

70

400MW MARIB GTPP PHASE-II YEMEN

**PROJECT SPECIFIC
TECHNICAL SPECIFICATION FOR MISC. TANKS SITE
FABRICATED**

SPECIFICATION NO.: PE-TS-372-167-A001



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



TECHNICAL SPECIFICATION FOR MISC. TANKS – SITE FABRICATED

400 MW MARIB GTPP PH-II YEMEN

Specification no.: PE-TS-372-167-A001

Vol IIB & III

Date: SEPTEMBER'2012

Sheet 1 of 1

INDEX

S.N.	DESCRIPTION	VOLUME/ SECTION
1.0	Intent of specification	II-B / A
2.0	Project information	II-B / B
3.0	Specific Technical Requirement	II-B / C
	a. Scope of Supply & Services	
	b. Mandatory Spares	
	c. Terminal points and exclusions	
	d. Drawings & documents to be submitted with the Bid	
	e. Annexure-I (for Tank)	
	f. Annexure-II (Painting)	
4.0	Standard Technical Requirements	II-B / D
	a. Standard technical specification for tanks	
	b. Datasheet for Valves	
	c. Datasheet for Level indicator	
	d. Datasheet for Pipes, fittings, flanges & accessories	
5.0	Annexure III – Specific confirmation from Bidders	
6.0	Quality plans	
7.0	Annexure IV - Sea worthy packing for Marib Project	
8.0	Technical Schedules	III
9.0	Annexure-V (List of makes of various items(CS &SS))	
10.0	Annexure-VI (Drawings and documents requirements)	

68


400MW MARIB GTPP PHASE-II YEMEN

SECTION – A (INTENT OF SPECIFICATION)



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

(67)

	TECHNICAL SPECIFICATION FOR MISC. TANKS – (Site fabricated) 400MW MARIB GTPP PH-II YEMEN	SPECIFICATION NO. PE-TS-372-167-A001	
		VOLUME II-B	SECTION 'A'
		REVISION 00	DATE: 01/06/2012
		PAGE 1 of 2	

1.0 INTENT OF SPECIFICATION

- 1.1 The specification is intended to cover design, engineering, manufacture, inspection and testing at vendor's / sub vendor's works, proper packing, shipment & delivery at port, supervision of erection and commissioning including commissioning spares & mandatory spares (if applicable) for Misc tanks- site fabricated as mentioned in different sections of the specification.
- 1.2 The contractor shall be responsible for providing all the material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work cover under this specification, irrespective of whether it has been specifically listed herein or not.
- 1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment / system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgement is not in full accordance herewith.
- 1.4 Deviations, if any, should be very clearly brought out clause by clause in the enclosed schedule otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification.
- 1.5 Wherever clause for erection and commissioning is indicated, same is not applicable. However, bidder to furnish suggestive erection and commissioning procedure along with drawings / documents to facilitate erection and commissioning of tank.
- 1.6 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Vol-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.
- 1.7 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are hereby made part of the tender specifications. The equipment / material and works covered by this specification is subject to compliance to all the attachments referred in the specification. The tenderer shall be responsible for adherence to all requirements stipulated herein.
- 1.8 All text/numeric in the documents/drawings to be generated by the successful bidder will be in English language only.

66



TECHNICAL SPECIFICATION FOR
MISC. TANKS – (Site fabricated)
400MW MARIB GTPP PH-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION 'A'

REVISION 00

DATE: 01/06/2012

PAGE 2 of 2

- 1.9 The bidder's offer shall not carry any sections like clarifications, interpretations and /or assumptions.
- 1.10 In case all the above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.
- 1.11 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and customer/purchaser/employer will mean BHEL and /or Public Electricity corporation, Republic of Yemen.

65

400MW MARIB GTPP PHASE-II YEMEN

SECTION – B (PROJECT INFORMATION)



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

400 MW MARIB GTPS PHASE-II, YEMEN

PROJECT INFORMATION-REV00

1.	Owner	PUBLIC ELECTRICITY CORPORATION, MINISTRY OF ELECTRICITY AND ENERGY , REPUBLIC OF YEMEN
2.	Project	400 MW MARIB GTPS PHASE-II
3.	Owner's consultant	The Kuljian corporation , Philadelphia , USA
4.	Location	Marib , Yemen
5.	Nearest Airport	El Rahaba Airport (SAH), Sana'a, Yemen
6.	Nearest Railway Station	No rail network in Yemen
7.	Access to site	<p>a. <u>Through sea</u>:</p> <ul style="list-style-type: none"> Distance of site: From Aden Port (Gulf of Aden): 419 Km <p>b. <u>By Air</u> : Sana'a Airport</p> <ul style="list-style-type: none"> Distance from site : 172 Km
8.	Site data	
A	Altitude	1100 m above Mean Sea Level
B	Ambient Air Temperature	45 °C

	1. Design Minimum Temp.	-----
C	RELATIVE HUMIDITY	
	Design Relative Humidity	60%
D	RAINFALL	
1.	Average Rainfall per annum	< 100 mm
E	WIND VELOCITY & PRESSURE	
1.	Max. Design Wind Velocity	120 km/h
2.	Max. Barometric Pressure Barometric Pressure at sea level	1023.6 mbar 887.7 mbar
F	SEISMIC ZONE	UBC 1997, Zone-2 A
9.0		
A	Design Ambient temperature for Gas Turbine & Mechanical equipment	45 °C
B	Design Ambient temperature of electrical equipment	50 °C

400MW MARIB GTPP PHASE-II YEMEN

SECTION – C
(Specific Technical Requirements)



BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NEW DELHI
INDIA

PEM-6666-0



TITLE TECHNICAL SPECIFICATION FOR MISCELLANEOUS TANKS (SITE FABRICATED) 400MW MARIB GTPP PHASE-II YEMEN	SPECIFICATION NO. PE-TS-372-167-A001	
	VOLUME II-B	
	SECTION C	
	REV 00	DATE 01 JUNE 2012
	SHEET 1 of 8	

1.0 SCOPE OF SUPPLY

- 1.1 The steel tanks to be fabricated and supplied at site under this specification shall be generally as per below enclosed **Annexure-I for Condensate storage tank / DM storage tank** and sketch. Modifications may be made by the bidder to suit good engineering practice to the satisfaction of the customer. The customer, however, reserves the right to reject any modifications.
- 1.2 The connections and accessories which are required to be supplied with each tank by the bidder shall be as indicated in the below enclosed **Annexure-I for Condensate storage tank / DM storage tank** and sketch.
- 1.3 The piping material inside the tank shall be supplied by the bidder. All inlet piping shall be extended up to the bottom of the tank and the clearance between the bottom of the tank and the edge of the inlet piping shall be kept as 500 mm (maximum). Inlet piping shall be properly supported with inside shell of tank. Weir plates of adequate thickness (minimum 8 mm) shall be provided for all inlet piping.
- 1.4 Pad plates on the tanks for supporting outside piping shall be provided by the bidder. Details of the pad plates (sizes, quantity etc.) shall be informed to bidder during detail engineering..
- 1.5 Fabrication and supply of all flanges and counter flanges for all nozzles of tank connections shall be included in the scope of work of the bidder. Necessary bolts, nuts and gaskets for these connections shall also be supplied by the bidder.
- 1.6 The manhole shall be of hinged & bolted type with nuts, bolts and gaskets in bidder's scope of supply. The size of the manhole shall be minimum 600 mm.
- 1.7 The scope of works shall also include supply and installation of special accessories as indicated in **Annexure-I for Condensate storage tank / DM storage tank** and sketch. The necessary fixtures and other accessories for mounting these special fittings shall be included in the scope of work of the bidder.
- 1.8 Level gauge / indicator for each tank shall be provided by the bidder along with all fittings & accessories as required for mounting the level gauge / indicator on the tanks. Float and arrow type level gauge / indicator shall be provided unless otherwise specified in **Annexure-I for Condensate storage tank / DM storage tank** and sketch for storage tanks.
- 1.9 Drain, vent & isolating valves for standpipe (if applicable) shall be provided by the bidder. The size of the drain and vent valve of standpipes shall be 25 NB and size of the isolating valves for standpipe shall be 50 NB unless otherwise specified in **Annexure-I for Condensate storage tank / DM storage tank** and sketch. Two (2) numbers of isolating valves for each stand-pipe shall be supplied by the bidder.

Required number of tapings with 25NB instrument root valves shall be provided by the bidder for mounting instruments like level switches, level transmitters etc. The number of tapings shall be as indicated in the **Annexure-I for Condensate storage tank / DM storage tank** and sketch.

- 1.10 Sampling Connection with isolation valve of size 50 NB for each tank (if indicated in **Annexure-I for Condensate storage tank / DM storage tank**) shall be provided.



TITLE

**TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION C

REV 00

DATE 01 JUNE 2012

SHEET 2 of 8

- 1.11 Drain valve of size 100 NB for each tank shall be provided by the bidder unless otherwise indicated in the **Annexure-I for Condensate storage tank / DM storage tank and sketch**.
- 1.12 Quantity and size of spare nozzles and valves shall be supplied by the bidder as per **Annexure-I for Condensate storage tank / DM storage tank and sketch**.
- 1.13 NaOH / KOH breather and seal pot shall be provided with necessary drain valve of size 25 NB with stainless steel construction unless otherwise specified in the **Annexure-I for Condensate storage tank / DM storage tank and sketch**. Two (2) nos. NaOH / KOH breather shall be provided by the bidder for each tank out of which one shall be used for in-breathing purpose and the other shall be used for out-breathing purpose.
- 1.14 Pipes, fittings, nozzles, flanges and counter flanges shall be supplied by the bidder. The minimum requirement like quantity, size, type etc. are indicated in the **Annexure-I for Condensate storage tank / DM storage tank and sketch** and may undergo change during detail engineering stage and these shall be supplied by the bidder as per the approved drawings / documents for which no commercial implication shall be entertained by BHEL. Material of construction of all pipes, fittings, nozzles, flanges and counter flanges shall be as per **Annexure-I for Condensate storage tank / DM storage tank and sketch**.
- 1.15 NaOH / KOH breather and seal pot shall be located in the bottom / ground level and necessary connection from tank vent to NaOH / KOH breather shall be provided through 200 NB SS pipe.
- 1.16 Vent size calculation shall be furnished by the bidder during detail engineering stage based on the tank filling / emptying rate for approval and increase in vent size from the minimum size requirement, if any, shall be provided by the bidder without any commercial implication.
- 1.17 The overflow pipe from overflow nozzle to seal pot shall also be in bidder's scope of work.
- 1.18 All anchor bolts, nuts, washers including pad plates shall be provided by the bidder, if required for anchoring of tank as per approved design calculation during detail engineering stage and for which no commercial implication shall be entertained by BHEL.
- 1.19 Bidder shall provide adequate numbers of earthing / grounding pads for each tank. Each pad shall be made of stainless steel or mild steel of required size, which will be informed to the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL. Further, grounding of tank with the earth mat shall be in BHEL scope.
- 1.20 Painting of the tanks is included in bidder's scope of work. Painting specifications of storage tanks / seal pot / NaOH / KOH breather are enclosed in **Annexure - II**.
- 1.21 Even though the erection and commissioning of tank is not in bidder's scope. Erection and Commissioning spares as required for commissioning of the tanks / NaOH breathers / seal pots are in bidder's scope.
- 1.22 Platforms, staircase, monkey ladder, hand railing, knee guard, toe guard (in stair case and all along the periphery of roof of the tank) etc. as per the relevant design code / good engineering practice (as indicated in the **Annexure-I for Condensate storage tank / DM storage tank**) shall be included in bidder's scope of work. All stair tread and platforms shall be made from 8 thk chequered plate / gratings.



TITLE

TECHNICAL SPECIFICATION FOR

MISCELLANEOUS TANKS (SITE FABRICATED)

400MW MARIB GTPP PHASE-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION C

REV 00

DATE 01 JUNE 2012

SHEET 3 of 8

- 1.23 Suitable structural items like channels and saddle supports shall be provided for fixing the tank with foundation for each of rectangular tank and horizontal cylindrical tank respectively.
- 1.24 Draw off sump shall be provided in all vertical cylindrical storage tanks. Size and design of the same shall as per latest edition of IS 803/API 650.

- 1.25 All the valves/instruments mounted on tank shall be nearby to staircase for easy access. if it is away then necessary platform/approach device shall be provided by bidder.

2.0 SCOPE OF SERVICES

Services shall include but not be limited to the followings:

- 2.1 Design, engineering, preparation of detailed fabrication drawings, bill of material, tag and piece numbers, welding procedures etc. Stiffeners and other structural framing for supporting the tank shall be designed by the fabricator and properly shown in the fabrication drawings.
- 2.2 Supervision of erection and commissioning ¹⁵ ~~125~~ man days.
- 2.3 Preparation of civil assignment drawings i.e foundation drawing, insert plates / embedment's plates required for supporting pipes and equipments, and review of civil drawings prepared by customer based on civil assignment drawing of bidder.
- 2.4 Preparation of drawings as per list enclosed.
- 2.5 Engineering support as and when required during erection and commissioning of the system.

3.0 MANDATORY SPARES-

Void.

4.0 TERMINAL POINTS

Matching counter flanges for all nozzles mounted on the tank and its accessories. However, counter flanges for all nozzles of tank shall be provided by the bidder.

5.0 EXCLUSIONS

Erection and commissioning of tanks, Tank foundation & associated civil works are excluded from bidder's scope of work. However, foundation drawing along with loading data, anchor bolt details etc. shall be furnished by the successful bidder during detailed engineering stage.

6.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The bidder must submit the following drawings and documents along with their bid in 4 sets so as to enable BHEL to evaluate their offer. In absence of any of these documents, BHEL reserves right not to evaluate the offer of the concerned bidder.

- a) Signed and stamped copy of Annexure-I and Sketch.



TITLE TECHNICAL SPECIFICATION FOR MISCELLANEOUS TANKS (SITE FABRICATED) 400MW MARIB GTPP PHASE-II YEMEN	SPECIFICATION NO. PE-TS-372-167-A001	
	VOLUME II-B	
	SECTION C	
	REV 00	DATE 01 JUNE 2012
	SHEET 4 of 8	

- b) Un-priced copy of price format indicating quoted/ not quoted against each row & column.
- c) Deviation schedule, strictly as per enclosed format.
- d) Specific confirmation sheet

In the absence of any documents mentioned above, bidder's offer is liable to be rejected. Further any documents submitted by bidder other than above shall not be taken cognizance of and these shall not form part of contract.

7.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the following drawings / documents during detail engineering for approval / information / reference (as the case may be):-

S.No.	Document no.	Title
A.	MECHANICAL	
1	PE-V0-XXX-167-A001	Design Calculation - Condensate / DM storage tank
2	PE-V0-XXX-167-A002	Stadd calculation of Roof Structure (if applicable)
3	PE-V0-XXX-167-A101	GA - Condensate / DM storage tank
4	PE-V0-XXX-167-A102	Staircase detail of Condensate / DM storage tank
5	PE-V0-XXX-167-A103	Roof structural detail of Condensate storage tank / DM storage tank
6	PE-V0-XXX-167-A104	Nozzle orientation drawing of Condensate storage tank / DM storage tank
7	PE-V0-XXX-167-A105	Detail of Seal pot & NaOH Breather for Condensate storage tank / DM storage tank
8	PE-V0-XXX-167-A106	Fabrication Drawing for Condensate storage tank / DM storage tank (plate cutting)
9	PE-V0-XXX-167-A107	Load Data of Tank Foundations and Details of Anchor Chair for Tank Foundations
B.	DATA SHEETS	
1	PE-V0-XXX-167-A201	Data sheet for valves
2	PE-V0-XXX-167-A202	Data sheet for Pipe, Fittings, Flanges & Accessories.
3.	PE-V0-XXX-167-A203	Datasheet for Level indicator
C.	QUALITY PLANS	
1	PE-V0-XXX-167-A301	Inspection Check List of MS Plates & Structural Steel
2	PE-V0-XXX-167-A302	Inspection Checklist for Pipe, Fittings, Flanges & Accessories.
3	PE-V0-XXX-167-A303	QAP for Valves
4	PE-V0-XXX-167-A303	QAP for Level indicator



TITLE
TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION C

REV 00

DATE 01 JUNE 2012

SHEET 5 of 8

8.0 BID EVALUATION CRITERIA

The bid shall be evaluated based on the price quoted for the tank and its accessories & commissioning spares and any technical loading due to non adherence to the technical specification. However, the price for recommended spares (if applicable) shall not be considered for evaluation purpose.

9.0 CONDITION OF REJECTION

Bid may be rejected if the data sheets, drawings and documents, price formats (schedule of price and unit price) as asked for in clause No ~~10.0~~ above, is not properly filled-up and submitted along with the bid with no company seal.

10.0 OPTIONAL ITEM

Void.

11.0 OTHER TECHNICAL REQUIREMENTS

1. The inside piping shall be adequately supported and shall be provided with adequately sized vent connection at pipe top.
2. Material of construction for standpipe (if applicable) shall be stainless steel (SS) and size shall not be less than NB 100 unless otherwise specified in **Annexure-I for Condensate storage tank / DM storage tank and sketch**.
3. Material of construction of all tanks shall be mild steel conforms to IS – 2062 grade – B.
4. All valves shall be of stainless steel (SS – 304) construction unless otherwise indicated in the **Annexure-I for Condensate storage tank / DM storage tank and sketch**.
5. All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant's drawing no; which will be forwarded to the successful bidder during detail engineering stage.
6. Data sheets of various items shall be prepared by the bidder for storage tanks and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.
7. GA drawing, nozzle schedule, design data, material of construction etc. shall be prepared by the bidder during detail engineering stage based on specification / contractual requirement and there should be no commercial implication on account of finalization of the drawings and documents.
8. O & M manual shall be furnished to BHEL for approval during detailed engineering stage.
9. Field quality plan / quality assurance plan / check list shall be prepared by the bidder for storage tanks / each instrument / item and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL /

54

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TITLE TECHNICAL SPECIFICATION FOR MISCELLANEOUS TANKS (SITE FABRICATED) 400MW MARIB GTPP PHASE-II YEMEN	SPECIFICATION NO. PE-TS-372-167-A001	
	VOLUME II-B	
	SECTION C	
	REV 00	DATE 01 JUNE 2012
	SHEET 6 of 8	

customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

10. All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.
11. Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.
12. Any other drawings and documents in addition to the list of drawings and documents indicated in the NIT specification as required by BHEL for the execution of the project shall be furnished by them during detailed engineering stage and no commercial implication shall be entertained by BHEL for the same.
13. Bidder to confirm that all the drawings shall be prepared in Auto Cad - 2010 version and required number of hardcopies and soft copies shall be furnished to BHEL during detailed engineering stage. Exact requirement of number of hard copies and soft copies of all drawings and documents as required by BHEL / customer / consultant shall be informed to the successful bidder during detail engineering stage and bidder to furnish the same for which no additional cost shall be entertained.
14. 15 days time is required by BHEL to offer their comments on the drawings and documents being submitted by the bidder (during detailed engineering stage in the event of L.O.I being placed) from the date of receipt.
15. Civil works will be provided by BHEL. Hence, bidder has to furnish the civil inputs in time. Bidder has to carry out the rectification in the civil works in the event of any changes in the civil input data furnished by them or delay in submission of input data by them. Bidder to furnish the civil foundation drawing of the tanks / seal pots /

NaOH or KOH breather along with the loading data for approval during detailed engineering stage showing / indicating the followings:-

- a) Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.
- b) Recommended locations of earthing pads.
- c) Civil loads shall be furnished and the detailed calculation showing weights of roof, bottom, and shell plates, all accessories and nozzles etc.
- d) Details of pockets as required for anchor bolts.
16. Bidder to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL. However, minimum 7 days notice shall be served for the same.
17. All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc in tabular form

58

PEM-6666-0



TITLE
**TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001	
VOLUME II-B	
SECTION C	
REV 00	DATE 01 JUNE 2012
SHEET 7 of 8	

indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

18. All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-
 - a) All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.
 - b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.
 - c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.
 - d) Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least 3 make.
19. Bidder to assess the capability of their sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them. No deviations shall be entertained.
20. Commercial implication includes price implication as well as delivery implication.
21. Size of hand rails on stairway and tank roof / top shall be minimum 32 NB and shall conform to IS 1239 (M).
22. Type of roof for vertical cylindrical storage tanks shall be either supported cone roof or self supporting cone roof as per latest edition of relevant design code.
23. **Bidder to furnish the weight of each tank (in empty condition and water filled condition) in Tonnes for BHEL's reference only. Bidder to note that the weight in water filled condition shall be considered from bottom of tank up to top of curb angle.**
24. Bidder shall check that specifications of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.
25. List of drawings and documents including data sheet, manual calculation, quality plan, list of sub-vendors, technical specification and material of construction, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.
26. Bidder to furnish list of sub-vendors for various items during detail engineering stage for BHEL's review and approval and items shall be procured from these suppliers only.



TITLE
TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001
VOLUME II-B
SECTION C
REV 00
DATE 01 JUNE 2012
SHEET 8 of 8

27. Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structurals, flanges, counter flanges etc. from BHEL approved sub vendor only. No argument on this account shall be entertained.

Note:

In case of any contradiction between various clauses of the specification OR between specification clauses and relevant code requirements, the decision of BHEL's engineer shall be final and binding on the bidder and no commercial implication on account on the same shall be entertained by BHEL.

57

BHEL PEM	ANNEXURE - I		DOC. NO.: PE-DC-372-167-A001
			SH- 01 of 4
	PROJECT TITLE : 400MW MARIB GTPP PHASE-II YEMEN TPP		REV. NO.: 0
1.0	SERVICE IDENTIFICATION	DM WATER STORAGE TANK	
2.0	NUMBER REQUIRED	ONE (01) NO. FOR STATION	
3.0	STORAGE MEDIUM	DM WATER	
4.0	SIZE & TYPE	11.0M. DIA X 10.0M. HEIGHT (VERTICAL CYLINDERICAL)	
5.0	CORROSION ALLOWANCE	2.0MM	
6.0	MINIMUM PLATE THICKNESS (WITH CORROSION ALLOWANCE)		
	A) SHELL	8.0 MM	
	B) BOTTOM	8.0 MM	
	C) ROOF	8.0 MM	
7.0	DESIGN TEMPERATURE & PRESSURE CLASS	60 °C, DESIGN FOR FILLED WATER HEAD / ATMOSPHERE	
8.0	LOCATION OF INSTALLATION	OUTDOOR	
9.0	DRAIN VALVE FOR TANK	100NB	
10.0	DRAIN VALVE FOR NaOH / KOH BREATHER	25NB	
11.0	DRAIN VALVE FOR SEAL POT	100NB	
12.0	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE	
13.0	NOZZLE CONNECTIONS REQD / END CONNECTION	AS PER ENCLOSED SKETCH (PE-DC-372-167-S001) / SOCKET WELDED FOR SIZE ≤ NB50 & FLANGED FOR SIZE > NB50	
14.0	INSTRUMENTS / ACCESSORIES REQUIRED (REFER ENCLOSED SKETCH)	(a) NaOH /KOH BREATHER (TO BE PLACED ON GROUND) (b) OVERFLOW OF 200NB & DRAIN PIPING OF 100NB WITH DRAIN VALVE (c) SEAL POT WITH DRAIN VALVE ETC. FOR OVERFLOW (d) LEVEL GAUGE (MECHANICAL FLOAT TYPE) WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT & HOUSING OF SS316) (e) 2 NOS TAPPINGS WITH NB 25 ROOT VALVES (FOR MOUNTING LEVEL TRANSMITTERS) (f) SAMPLING CONNECTION WITH NB 50 VALVE ON TANK. (g) 3 NOS. SPARE INSTRUMENT CONNECTIONS ON TANK OF SIZE 25 NB (h) SPARE CONNECTIONS WITH VALVES: TWO (2) NOS OF 200NB AND 1 NO. 150NB AS GIVEN IN SKETCH NO. PE-DC-372-167-S001	
15.0	EXTERNAL & INTERNAL PAINTING	REFER ANNEXURE-II REGARDING PAINTING	
16.0	MANHOLE	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF (SIZE MIN. 600 NB)	

BHEL PEM	ANNEXURE - I		DOC. NO.: PE-DC-372-167-A002
	PROJECT TITLE : 400MW MARIB GTTP PHASE-II YEMEN TPP		SH- 02 of 4
			REV. NO.: 0
1.0	SERVICE IDENTIFICATION	FILTERED WATER STORAGE TANK	
2.0	NUMBER REQUIRED	ONE (01) NO. FOR STATION	
3.0	STORAGE MEDIUM	FILTERED WATER	
4.0	SIZE & TYPE	8.6M. DIA X 8.0M. HEIGHT (VERTICAL CYLINDERICAL)	
5.0	CORROSION ALLOWANCE	2.0MM	
6.0	MINIMUM PLATE THICKNESS (WITH CORROSION ALLOWANCE)		
	A) SHELL	8.0 MM	
	B) BOTTOM	8.0 MM	
	C) ROOF	8.0 MM	
7.0	DESIGN TEMPERATURE & PRESSURE CLASS	60°C, DESIGN FOR FILLED WATER HEAD / ATMOSPHERE	
8.0	LOCATION OF INSTALLATION	OUTDOOR	
9.0	DRAIN VALVE FOR TANK	100NB	
10.0	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE	
11.0	NOZZLE CONNECTIONS REQD / END CONNECTION	AS PER ENCLOSED SKETCH (PE-DC-372-167-S002) / SOCKET WELDED FOR SIZE ≤ NB50 & FLANGED FOR SIZE > NB50	
12.0	INSTRUMENTS / ACCESSORIES REQUIRED (REFER ENCLOSED SKETCH)	(a) OVERFLOW OF 100NB & DRAIN PIPING OF 100NB WITH DRAIN VALVE (b) LEVEL GAUGE (MECHANICAL FLOAT TYPE) WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT & HOUSING OF SS316) (c) 1 NO TAPPING WITH NB 25 ROOT VALVES (FOR MOUNTING LEVEL TRANSMITTERS) (d) SAMPLING CONNECTION WITH NB 50 VALVE ON TANK. (e) SERVICE WATER OUTLET CONNECTION OF 80NB AS PER SKETCH (f) SPARE CONNECTIONS WITH VALVES: TWO (2) NOS OF 100NB AS GIVEN IN SKETCH NO. PE-DC-372-167-S002	
13.0	EXTERNAL & INTERNAL PAINTING	REFER ANNEXURE-II REGARDING PAINTING	
14.0	MANHOLE	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF (SIZE MIN. 600 NB)	

BHEL PEM	ANNEXURE - I		DOC. NO.: PE-DC-372-167-A003
			SH- 03 of 4
	PROJECT TITLE : 400MW MARIB GTPP PHASE-II YEMEN TPP		REV. NO.: 0
1.0	SERVICE IDENTIFICATION	RO PERMEATE STORAGE TANK	
2.0	NUMBER REQUIRED	ONE (01) NO. FOR STATION	
3.0	STORAGE MEDIUM	RO PERMEATE	
4.0	SIZE & TYPE	6.2M. DIA X 6.0M. HEIGHT (VERTICAL CYLINDERICAL)	
5.0	CORROSION ALLOWANCE	2.0MM	
6.0	MINIMUM PLATE THICKNESS (WITH CORROSION ALLOWANCE)		
	A) SHELL	8.0 MM	
	B) BOTTOM	8.0 MM	
	C) ROOF	8.0 MM	
7.0	DESIGN TEMPERATURE & PRESSURE CLASS	60 °C, DESIGN FOR FILLED WATER HEAD / ATMOSPHERE	
8.0	LOCATION OF INSTALLATION	OUTDOOR	
9.0	DRAIN VALVE FOR TANK	50NB	
10.0	DRAIN VALVE FOR NaOH / KOH BREATHES	25NB	
11.0	DRAIN VALVE FOR SEAL POT	50NB	
12.0	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE	
13.0	NOZZLE CONNECTIONS REQD / END CONNECTION	AS PER ENCLOSED SKETCH (PE-DC-372-167-S003) / SOCKET WELDED FOR SIZE ≤ NB50 & FLANGED FOR SIZE > NB50	
14.0	INSTRUMENTS / ACCESSORIES REQUIRED (REFER ENCLOSED SKETCH)	(a) NaOH /KOH BREATHES (TO BE PLACED ON GROUND) (b) OVERFLOW OF 50NB & DRAIN PIPING OF 50NB WITH DRAIN VALVE (c) SEAL POT WITH DRAIN VALVE ETC. FOR OVERFLOW (d) LEVEL GAUGE (MECHANICAL FLOAT TYPE) WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT & HOUSING OF SS316) (e) 1 NO TAPPING WITH NB 25 ROOT VALVES (FOR MOUNTING LEVEL TRANSMITTERS) (f) SAMPLING CONNECTION WITH NB 50 VALVE ON TANK. (h) SPARE CONNECTIONS WITH VALVES: TWO (2) NOS OF 100NB AS GIVEN IN SKETCH NO. PE-DC-372-167-S003	
15.0	EXTERNAL & INTERNAL PAINTING	REFER ANNEXURE-II REGARDING PAINTING	
16.0	MANHOLE	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF (SIZE MIN. 600 NB)	

BHEL PEM	ANNEXURE - I		DOC. NO.: PE-DC-372-167-A004
	PROJECT TITLE : 400MW MARIB GTPP PHASE-II YEMEN TPP		SH- 04 of 4
			REV. NO.: 0
1.0	SERVICE IDENTIFICATION	RAW WATER STORAGE TANKS	
2.0	NUMBER REQUIRED	TWO (02) NO. FOR STATION	
3.0	STORAGE MEDIUM	RAW WATER	
4.0	SIZE & TYPE	10.0M. DIA X 9.6M. HEIGHT (VERTICAL CYLINDERICAL)	
5.0	CORROSION ALLOWANCE	2.0MM	
6.0	MINIMUM PLATE THICKNESS (WITH CORROSION ALLOWANCE)		
	A) SHELL	8.0 MM	
	B) BOTTOM	8.0 MM	
	C) ROOF	8.0 MM	
7.0	DESIGN TEMPERATURE & PRESSURE CLASS	60 °C, DESIGN FOR FILLED WATER HEAD / ATMOSPHERE	
8.0	LOCATION OF INSTALLATION	OUTDOOR	
9.0	DRAIN VALVE FOR TANK	100NB	
10.0	PIPE MATERIAL FOR HAND RAILING	CARBON STEEL, GALVANIZED, MEDIUM GRADE	
11.0	NOZZLE CONNECTIONS REQD / END CONNECTION	AS PER ENCLOSED SKETCH (PE-DC-372-167-S004) / SOCKET WELDED FOR SIZE ≤ NB50 & FLANGED FOR SIZE > NB50	
12.0	INSTRUMENTS / ACCESSORIES REQUIRED (REFER ENCLOSED SKETCH)	(a) OVERFLOW OF 200NB & DRAIN PIPING OF 100NB WITH DRAIN VALVE (b) LEVEL GAUGE (MECHANICAL FLOAT TYPE) WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT & HOUSING OF SS316) (c) 1 NO TAPPING WITH NB 25 ROOT VALVES (FOR MOUNTING LEVEL TRANSMITTERS) (d) SAMPLING CONNECTION WITH NB 50 VALVE ON TANK. (h) SPARE CONNECTIONS WITH VALVES: TWO (2) NOS OF 200NB AND 1 NO. 150NB AS GIVEN IN SKETCH NO. PE-DC-372-167-S004	
13.0	EXTERNAL & INTERNAL PAINTING	REFER ANNEXURE-II REGARDING PAINTING	
14.0	MANHOLE	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF (SIZE MIN. 600 NB)	

400MW MARIB GTPP PHASE-II YEMEN

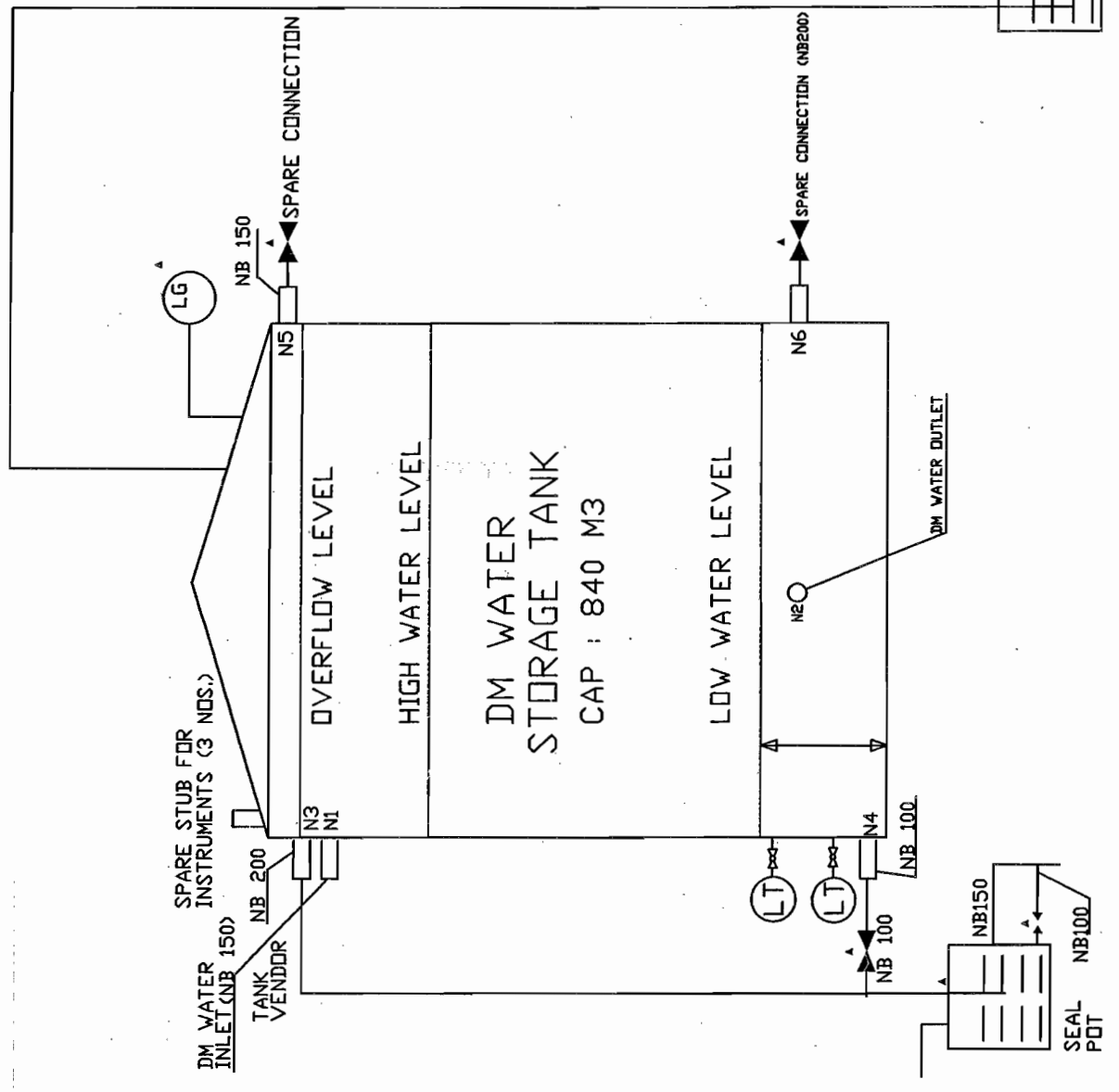
DOC. NO.: PE-DC-372-167-S001

SKETCH FOR DM WATER STORAGE TANK

NOTES:

- 1.0 HIGH WATER LEVEL SHALL BE MIN. 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.
- 2.0 ▲-ITEMS THUS MARKED ARE TO BE SUPPLIED ALONG WITH TANK.
- 3.0 -NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT

NOZZLE NO.	DESCRIPTION	SIZE(NB)
N1	DM INLET	150
N2	DM OUTLET	200
N3	OVERFLOW	200
N4	DRAIN	100
N5	SPARE (INLET)	150
N6	SPARE(OUTLET)	200



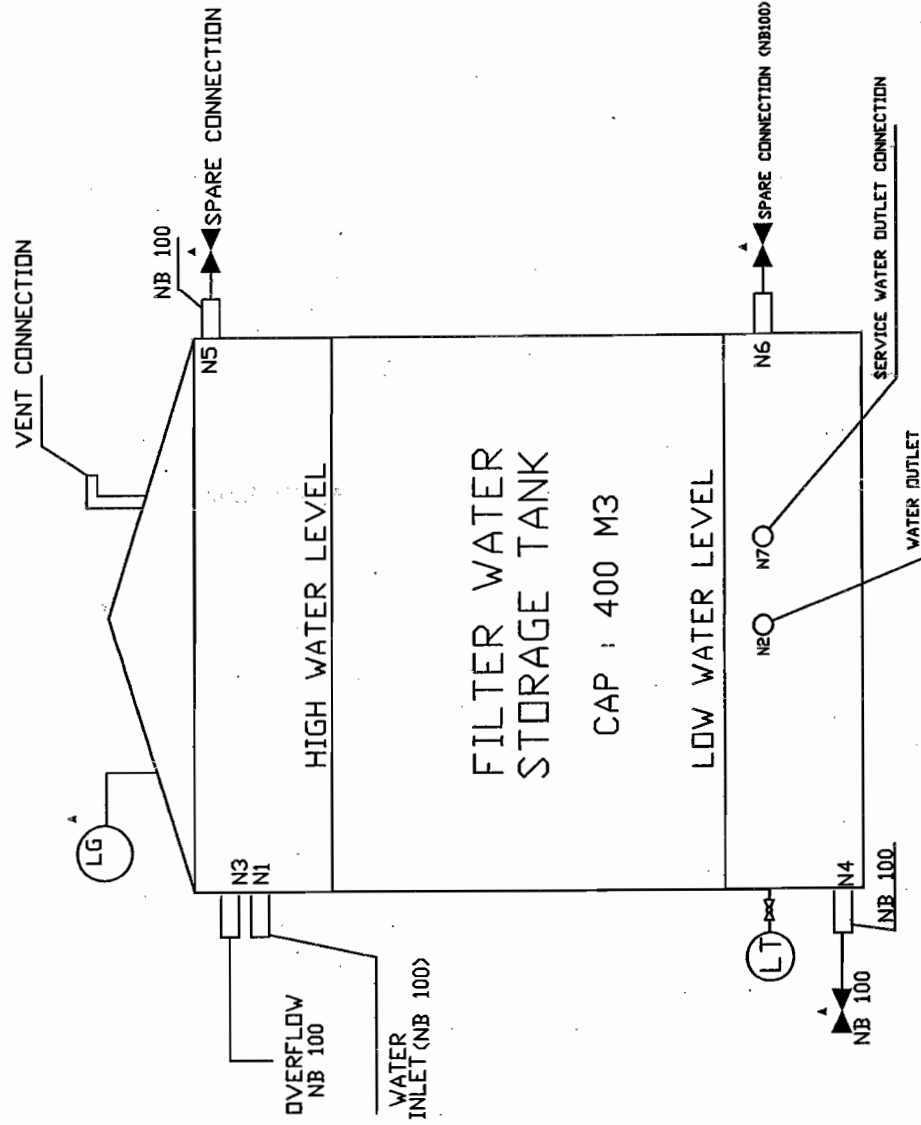
SKETCH FOR FILTER WATER STORAGE TANK

NOTES:

1.0 HIGH WATER LEVEL SHALL BE MIN. 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.

2.0 ▲-ITEMS THUS MARKED ARE TO BE SUPPLIED ALONG WITH TANK.

3.0 -NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT



NOZZLE NO.	DESCRIPTION	SIZE(NB)
N1	INLET	100
N2	OUTLET	100
N3	OVERFLOW	100
N4	DRAIN	100
N5	SPARE (INLET)	100
N6	SPARE(OUTLET)	100
N7	SERVICE WATER OUTLET CONNec.	80

400MW MARIB GIPP PHASE-II YEMEN

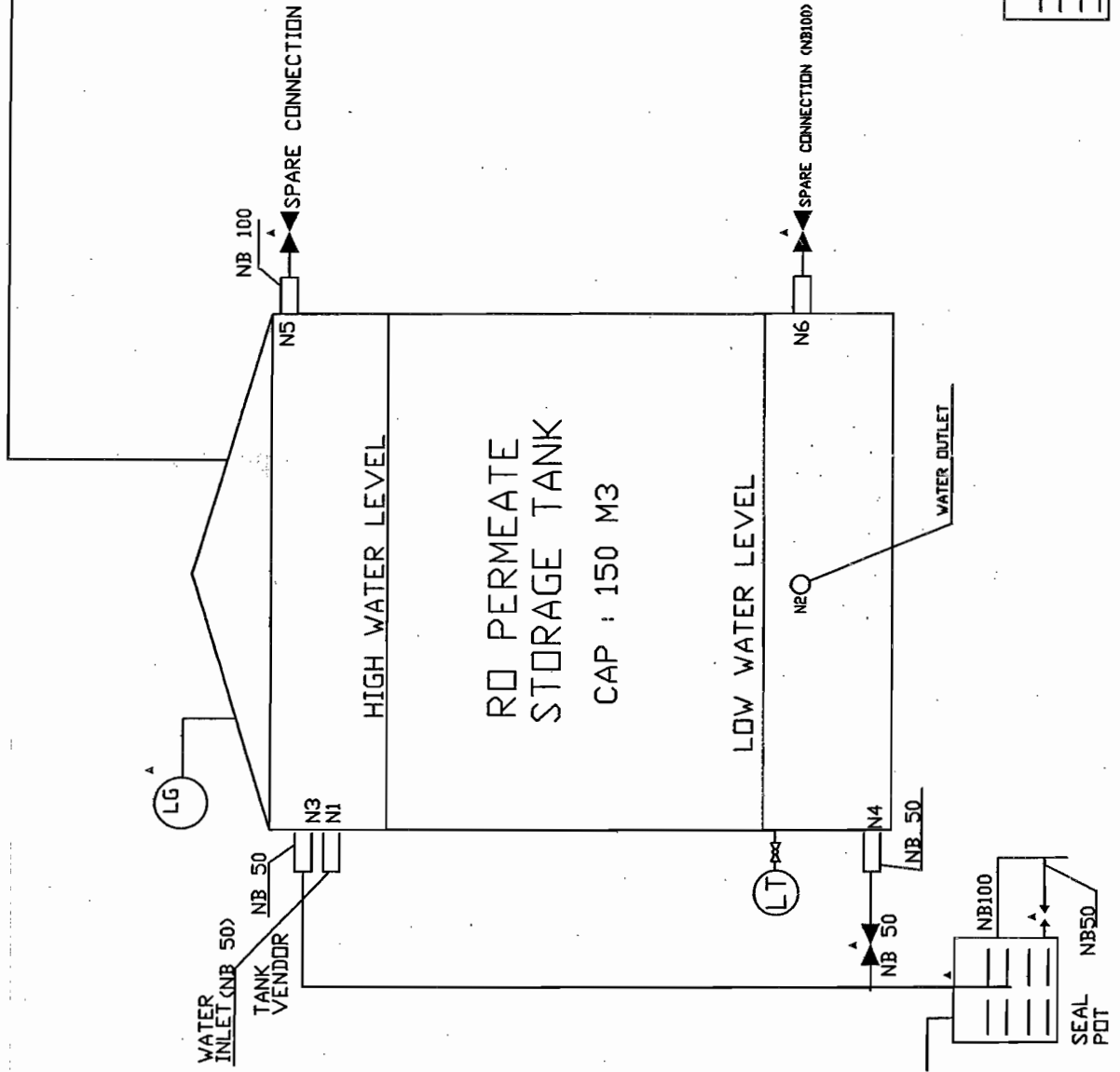
DOC. NO.: PE-DC-372-167-S003

SKETCH FOR RO PERMEATE STORAGE TANK

NOTES:

- 1.0 HIGH WATER LEVEL SHALL BE MIN. 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.
- 2.0 ▲-ITEMS THUS MARKED ARE TO BE SUPPLIED ALONG WITH TANK.
- 3.0 -NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT

NOZZLE NO.	DESCRIPTION	SIZE(NB)
N1	INLET	50
N2	OUTLET	50
N3	OVERFLOW	50
N4	DRAIN	50
N5	SPARE (INLET)	100
N6	SPARE(OUTLET)	100

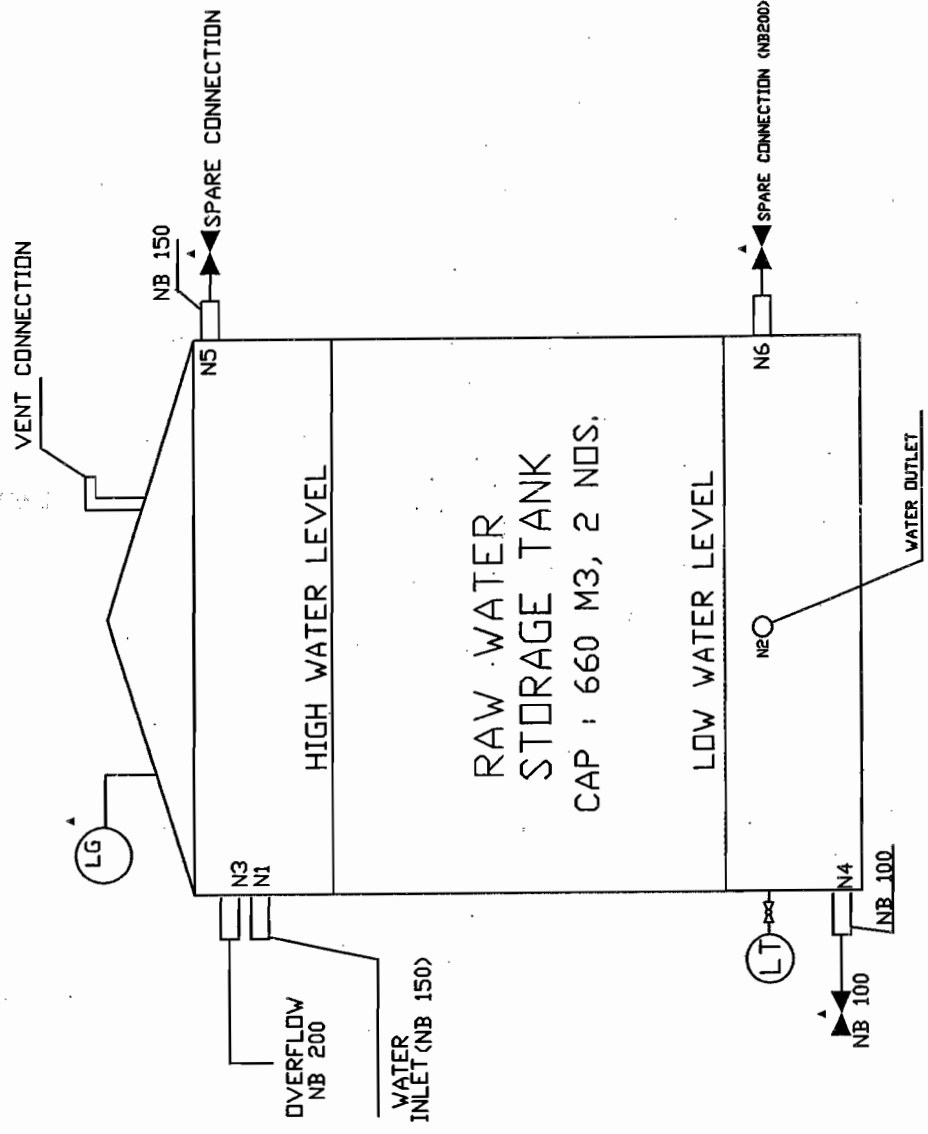


SKETCH FOR RAW WATER STORAGE TANK

NOTES:

- 1.0 HIGH WATER LEVEL SHALL BE MIN. 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.
- 2.0 ▲-ITEMS THUS MARKED ARE TO BE SUPPLIED ALONG WITH TANK.
- 3.0 -NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT

NOZZLE NO.	DESCRIPTION	SIZE(NB)
N1	INLET	150
N2	OUTLET	200
N3	OVERFLOW	200
N4	DRAIN	100
N5	SPARE (INLET)	150
N6	SPARE(OUTLET)	200



ANNEXURE-II

Painting specification of Condensate storage tank, NaOH breathers and seal pot for 400MW MARIB GTPP PHASE-II YEMEN

	Internal	External	Underneath
Surface preparation	Blast clean to SA 2.5	Blast clean to SA 2.5	Wire Brushing/ hand tool cleaning to ST-2.
Primer	Two (2) coats of HB epoxy zinc phosphate primer of 35 micron each.	One (1) coat of HB epoxy zinc phosphate primer of 75-100 microns.	2 coats of high build coal tar epoxy suitably pigmented (2 pack), DFT: 80 – 100 microns each coat.
Intermediate coat	N. A.	One (1) coat Micaceous Iron Oxide coating of 50-75 micron.	N. A.
Finish	Solvent free epoxy coating (Min. 2 coats) of DFT 200 Microns each.	Two (2) coats of Aliphatic polyurethane 30-35 microns per coat.	N. A.
Total DFT	470 microns	185 - 245 microns	160 – 200 microns

Note:-

- 1) Make of paints shall be as per approved BHEL vendor list.

48

400MW MARIB GTPP PHASE-II YEMEN

SECTION – D

(Standard technical Requirements)



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

47

PEM-6666-0



TITLE
STANDARD TECHNICAL SPECIFICATION FOR
MISC. TANKS - SITE FABRICATED

SPECIFICATION NO. PE-TS -STD-167-A001

VOLUME II B

SECTION D

REV 00

DATE June 2007

SHEET OF 10

1.0 SCOPE

This specification covers design, engineering, supply of material, fabrication, assembly, inspection and testing at shop as well as at site, erection and commissioning, painting and PG testing at site.

2.0 CODES & STANDARDS

The design, fabrication & assembly, erection & performance of steel tanks shall comply with all latest statutory regulations and safety codes applicable in the locality where the tanks are to be installed. Tanks shall conform to the latest applicable Indian / British / USA standards. The vendor shall not be construed to be relieved of his responsibility by virtue of this specification. The tank in general shall conform to the latest editions, as applicable, out of the following standards.

1. IS-800 Code of practice for use of steel in general building construction
2. IS-803 Code of practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tank.
3. IS-804 Specification for rectangular pressed steel tanks
4. IS-805 Code of practice for use of steel in gravity water tank.
5. IS-816 Code of practice for metal arc welding for general construction in MS.
6. IS-817 Code of practice for training and testing for metal arc welder
7. IS-2825 Code of practice for unfired pressure vessel
8. BS-2594 Specification for carbon steel welded horizontal cylindrical storage tank
9. BS-2654 Specification for vertical steel welded storage tanks with butt welded shells for the petroleum industry
10. Indian explosive act and statutory requirements of chief controller of explosives, Nagpur (For oil storage tanks.)
11. Indian Boiler Regulations
12. Indian Factories Act
13. American code for oil tanks API 650
14. Material Specification as per relevant IS / or approved equal
15. American water works association standards (AWWA D100)



TITLE

**TECHNICAL SPECIFICATION FOR
CONDENSATE STORAGE TANK (SITE FAB.)**

SPECIFICATION NO. PE-TS-STD -167-A001

VOLUME II B

SECTION C

REV 00

DATE: June, 2007

SHEET 12 of 12

23. Bidder shall check that specification of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.
24. Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test procedure, list of sub - vendors (mechanical, C & I and erection and commissioning), technical specification and material of construction, painting specification / schedule, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.
25. All tools and plants including welding machines, crane, hydra, fork lift, batching plant etc. and instruments as required for construction, erection and commissioning, trial run and PG test at site shall be arranged by the bidder.
26. Makes of all instruments, items, valves etc. in bidder's scope shall be subject to BHEL / purchaser's approval and bidder shall adhere to the approved list only.
27. Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structurals, flanges, counter flanges etc. from BHEL approved sub vendor only. No argument on this account shall be entertained.

46



TITLE
TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001
VOLUME II-B
SECTION D
REV 00 **DATE 01 JUNE 2012**
SHEET 1 of 6

3.0 **DESIGN CONSIDERATIONS**

3.1 **General**

3.1.1 All tanks will be mild steel welded construction tanks and will be designed for the capacities, dimensions, necessary connections and working conditions as specified in Annexure-I. The design of tanks will be such as to allow easy inspection, cleaning and repair. Adequate stiffening will be provided to prevent the failure of tank due to buckling when it is empty.

The successful bidder shall furnish design calculations to BHEL during detailed engineering stage for approval along with the Xerox copies of relevant pages of authentic supporting literature e.g. Code, Hand book, National / international Standards etc. Calculation shall be necessarily done in **SI UNITS** only for the followings: -

- a) The tanks shall be designed as per IS – 803 / API – 650 / AWWA – D 100 / IS –2825 / BS – 2594 / Good engineering practice as applicable and referred code shall be of latest edition. However, requirement of codes and standards shall be as indicated in the **Annexure-I for Condensate storage tank / DM storage tank.**
- b) Plate thickness calculation (different courses of shell plate, bottom plate and roof plate thickness), roof curb angle, top wind girder, intermediate wind girder, tank internal pressure vis –a-vis. allowable value.
- c) Design of roof and roof structures for vertical storage tanks shall be designed based on guidelines given in the book titled “Process equipment design” by Brownell and Young.
- d) Tank stability calculation (wind load / seismic / overturning stability) shall be done as per API – 650, latest edition. However, factors / coefficients as required for the design of tank shall be obtained from BHEL by the bidder after placement of order.
- d) Vent sizing calculation shall be done as per API – 2000, latest edition
- e) Sizing calculation for vent, NaOH / KOH breather, seal pot and breather valve.
- f) Weight calculation of plates, appurtenances & structures separately shall be included in the Design calculation.

3.1.2 The successful bidder shall indicate references of all the clauses indicating their page number from respective standard in the design calculation during detail engineering stage. All calculations shall necessarily be done in SI units only. All steps including formulas and abbreviations shall be clearly shown in the calculation. All inputs / assumptions shall be indicated in the first sheet of the calculation.

3.1.3

- a) Minimum 8 mm (excluding tolerance on plate as per relevant IS) thick plates including corrosion allowance shall be considered for bottom, roof and side / shell plates for all tanks. Calculation for the plate thickness shall be got approved from BHEL / Customer during detailed engineering stage. However, if the addition / summation of calculated value of plate thickness (excluding tolerance on plate as per relevant IS) / nominal minimum thickness specified in the relevant design code / standard and corrosion allowance of 2 mm comes out more than 8 mm then the nearest available (higher side) plate thickness in the market shall



TITLE

**TECHNICAL SPECIFICATION FOR
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400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION D

REV 00

DATE 01 JUNE 2012

SHEET 2 of 6

be provided for bottom, shell and roof plates without any commercial implication.

- b) Negative tolerance on plate thickness shall not be considered in the plate thickness calculation and also shall not be provided in the tank. Only positive tolerance shall be considered.
- c) If the stiffening of bottom, shell and/ or roof is necessary, tank will be stiffened from outside.
- d) Flange faces of all the nozzles shall be machined and squared with vessel centre line.
- 3.1.4 All appurtenances and mountings shall also be designed as per relevant clauses of IS: 803 / API – 650 as per the design code indicated in **Annexure-I for Condensate storage tank / DM storage tank**.
- 3.1.5 Tank shall be suitably constructed for safe, proper and continuous operation under all conditions that can be expected in a plant life without undue strain, corrosion or other operating difficulties.
- 3.1.6 In calculating the minimum plate thickness, the specific gravity of the liquid shall not be taken less than 1.
- 3.1.7 The flanges shall be made by V-die and the corners welded, provided no cracks are developed.
- 3.1.8 Vessels seams shall be so positioned that they do not pass through vessel connections. For cylindrical vessels consisting of more than two sections longitudinal seams shall be offset.
- 3.1.9 Wherever possible, the inside seam weld shall be ground smooth, suitable for application of corrosion resistant primer.
- 3.1.10 Due consideration shall be given by the supplier for wind load and earthquake effect in the design of tanks.
- 3.1.11 For the tanks being of diameter larger than 3.75 m added structural supports in the form of rafter shall be provided.
- 3.1.12 Reinforcement in tanks shall be provided as per design code as indicated in **Annexure-I for Condensate storage tank / DM storage tank**. The reinforced connection shall be completely pre - assembled into shell plate.
- 3.1.13 The joint efficiency factor to be adopted for design calculation shall be in accordance with the specified design code.
- 3.1.14 All roofs and supporting structures shall be designed to support dead load plus a uniform live load of not less than 150 kg/m² of projected area.
- 3.1.15 Staircase / access ladder and hand railing shall be provided as per the relevant codes and standards.
- 3.1.16 Water draw off sump shall be provided as per the relevant design code, latest editions.
- 3.1.17 Code conformance for flanges / counter flanges shall be ANSI B 16.5. Code conformance for bolts and nuts shall be SA 193 & 194 respectively.

48



TITLE
TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION D

REV 00

DATE 01 JUNE 2012

SHEET 3 of 6

- 3.1.18 The number & size of nozzles (including flanges, counter flanges and inside piping) indicated in the sketches attached with the data sheets are tentative and for bidder guidance purpose only and the same may undergo change during detail engineering stage for which no commercial implication shall be entertained by BHEL.
- 3.1.19 Bidder shall furnish the Stadd calculation along with the roof structure calculation (if roof is designed on the basis of trusses) during detail engineering for checking the stability of roof.
- 3.1.20 Provision shall be made by the bidder to minimise the air ingress in the tank through float with arrow type level gauge and details of the same shall be furnished during detail engineering stage for BHEL's approval and approved arrangement shall be provided by the bidder without any commercial implication.
- 3.1.21 The tank shall be designed for filled water head / atmospheric pressure and design temperature for the tank shall be as specified in the **Annexure-I for Condensate storage tank / DM storage tank**.

3.1.22 Gaskets shall be 3 mm thick CAF. On completion of hydro test/ water fill test, contractor shall replace the gaskets used during testing at his own cost.

3.2 STAIRCASE/ ACCESS LADDER AND HAND RAILING

- 3.2.1 All cylindrical vertical tanks shall be provided with spiral staircase and shall confirm to the requirements specified in design codes / standards unless specified otherwise. All stair tread shall be 32 mm steel fabricated gratings. Each tread, if needed shall be housed in individual steel fabricated frame which shall be adequately supported from the tank periphery. The staircase shall have minimum 750mm clear width.
- 3.2.2 Access ladder, one (1) for each horizontal cylindrical / rectangular tank shall be provided for access to the tank roof. It shall be steel fabricated having minimum 450mm width. Ladder stringers shall be heavy steel flats or angle section. All rungs shall be minimum 20 mm diameter rods spaced at more than 30mm centre to centre. All ladders shall have steel fabricated safety cage to the approved construction. Safety cages shall be provided at about 2.5 m clear height of the ladder. Access ladder's stringers shall be widely spaced at top for free access to the tank roof.
- 3.2.3 All staircase and roofs of vertical cylindrical tanks shall be provided with pipe hand railings of effective height as indicated in the relevant code / standard throughout. Handrails shall be constructed out of 32 mm medium class galvanized steel pipe confirming to IS – 1239:1968. Handrail posts shall be arranged at spacing not greater than 1850mm. Two (2) sets of pipe horizontal runners all along the length shall be provided. All weld joints in the handrails shall be ground flush to protect any person getting injured. Steel toe plates of 100 mm flats shall be used. Hand railing shall be fabricated and installed in an approved manner as directed by purchaser in accordance with approved drawings.

3.3 VERTICAL CYLENDRICAL STORAGE TANKS

- 3.3.1 The vertical cylindrical storage (non-pressure) tanks shall be of mild steel welded construction and shall be designed in accordance with codes and standards as applicable. The vertical cylindrical storage tanks shall have slightly sloping bottom towards an



TITLE

**TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION D

REV 00

DATE 01 JUNE 2012

SHEET 4 of 6

adequately sized sump inside the tank to enable complete draining of the tank. The tank shall be designed for a wind pressure and seismic coefficient as specified.

- 3.3.2 Conical roof shall be either self-supported or supporting. The roof shall have a slope as specified in the relevant design code to ensure drainage of rainwater. Needed roof rafters and purlins adequately designed shall be provided.
- 3.3.3 All plates to be used for fabrication of tanks shall be checked and all sides trimmed to make them square.
- 3.3.4 All bottom plates shall have lap weld joints on all sides with overlap not less than five times the plate thickness.
- 3.3.5 All shell courses shall be taken to erection after bending to prevent plate skewing. For butt welding joints, edges shall be prepared which shall be uniform and smooth throughout. To maintain needed root penetration gap at any butt weld joint, sufficient number of erection cleats shall be provided on all sides of outer periphery of each shell plate. Plates for tanks shall be straightened by pressing or by other non-injurious methods.
- 3.3.6 Each shell course shall be of uniform width throughout longitudinal weld in plates. Make up for the course width shall not be permitted. Shell plates in each course width shall be so arranged that all vertical joints be staggered having a minimum stagger of 600 mm. Shell thickness could be reduced in upper courses depending on design requirements but in no case the plate thickness shall be less than 6 mm.
- 3.3.7 The tank height shall be completed by the provision of top curb angle which shall be butt welded to the adjacent tank plate courses. The outstanding leg of the curb angle shall be kept outside the tank periphery. All butt weld joints shall be full strength welds but for design of shell plate thickness adequate weld efficiency as recommended by applicable code(s) shall be used.
- 3.3.8 Tank roof shall be either self supported or supported over rafters / steel fabricated central column(s). Adequately sized and shaped rafters and purlins shall be provided. All rafters shall have sliding bolted connections at one end and preferably on the tank periphery side. The roof-supporting frame shall have needed tie rods or bracing sets.
- 3.3.9 Roof plates shall have lap joints with lap not less than 25 mm and lap weld over the top surface only. Roof plates shall have continuous fillet welds around the tank curb angle. No joint of roof plate over the supporting frame shall be made.
- 3.3.10 Needed openings for mounting various specified accessories shall be well reinforced in accordance with application codes and as approved. Manhole shall be bolted and hinged with covers unless otherwise specified.
- 3.3.11 All inlet pipe nozzles located at the top of tanks shall be provided with internal piping up to 500 mm height above the tank's bottom plate with suitable weir plate at bottom. The inside piping shall be adequately supported and shall be provided with adequately sized vent connection at pipe top.



TITLE

**TECHNICAL SPECIFICATION FOR
MISCELLANEOUS TANKS (SITE FABRICATED)
400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II-B

SECTION D

REV 00

DATE 01 JUNE 2012

SHEET 5 of 6

4.0 WELDING

- 4.1 Welding shall be in accordance with the requirement of IS: 803, 816, 817 and 823 or equivalent.
- 4.2 Welding sequence shall be adopted in such a way so as to minimize the distortion due to welding shrinkage. Contractor shall indicate in his drawing the sequence of welding proposed by him, which should meet prior approval of the Engineer.
- 4.3 All welders shall be BHEL / customer / consultant qualified as per the approved quality plan / field quality plan which will be submitted by the successful bidder during detail engineering stage. WPS and PQR shall be submitted by the successful bidder to BHEL / customer / consultant for review and approval.
- 4.4 Welding shall not be carried out when the surface is wet and during periods of rain and high winds unless the welder and work are properly shielded which should meet the approval of purchaser.
- 4.5 Inspection of all welds shall be carried out in accordance with the governing code of construction. All materials used by the vendor such as electrodes, gaskets, bolts, nuts etc shall be conforming to reputed standards and approved by the purchaser prior to use.
- 4.6 All openings in tank plate shall be well reinforced in approved manner by adding pad plates of adequate size and/ or structural sections.

5.0 Alignment

- 5.1 Plates to be joined by butt welding shall be matched accurately. Misalignment in completed vertical joints shall not exceed 10% of the plate thickness or 1.5mm for plates of 20mm thick and under, whichever is larger.
- 5.2 In completed horizontal butt joints, the upper plate shall not project beyond the face of the lower plate at any point by more than 20% of the upper plate thickness with a maximum of 3 mm for plate thickness 8 mm. Also for plate thickness under 8 mm, the maximum projection shall not be more than 1.5mm.
- 5.3 Each tank shall be properly constructed ensuring perfect vertical alignment within 5mm or as specified in the relevant code / standard and tank circularity within 5 mm on diameter or as specified in the relevant code/ standard. Local bulging and/ or depression at any location of tank particularly shell shall not be permitted.



TITLE

STANDARD DATASHEET -

400 MW MARIB GTPP PHASE-II
YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II - B

SECTION D

REV 00

SHEET

DATA SHEET FOR LEVEL INDICATOR

S.NO.	COMPONENT	DESCRIPTION
1	Type	Float and Arrow Type Level Gauge
2	Float Material	SS 316
3	Guide Cable	SS-316
4	Float Cable	SS-316
5	Spring	SS-304
6	Cover	SS-316
7	Roller / Pulley and Pulley Housing	SS
8	Scale Board	Aluminium, P.U. Painted
9	Pointer and Graduations	Aluminium and S.S.
10	Accuracy	± 5 mm
11	Range	To suit tank size
12	Quantity	one(1) number per tank

NOTE: For other components, the material shall be intimated to successful bidder by BHEL during detail engineering for which no commercial implication shall be entertained by BHEL. Suitable mechanism shall be provided by the bidder to minimise air ingress into the tank.

43

PEM-6666-0



TITLE
STANDARD DATASHEET -
400MW MARIB GTPP PHASE-II
YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II - B

SECTION D

REV 00

SHEET

DATA SHEET FOR PIPES, FITTINGS, FLANGES & ACCESSORIES

1.0	Pipes	Material Standard	Dimensional Standard
1.1	50 NB and below	Stainless steel pipe as per ASTM A-321, Gr. TP-304, Seamless, Sch. 40	As per ANSI B-36.19, Beveled ends
1.2	65 NB and above	Stainless steel pipe as per ASTM A-321, Gr. TP-304, ERW Welded, Sch. 10	As per ANSI B-36.19, Beveled ends
1.3	32 NB for Handrails	ERW pipe as per IS:1239 (Part-I), Gr. Medium, Galvanized as per IS:4736	As per ANSI B-36.10, Plain ends
2.0	Fittings(Elbow, Tees & Reducers)	Material Standard	Dimensional Standard
2.1	50 NB and below	Forged Stainless steel as per ASTM A-182, TP-304	ANSI B 16.11, S/W ends
2.2	65 NB and above	ERW Stainless Steel as per ASTM A-403, TP-304, Sch. 10	ANSI B 16.9, B/W ends
3.0	Slip-on-Flange/Blind Flange	Material Standard	Dimensional Standard
3.1	For SS Pipes	SS Plate Fabricated as per ASTM A-240, TP-304	ANSI B16.5, Cl.150#, RF
3.2	For MS Plates	MS Plate Fabricated as per IS-2062, Gr. B	ANSI B16.5, Cl.150#, FF
4.0	Bolts & Nuts	Material Standard	Dimensional Standard
4.1	For SS Pipes	ASTM A-193, Gr. B7 for Bolts ASTM A-194, Gr. 2H for Nuts	ASTM A-193 / A-194
5.0	Gasket	3 mm thick full face Rubber or CAF Gasket	ANSI B 16.21
6.0	Washer	Round plain washer 1.5mm thick for SS Pipe	



TITLE

STANDARD DATASHEET

400MW MARIB GTPP PHASE-II
YEMEN

SPECIFICATION NO. PE-TS-372-167-A001

VOLUME II - B

SECTION D

REV 00

SHEET

DATA SHEET FOR VALVES

S.NO.	COMPONENT	DESCRIPTION
1	Body and Bonnet	ASTM A 182 Gr. F 304 (50 NB and below) ASTM A 351 Gr. CF8M (above 50 NB)
2	Wedge and Seat Ring	ASTM A 182 Gr. F 304 (50 NB and below) ASTM A 351 Gr. CF8M (above 50 NB)
3	Trim	ASTM 182 Gr F316
4	Bolts and Nuts	A193Gr. B7 / A194 Gr. 2H
5	Rating	ANSI Class 800 (50 NB and below) ANSI Class 150 (above 50 NB)
6	Ends	SW 3000 # to B 16.11 (50 NB and below) Flanged to ANSI B16.5 (above 50 NB)
7	Design Standards	API 602 for gate valve (50 NB and below) API 600 for gate valve (above 50 NB) BS 5352 for globe Valves (50 NB and below) BS 1873 for globe Valves (above 50 NB)
8	Testing Standards	API 598 for gate valve (50 NB and below) API 598 for gate valve (above 50 NB) API 598 for globe valve (50 NB and below) BS 6755 for globe valve (above 50 NB)
9	Inspection	As per BHEL's approved QPs

42




**STANDARD DATASHEET FOR CS PIPES,
FITTINGS & FLANGES
400MW MARIB GTPP PH-II YEMEN**

DOC. NO. PE-TS-372-167-A001
VOL-IIIb SECTION-D
REV-00

DATA SHEET FOR CS PIPES, FITTINGS & FLANGES-

Sr. No	Size	Material Standard/ Other details	Dimension Standard
1.	PIPE		
	All sizes	Seamless Carbon Steel Pipes to A106, Gr. B, Standard weight or Sch.-40 as available /API 5L Gr B (with thicknesses corresponding those covered in other mentioned standards) / Equivalent with type of end as available and acceptable in line with relevant standard.	ASME B36.10 API 5L /Equivalent
	Type of end connection (Pipe to pipe & Pipe to equipment)	Butt welded for pipe size 65 NB & above; however, near equipment, this shall be of flanged type. Socket welded for 50 NB & below; near equipment this may be either socket welded or flanged.	Socket welding – ANSI B 16.11 Butt welding – ANSI B 16.25 Flanged- ANSI B 16.5 /BS 4504 / IS 6392; Class- As per relevant standard & suitable for intended service
2.	Fittings (Elbow, Tees and Reducers)	Material Standard	Dimension Standard
	50 NB and below	Forged carbon steel to ASTM A 105	SW ends to ANSI B 16.11 (3000#)
	50 NB above	Fabricated from parent pipe / Carbon Steel to ASTM A 234,Gr.WPB	BW ends to ANSI B 16.9, Sch.40
3.	Slip on Flanges / Blind Flanges	Material Standard	Dimension Standard
	All sizes	ASTM A 105/ Fabricated from IS2062 plate	As per ANSI B16.5, Class 150,/BS 4504/ IS 6392 ; class 150 lb/ equivalent to relevant standard.

41

	STANDARD DATASHEET FOR CS PIPES,		DOC. NO. PE-TS-372-167-A001	
	FITTINGS & FLANGES		VOL-IIB	SECTION-D
	400MW MARIB GTPP PH-II YEMEN		REV-00	

DATASHEET FOR CS VALVES

S.No.	Valve	Characteristics
1	Gate Valves	<p>i) Gate Valves for sizes up to 50 NB (As per manufacturer's standard) shall be of class 800, forged carbon steel valves with solid wedge, OS and Y rising stem and bolted bonnet, Trim shall be of 13% chrome steel. Body material shall be to ASTM A105 and ends shall be socket welded.</p> <p>ii) For sizes above 50 NB (As per manufacturer's standard), valves shall be of class 150/300 (depending on service), Cast Carbon Steel gate valves. Face to face dimensions shall be as per ANSI B 16.10. Body material shall be ASTM A216 Gr. WCB and ends shall be flanged to ANSI 150/300 lbs rating with raised face.</p> <p>iii) The valves shall conform to API-600/API-602 and shall be tested to API 598/IS: 6157 requirements,</p>
2	Globe Valves	<p>i) Globe valves for sizes up to 50 NB (As per manufacturer's standard) shall be of class 800 forged carbon steel valves with plug disc. Other particulars shall be same as 1 (ii) above.</p> <p>ii) For sizes above 50 NB (As per manufacturer's standard), valves shall be class 150/300 (depending on service) Cast Carbon steel globe valves with plug or ball type disc, Other particulars shall be same as 1 (iii) above.</p> <p>iii) The valve shall conform to BS, 1873/BS:2995 and shall be tested to BS:5146 requirements.</p>

Note: CS valves are to be used for RAW water and FILTERED water storage tanks. For other tanks, SS valves are applicable

SPECIFIC CONFIRMATION / COMMENTS REQUIRED FROM BIDDER		SPECIFICATION: PE-TS-372-167-A001	
TITLE: MISC. TANKS - SITE FABRICATED		Annexure- III	
PROJECT: 400 MW MARIB GTPP PHASE-II YEMEN		DATE: 1 JUNE, 2012	
		No. of SHEETS: 1	
S.N.	DESCRIPTION	REPLY / COMMENTS BY BIDDER	
1.00	MECHANICAL		
1.01	Bidder to confirm that there is no deviation from the Annexure-I attached in the Project Specific Technical Specification (PE-TS-372-167-A001 REV. 00). Bidder to confirm.	CONFIRMED / NOT CONFIRMED	
1.02	Bidder to confirm that Recommended foundation drawing along with loading data & anchor bolt details shall be in Bidder's scope however tank foundation & associated civil works are excluded from bidder's scope of work.	CONFIRMED / NOT CONFIRMED	
1.03	Bidder to confirm that material of construction of bolts and nuts shall be as per SA 193 Grade B-7 & 194 Grade-2H respectively & Material of construction of Gaskets shall be CAF / Rubber.	CONFIRMED / NOT CONFIRMED	
1.04	Bidder to note that Blast clean type (Grit blasting by Copper/MS/Other) shall be decided during detail engineering for which no commercial implication shall be entertained by BHEL.	CONFIRMED / NOT CONFIRMED	
1.05	Bidder to note that type of valve (Gate/Globe) shall be decided after award of contract for which no commercial implication shall be entertained by BHEL.	CONFIRMED / NOT CONFIRMED	
1.06	Bidder to confirm that deviation, if any, has to be strictly given in the Deviation sheet attached in the Technical Specification. Deviation given elsewhere in the offer, will not be taken cognizance of in any case Bidder to confirm.	CONFIRMED / NOT CONFIRMED	
1.07	Bidder shall completely adhere to the Manufacturing Quality plan attached in the Technical Specification (PE-TS-380-167-A001 REV. 00) for the following items: 1) Valves 2) Pipes and Fittings and Structural Steel 3) Level Switches and Level Gauges / Indicators. No deviation from the Quality Plan given by BHEL is acceptable. Bidder to confirm.	CONFIRMED / NOT CONFIRMED	

40

1.08	Bidder will strictly quote for complete scope of supply / services to be provided as mentioned in the Technical Data Sheet. Bidder to note that the following is also included in the main scope of supply: a) Commissioning spares.	CONFIRMED / NOT CONFIRMED
1.09	Bidder to confirm the compliance to the same. PG test will not be applicable however Commissioning of tanks will consist of installation of all accessories of tanks as per approved drawing/specification, charging of tank, water-fill test(for minimum 24 hours after complete filling of tank), satisfactory functioning of all accessories, emptying of tank, subsequent painting of complete tanks and changing of gaskets as per specification requirement.	CONFIRMED / NOT CONFIRMED
1.10	Bidder to provide operation and maintenance platform(s) with suitable access ladder for all valves not located at grade level.	CONFIRMED / NOT CONFIRMED
1.11	Bidder to review civil drawings prepared by customer based on civil input drawings furnished by the successful bidder.	CONFIRMED / NOT CONFIRMED

400MW MARIB GTPP PHASE-II YEMEN

(QUALITY PLANS)



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

Manufacturer's Name & Address :		MANUFACTURING QUALITY PLAN				Project :				
SAIL / TISCO		Item : MS Plates		QP No. : Rev. No. : 0 Date : Page No. : 2 of 2		BHEL Ref. : Contract No. : Contractor : BHEL SUB-CONTRACTOR-		Remarks		
Sl. No.	Components & Operations	Characteristic/Item	Class	Type/Method of check	Extent of Check	Reference Document	Acceptance	Format of Record	Agency P W V	
1	RAW MATERIAL Steel Plates	3	4	5	6	7	8	9	10	
1		Chemical composition and Mechanical test	Major	Review of correlated MTC	One/each	IS:2062	IS:2062	Mfgr. TC	3	2.1
2		Visual and dimensional Check	Major	Visual and measurement	100%	Mfgr. TC	Mfgr. TC IS 1852	Mfgr. TC	3	2.1
3		Identification / Marking	Major	Co-relation establish	100%	AS per manufacturing practice	AS per manufacturing practice IS 2062	Mfgr. TC	3	2
MANUFACTURER/ SUBCONTRACTOR		CONTRACTOR		SIGNATURE		LEGEND :		BHEL Doc. No. PE-QP-247-166-A801		Rev. 0
				1 - BHEL / CUSTOMER 2 - UML 3 - Manufacturer		P - Agency Performing the Test W - Agency Witnessing the Test V - Agency Verifying the Test		NAME & SIGNATURE OF APPROVING AUTHORITY		

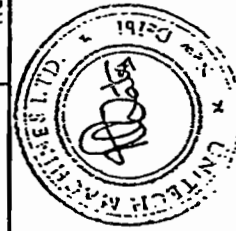
Notes:

- 1 In case material is despatched directly from SAIL/TISCO plant/stockyard or procured from dealer against co-related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of SAIL/TISCO.
- 2 In case material is procured from dealer and co-related TC's are not available, check on 100% quantity of plates will be performed on sample drawn from them at NABL certified/ approved laboratory or any govt approved laboratory for chemical & physical properties, However dimensional check shall be witnessed by BHEL.
- 3 There will not be any inspection by CUSTOMER.

28

MANUFACTURING QUALITY PLAN FOR VALVES

Sr. No	Component/Operation	Characteristics	Cl.	Type Check	Quantum	Reference Document	Acceptance Norms	Formal of Record	Insp. Agency				Remarks
									D	M	C/8	B*	
1.0	Material:												
1.1	Body, Bonnet, wedge/disc/Gland flg.	1. Chem. Composition	CR	Chem. Test	one/meal	Appd. Dtg/Data Sheet	Relevant Standard	TC	✓	P	V	V	Body/bonnet carry the heel mark for correlation with MFC.
		2. Mech. Properties	CR	Mech. Test	one/meal HT Batch	Appd. Dtg/Data Sheet	Relevant sid.	TC	✓	P	V	V	
		3. Heat treatment	MR	Review of HT Chart	100%	Relevant testing std.	Relevant testing std.	IR	✓	P	V	V	
		4. Surface defects	MR	Visual	100%	Defect Free	Defect Free	IR		P			
1.2	Stem, seal ring	1. Chem. Composition	MR	Chem. Test	one/meal	Appd. Dtg/Data Sheet	Relevant sid.	TC	✓	P	V	V	
		2. Mech. Properties	MR	Mech. Test	one/meal HT Batch	Appd. Dtg/Data Sheet	Relevant sid.	IR	✓	P	V	V	
1.3	Fasteners	1. Chem. Composition	CR	Chem. Test	one/meal	Appd. Dtg/Data Sheet	Relevant sid.	TC	✓	P	V		
		2. Mech. Properties	CR	Mech. Test	one/meal HT Batch	Appd. Dtg/Data Sheet	Relevant sid.	TC	✓	P	V		
<div> <div>For LEADER VALVES LIMITED</div> <div>BHEL</div> </div>													
<div> <div>LEGENDS:-</div> <div> 1. Manufacturer/sub-contractor, C-Contractor/BVIS 2. BHEL P - Perform, V - Verification, W-Witness, MR - Major, CR - Critical, CHP-Customer Hod IR - Review, NDT - Non Destructive Test, TC - Test Certificate, IR - Inspection Report, D: Data folder, DTP - Dye Penetrant Test </div> </div>													
<div> <div>Manufacturer/sub-contractor</div> <div>Asst. Mgr.</div> </div>									Reviewed by		Name & signature of approving authority & seal		



PM

Page : 3 of 5

Sr. No	Component/Operation	Characteristics	Cl.	Type Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Insp. Agency			Remarks	
									D	M	Q		
2.0	In Process Inspection :-												
2.1	Machining of valves components	Surface quality	MR	Visual	100%	Mfg.Drg	Mfg.Drg.	IR		P			
		Dimensions	MR	Measurements	100%	Mfg.Drg	Mfg.Drg.	IR		P			
2.2	Splindle	Surface finish	MR	Measurements	100%	Mfg.Drg	Mfg.Drg.	IR		P			
		Surface defects	MR	DPT	100%	ASME 1.65	No defects	IR	✓	P	V	V	
2.3	Wedge/disc & seating stem, back seating ring	Lapping	MR	Blue matching	100%	Surface shall be smooth & have 100% metal to metal contact		IR		P	V	V	
3.0	Assembly												
		1. Dimensions	MR	Measurements	100%	Apprd.Drg	Apprd.Drg	IR		P	V		
		2. West travel/valve lift	MR	Measurements	100%	Mfg.Stel.	Mfg.Stel.	IR		P	V		
		3. Cleaning & deburring	MR	Visual	100%	Mfg.Stel.	Mfg.Stel.	IR		P	V	V	
4.0	Testing & Final Inspection												
4.1	Operational test	Smooth opening & closing	MR	Manual	100%	Smooth operation		IR	✓	P	W	W	
4.2	Body/seal, Back seal	Pressure testing	CR	Hydrotesting	100%	Apprd.Drg/No leakage data sheet		IR	✓	P	W	W	
4.3	Seal	Pressure testing	CR	Pneumatic testing	100%	Apprd.Drg/No leakage data sheet		IR	✓	P	W	W	
4.4	Final Inspection	1. Dimensions	MR	Measurements	100%	Apprd.Drg	Apprd.Drg	IR	✓	P	W	W	
		2. Cleanliness & complete	MR	Visual	100%	Apprd.Drg	Apprd.Drg	IR	✓	P	W	W	
<p>For LEADER VALVES LIMITED</p> <p>Manufacturer/sub-contractor</p> <p>Regional manager</p>													
<p>LEGENDS :-</p> <p>M - Manufacturer/sub-contractor, C-Contractor/BVIS</p> <p>B - BHEL</p> <p>P - Perform, V - Verification, W-Witness, MR - Major, CR - Critical, CHP-Customer Hod</p> <p>R-Review, NDT - Non Destructive Test, TC - Test Certificate,</p> <p>IR - Inspection Report, D-Data folder, DTP - Dye Penetrant Test</p>													
										Reviewed by		Name & signature of approving authority & seal	



37

MANUFACTURING QUALITY PLAN FOR PRE-FABRICATED PLATES, PIPES & FITTINGS, STRUCTURAL STEEL

Component/Operation	Characteristics Checked	Category	Type/Method of Check	Percent of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks
								M P Q V N	
Painting	Surface Preparation	MA	Visual	100%	As per BHEL appd. Drg./painting procedure	As per BHEL appd. Drg./painting procedure	Inspection Report	P V	
	Thickness	MA	coating gauge	100%	As per BHEL appd. Drg./painting procedure	As per BHEL appd. Drg./painting procedure	Inspection Report	P W	
Packing	Correctness	MA	Visual	100%	As per BHEL appd. Drg.	As per BHEL appd. Drg./painting procedure	Internal Insp. Report	V V	
QA & QC Documentation	Review of all TC/Inspection reports	MA	Visual	100%	Technical specification	Technical specification	Insp. Report	V V	
<p>LEGENDS :-</p> <p>M-Manufacturer/sub-contractor, C-Contractor/nominated inspection agency (BHEL/BVIS)</p> <p>N-Customer/Consultant</p> <p>P-Perform, V-Verification, W-Witness, MA-Major, CR-Critical, CHP-Customer hold point, DPT-Dye penetration test</p> <p>D*-Data folder (Records identified with "D" shall be essentially included by the contractor/manufacturer)</p>									
								Review by	Name & Signature of approving authority & seal

Component/Operation	Characteristics Checked	Category	Type/Method of Check	Extent of Check	Reference Documents	Acceptance Norms	Format of Record	Agency	Remarks	
							D ⁺	M	C	N
Receipt of Material Plates, Pipes, Pipe fittings, structural steel	Dimension & finish	MA	Measurement & Visual	100%	Inspection Report & MTC	Inspection Report & MTC	Internal Insp. Report	V	V	A
Fabrication of Plates, Pipes & Structural Steel	Cutting & edge, preparation of plates, pipes, structural steel	MA	By Tinsquare	100%	Sides to be perpendicular to each other	Sides to be perpendicular to each other	Internal Insp. Report	V	V	-
	Cutting	MA	Measurement & Visual	100%	As per BHEL Apprd. Drg.	As per BHEL Apprd. Drg.	Internal Insp. Report	P	V	-
	Edge Preparation	MA	Measurement & Visual	100%	As per BHEL Apprd. Drg.	As per BHEL Apprd. Drg.	Internal Insp. Report	P	V	-
Surface Preparation of plates, CS Pipes, Structural Steel	Surface Finish	MA	Visual	100%	As per BHEL Apprd. Drg.	As per BHEL Apprd. Drg.	Inspection Report	P	V	-
Rolling of Shell Plates	Dimensions	MA	Measurement	100%	As per BHEL Apprd. Drg.	As per BHEL Apprd. Drg.	Inspection Report	P	W	-
Pipes, fittings & structural steel	Dimensions	MA	Measurement	100%	As per BHEL Apprd. Drg.	As per BHEL Apprd. Drg.	Inspection Report	P	W	-
Fabrication of Nozzles	Correctness	MA	Scrutiny	100%	ASME Sec. IX	ASME Sec. IX	Format of ASME Sec. IX	P	V	-
Welding Procedure specification (WPS)	weld soundness	MA	Physical test, R.T	ASME Sec. IX	ASME Sec. IX	ASME Sec. IX	Format of ASME Sec. IX	P	V	-
Procedure & welder Qualification	Weld defects	MA	DPT on butt weld/fillet weld	100%	ASME Sec. VIII Div. I	ASME Sec. VIII Div. I	Internal Inspection Report	P	V	-
Welding										
<p>LEGENDS:-</p> <p>M-Manufacturer/sub-contractor, C-Contractor/nominated inspection agency (BHEL/BVIS)</p> <p>N-Customer/Consultant</p> <p>P-Perform, V-Verification, W-Witness, MA-Major, CR-Critical, CHP-Customer hold point, DPT-Dye Penetration Test</p> <p>D⁺-Data folder (records identified with "D" shall be essentially included by the contractor/manufacturer)</p>										
<p>BHEL</p> <p>Contractor</p>									Review by	Name & Signature of approving authority & seal

status shall be interpreted as it shall not relieve contractor of its obligations.

APPROVAL CATEGORY: AWARDED - I

CAT. I is approved

CAT. II approved with Comments as Noted

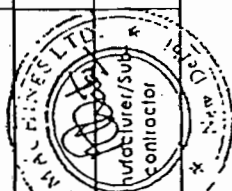
CAT. III Approved

Approved Drawing


APPROVED BY

DATE

03.02.05



36

Manufacturer's Name:				QUALITY ASSURANCE PLAN				PROJECT: PACKAGE: Condensate & DM Water Storage Tanks (Site Fabricated) LOI No.: Owner: Customer: BHEL				BHEL Doc. No.: PE-VO-298-167-A506 Rev. No.: 0 Date:			
				QA OF LEVEL INDICATOR				Format of Record (D*)				Remarks			
Sl. No.	Components and Operation	Characteristic/ Item	Class	Type of Check	Extent of Check	Reference Document	Acceptance Norm					Agency M C N			
1	2	3	4	5	6	7	8	9				11			
1	Level Indicator	Check for Type, Model No., Tag No.	MA	Visual	100%	Approved Data Sheet	Approved Data Sheet	Mfr. TC				P	V	V	
2		Float Leakage Test	CR	Mechanical	100%	Approved Data Sheet	Approved Data Sheet	Mfr. TC				P	V	V	
3		Review of TC for Material	CR	Visual	For Lot	MTC	MTC	Mfr. TC				P	V	V	
LEGEND : * RECORDS IDENTIFIED WITH "TICK" SHALL BE INCLUDED												DOC. NO. : 9484-108-01PE-PVQ-Q-016 Rev No.1			
				N : NTPC C : BHEL M : Manufacturer				P - Perform W - Witness V - Verification							
Manufacturer / Contractor / Sub				CR-Critical Characteristics MA - Major Characteristics MI- Minor Characteristics								APPROVAL SEAL			
Signature								FOR CUSTOMER				APRD. BY			

400MW MARIB GTPP PHASE-II YEMEN

ANNEXURE-IV

(Sea worthy Packing for Export jobs)



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

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**

32

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

1.0 Purpose

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

2.0 SCOPE

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

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

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


3.0 Application

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

4.0 Definitions

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

5. General Information

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 2	OF 52

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

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

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

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

6.0 Criteria for Selection of Packaging

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

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

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

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

Materials can be classified in following categories

- Hazardous Material
- Non-Hazardous Material


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

6.1 Hazardous Materials

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

6.2 Non-Hazardous GOODS

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 3	OF 52

7.0 Marking Instructions & Despatch details, Storage Code

7.1 Marking Instructions & despatch details

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

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

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

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

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

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

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

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

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

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


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

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

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

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

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 4	OF 52

7.2 Storage Code

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

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

8.0 GUIDELINES FOR PACKING GOODS

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

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

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

IMPORTANT NOTE:

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

8.1.2 Pipe

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

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

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

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


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

8.1.3 Pipe Fittings, Flanges and Valves

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

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

8.1.4 Structural Steel

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 5	OF 52

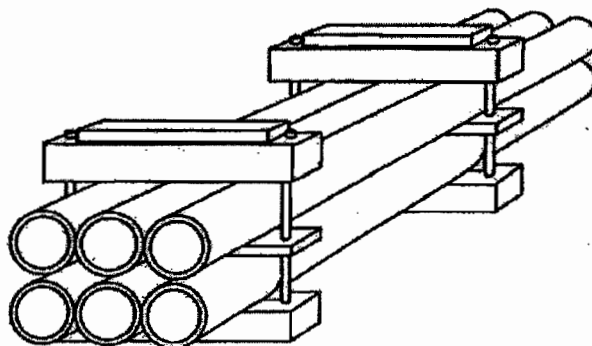
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

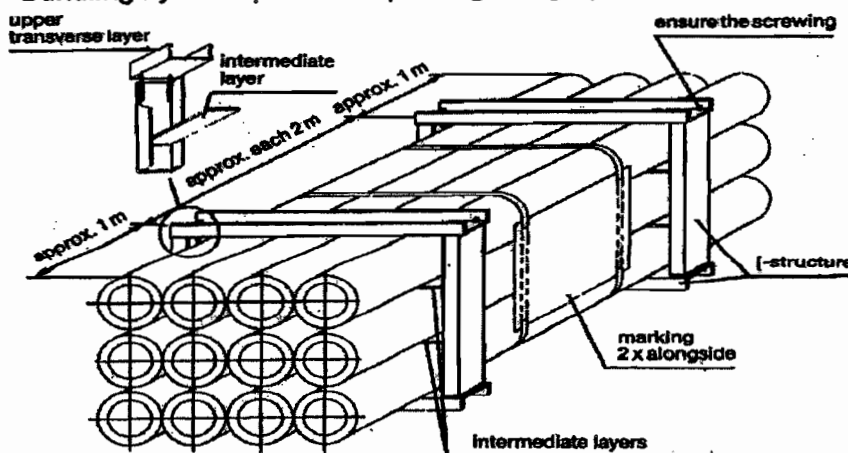
8.2.1 Type of Equipment

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME	II B
		SECTION	D
		REV. NO. 0	DATE 10/08/2010
		SHEET	6 OF 52

- 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)

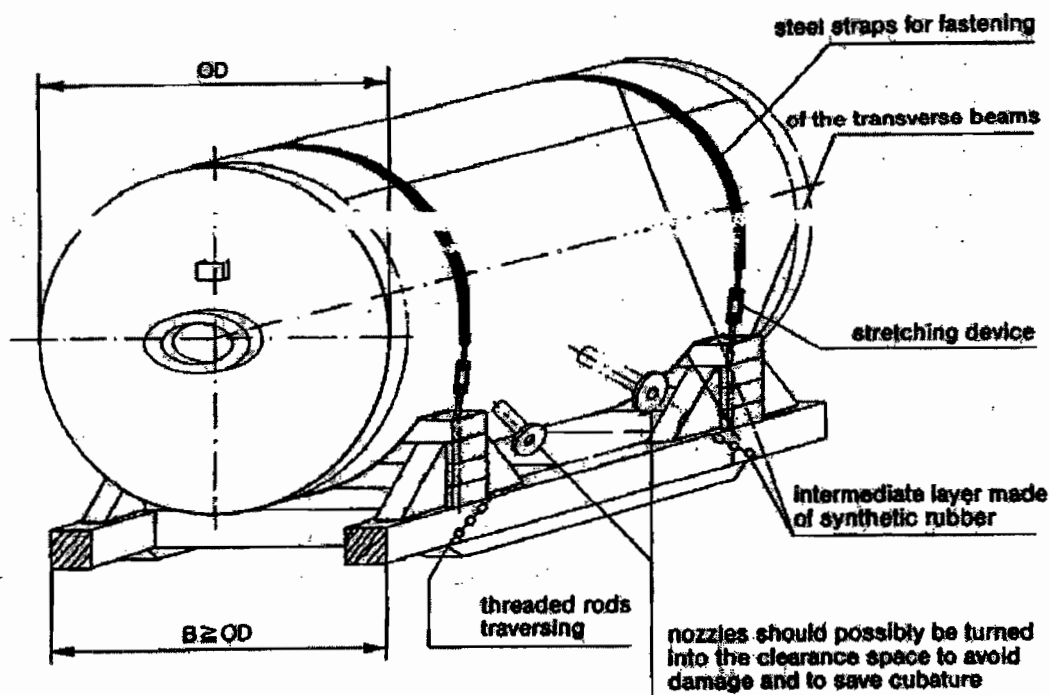
8.3.1 Type of Equipment


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



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 7	OF 52

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

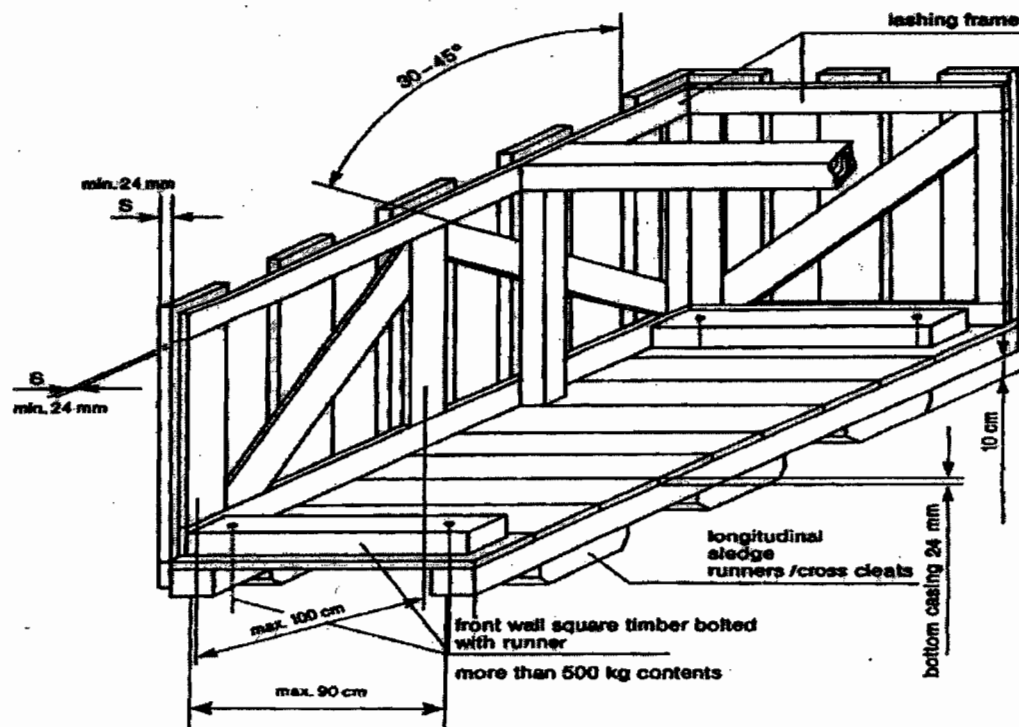
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

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



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 8	OF 52

8.4.2 Cases with Lining – Packing Category IV

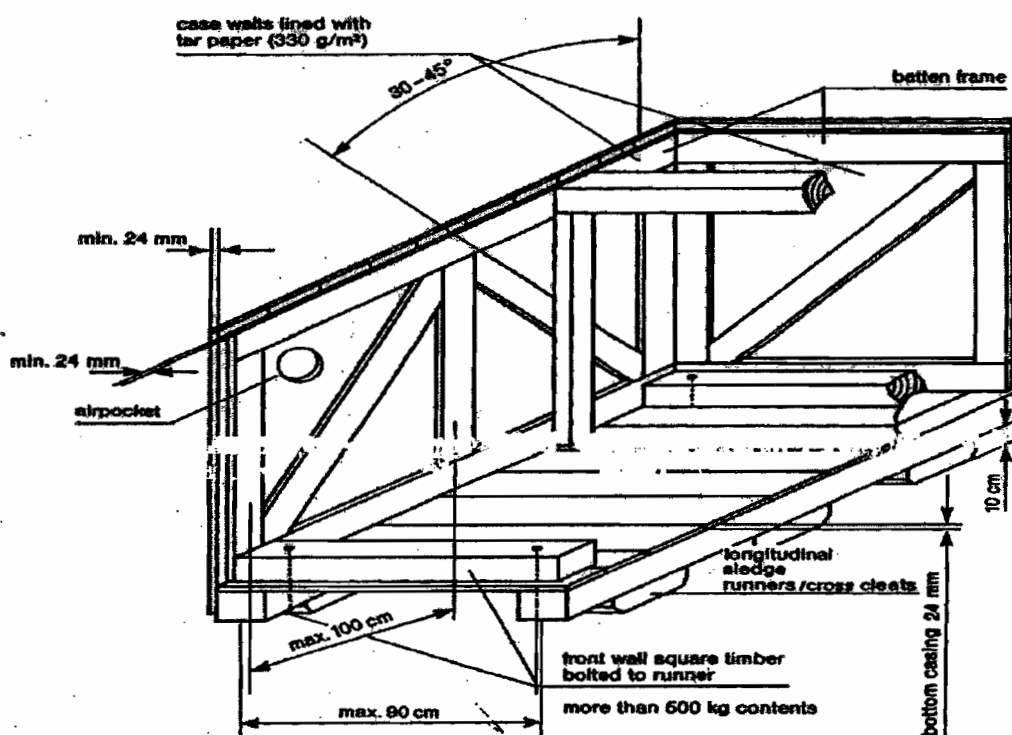
8.4.2.1 Type of Equipment

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.

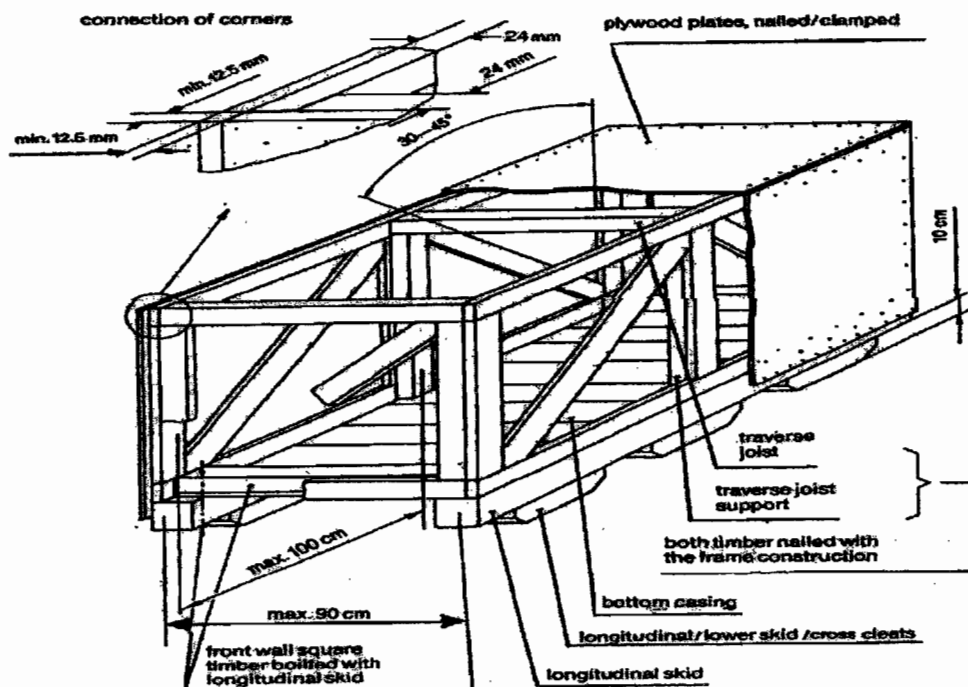
Packing Category IV



8.4.3 Cases with Alternative Surface Materials

8.4.3.1 Plywood Box – Packing Category IV A

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 9	OF 52



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

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

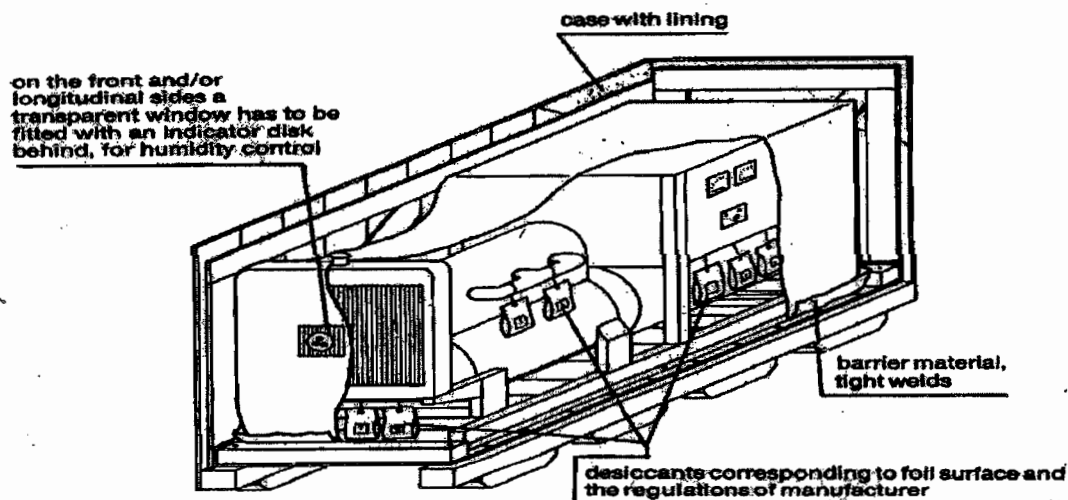
Electrical equipment such as, switchboards, electric motors, sensitive equipment, with non-corrosion guarantee, for a period up to twelve (12) months.

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).

98

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 11	OF 52

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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001			
		VOLUME II B			
		SECTION D			
		REV. NO. 0	DATE 10/08/2010		
		SHEET	12	OF	52

8.5.2 Type of Packing

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

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

8.5.3 Dimensions

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

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

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

9.1 Technical specification for wood

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

9.2 Chemical Treatment of Wood.


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

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:

9.3.1 PACKING OF EQUIPMENTS

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

9.3.1.1 Bottom Frame

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 13	OF 52

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

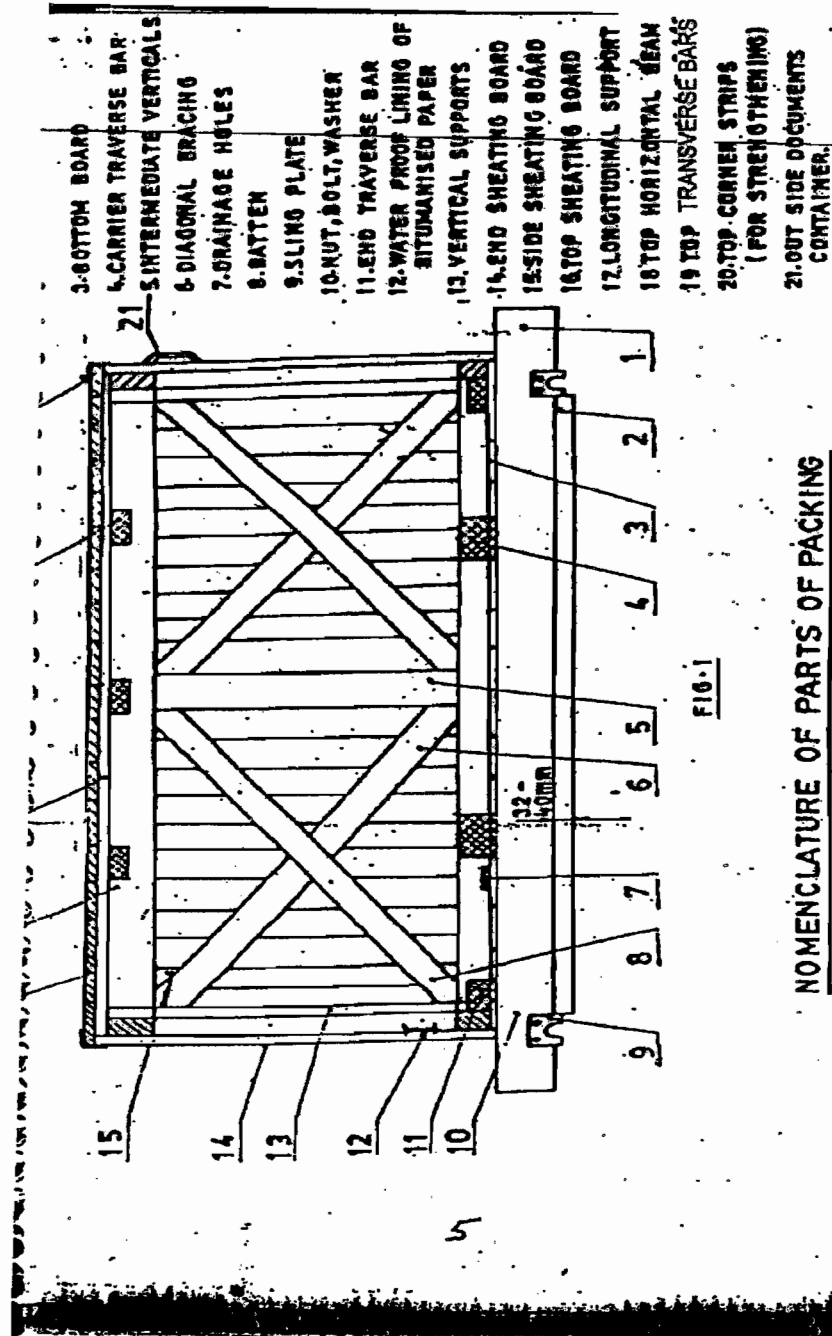
- The thickness of planks for top, bottom, side and end panels shall be at least 25mm. Planks used for this purpose shall be joined with each other by tongue and groove joint. The groove dimension shall be such that tongue fits tightly into groove to make the joint.
- Runners/slides, traverse bars, etc 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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 14	OF 52

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.

	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 15	OF 52		




NOMENCLATURE OF PARTS OF PACKING

CASES

FIG-1

028

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 16	OF 52

BOTTOM FRAME ARRANGEMENTS

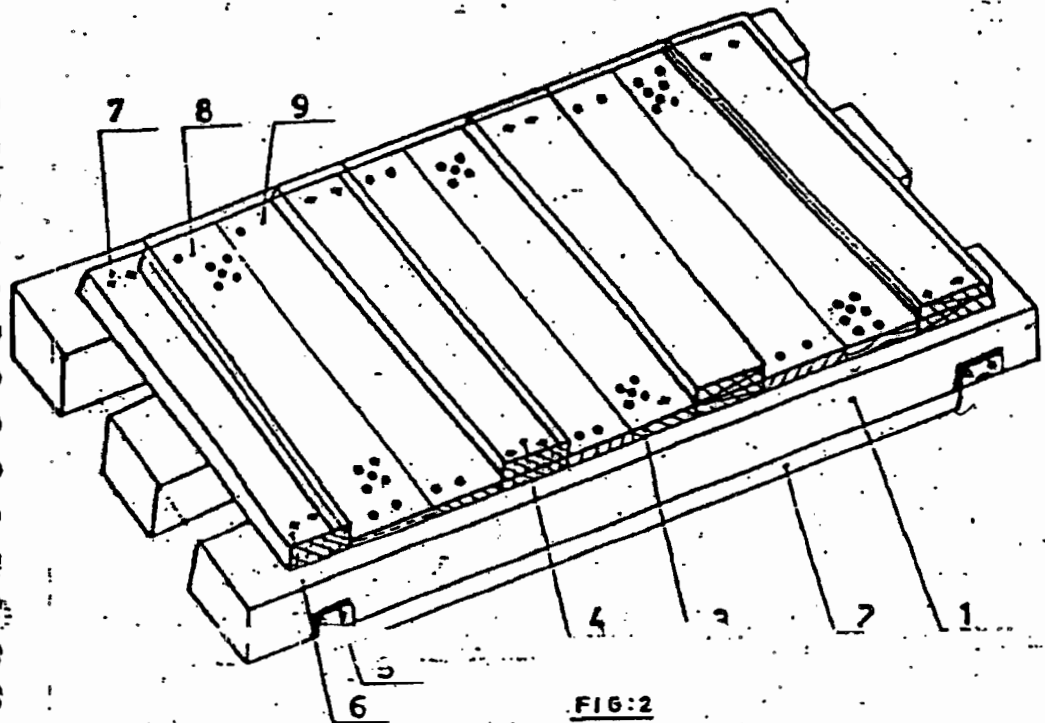



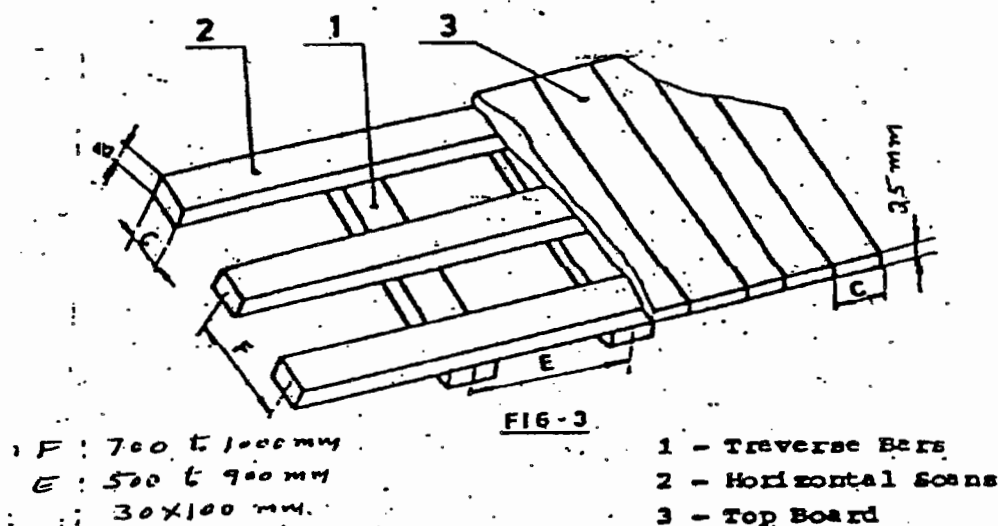
FIG:2

Nos. of slides: Minimum 2 Nos.
 For length more than 1800 mm or
 load more than 1000kg, Nos. of
 slides shall be minimum 3 Nos.
 For dimensions of slides, refer Table 1
 Cross section of end traverse bar; 100x100 mm
 (minimum)

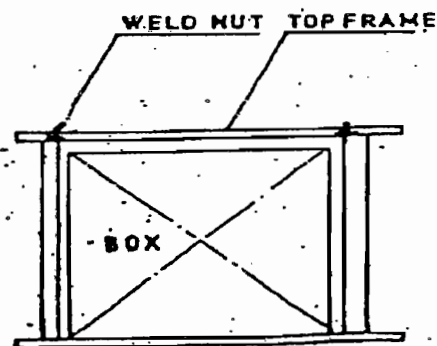
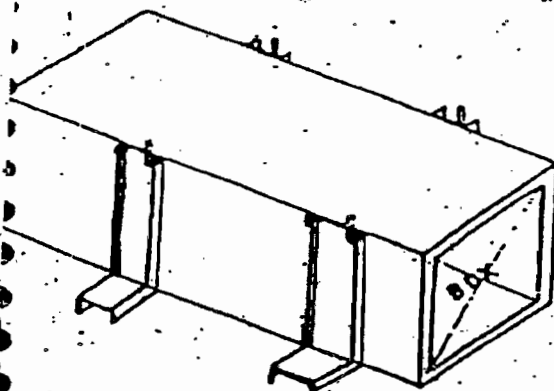
1. SLIDE
2. UNDER SLIDE BOARD
3. BOTTOM BOARD
4. CARRIER TRAVERSE BAR
5. SLING PLATE
6. TRAVERSE BAR
7. BOLT, NUT & WASHER
8. DRAINAGE HOLES
9. NAILS


	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 17	OF 52

TOP FRAME ARRANGEMENT



ARRANGEMENT OF C-CLAMPS AROUND CASES



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 18	OF 52

ARRANGEMENT OF DIAGONAL BRACING AND HORIZONTAL SUPPORT

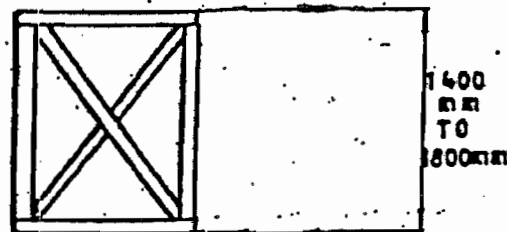


FIG: 6

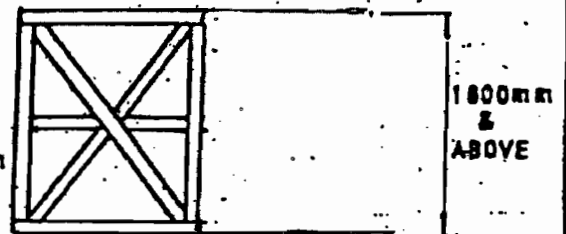
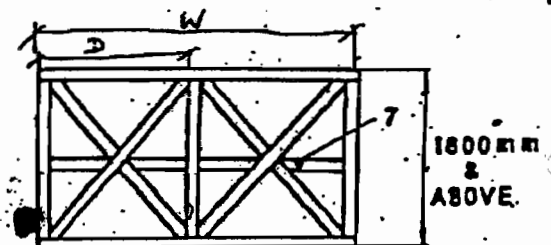


FIG: 8



7- Middle Horizontal Support

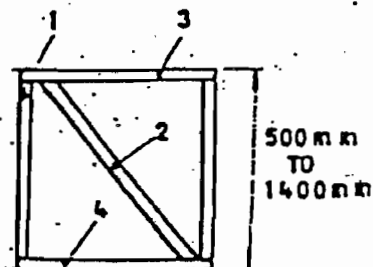


FIG: 5

1- Vertical Support

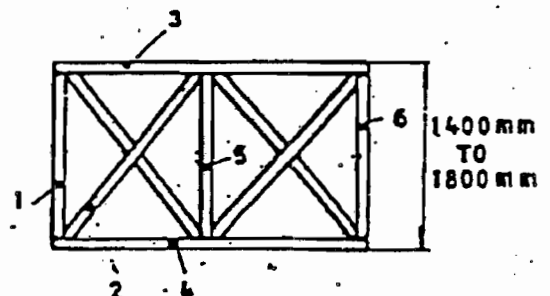



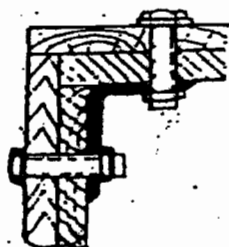
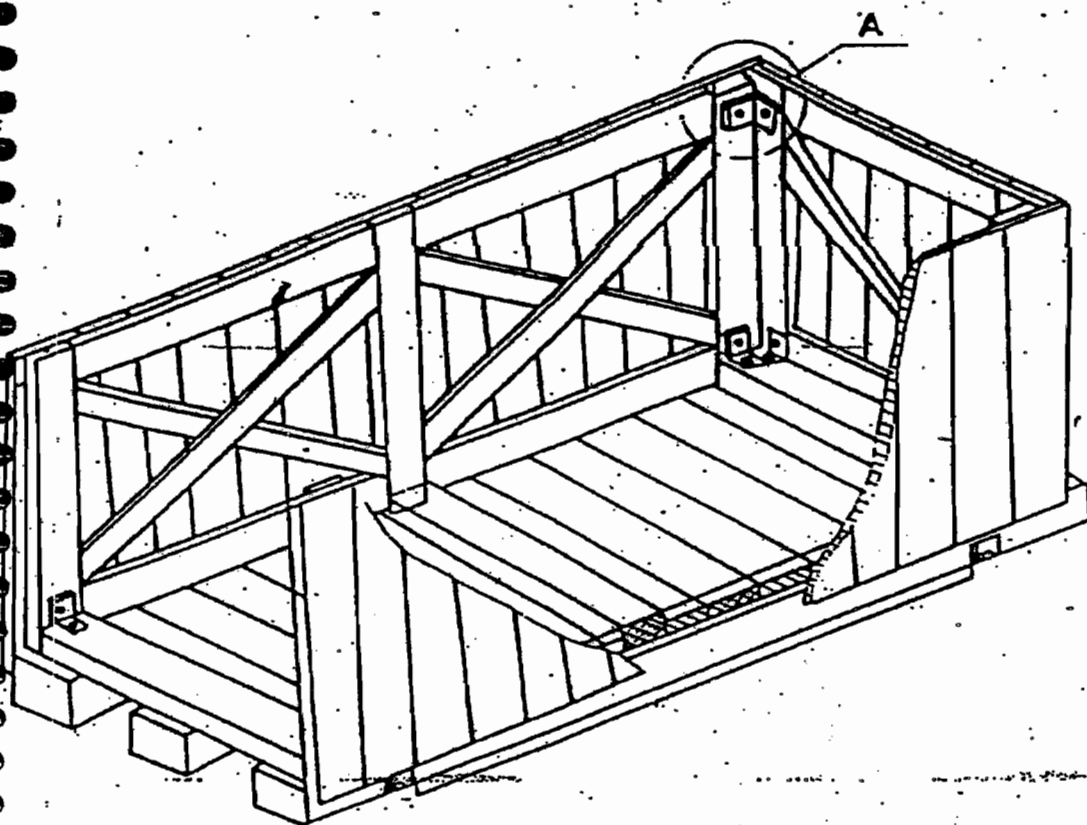
FIG: 7

1, 5, 6 - Vertical Support

24

	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 19	OF 52

ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

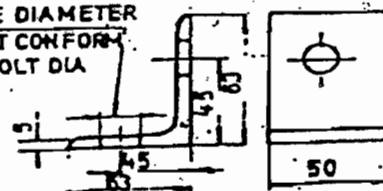

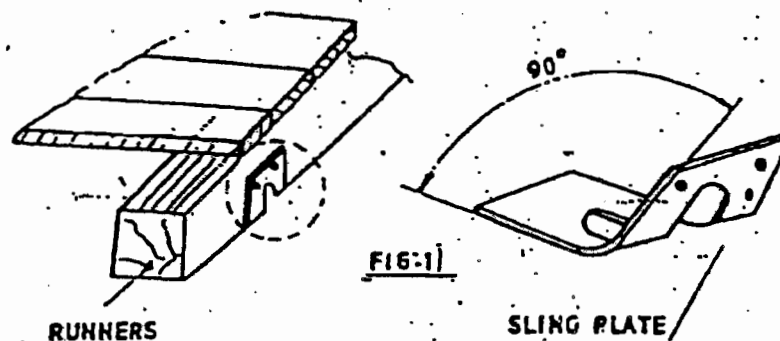


FIG:10

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 20	OF 52

ARRANGEMENT OF SLING & PLATE ON CASES



23


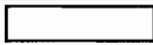

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 21	OF 52

TABLE-1



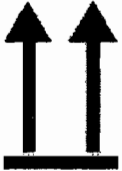




LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c						
500	50 X 100	50 X 100	50 X 100	50 X 100	75 X 100	75 X 100	100 X 100
800	50 X 100	50 X 100	75 X 100	75 X 100	75 X 100	75 X 100	100 X 100
1000	75 X 100	75 X 100	75 X 100	100 X 100	100 X 100	100 X 110	100 X 150
1500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

SHEET 22 OF 52

End and side panels	Width of the panel "W"	Distance between longitudinal support (Dimension "D")						
		600	800	1000	1200	1400	1600	1800
		Cross section b x c				Item 1 to 7		
Fig- 5 to Fig-9	600 to 1200	30	30	30	30	30	30	30
		X	X	X	X	X	X	X
		100	100	100	130	130	130	130
	1201 to 1600	30	30	30	30	30	30	30
		X	X	X	X	X	X	X
		130	130	130	130	130	130	130
	1601 to 2000	30	30	30	30	30	30	30
		X	X	X	X	X	X	X
		130	130	130	130	130	130	130
	2001 to 3000	30	30	30	30	30	30	40
		X	X	X	X	X	X	X
		130	130	130	130	130	130	150
	3001 to 4000	40	40	40	40	40	40	40
		X	X	X	X	X	X	X
		150	150	150	150	150	150	150


	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 23	OF 52

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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME	II B
		SECTION	D
		REV. NO. 0	DATE 10/08/2010
		SHEET	24 OF 52

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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 25	OF 52





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

	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 26	OF 52

BHEL-PEM-DELHI-INDIA			
CONSIGNEE			
MATERIAL			
CUSTOMER REF.	MD. NO.		
DESPATCH ADVICE NOTE NO.	CASE NO.		
DIMENSIONS(MM) LXBXH	NET WT -KGS	GROSS WT -KGS	
SPECIAL INSTRUCTIONS	HANDLE WITH CARE -- KEEP DRY DO NOT DROP -- DO NOT TILT		

FIG-13: MARKING PLATE

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 27	OF 52

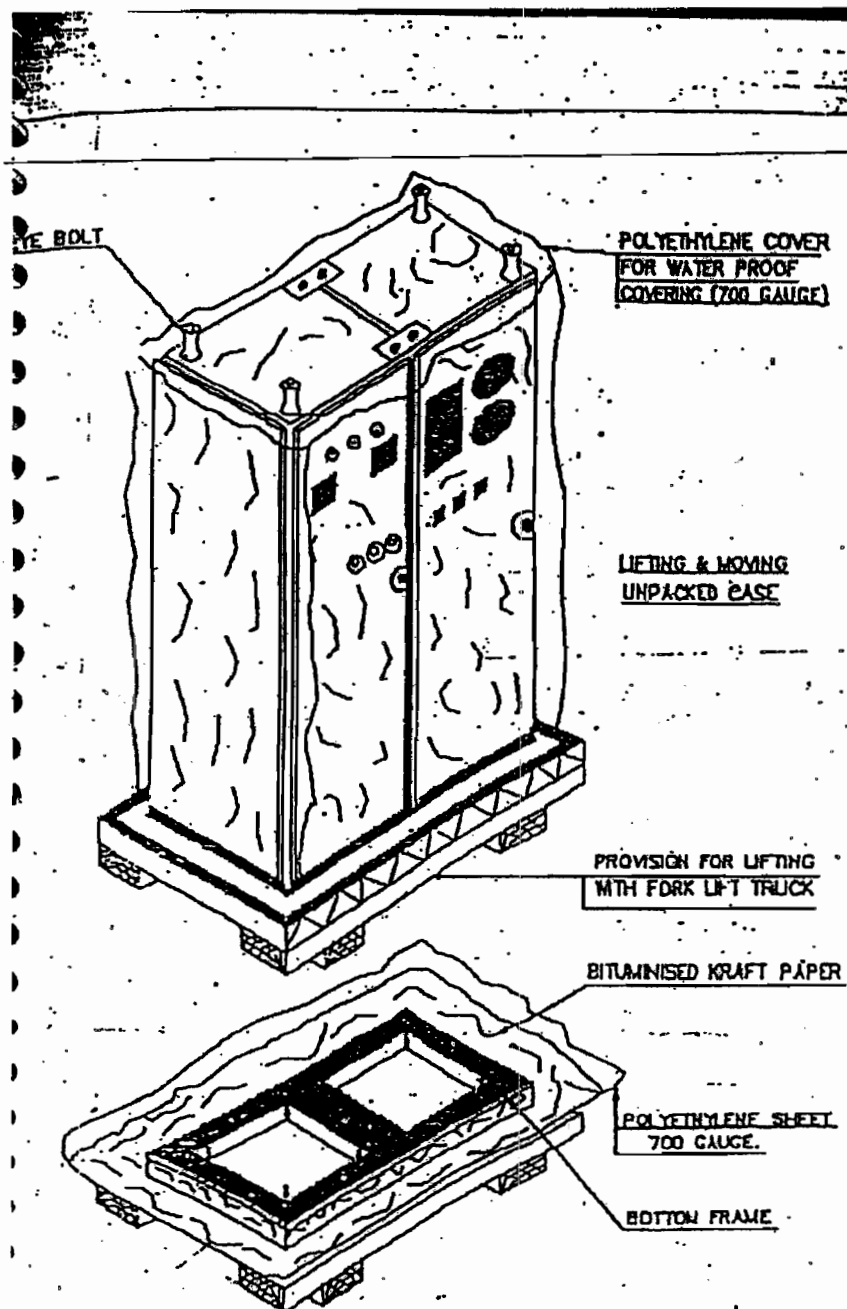



FIGURE-14

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 28	OF 52

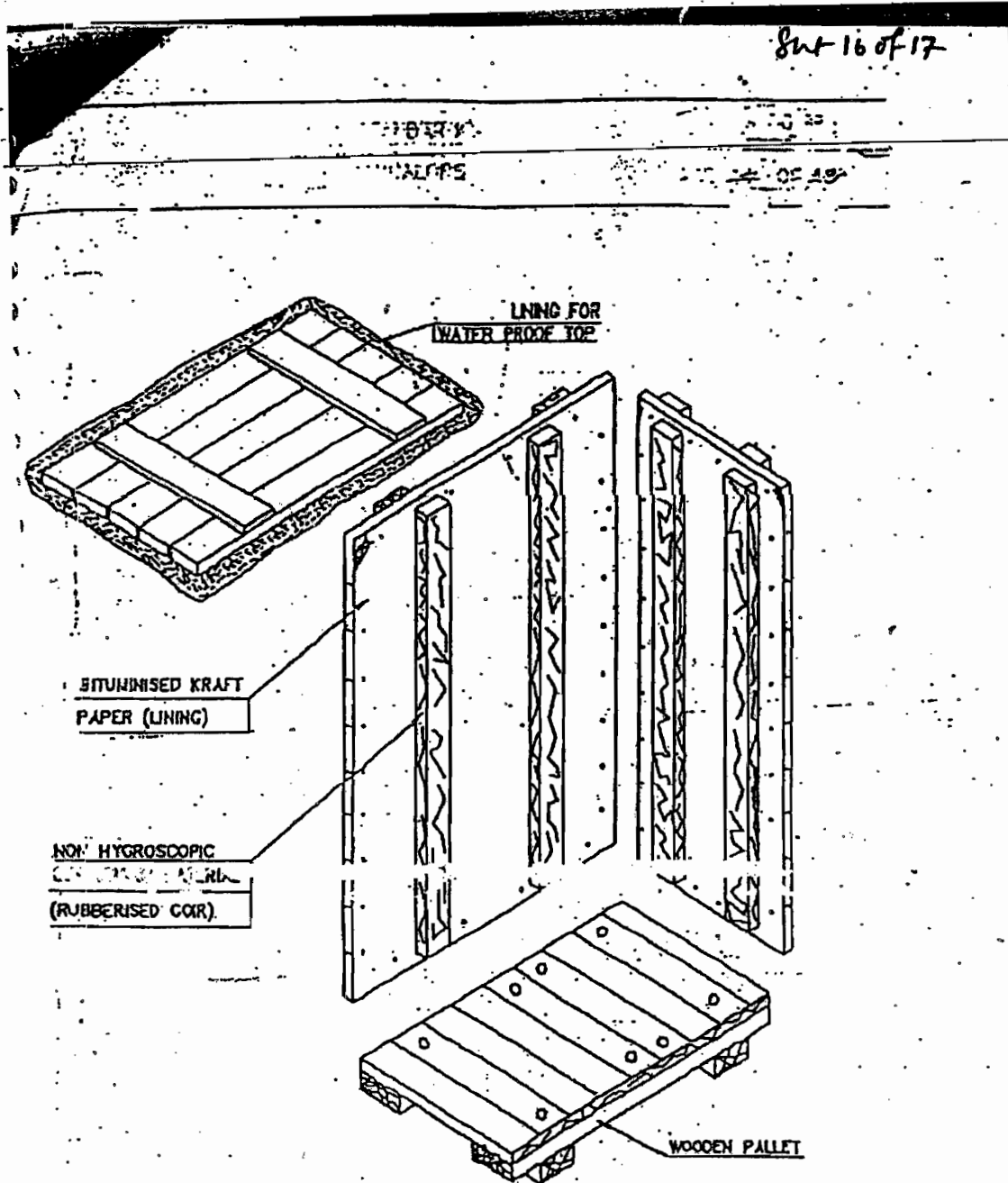

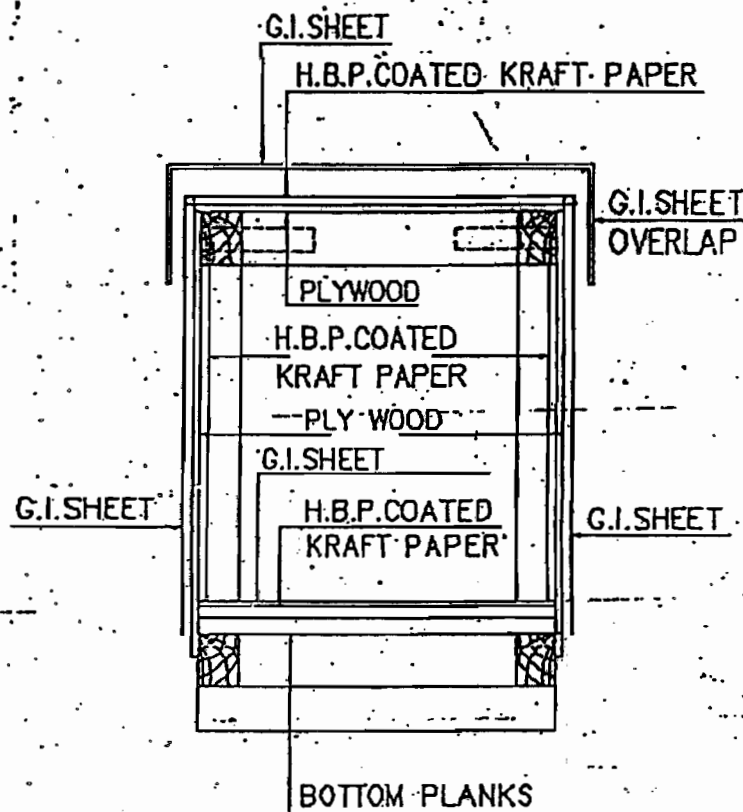



FIGURE-15

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 29	OF 52



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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 30	OF 52

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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 31	OF 52

- h. Putting circumferential polyester strap (3 nos.) & eye polyester strap (4 nos.).
- i. After placing the coil on coil filter 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 comers.


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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 32	OF 52

- 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.

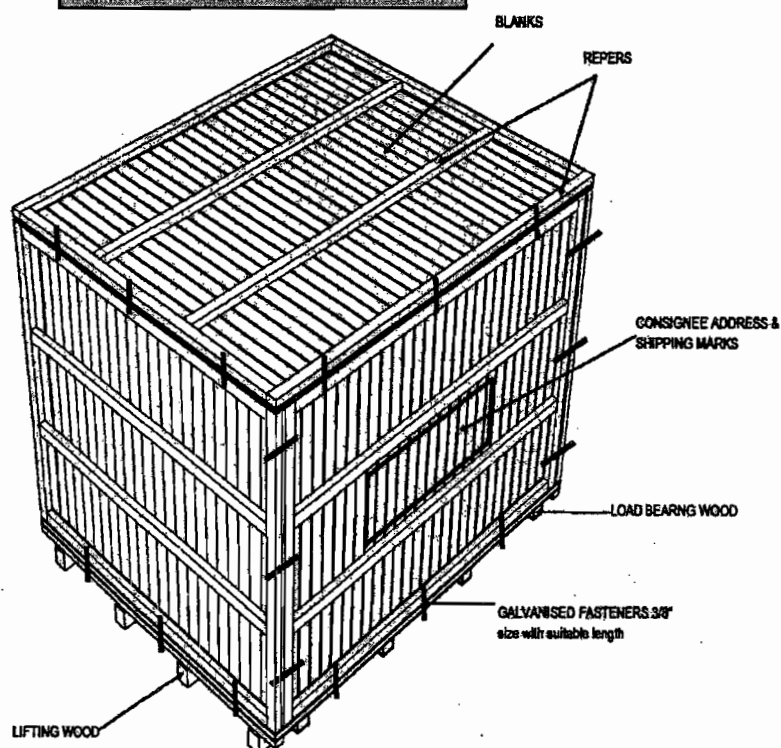
17


	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME	II B
		SECTION	D
		REV. NO. 0	DATE 10/08/2010
		SHEET	33 OF 52

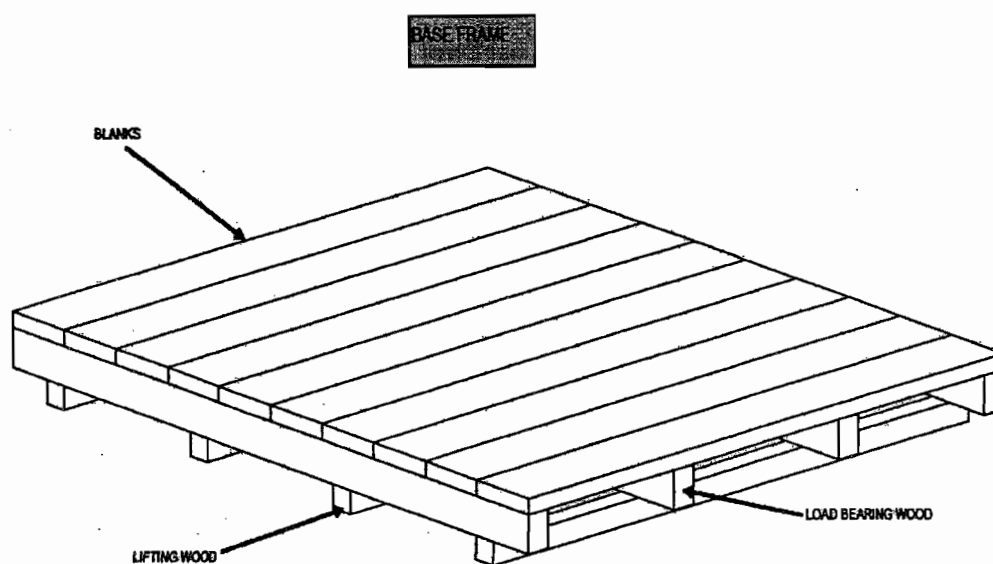
MODEL FASTENERS TYPE (BASE, SIDE & TOP
ATTACHED WITH BOLT, NUT & WASHER)

This Type of case to be used for
following items:

1. BALL SEPARATOR
2. BALL COLLECTOR SKID



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 34	OF 52

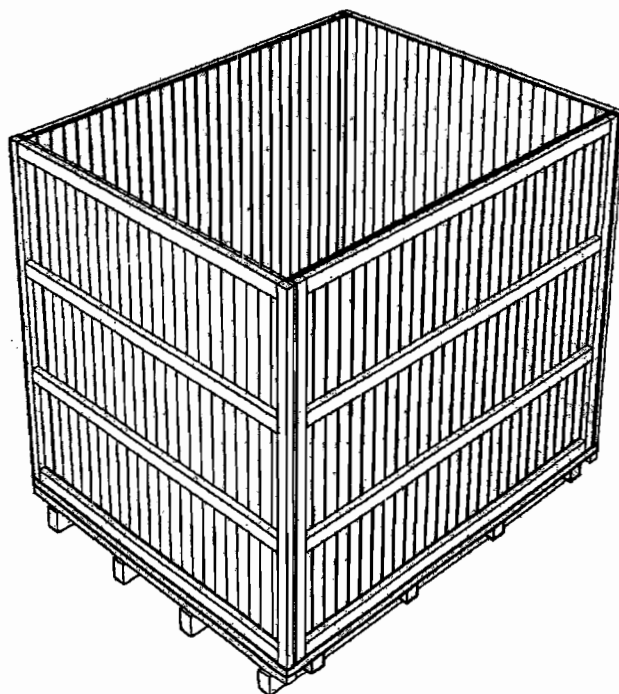


SHEET 06 of 10

TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS

SHEET 35 OF 52

MODEL FASTNERS TYPE WITHOUT TOP





TITLE

TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS

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

VOLUME II B

SECTION D

REV. NO. 0 DATE 10/08/2010

SHEET 36 OF 52

WOODEN CASE
TYPE A (NO. 1) - 1000 LITERS

- THIS TYPE OF CASE TO BE USED FOR THE FOLLOWING ITEMS:
1. PUMP/SCO
 2. CONTROL PANEL
 3. ENGINE/TECH. TOOLS & TACKLES
 4. SPARE PARTS
 5. SPARE PARTS
 6. CLEANING BALLS
 7. CABLES & ACCESSORIES

Shipping marks & Consignee Address

BLANK

LIFTING WOOD

BLANKS

KEEPPERS


BLANKS

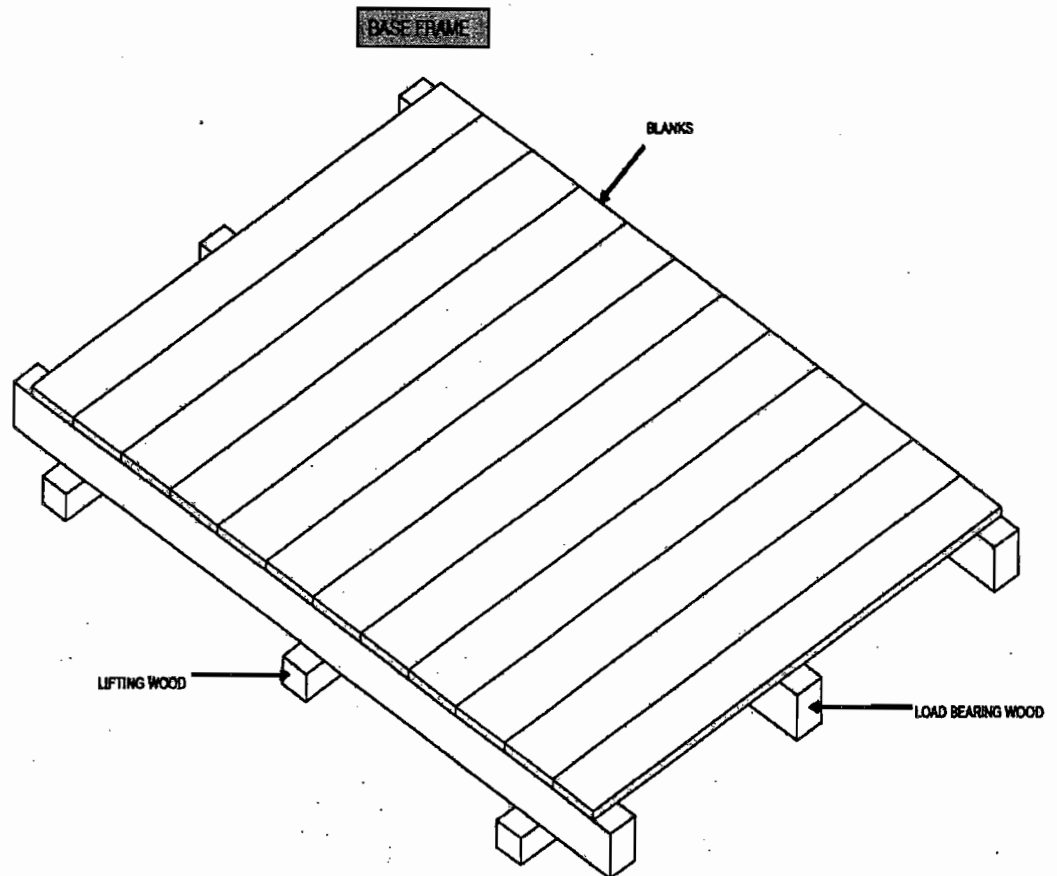
KEEPPERS


LOAD BEARING WOOD

SHEET 06 of 10

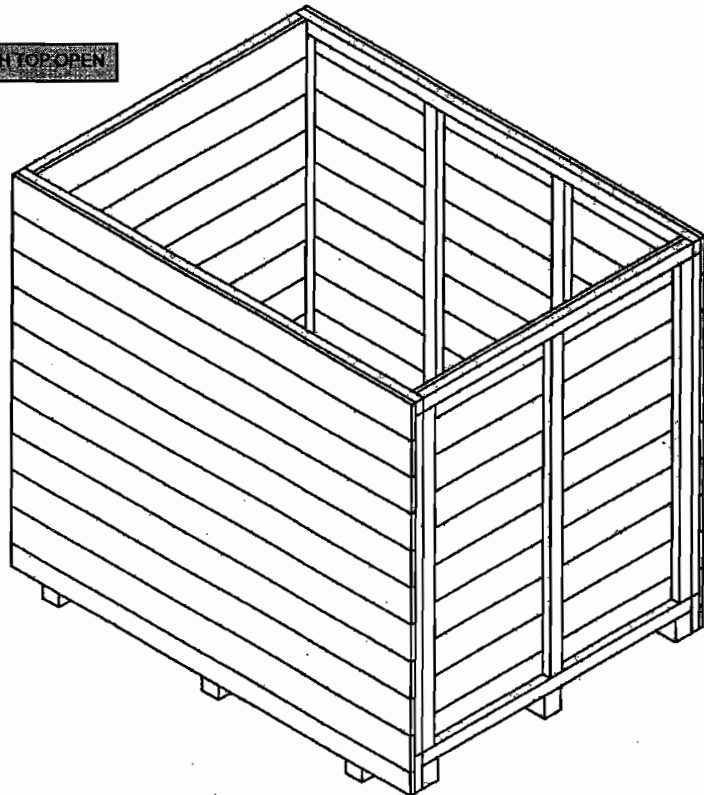
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	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 37	OF 52



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 38	OF 52

VAILING TYPE MODEL WITH TOP-OPEN



	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME	II B
		SECTION	D
		REV. NO. 0	DATE 10/08/2010
		SHEET	39 OF 52

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/J 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).



TITLE

TECHNICAL SPECIFICATION
FOR SEAWORTHY PACKING
FOR EXPORT JOBS

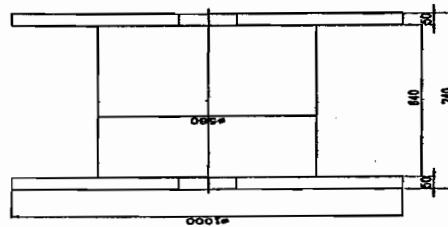
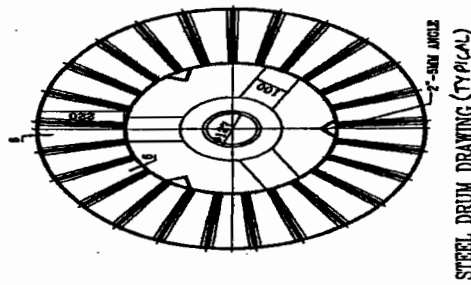
SPECIFICATION NO. PE-TS-888-100-A001


VOLUME II B

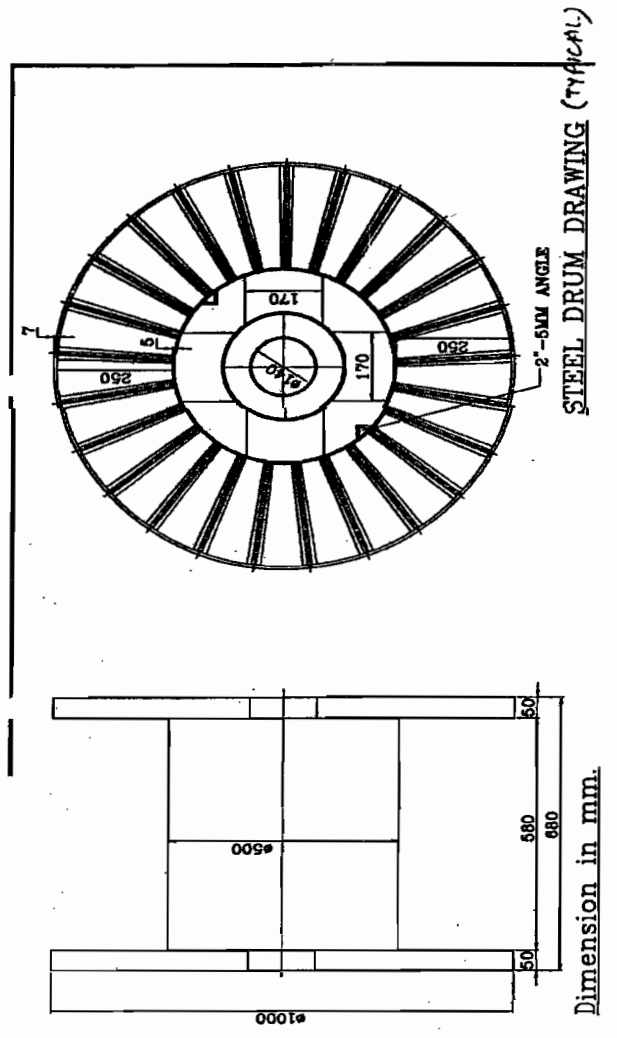
SECTION D

REV. NO. 0 DATE 10/08/2010

SHEET 40 OF 52




	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 41	OF 52




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.

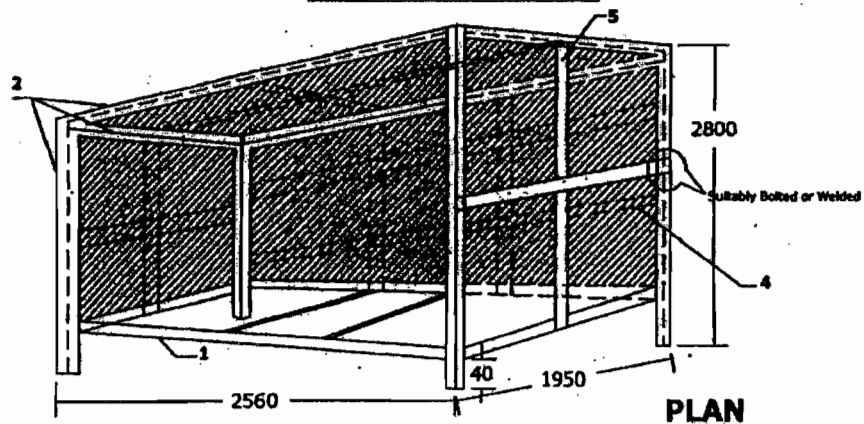
- 1) All Dimensions are in "mm" unless otherwise stated.
- 2) Packing Box shall be fabricated using 50x50x6mm MS Angle, 50x3mm Flat, 2.5 mm thick C Channel, 1mm & 1.6mm Thick sheet.
- 3) Finish of Packing Box Shall be Galvanized.
- 4) Angle & Channel Section forming part of the Main frame shall be welded 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.

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 42	OF 52

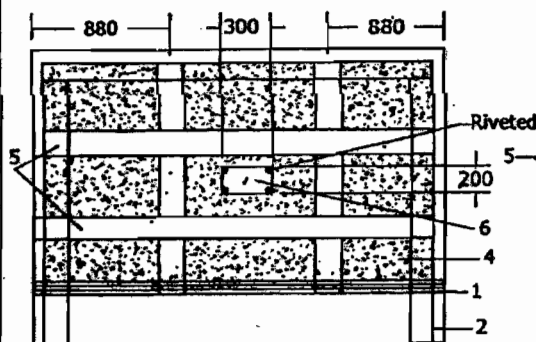
- 6) Welding Portion on galvanized surfaces shall be painted with Zinc Rich Paint.
- 7) Dispatch details such as consignor/consignee address, contract and case details, 'country of origin, port of delivery, stacking instructions shall be written on one of the side of boxes. An anodized aluminium plate 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 of 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 TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001
		VOLUME II B
		SECTION D
		REV. NO. 0 DATE 10/08/2010
		SHEET 43 OF 52

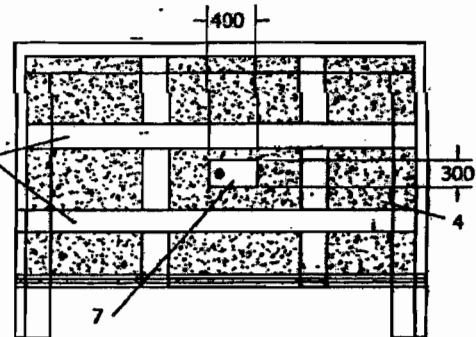
STEEL PACKING (TYPICAL DETAILS)



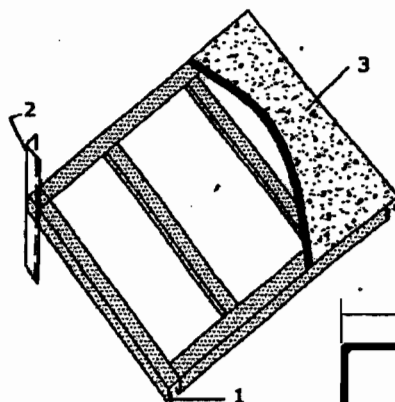
PLAN



FRONT SIDE OF BOX



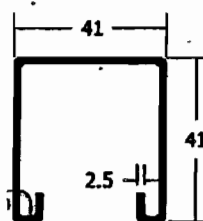
BACK SIDE OF BOX




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 Aluminium Plate for Marking.
7. Hinged Inspection Window.



DETAILS OF "C" CHANNEL

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 44	OF 52

11.3 PACKING FOR STATION LIGHTING SYSTEM

Aspects of packing specific to equipments / items of station lighting system are given here. All other instructions / aspects as per the main specification of export packing which are not covered here shall also be applicable.

11.3.1 For LIGHTING TRANSFORMER, DISTRIBUTION BOARDS, LIGHTING PANELS,

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

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

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

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

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

11.3.3 For CONDUIT PIPE

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


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

11.3.4 For POLES

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

11.3.5 For STRUCTURAL STEEL

11

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 45	OF 52

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.

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

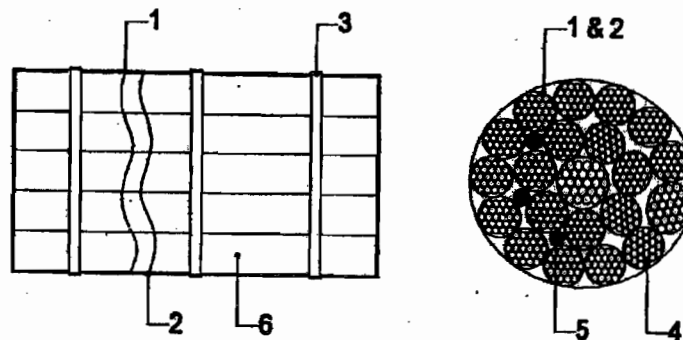
SPECIFICATION NO. PE-TS-888-100-A001

VOLUME II B

SECTION D


REV. NO. 0 DATE 10/08/2010

SHEET 46 OF 52

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.

10

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 47	OF 52

PACKING PROCEDURE FOR STRUCTURAL STEEL

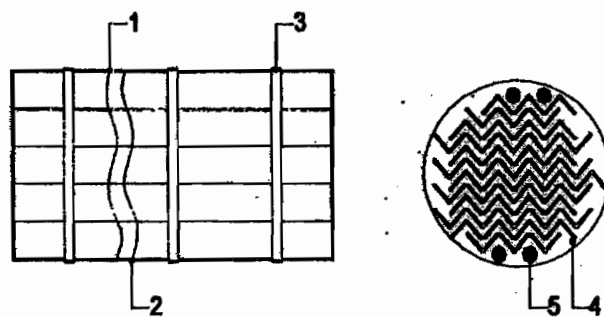


FIGURE "B"

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

**TITLE**

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

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

VOLUME II B

SECTION D

REV. NO. 0 DATE 10/08/2010

SHEET 48 OF 52

packing procedure for poles

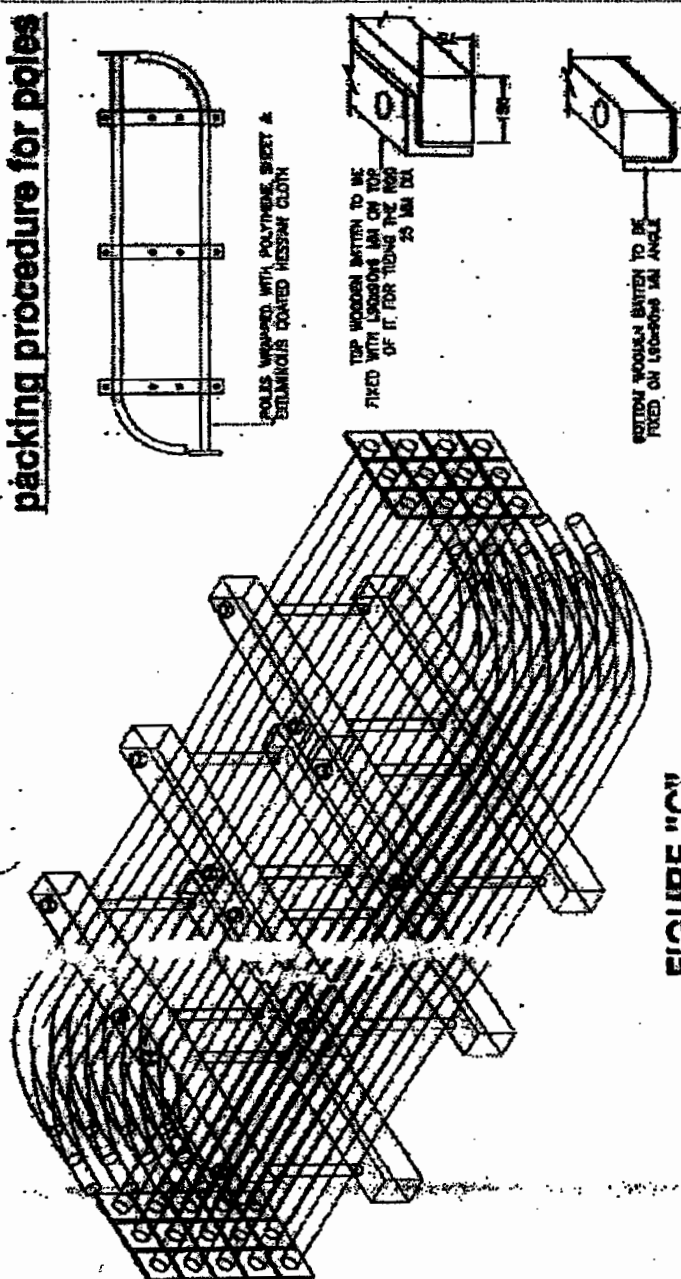



FIGURE "C"

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME	II B
		SECTION	D
		REV. NO. 0	DATE 10/08/2010
		SHEET	49 OF 52

11.4 PACKING FOR DC BATTERY

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

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


- a) The packing boxes shall be made up of plywood boxes (thickness 9mm min.) with blocks at the bottom of the box for provision for handling the boxes using the forklift. The packing boxes sizes are generally standardized to half-euro size (capable of handling equipment's weight).
- b) Rubberized coir of 25mm thickness shall be provided as cushioning material at the bottom and thermocole of 20mm shall be provided inside on all four sides. Other than this polyethylene film wrap or cover also will be provided. Left out spaces to be filled with rubberized coir/ thermocol to get cushioning effect.
- c) Silica gel in dust free air permeable cotton/paper bag shall be placed in the packing boxes for storage period of 1 year as per IS 304 (1979)
- d) While packing the cells, transit caps (polypropylene) of red and blue shall be used for big size cells for ensuring that cells does not get damaged during the transport due to vibrations etc.
- e) The battery accessories shall be packed with suitable precautions as follows:
 - i) Copper connectors shall be packed after making bunches with lead wire seals to avoid misplacement.
 - ii) Hardware items shall be packed in polyethylene bags (Thickness $\geq 0.175\text{mm}$) with item slip
 - iii) Battery rack shall be packed in dismantled condition, wrapped with polyethylene sheet
 - iv) For Ni-Cd type battery, electrolyte in solid form for dry cells shall be packed in cans with KOH, LiOH being packed separately.
 - f) Galvanized Steel straps are provided for binding the packing box sides.
 - g) The handling instructions shall be marked in indelible/ non-washable ink, indicating the upright position.

11.5 PACKING OF SERVICE TRANSFORMERS(OIL FILLED) & ACCESSORIES

This instruction is applicable for packing of transformers (oil filled), its accessories and components so as to ensure safe delivery to end user. Aspects of packing specific to equipments / items of transformers(oil filled) are given here. All other instructions / aspects as per the main specification of export packing which are not covered here shall also be applicable.

11.5.01 PACKING DETAILS :

- a) Items shall be packed in case / crates as per the shipping list.
- b) All fragile items and small items shall be packed in cases and to be marked as "Fragile, handle with care Fragile items".
- c) Fragile accessories are to be first packed in their original boxes (VENDOR's packing). Very

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 50	OF 52

- d small / delicate items such as glass thermometer, door keys shall be packed in separate box.
- e 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:

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 51	OF 52

- 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

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

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.

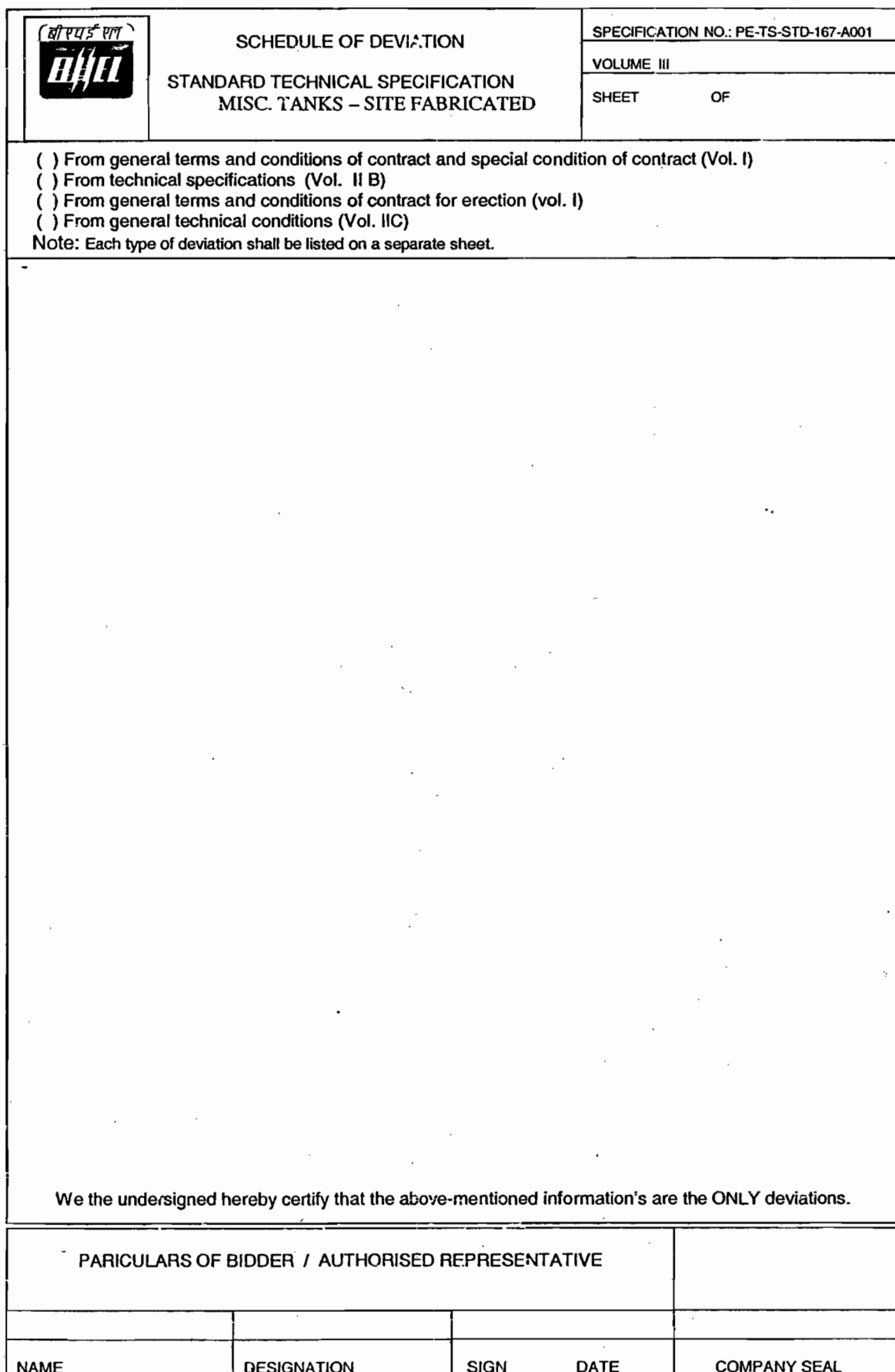
7

400MW MARIB GTPP PHASE-II YEMEN


VOLUME-III
(TECHNICAL SCHEDULES)



BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NEW DELHI
INDIA



4

	SCHEDULE OF WEIGHTS AND DIMENSIONS		SPECIFICATION NO.: PE-TS-STD-167-A001	
			VOLUME III	
	STANDARD TECHNICAL SPECIFICATION MISC. TANKS – SITE FABRICATED		SHEET	OF

() From general terms and conditions of contract and special condition of contract (Vol. I)

() From technical specifications (Vol. II B)

() From general terms and conditions of contract for erection (vol. I)

() From general technical conditions (Vol. IIC)

PARTICULARS OF BIDDER / AUTHORISED REPRESENTATIVE			
NAME	DESIGNATION	SIGN DATE	COMPANY SEAL

(3)

ANNEXURE-V - SS & CS items

LIST OF MAKES OF SUB VENDOR ITEMS FOR MISC. TANKS - SITE FABRICATED (PART OF TECHNICAL SPECIFICATION NO. PE-TS-STD-167-A001)			
SL. NO.	ITEM / SERVICE	SUB VENDORS	PLACE
1	M.S. Plate	SAIL	
		JINDAL STEEL & POWER LTD	Mumbai
		ESSAR	Hazira
		TISCO	Jamshedpur
2	Structural Steel Section	SAIL	
		RASHTRIYA ISPAT NIGAM	
		TISCO	Jamshedpur
3	SS Valves	Audco	Chennai
		Fouress	Baroda
		KBL	Pune
		BDK	Hubli
		Leader	Jalandhar
4	SS Pipes	Remi	Mumbai
		Ratnamani	Kutch
		Choksi	Ahmedabad
5	SS Fittings	Gujarat Engineering	Mumbai
		M.S. FITTINGS	Kolkata
		TUBE PRODUCTS	Baroda
6	MS ERW Pipes	Surya Roshni	Delhi
		SAIL	
		Jindal	Mumbai
7	Level Indicator	SBEM	Pune
		SIGMA	Mumbai
		Levcon	Kolkata
		Khrone-marshall	Pune
8	Paints	Shalimar / Berger / Asian	



TITLE

ANNEXURE-V (SHEET- 2)**400MW MARIB GTPP PHASE-II YEMEN**

SPECIFICATION NO. PE-TS-372-167-A001

2

Tentative list of Sub-vendors for CS items

S.no	Package	Vendor	
MECHANICAL			
	CS/GI PIPES- ERW	TISCO SAIL AJANTA TUBES, GHAZIABAD JINDAL , GHAZIABAD SURYA ROSHINI, BAHADUR GARH	UPTO 400 NB UPTO 350 NB UPTO 400 NB
	SEAMLESS PIPES	ISMT, AHMEDNAGAR MAHARASHTRA SEAMLESS, RAIGARH BHEL, TRICHY	
	FITTINGS	MS FITTINGS, KOLKATA SIDDHATHA & GAUTAM , FARIDABAD EBY, MUMBAI BHRAT FORGE , PUNE TUBE PRODUCTS, BARODA NITIN PROFILE, BARODA	
	CAST STEEL GATE/GLOBE/NR VALVES	BABCOCK BORSIG ESPANA, S.A. CRESCENT VALVES MFG.CO.PVT.LTD. FOURESS ENGG.INDIA LTD. KSB PUMPS LTD. LEADER VALVES LTD. NITON INDUSTRIES B.D.K ENGG INDUSTRIES LTD.	
	CARBON STEEL BALL VALVES	AQUA VALVES PVT.LTD. CRESCENT VALVES MFG.CO.PVT.LTD. FISHER-XOMOX SANMAR LTD. KSB PUMPS LTD. LEADER VALVES LTD. MICROFINISH VALVES LTD. B.D.K ENGG INDUSTRIES LTD.	Valves shall be of Fire Safe Design
	G.M. GATE/GLOBE/NRV	A.V. VALVES LIMITED LEADER VALVES LTD. SANT VALVES PVT. LTD.	

ANNEXURE - VI

DRAWINGS AND DOCUMENTS REQUIREMENT			
S. NO.	DESCRIPTION OF MANUALS	NO. OF PRINTS	NO. OF CD ROMS (SETS)
1	PLANT DEFINITION MANUAL		3
2	DRAWINGS FOR APPROVAL	8	3
3	DRAWINGS FOR INFORMATION	8	3
4	FINAL DRAWINGS	15	3
5	AS BUILT DRAWINGS	15	3
6	DATA SHEETS, DESIGN CALCULATIONS, PURCHASE SPECIFICATIONS AND OTHER TYPE OF DOCUMENTS		
6.1	FOR APPROVAL	8	3
6.2	FINAL	15	3
6.3	ANALYSIS REPORT OF EQUIPMENTS / PIPING / STRUCTURES / SYSTEMS EMPLOYING SOFTWARE PACKAGES AS DETAILED IN SPECIFICATION		
6.3.1	INPUT	8	3
6.3.2	OUTPUT	8	3
6.3.3	DRAWING / SKETCHES	8	3
7	ERECTION MANUAL - FINAL		3
8	OPERATIONS AND MAINTENANCE MANUAL - FINAL		3
9	PLANT HAND BOOK - FINAL		3
10	COMMISSIONING AND PERFORMANCE PROCEDURE MANUAL - FINAL		3
11	PERFORMANCE AND FUNCTIONAL	8	3
12	PROGRESS REPORTS	8	3
13	PROJECT COMPLETION REPORT	15	3
14	QA PROGRAMME INCLUDING ORGANIZATION FOR IMPLEMENTATION AND QA SYSTEM MANUAL	1	1
15	VENDOR DETAILS IN RESPECT OF PROPOSED VENDORS INCLUDING CONTRACT EVALUATION REPORT	1	1
16	MQP AND FIELD QPs, FIELD WELDING SCHEDULES AND THEIR REFERENCE DOCUMENTS LIKE TEST PROCEDURES, WPS, POR ETC.		
16.1	FOR REVIEW / COMMENTS	3	1
16.2	FOR FINAL APPROVAL	4	1
17	WELDING MANUAL, HEAT TREATMENT MANUAL, STORAGE AND PERSERVATION MANUALS		
17.1	DRAFT	4	
17.2	FINAL	4	2
18	MONTHLY VENDOR APPROVAL AND QP APPROVAL STATUS	2	1
19	QP DOCUMENTATION PACKAGE FOR ITEMS / EQUIPMENTS MANUFACTURED AND DEPATCHED TO SITE	2	2
20	QA DOCUMENTATION PACKAGE FOR FIELD ACTIVITIES ON EQUIPMENT / SYSTEMS AT SITE	2	2