quick exhast for each port-Vendor to confirm		
				Stay put (Air Lock Device required-vendor to confirm)		
				In Pneumatic Circuit 1/2" Ball Valve to be provided before filter regulator - vendor to confirm		
				limit switch -DPDT -2 Nos.- Vendor to confirm		
				All wiring with suitable cable glands from solenoid valves & from limit switch shall be terminated at the junction box (IP 55). Junction box shall be mounted on the cylinder itself. Schematic of wiring diagramof Limit switch, solenoid valve & JB shall also be provided. -Vendor to confirm	**Terminals**	
				All fasteners shall be of ISO / international standard -Vendor to confirm	**Fasteners**	
				All Ferrous materials A29/A36/A283 (only international standards acceptable) - Vendor to confirm	**Raw Material**	
				Painting shall be as per enclosed specification: - Blast Cleaning SA2.5. One coat of Zinc Epoxy, 80 micron per coat. One/two coats of epoxy high solid, total dft of 160 micron. One coat of 2-component polyurethane paint, 50 micron per coat. Total film thickness 290 micron - **Vendor to confirm**	**Paint**	
				GA of valve assembly with sectional view &BOM along with enquiry to be submitted in PDF & Auto CAD format -Vendor to confirm	**Documents**	

RANIPET	Manufacturer's Name and Address: BHEL/BHEL Appd Sources.	**MANUFACTURING QUALITY PLAN**		PROJECT: 2X660MW MAITREE PROJECT
		ITEM: WAFER BUTTERFLY VALVES(CASTED)	QP NO: FGD:MAIT:707	Package : FGD PACKAGE
			REV:02	
		SUB SYSTEM: CUST NO**.: R4M8** – R4M9	DATE: 05.09.2019	
			Page **1** of **7**	Contractor: BHEL

S.NO	COMPONENTS & OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	D	AGENCY			REMARKS
					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12
1.0	RAW MATERIAL													
1.1	Body & Disc Casting(As Applicable)	Chem & Mech Properties	Major	Chem & Mech Analysis	1 Sample/Heat		Drawing/ Data Sheet/Tech. Specs		TC	√	P	V	-	No Weld Repair Is Allowed On CI/DI Castings
		Surface Defects	Major	Visual	100%		Drawing/Datasheet/Specification		IR	√	P	V	-	
1.2	Bar Stock For Shaft and taper pin (Drive/Stub)	Chem & Mech Properties	Major	Chem & Mech Analysis	1 Sample/Heat/Batch		Drawing/ Data Sheet/Tech. Specs		TC	√	P	V	-	
		Internal Defect	Major	UT For Shaft	100%		ASMT A388	Refer Note-1	IR	√	P	V	-	For Shaft Diameter ≥50mm
1.3	Pneumatic Tubing – SS304	Chem &Mech Properties	Major	Chemical Analysis	1 Sample/Heat		Drawing / Data Sheets/Tech. Specs		TC	√	P	V	-	
		Heat Treatment	Major	Heat Treatment	1 Sample/He		--Do--		TC	√	P	V	-	

Rakesh Kr Madhu, Dy.Mgr/QA	**LEGEND:** * RECORDS, INDENTIFIED WITH "TICK" (√) UNDER COLUMN 'D'SHALL BE SUBMITTED TO CUSTOMER AS A QA DOCUMENTATION PACKAGE. **M:** MANUFACTURER/SUB-SUPPLIER, **C**: MAIN SUPPLIER(BHEL/ BHEL NOMINATED INSPECTION AGENCY), B/BIFPCL/ CUSTOMER NOMINATED INSPECTION AGENCY **P:** PERFORM **W**: WITNESS AND **V:** REVIEW OF RECORDS **CHP**: BIFPCL SHALL IDENTIFY IN COLUMN'N' AS W,	K C GandhiParimalam, DGM/QA
Prepared by		Reviewed & Approved By

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					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12
					at									
		IGC test	Major	Chemical	1 Sample/HT Batch		Relevant Standard		TC	√	P	V	-	
1.4	Rubber Seal/Seat													
		Dimensions	Major	Measurement	1sample/Size/Batch		Mfg. Drg		IR	-	P	V	-	
		Surface Finish	Major	Visual	100%		Mfg. Drg.	No Burrs	IR	√	P	V	-	
		Shore Hardness	Major	Measurement	1sample/Batch		Drg/Datasheet/Relevant Standard		TC	√	P	V	-	
		Tensile Strength, Elongation	Major	Measurement	1sample/Batch		Drg/Datasheet //Relevant Standard		TC	√	P	V	-	
1.5	Gear Actuator(Gear Box/MOR)	Chem & Mech Properties	Major	Chemical Analysis	1sample/Heat		Approved Drawing / Mfg.Std		Supplier TC	-	P	V	-	

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					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12
		Torque Test/Mechanical Advantage	Major	Torque Load Kg	1sample/Lot		Manufacturer Standard/Tech.Specs./ Drg./Datasheet		Supplier TC	√	P	V	-	
		Model	Major	Verification	1sample/Lot		Approved Drawing/ Manufacturer Standard		Supplier TC	√	P	V	-	
2.0	**IN PROCESS INSPECTION**													
2.1	Body & Disc after machining	Dimension	Major	Measurement	100%		Mfg.Drg		IR	√	P	-	-	
		Surface Defect of Machined Surface	Major	DPT	100%		Relevant Standard	No Linear Indication	IR	√	P	V	-	
		Body Shell Strength	Major	Hydro Test	100%		Relevant Standard	No Leakage	Test Report	√	P	V	-	

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Prepared by	**P:** PERFORM **W**: WITNESS AND **V:** REVIEW OF RECORDS **CHP**: BIFPCL SHALL IDENTIFY IN COLUMN'N' AS W,	Reviewed & Approved By

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					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12
2.2	Drive & Stub Shafts	Dimension	Major	Measurement	100%		Mfg.Drg		IR	-	P	-	-	
		Surface Finish	Major	Visual	100%		Mfg.Drg	No burrs	IR	√	P	-	-	
		Surface Defects	Major	DPT	100%		Relevant Standard	No Linear Indication	IR	√	P	V	-	
3.0	**FINAL INSPECTION**													
3.1	Completed Valve with Gb/Electric & Pneumatic Actuator & Access. (As applicable)	Visual & Dimension	Major	Measurement	100 %	10 % of each size	Drawing/Data Sheet/Relevant Standard		TC/IR	√	P	W	-	
3.2	a)Shell Tightness Test(24kg/cm2 b)Seat Tightness test(16kg/cm2) (seat test will be done with		Critical	Hydro Test	100 %	10 % of each	BS EN 12266-1 Bobble BS EN 12266-1 Rate A		TC	√	P	W	-	Holding time as per BS EN 12266-1

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					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12
	PN actuator in operation with air pressure 4.2kg/cm2 without mechanical lock					size								
3.3		Disc Strength Test	Critical	Hydro Test	As Per Relevant STD		Relevant Standard	No Permanents Deformation	TC	√	P	W	-	
3.4	Open & close operation –a)using PN actuator and b) using manual lever/hand wheel		Critical	Operation(3 Times Open/Close)	100 %	10 % of each size	Data Sheet/Drawing a)limit switch feedback b) position indicator		TC	√	P	W	-	** 10 seconds can be achieved by adjusting speed control valve along with Quick exhaust valve
	Valve stay put – air failure (lock up relay function test)						Valve position remains - stay put							
	Valve stay put – Power failure						Valve position remains - stay put							
	Speed control test –(by adjusting the speed control						Increase /decrease of closing time							

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1	2	3	4	5	6		7	8	9	10	11			12
	valve)													
	Quick exhaust valve – function test						** Within 10 sec (as per specification requirement							
	Manual override function – a)lever operation –clockwise to close b)Hand wheel and gear box operation – clockwise close						Observe valve shaft disengaged from the actuator and function of valve./Appd Drawing							
	c) Valve Locking open & Close position						Approved Drawing							
3.5	Painting	Paint Appearance, Thickness & Adhesion	Major	Visual & Measure	100 %	100 %	Tech Spec/App Drawing	IR	√		P	V	-	
3.6	Marking	Name Plate/Flow Direction Indication	Major	Visual	100 %	-	Drawing	-			P	-	-	

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RANIPET	Manufacturer's Name and Address: BHEL/BHEL Appd Sources.	**MANUFACTURING QUALITY PLAN**		PROJECT: 2X660MW MAITREE PROJECT
		ITEM: WAFER BUTTERFLY VALVES(CASTED)	QP NO: FGD:MAIT:707	Package : FGD PACKAGE
			REV:02	
		SUB SYSTEM: CUST NO**.: R4M8** – R4M9	DATE: 05.09.2019	
			Page **7** of **7**	Contractor: BHEL

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					M	C/B					M	C	B	
1	2	3	4	5	6		7	8	9	10	11			12

Note: 1.

2. During inspection, vendor shall produce catalogue of actuator selected. TC's for Pneumatic actuator , air lock relay, junction box IP55,EPDM lining, PTFE bearing, Viton O ring , Solenoid valve, Limit switch, speed control valve, Quick exhaust valve , Ball valve & Gear Box.

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