2 X 660 MW MAITREES STPP, BANGLADESH

TECHNICAL SPECIFICATION
FOR
ELECTROMAGNETIC FLOWMETER

VOLUME-II-B

SPECIFICATION No: PE-TS-421-145-I917

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

SECTION – A

SCOPE OF ENQUIRY

SCOPE OF ENQUIRY

1.0 SCOPE

1.1 This specification covers the Design, Manufacture, Inspection and Testing at manufacturer's works, proper packing for transportation and delivery to site of the Electromagnetic Flow Meter with accessories as mentioned in different sections of this specification for 2X660 MW MAITREE Super Thermal Power Plant.

1.2 The quality plan enclosed, forms the minimum requirement but not limited to be adhered to by the bidder. Bidder to sign and stamp the same and submit along with the offer as an acceptance.

1.3 Scope of supply shall be electromagnetic flow meter along with accessories as indicated in specification

1.4 Following formats to be signed, stamped with company seal and submitted:

a) Complete offer including calculation sheets, catalogues, Compliance Certificate etc.
b) Quality Plan
c) Datasheets A & B, duly filled
d) Provenness Certificate.

2.0 GENERAL TECHNICAL INSTRUCTIONS

2.1 It is not the intent here to specify all the details of design and manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the customer / consultant, who will interpret the meaning of drawing and specification and shall be entitled to reject any component or material which in his judgment is not in full accordance herewith.

2.2 The omission of specific reference to any component / accessory necessary for the proper performance of the equipments shall not relieve the supplier of the responsibility of providing such facilities to complete the supply within the quoted prices.

2.3 BHEL's/Customer's representative shall be given access to the shop in which the equipments are being manufactured or tested and all test records shall be made available to him.

2.4 The equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL/Customer.

SECTION – C

SPECIFIC TECHNICAL REQUIREMENT

SPECIFIC TECHNICAL REQUIREMENTS

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

1.0 Bidder to furnish necessary credentials & performance certificate for successful Operation in any industry with similar flow requirements. Further, Bidder to furnish filled format for proveness criteria, attached in the specification.

2.0 Bidder to note that duly filled up Data Sheet-B, Quality Plan, Format enclosed in Section-D of Volume IIB, to be signed and stamped and submitted with the bid.

3.0 Bidder Presence is required for Electromagnetic Flow Meter for Supervision of Erection & Commissioning and any site support requirement. All the expenses like boarding, lodging and travel, Air fare etc. shall be in bidder's scope.

4.0 The Datasheets shall be used by the Vendor- as inputs for applicable material for EMF.

5.0 In case during erection/commissioning of the Electromagnetic flow meter, any spares are required which have not been specified in the Start-up/commissioning spares list, the same will have to be supplied by the vendor without any implication.

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

7.0 Sea worthy Packing schedule & Painting schedule are part of this specification and same shall be followed.

8.0 Electromagnetic Flow Meter shall comply with the relevant international standards such as DIN, BS. Chinese codes & standards are not acceptable.

9.0 In case of any discrepancy in Specific Technical Requirement and Equipment specification, Specific Technical Requirement shall prevail.

SECTION – D

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

SECTION-D

EQUIPMENT SPECIFICATION

1.0 SCOPE

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

2.0 CODES AND STANDARDS

2.1 All the equipment's specified herein shall comply with the requirements of the latest issue of the relevant National and International standards. Chinese codes and Chinese materials are not acceptable. Chinese material is also not acceptable.

2.2 The Electromagnetic Flow Meters shall be of proven reliability, accuracy and repeatability requiring a minimum of maintenance. The Design and Materials used for the components shall also comply with the relevant National and International standards.

3.0 TECHNICAL REQUIREMENT

The Electromagnetic Flow Meters and the accessories shall be suitable for **sea water application** and continuous operation under an ambient temperature of 0-55°C and Relative Humidity of 5-100% unless specified otherwise in volume IIB Section-C.

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

3.1 Accessories:

All mounting hardware like clamping fixtures, mechanism to remove the sensors on line, interconnecting screened cables between Transducer & Transmitter, Cable Glands etc. is required to be supplied. Material of all fittings shall be suitable for sea water application.

4.0 TEST & INSPECTION

4.1 The bidder shall adopt suitable quality assurance plan to ensure that the equipments offered will meet the specification requirements in full.

4.2 The Quality Plan shall be discussed and finalized with the technically accepted bidders before opening the price bid. The stages where the purchaser would like to be associated for witnessing or verification would be indicated by the purchaser in the Quality Plan before approval.

4.3 Inspection will be conducted by BHEL and/or their authorized representatives as per the agreed inspection schedule. The inspection schedule will be submitted by the bidder for BHEL's approval at contract stage. The cost of all tests and inspections will be deemed to have been included in the bid. For all the type tests "Type Test Certificates" as per agreed Quality Plan shall be furnished. In the absence of the same, such Type Tests shall be arranged at the Vendor's works in the presence of BHEL and/or their authorized representatives or in independent Test House/Laboratory approved by BHEL.

5.0 SPARES AND CONSUMABLES

5.1 Commissioning Spares and consumables

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

5.2 Recommended Spares

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

5.3 Special Tools & Tackles

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

6.0 DRAWINGS & DOCUMENTS

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

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

6.2 4 copy each of the following along with 2 CDs to be furnished after award of contract for owner approval.

i. Data Sheet, Calculation, BOQ/BOM & GA DRAWING for EMF.
ii. Quality Plan (QAP) for EMF
iii. O&M Manual for EMF

7.0 FOR INFORMATION

7.1 Storage and Commissioning Instruction

7.2 O&M are to be supplied as specified.

8.0 PACKING & MARKING

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

8.2 Each assembly shall be identified with the following information.

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

9 APPLICABLE DATA SHEETS

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

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

SECTION-D

DATA SHEETS - A&B

BHEL	**DATA SHEET FOR ELECTRO-MAGNETIC FLOW METER**	SPEC NO.: PE-TS-421-145-I917	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE :27.01.21
		SHEET 1 OF 6	

Tag No. 01PCB10BP100, 02PCB10BP100

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**2X660 MW MAITREE, BANGLADESH TPS**	……
	TAG NO.	01PCB10BP100, 02PCB10BP100	……
	QUANTITY	TWO (02)	……|……..
	SERVICE :	ACW Pumps Discharge Header	
	MAKE : MODEL	Bidder to indicate	
TECHNICAL	PROCESS END CONNECTION	Full Bore (with Flanged connection)	……
	FLOW MEASUREMENT	[■] Instantaneous flow rate	……
		[■] Totalized flow	……
	OUTPUT	Isolated 4-20 mA DC	……
	ACCURACY	± 0.5% of calibrated span or better	
	REPEATABILITY	± 0.2% of calibrated span or better	……
	RANGEABILITY	100:1	……
	FLOW TUBE	SS304 or better with rubber lining	……
	LINER	Rubber Lining	……
	ELECTRODE	Hastelloy-C	……
	DISPLAY/INDICATION	LCD with Internal keypad (Flow rate of totalization).	……
	OPERATING VOLTAGE	[■] 240V AC [] 24 VDC [] 110 VAC	
	TOTALIZING FACILITIES	[■] YES [] NO	
	ENCLOSURE	IP-65	
PROCESS DATA	FLUID	ACW (Sea Water)	……
	RATE OF FLOW (T/HR)	NORMAL: 4070, MAX: 5291	……
	UPSTREAM WORKING PRESS		……
	(Kg/cm2g)	5.0	……
	DESIGN PRESS (Kg/cm2g)	7.5	……
	NORMAL TEMP (Deg C)	34	……
	MAXIMUM TEMP (Deg C)	60	……
	PIPE LOCATION	OVERGROUND & OUTDOOR	

	DATA SHEET FOR ELECTRO-MAGNETIC FLOW METER	SPEC NO.: PE-TS-421-145-I917	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE :27.01.21
		SHEET 2 OF 6	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	813.0 x 9.53	……
	PIPE MATERIAL	CARBON STEEL AS PER SA134-A283 Gr. D / SA515 Gr.60 WITH RUBBER LINED	…… …… ……
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 5D DOWNSTREAM : 3D	

NOTE:- 1) Material of EMF parts / accessories, which comes in contact with process fluid shall be Duplex SS or better.

2) Accessories like Gaskets (including terminal flanges), ½" NPT cable gland, Transducer cable (20 m), All Process End Connection hardware, SS nameplate etc. shall be provided.

3) Double compression type nickel plated brass cable gland.

4) Remote Transmitter. Transmitter shall be located at a approachable & convenient location.
Flow meter with LCD screen backlight based local display and keypad.
Daily & Monthly Display can also be obtained by using a Data Logger mounted locally.
i) Transmitter Enclosure Material – Die Cast Aluminum / SS

5) Packing shall be **Sea Worthy**.

6) Protection class: IP-65 or better

7) Power Supply: 240V AC ± 10%

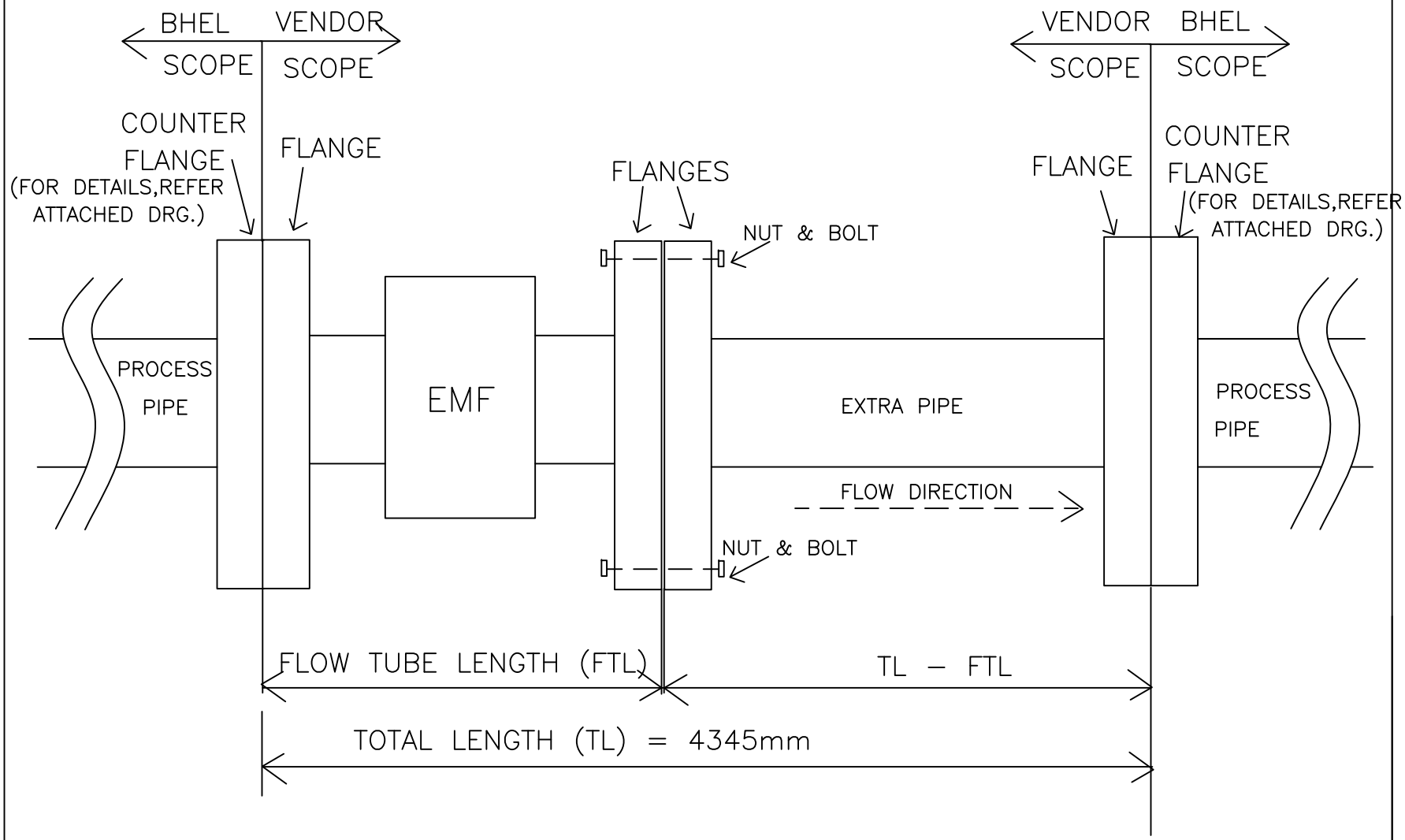
8) Flow tube material shall be SS304 or better. Hard Rubber lining is required.

9) EMF Assembly including "Extra Pipe" shall be supplied with flange. Flange supplied shall match with the counter flange. Counter flange is supplied with process pipe. For flange details, refer ANNEXURE-A, as attached.

10) Spool piece labelled as "Extra Pipe" shall also be supplied by vendor with its flanges & gaskets. The pipe diameter and its Thickness & rubber lining shall match with the process pipe.

11) The electronic flow meter shall include flow sensor and flow indicator cum integrator / totalizer and shall include all required accessories for satisfactory operation.

12) Since the plant is located in the coastal area, so all accessories shall be compatible with coastal area zone.



NOTE:

TOTAL LENGTH IS FIXED. FLOW TUBE LENGTH IS VENDOR DEPENDENT.

EXTRA PIPE LENGTH SHALL BE CALCULATED AS TOTAL – FLOWTUBE LENGTH.

THIS DRG IS APPLICABLE FOR :

1. 01PCB10BP100 2. 02PCB10BP100

BHEL	**DATA SHEET FOR ELECTRO-MAGNETIC FLOW METER**	SPEC NO.: PE-TS-421-145-I917	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE :27.01.21
		SHEET 3 OF 6	

Tag No. 00GAC11BP001, 00GAC15BP001

DATA SHEET – A & B

DATA SHEET – A (TO BE FILLED BY PURCHASER)			DATA SHEET – B (TO BE FILLED UP BY BIDDER)
GENERAL	PROJECT	**2 X 660 MW MAITREE, BANGLADESH TPS**	……
	TAG NO.	00GAC11BP001, 00GAC15BP001	……
	QUANTITY	TWO (02)	……|……..
	SERVICE :	Raw Water Pumps Discharge Header	
	MAKE : MODEL	Bidder to indicate	
TECHNICAL	PROCESS END	Full Bore (with Flanged connection)	……
	CONNECTION	[■] Instantaneous flow rate	……
	FLOW MEASUREMENT	[■] Totalized flow	……
	OUTPUT	Isolated 4-20 mA DC	……
	ACCURACY	± 0.5% of calibrated span or better	
	REPEATABILITY	± 0.2% of calibrated span or better	……
	RANGEABILITY	100:1	……
	FLOW TUBE	SS304 or better with rubber lining	……
	LINER	Rubber Lining	……
	ELECTRODE	Hastelloy-C	……
	DISPLAY/INDICATION	LCD with Internal keypad (Flow rate of totalization).	……
	OPERATING VOLTAGE	[■] 240V AC [] 24 VDC [] 110 VAC	
	TOTALIZING FACILITIES	[■] YES [] NO	
	ENCLOSURE	IP-65	
PROCESS DATA	FLUID	Raw water	……
	RATE OF FLOW (T/HR)	NORMAL: 3226, MAX: 4194	……
	UPSTREAM WORKING PRESS (Kg/cm2g)	3.5	……
	DESIGN PRESS (Kg/cm2g)	7.0	……
	NORMAL TEMP (Deg C)	34	……
	MAXIMUM TEMP (Deg C)	60	……
	PIPE LOCATION	OVERGROUND & OUTDOOR	……

	DATA SHEET FOR ELECTRO-MAGNETIC FLOW METER	SPEC NO.: PE-TS-421-145-I917	
		VOLUME II B	
		SECTION D	
		REV. NO. 00	DATE :27.01.21
		SHEET 4 OF 6	

PIPE LINE DATA	PIPE SIZE (OD x THK) mm	711.0 x 9.53	……
	PIPE MATERIAL	CARBON STEEL AS PER SA134-A283 Gr. D / SA515 Gr.60 WITH RUBBER LINED	…… …… ……
	AVAILABLE PIPE STRAIGHT LENGTH	UPSTREAM : 5D DOWNSTREAM : 3D	

NOTE:- 1) Material of EMF parts / accessories, which comes in contact with process fluid shall be Duplex SS or better.

2) Accessories like Gaskets (including terminal flanges), ½" NPT cable gland, Transducer cable (20 m), All Process End Connection hardware, SS nameplate etc. shall be provided.

3) Double compression type nickel plated brass cable gland.

4) Remote Transmitter. Transmitter shall be located at a approachable & convenient location.
Flow meter with LCD screen backlight based local display and keypad.
Daily & Monthly Display can also be obtained by using a Data Logger mounted locally.
i) Transmitter Enclosure Material – Die Cast Aluminum / SS

5) Packing shall be **Sea Worthy**.

6) Protection class: IP-65 or better

7) Power Supply: 240V AC ± 10%

8) Flow tube material shall be SS304 or better. Hard Rubber lining is required.

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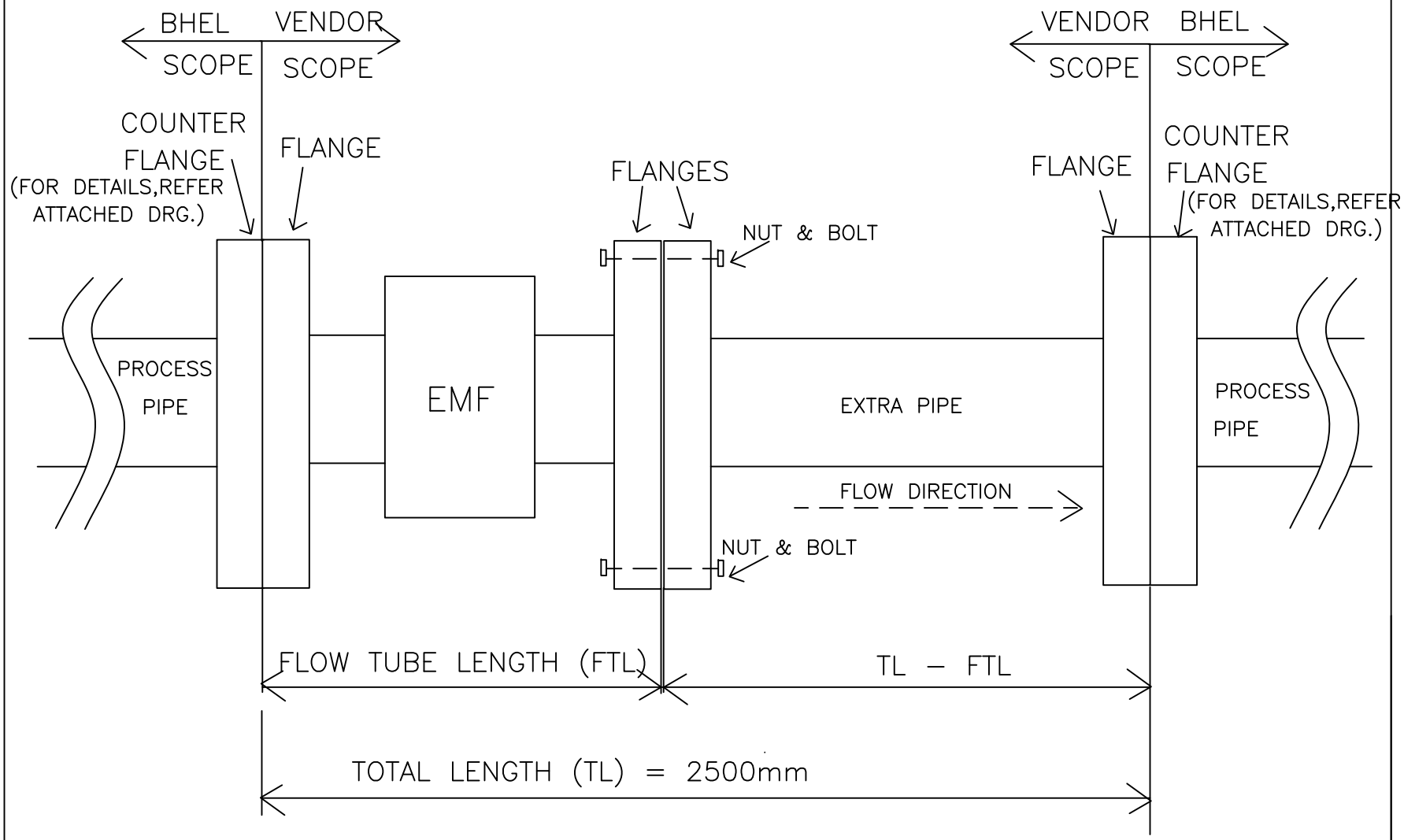
12) Since the plant is located in the coastal area, so all accessories shall be compatible with coastal area zone.



NOTE:

TOTAL LENGTH IS FIXED. FLOW TUBE LENGTH IS VENDOR DEPENDENT.

EXTRA PIPE LENGTH SHALL BE CALCULATED AS TOTAL – FLOWTUBE LENGTH.

THIS DRG IS APPLICABLE FOR :

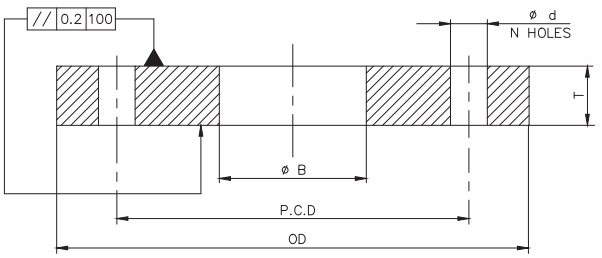
1. 00GAC11BP001
2. 00GAC15BP001

FIRST ANGLE PROJECTION (ALL DIMENSIOINS ARE IN MILLIMETRES)

DRAWING NO. 3-80-468-34836

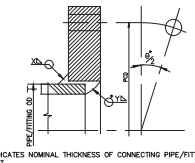
ANNEXURE-A

6.3



VAR NO.	FLANGE SIZE & RATING	OD	PCD	øB	T	ød	N	WEIGHT	BOLT SIZE
01	NB600-CL.D	813	749.3	614	32	35	20	51.32	M33
02	NB700-CL.D	928	863.6	718	36	35	28	65.6	M33
03	NB800-CL.D	1060	978	817	40	41.3	28	97.9	M36
04	NB900-CL.D	1168	1086	917	42	41.3	32	120.2	M36
05	NB1000-CL.D	1289	1200.1	1021	42	41.3	36	144.4	M36
06	NB1100-CL.D	1404	1315	1122.5	45	41.3	40	179.77	M39
07	NB1200-CL.D	1512	1422.4	1224	45	41.3	44	199.22	M39

TYPICAL FLANGE WELDING DETAILS WITH CONNECTING PIPE/FITTING



T INDICATES NOMINAL THICKNESS OF CONNECTING PIPE/FITTING
X = T
Y = T OR 6 MM WHICHEVER IS SMALLER

NOTES:
1. * WELD TO BE FINISHED, ROUND AND SMOOTH
2. FOR FLANGE WELDING WITH PIPE/FITTING, THE DRILLED HOLES SHALL BE EQUALLY STAGGERED WITH RESPECT TO LONGITUDINAL AXIS OF PIPE/FITTING

NOTES:
1. THE FLANGES (UNLESS OTHERWISE MENTIONED) SHALL BE AS PER AWWA C207 FOR SIZES NB600 & ABOVE UP TO AND INCLUDING NB1200
2. FLANGE MATERIAL SHALL BE SA515GR60/GR70
3. TOLARANCES FOR FLANGES AS PER AWWA C207 CLASS-D
   a. TOLERANCE ON INSIDE DIAMETER ..... $+1.58\ -0.00$
   b. TOLERANCE ON OUTSIDE DIAMETER ..... ± 3.175
   c. TOLERANCE ON PITCH CIRCLE DIAMETER ..... ± 1.58
   d. TOLERANCE ON THICKNESS ..... $+4.76\ -0.00$
   e. TOLERANCE ON BOLT HOLE SPACING ..... ± 0.79

VAR NO.	DESCRIPTION	DRAWING NO.	ITEM NO. / VAR NO.	MATERIAL CODE / MATERIAL SPEC.	A / C	UNIT WT. / QTY.
07	PLATE ; T=45 ; OD1512	3-80-468-34836		15 942 118 0000		199 220
				SA 515 GR60/70		1
06	PLATE ; T=45 ; OD1404	3-80-468-34836		15 942 118 0000		179 770
				SA 515 GR60/70		1
05	PLATE ; T=45 ; OD1289	3-80-468-34836		15 942 118 0000		144 400
				SA 515 GR60/70		1
04	PLATE ; T=45 ; OD1168	3-80-468-34836		15 942 118 0000		120 200
				SA 515 GR60/70		1
03	PLATE ; T=40 ; OD1060	3-80-468-34836		15 942 117 0000		97 900
				SA 515 GR60/70		1
02	PLATE ; T=40 ; OD928	3-80-468-34836		15 942 117 0000		65 600
				SA 515 GR60/70		1
01	PLATE ; T=35 ; OD813	3-80-468-34836		15 942 116 0000		51 320
				SA 515 GR60/70		1

REV	DATE	ALTERED
01		APPROVED
ZONE		

BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
MADRAS 600 017

	NAME	SIGN	DATE	NO.OF VAR.
DRN	M.R.K.		01.10.18	
CHD	I.D.B.RAJU		01.10.18	
APPD	SARAVANAN.C		01.10.18	

DEPT / CODE	GRADE OF UNTOL. DIM	SCALE	WEIGHT (KG)	REF. TO ASSY./OLD DRG.	ITEM NO.	NO.OF ITEMS
PC	C/M/F	N.T.S				

TITLE	CARD CODE	DRAWING NO.	REV
FLAT FACED FLANGE (C.S)	U 01	3-80-468-34836	00

Size A3

	TECHNICAL SPECIFICATION FOR ELECTROMAGNETIC FLOWMETER	SPEC NO.: **PE-TS-421-145-I917**
		VOLUME II B
		SECTION D
	2 X 660MW MAITREE STPP, BANGLADESH	REV. NO. 00 / DATE 27/01/2021

SECTION-D

QUALITY PLAN

PEM :: C&I

QUALITY PLAN
FOR
ELECTROMAGNETIC FLOWMETER

QUALITY PLAN NO.:	**PE-QP-421-145-I 011**
VOLUME	IIB
SECTION	D
REV. NO.	00 DATE: 27.01.2021
SHEET	1 OF 1

Sl. No.	Component / operation	Characteristics Checked	* Category	Type/Method of Check	Extent of Check	Reference documents	Acceptance Norms	Format of Records	Agency $			Remarks
									P	W	V	
1	Standard Certificates	Certificate of Compliance, Warranty Certificate,	Major	Visual	As applicable	Technical documents/Approved documents	Technical catalogue/Approved documents	Technical catalogue/ Approved documents	2/3	---	2, 1	
2	Visual Check	Mechanical	Major	Visual	100%	Technical catalogue/Approved documents	Technical catalogue/Approved documents	Technical catalogue/ Approved documents	2/3	1	1	
3	Functional test & power ON	Electrical	Major	Visual	100%	Functional test report for meter & transducer	Approved documents	Technical catalogue/ Approved documents	2/3	-	1	
		Calibration	Major	Performance Test	One per Type	Approved Data Sheet	Approved Data Sheet	Test Certificate	2/3	2 / 3	1	Refer Note -1

Note:

1. CALIBRATION SHALL BE DONE AT FCRI AND ANY OTHER GOVT. APPROVED THIRD PARTY LAB.

LEGEND:

$ P - Agency Performing the Test.
W - Agency Witnessing the Test.
V - Agency Verifying the Test.

1 - BHEL
2 - Vendor
3 - Sub-vendor

SECTION-D

BILL OF QUANTITY

BILL OF QUANTITY

[A]

S. No.	KKS	SERVICE/ ITEM DESCRIPTION	QUANTITY
1	01PCB10BP100	ACW Pump Discharge Header	1
2	02PCB10BP100	ACW Pump Discharge Header	1
3	00GAC11 BP001	RAW Water Pumps Discharge Header	1
4	00GAC15 BP001	RAW Water Pumps Discharge Header	1

[B] Charges of Supervision of Erection & Commissioning at site (Including lodging & boarding, Local Conveyance at site) per Man-days (Excluding Travel Time)

[C] Lump sum price for travel (Per Visit) including ticket, Visa/ Insurance (as applicable), intermediary stay Including travel time

[D] MANDATORY SPARES - 10% or 1 No., whichever is more, of each type and model.

S.No.	ITEM DESCRIPTION	QUANTITY
1	Electronic Transmitters (Complete Assembly)	1

SECTION-D

PROVEN NESS CERTIFICATE

Provenness Compliance Sheet

Name of Item/ Package:

Name of Vendor:

#	Name of Reference Project	Plant Rating	Years of Successful operation as on 12.01.2021	Certificate Attached	Remarks
1.					
2.					
3.					
4.					
5.					
6.					
7.					

SECTION-D

PACKING SPECIFICATION

EXPORT PACKING

(PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)

1 GENERAL

This standard lays down packing instructions for export packing of components/assemblies/equipment to be dispatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments. For Seaworthy Packing refer standard AA0490004 wherever applicable.

The components/assemblies need to be packed suitably to avoid physical damage & corrosion during transit for storage. For specific applications, the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.

2 SCOPE

This procedure gives minimum guidelines for export packing to be complied with for packing of components/assemblies/equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

3 WOOD SPECIFICATION FOR PACKING:

a) The wood shall conform to specification AA51401.

In addition to the above the following has to be met:

The standard requires the use of debarked wood in the construction of compliant wood packaging material. Debarked wood is defined in the ISPM 15

b) Ply Wood planks as per specification IS:303 Gr. “MR” Type A,B are used for the sides, top & bottom of the packing cases.

c) Ply Wood of marine grade as per IS:710 for packing of control equipment and for support batten pinewood to be used as per specification AA51401.

4 TYPE OF PACKING:

The following types of packing have been standardized for packing of general components/assemblies.

- **‘OP’** - Open Type
- **‘PP’** - Partially Packed
- **‘CP’** - Crate Packing - Components/Equipment requiring physical protection
- **‘CQ’** - Case Packing - Small medium Components/ Assemblies/ Equipment which require corrosion & physical protection
- **‘CR’** - Case Packing - Electrical Components/Assemblies which require special packing viz. Water Proof, Shock Proof, etc.

DESCRIPTION OF TYPES OF PACKING

The various types of packing, as standardized above, are described below.

4.1 'OP' - Open Type

In case, of components which are not affected by water & dust & do not require special protection &, are generally not machined, shall be sent as open packages. However these components may be sent in crates, wherever necessary.

4.2 PP' - Partially Packed

Components which need special protection, at selected portions only, shall be dispatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces after application of TRP should be protected with Multi-layered cross laminated plastic film to AA51420.

4.3 'CP' - Crate Packing – General

Assemblies/Components which need only physical protection from the point of view of handling shall be dispatched duly packed in crates.

4.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

a) Small & Medium sized components/assemblies/equipment due to size/weight & to avoid handling, and pilferage, problems shall be packed in Case/Containers.

b) Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/ Tablets, packed in thin muslin cloth cotton bags shall be suitably placed.

c) Small machines/components of less weight shall be provided with suitable cushioning. Wood Wool/Expanded Polyethylene Foam Sheet, if used, shall be sandwiched between polyethylene sheets and sealed.

d) The components inside the case shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, where-ever required.

4.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons.

a) Adequate quantity of Silica gel to AA55619 packed in cotton bags, of 100 grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, before being packed in the cases.

b) VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.

c) Empty space in the cartons shall be filled with small chips of Expanded Polystyrene (Thermocole), Wood Wool etc. Polyethylene air bubble film shall conform to IS 12787/AA51420 Expanded polystyrene (Thermocole) shall conform to AA51416.

d) The cartons shall be manufactured from corrugated Fibre Board, meeting requirements of AA51414.

4.6 Special Packing

Components requiring special packing (as per customer/contractual/ engineering requirements) not included in this specification shall be covered by product standards.

5 PREPARATION OF PACKING CASE:

1) Export items are to be packed in sea-worthy wooden/Ply board cases.

2) The base of the case shall be made of wooden battens for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200mm from the ground level depending upon size & weight of equipment. However for packing cases of smaller size equipment can be at a height of 40mm from the ground level.

3) The four sides & top cover shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.

   Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.

It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.

4) Put the job on the base and wherever necessary may be screwed / fastened.

5) In case of delicate component Packing Viz. Electrical & Electronic components for instruments/ assemblies, a rubber sheet, Self-expanded polyethene foam sheet as per AA51423, preferably 10mm thick, shall be fixed on to the base to act as cushioning to the equipment.

6) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.

7) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.

8) Whole Equipment shall be covered and sealed with Multi-layered cross-laminated Polyethylene sheet to AA51420.

9) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/ expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.

10) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.

11) The inner side of the top cover shall be lined with M.L.C. laminated polyethylene sheet of at least 90GSM, which shall project approximately 25 to 150mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates & tacked, to, prevent ingress of water from the top.

12) For specific applications requiring additional protection the packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per specification AA10166, thickness of G.I. sheet shall be 0.25mm.

13) For specific applications requiring inspection, additional inspection window has to be provided for custom clearance for export jobs.

6 SEALED PACKING:

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture.

The components sub-assemblies and assemblies are completely covered with 2 layers of M.L.C. laminated poly film. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

Certain special precautions are required for seal tight packing of specific item have to be covered by product standard.

7 OTHER PACKING MATERIAL

7.1 Volatile Corrosion Inhibitor (VCI) Paper as per AA51406:

a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.

b) 7m3 VCI paper is necessary for 1 m3 of packed item approximately as per AA51406.

Application Limitation:

VCI paper shall not be used for components made of aluminium, aluminium alloys as well as Zinc, copper, brass, cadmium and silver.VCI powder is sprinkled inside the piping components ends shall be protected with end cover as specified in plant standards, drawings.

7.2 Moisture Absorber:

Silica gel is used for this purpose to protect the contents over sufficiently long time from corrosion. At the time of use, silica gel should be so dried that its colour becomes dark blue. These shall be filled in small cotton bags. Before sealing the equipment, the silica gel bags should be kept inside the polyethylene film cover at different locations. The quantity of silica gel depends on the dimension of the polyethylene sheet as well as transit and storage time.

7.3 Sling Plate:

Sling plate shall be provided to prevent damage to the packing box during lifting. Size of the sling plate shall be selected depending upon the net weight of the consignment.

7.4 Packing Slip Holders:

Two nos. of packing list with suitable protecting cover shall be fixed one inside and the other outside of the packing box as per specification AA7240901.

7.5 Nails

The length and diameter of the nails depends upon the size of planks

7.6 Strapping Strips:

These are used for strapping the boxes. Suitable size of box strapping strip can be used as per size and weight of consignment. The material shall be free from rust.

7.7 Brackets:

These brackets are used for nailing to the corners of cubicle boxes.The brackets shall be of “L" shape, suitable holes shall be provided towards the end of each side for screwing /nailing.

7.8 Fasteners:

Bolts, double nuts, spring washers of suitable size will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box.

7.9 Polyethylene Sheet:

The polyethylene sheets are used to make covers to the jobs individually.multi-layered cross laminated polyethylene sheet as per AA 51420 can be used for packing of jobs.

7.10 Expanded Poly Foam Sheet and Air Bubble Film:

This item is used for covering the delicate items, Expanded Polyethylene Foam Sheet as per specification AA51423 and air bubble film as per specification AA51426

7.11 Thermocol (Expanded Polystyerene) Sheets:

This is used for covering delicate items. This material shall be as per spec. no AA51416

7.12 Cotton Bags:

These are used for holding silica gel.

7.13 Marking Ink:

The ink used normally is black in color. In some special cases other color also will have to be used. The ink shall be non-fading/indelible and non-washable by water

7.14 Polyethylene Bags:

These are to be used for keeping the, Packing slips. The bag shall be of size 70 mm X 100 mm (minimum).

7.15 Mechanical Latching Clamps:

For specific items self locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement, if needed.

8 DESIGN OF PACKING BOXES

Design/drawing of packing boxes shall be prepared based on actual weight and size of the equipment and shall be covered by concern product standards.

9 GENERAL PRECAUTIONS:

1) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.
2) Sling protection brackets to be provided on cases wherever required.
3) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.
4) For packing of small/delicate items - Item may be wrapped properly with M.L.C. laminated polyethylene and wrapped item may be further wrapped with air bubble film as per spec. AA51426, these curtains will be subsequently packed in wooden/ply boxes as at clause 7.
5) The various caution signs shall be marked with stencil on both sides of the packing box.
6) Instructions on handling,storage, preservation, represervation and transport of export order components at works and site shall be covered by product standards.

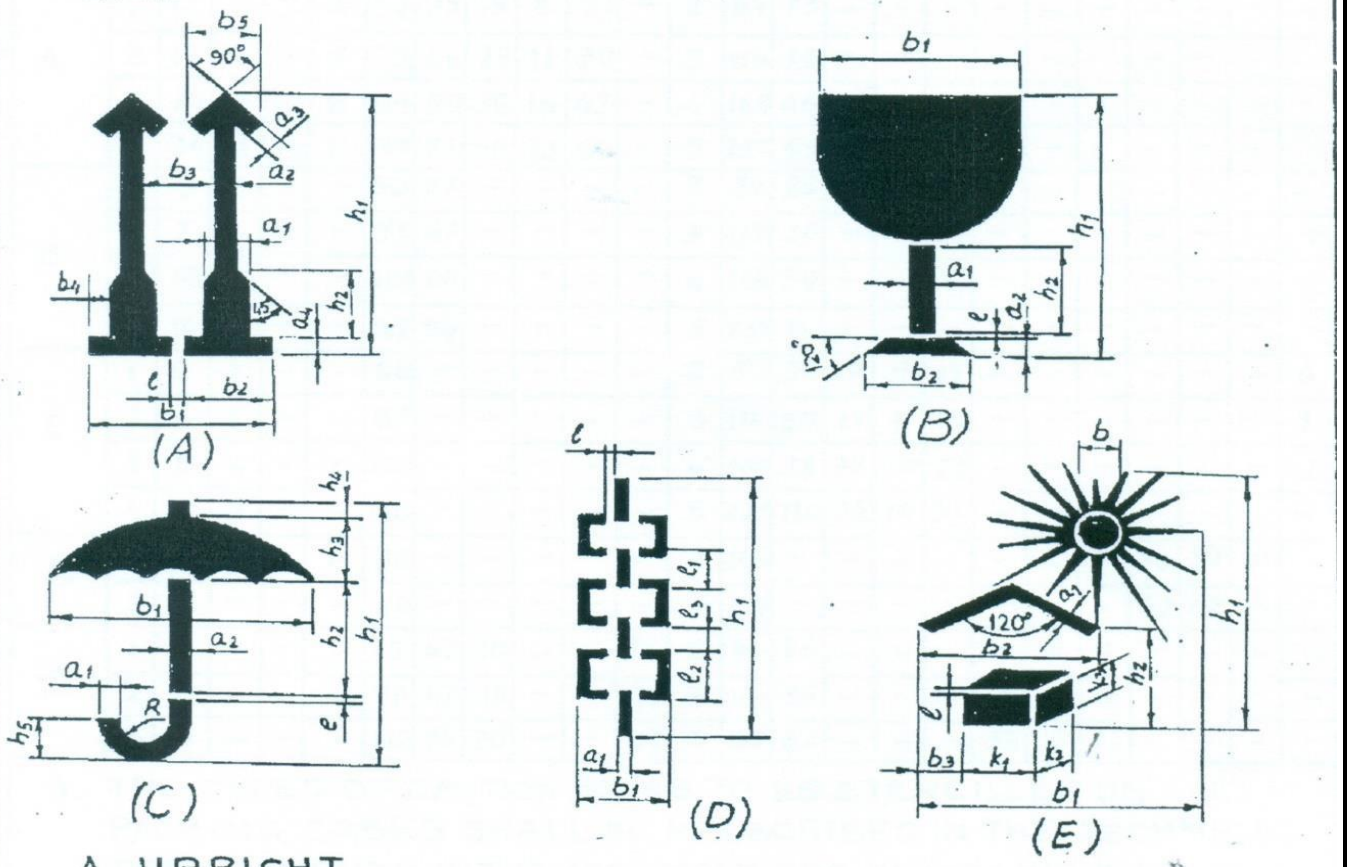
10 MARKING

The following details are to be marked on the packing cases.

a) Address of consignee.
b) Purchase Order No.
c) Description of item or title of packing list.
d) Case identification Number.
e) Net Weight.
f) Gross Weight.
g) Dimensions of box
h) Marking showing upright position.
i) Marking showing sling position.
j) Marking showing umbrella (i.e. for machines/components to be stored under covered storage.

MARKINGS ON PACKING CASES

1. THIS PLANT STANDARD PRESCRIBES THE VARIOUS CAUTION SIGNS AND OTHER MARKINGS ON PACKING CASES.
2. DIMENSIONS IN THE TABLE 1 SHALL BE USED FOR MAKING STENCILS ONLY.



A. UPRIGHT
B. FRAGILE
C. PROTECTION FROM FALLING OR CONDENSING MOISTURE.
D. SLINGING POSITION
E. PROTECTION FROM DIRECT RADIATIONS.

CENTER OF GRAVITY

Figure 1 – Markings

DESIGN-ATION		DIMENSIONS IN mm.																						
		a_1	a_2	a_3	a_4	b_1	b_2	b_3	b_4	b_5	b	ℓ	h_1	h_2	h_3	h_4	h_5	K_1	K_2	K_3	ℓ_1	ℓ_2	ℓ_3	R
A	1	12	5	5	4	52	25	19	8	21	–	2	84	23	–	–	–	–	–	–	–	–	–	–
	2	17	7	7	6	75	36	29	11	30	–	3	119	33	–	–	–	–	–	–	–	–	–	–
	3	24	10	10	8	104	50	38	16	42	–	4	168	46	–	–	–	–	–	–	–	–	–	–
	4	34	14	14	11	147	71	59	23	60	–	5	239	65	–	–	–	–	–	–	–	–	–	–
B	1	5	5	–	–	50	33	–	–	–	–	2	84	25	–	–	–	–	–	–	–	–	–	–
	2	7	7	–	–	71	47	–	–	–	–	3	119	36	–	–	–	–	–	–	–	–	–	–
	3	10	10	–	–	100	66	–	–	–	–	4	168	50	–	–	–	–	–	–	–	–	–	–
	4	14	14	–	–	142	94	–	–	–	–	5	239	71	–	–	–	–	–	–	–	–	–	–
C	1	4	3	–	–	66	–	–	–	–	–	2	80	39	19	5	11	–	–	–	–	–	–	6
	2	6	4	–	–	85	–	–	–	–	–	3	114	55	27	7	16	–	–	–	–	–	–	9
	3	8	6	–	–	120	–	–	–	–	–	4	160	78	38	10	22	–	–	–	–	–	–	12
	4	11	9	–	–	170	–	–	–	–	–	5	227	110	54	14	31	–	–	–	–	–	–	17
D	1	6	–	–	–	30	–	–	–	–	–	4	148	–	–	–	–	–	–	–	30	30	10	–
	2	9	–	–	–	42	–	–	–	–	–	5	209	–	–	–	–	–	–	–	42	42	14	–
E	1	3	–	–	–	69	47	10	–	–	16	2	91	26	–	–	–	17	8	11	–	–	–	–
	2	4	–	–	–	98	67	15	–	–	23	3	128	33	–	–	–	24	11	16	–	–	–	–
	3	6	–	–	–	138	94	20	–	–	32	4	182	62	–	–	–	34	16	22	–	–	–	–

Black and Red Marking Ink to IS:1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.

Incase of consignment consists of more than one package; each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in higher quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel (AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks. Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: Incase the size of package is small for using the stencils, and then hand written letters/figures shall be allowed.

11 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

1) Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.
2) Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.
3) Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.

4) For critical items, where specified, special handling fixtures shall be used for lifting.
5) Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.
6) Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.
7) Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.
8) **HANDLING OF COMPONENTS ON RECEIPT/DESPATCH**:

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

- The markings showing the upright position.
- The markings showing the sling position
- Markings showing the fragile contents.
- Other required markings as per Cl.No:10

a) Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15º.
b) Handling and lifting should be done without jerks or impacts.
c) Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.
d) On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.
e) Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.
f) Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

12 Treatment of Wood & Application and use of the mark

For seaworthy export packing, treatment of wood has to be carried out as below subject to BHEL Engg & QC approval.

As per customer requirement for export packing, wood to be treated as applicable should be done as per International Standards for Phytosanitary Measures ISPM: 15 to control the growth stages viz. egg to adult of structural insects (beetles, borers, bugs, fleas, flies, lice, moths, roaches, termites) and other pests (mice, rats, spiders) etc. in stored products.

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in Annex 2 of ISPM 15.

12.1 Heat treatment using a conventional steam or dry kiln heat chamber (treatment code for the mark: HT)

When using conventional heat chamber technology, the fundamental requirement is to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including its core).

This temperature can be measured by inserting temperature sensors in the core of the wood. Alternatively, when using kiln-drying heat chambers or other heat treatment chambers, treatment schedules may be developed based on a series of test treatments during which the core temperature of the wood at various locations inside the heat chamber has been measured and correlated with chamber air temperature, taking into account the moisture content of the wood and other substantial parameters (such as species and thickness of the wood, air flow rate and humidity). The test series must demonstrate that a minimum temperature of 56 °C is maintained for a minimum duration of 30 continuous minutes throughout the entire profile of the wood.

Treatment schedules should be specified or approved by the National Plant Protection Organisation (NPPO). Treatment providers should be approved by the NPPO.

12.2 Heat treatment using dielectric heating (treatment code for the mark: DH)

Where dielectric heating is used (e.g. microwave), wood packaging material composed of wood not exceeding 20 cm when measured across the smallest dimension of the piece or the stack must be heated to achieve a minimum temperature of 60 °C for 1 continuous minute throughout the entire profile of the wood (including its surface). The prescribed temperature must be reached within 30 minutes from the start of the treatment.

Treatment schedules should be specified or approved by the NPPO.

12.3 Methyl bromide treatment (treatment code for the mark: MB)

Wood packaging material containing a piece of wood exceeding 20 cm in cross-section at its smallest dimension must not be treated with methyl bromide.

The fumigation of wood packaging material with methyl bromide must be in accordance with a schedule specified or approved by the NPPO (National Plant Protection Organisation) that achieves the minimum concentration-time product (CT) over 24 hours at the temperature and final residual concentration specified in Table 1. This CT must be achieved throughout the profile of the wood, including its core, although the concentrations would be measured in the ambient atmosphere. The minimum temperature of the wood and its surrounding atmosphere must not be less than 10 °C and the minimum exposure time must not be less than 24 hours. Monitoring of gas concentrations must be carried out at a minimum at 2, 4 and 24 hours from the beginning of the treatment. In the case of longer exposure times and weaker concentrations, additional measurement of the gas concentrations should be recorded at the end of fumigation.

If the CT is not achieved over 24 hours, corrective action needs to be taken to ensure the CT is reached; for example, the treatment is restarted or the treatment time extended for a maximum of 2 hours without adding more methyl bromide to achieve the required CT (see the footnote to Table 2).

Table 1 – Minimum CT over 24 hours for wood packaging material fumigated with methyl bromide

Temperature (°C)	CT (g·h/m^3) over 24 h	Minimum final concentration (g/m^3) after 24 h#
21.0 or above	650	24
16.0 – 20.9	800	28
10.0 – 15.9	900	32

In circumstances when the minimum final concentration is not achieved after 24 hours, a deviation in the concentration of ~5% is permitted provided additional treatment time is added to the end of the treatment to achieve the prescribed CT.

One example of a schedule that may be used for achieving the specified requirements is shown in Table 3.

SEAWORTHY PACKING
(PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)

1 GENERAL

This standard lays down packing instructions for seaworthy packing of Components /Assemblies/ Equipment to be dispatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit for storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.

2 SCOPE

This procedure gives minimum guidelines for seaworthy packing to be complied with for packing of Components /Assemblies / Equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

3 CROSS REFERRED SPECIFICATION

– Multi-layered cross laminated plastic film : AA51420
– Packing Wood : AA51401
– Silica gel : AA55619
– Thermocole : AA51416
– Packing slip holders : AA7240901
– Corrugated Fibre Board : AA51414
– Rubber sheet : AA59001
– VCI paper : AA51406
– High quality full glossy out door finishing paint : AA56126
– Polyethylene air bubble film : IS 12787
– Structural steel - standard quality (plates, sections, strips flats & bars) : AA10108
– International Standards For Phytosanitary Measures No. 15 : ISPM-15:2009

4 WOOD SPECIFICATION FOR PACKING

The wood shall conform to specification AA51401.

For export packing wood in addition to the above the following has to be met:

The standard requires the use of debarked wood in the construction of compliant wood packaging material. Debarked wood is defined in the ISPM 5.

5 TYPE OF PACKING

The following 5 types of packings have been standardized for packing of General Components /Assemblies.

– 'OP' - Open Type
– 'PP' - Partially Packed
– 'CP' - Crate Packing - Components/Equipment requiring physical protection
– 'CQ' - Case Packing - Small medium Components/ Assemblies/ Equipment which require corrosion & physical protection
– 'CR' - Case Packing - Electrical Components/Assemblies which require special packing viz. Water Proof, Shock Proof, etc.

6 DESCRIPTION OF TYPES OF PACKING

The various types of packing, as standardized above, are described below.

6.1 'OP' - Open Type

In case, of components which are not affected by water & dust & do not require special protection &, are generally not machined, shall be sent as open packages. However these components may be sent in crates, wherever necessary.

6.2 'PP' - Partially Packed

Components which need special protection, at selected portions only, shall be dispatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces after application of TRP should be protected with Multi-layered cross laminated plastic film to AA51420.

6.3 'CP' - Crate Packing – General

Assemblies/Components which need only physical protection from the point of view of handling shall be dispatched duly packed in crates.

6.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

a) Small & Medium sized components/assemblies/equipment due to size/weight & to avoid handling, and pilferage, problems shall be packed in Case/Containers.

b) Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/ Tablets, packed in thin muslin cloth cotton bags shall be suitably placed.

c) Small machines/components of less weight shall be provided with suitable cushioning. Wood Wool/Expanded Polyethylene Foam Sheet, if used, shall be sandwiched between polyethylene sheets and sealed.

d) The components inside the case shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, where-ever required.

6.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons.

a) Adequate quantity of Silica gel to AA55619 packed in cotton bags, of 100 grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, before being packed in the cases.

b) VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.

c) Empty space in the cartons shall be filled with small chips of Expanded Polystyrene (Thermocole), Wood Wool etc. Polyethylene air bubble film shall conform to IS 12787/AA51420 Expanded polystyrene (Thermocole) shall conform to AA51416.

d) The cartons shall be manufactured from corrugated Fibre Board, meeting requirements of AA51414.

6.6 Special Packing

Components requiring special packing (as per customer/contractual/ engineering requirements) not included in this specification shall be covered by product standards.

7 PREPARATION OF PACKING CASE

1) Cases and crates with gross weight up to 1,000 kgs. shall be provided with bottom cleats of min. 40 mm thicknesses to ensure clearance for handling by forklift. Cases and crates exceeding gross weight of 1,000 kgs. shall be provided with skid runners, number and size according to weight of package.
2) The base of the case shall be made of wooden batons for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200 mm from the ground level depending upon size & weight of equipment. However for packing cases of smaller size equipment can be at a height of 40 mm from the ground level.
3) In case of 'CR1 - Packing Viz. Electrical & Electronic components for instruments/assemblies, a rubber sheet, Self-expanded polyethene foam sheet, preferably 10 mm thick, shall be fixed on to the base to act as cushioning to the equipment.
4) The four sides, shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.

   Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.

   It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
5) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100 grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.
6) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.
7) Cover the whole equipment with polyethylene sheet of at least 100 micron thickness, on all sides preferably by a single piece.
8) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.
9) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.
10) The inner side of the top cover shall be lined with polyethylene sheet, of at least
11) 100 micron thickness, which shall project approximately 25 to 150 mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates & tacked, to, prevent ingress of water from the top.
12) For specific requirement of packing the cases are to be provided with Tongue and Groove joints.

8 STEEL CONTAINERS

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies.

The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections.

Following precautions are to be taken during packing:

– Put the Components/Assemblies/Equipment in the steel container properly. Cover the Components/Assemblies/Equipment with polythene.

– To arrest the movement in the steel container necessary wooden Blocks/Batons may be put.

– Put cover on steel, container and Bolt Properly.

9 SEALED PACKING

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture.

The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

10 SLING PLATE

Sling plate shall be provided to prevent damage to the packing box during lifting. Size of the sling plate shall be selected depending upon the net weight of the consignment.

11 PACKING SLIP HOLDERS

Two nos. steel packing slip holders, specification no. AA7240901 containing the packing list, sealed in thick polyethylene film, shall be fixed one inside and the other outside the packing box.

12 Volatile Corrosion Inhibitor (VCI) Paper

a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.

b) 7 m^3 VCI paper is necessary for 1 m^3 of packed item approximately as per AA51406.

Application Limitation:

VCI paper shall not be used for components made of aluminium, aluminium alloys as well as Zinc, copper, brass, cadmium and silver.

VCI powder is sprinkled inside the piping components ends shall be protected with end cover as specified in plant standards, drawings.

13 Moisture Absorber

Silica gel is used for this purpose to protect the contents over sufficiently long time from corrosion. At the time of use, silica gel should be so dried that its colour becomes dark blue. These shall be filled in small cotton bags. Before sealing the equipment, the silica gel bags should be kept inside the polyethylene film cover at different locations. The quantity of silica gel should not be less than 1.0 kg per cubic metre volume of the packing box

14 GENERAL PRECAUTIONS

a) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.

b) Sling protection brackets to be provided on cases wherever required.

c) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.

d) The various caution signs shall be marked with stencil on both sides of the packing box.

e) Do not pack any other Mechanical items with this case (do not use any other non-permitted packing materials).

THE FOLLOWING DETAILS ARE TO BE MARKED ON THE PACKING CASES.

a) Address of consignee.

b) Purchase Order No./ SO No/WO No.

c) Description of item or title of packing list.

d) Case identification Number/ Packing List No.

e) Net Weight.

f) Gross Weight.

g) Dimensions of box

h) Marking showing upright position.

i) Marking showing sling position.

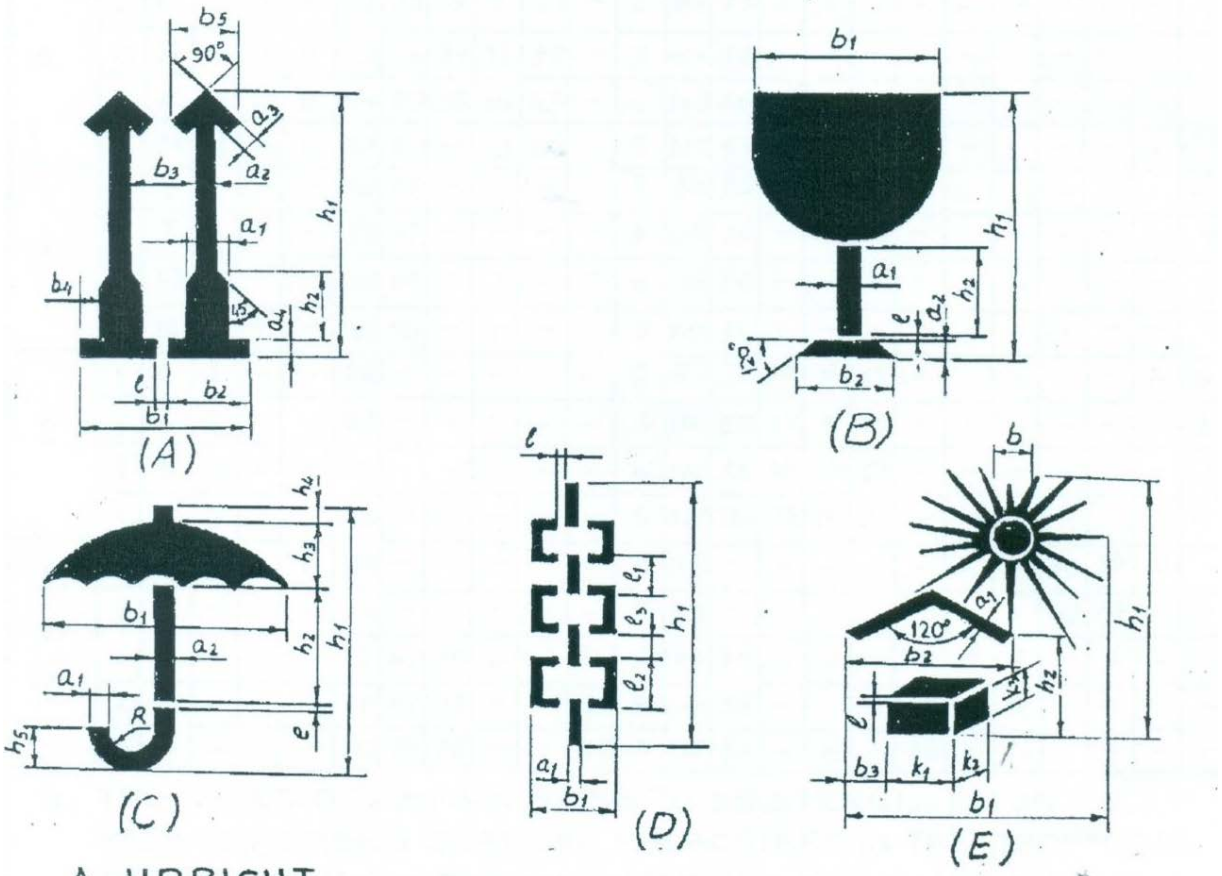
j) Marking showing umbrella (i.e. for machines/components to be stored under covered storage.

k) Loading and unloading precautions

CORPORATE STANDARD

MARKINGS ON PACKING CASES

1. THIS PLANT STANDARD PRESCRIBES THE VARIOUS CAUTION SIGNS AND OTHER MARKINGS ON PACKING CASES.
2. DIMENSIONS IN THE TABLE 1 SHALL BE USED FOR MAKING STENCILS ONLY.



A. UPRIGHT
B. FRAGILE
C. PROTECTION FROM FALLING OR CONDENSING MOISTURE.
D. SLINGING POSITION
E. PROTECTION FROM DIRECT RADIATIONS.

Figure 1

CENTER OF GRAVITY

Figure 2

Table 1

DESIGNATION		DIMENSIONS IN mm.																						
		a_1	a_2	a_3	a_4	b_1	b_2	b_3	b_4	b_5	b	ℓ	h_1	h_2	h_3	h_4	h_5	K_1	K_2	K_3	ℓ_1	ℓ_2	ℓ_3	R
A	1	12	5	5	4	52	25	19	8	21	–	2	84	23	–	–	–	–	–	–	–	–	–	–
	2	17	7	7	6	75	36	29	11	30	–	3	119	33	–	–	–	–	–	–	–	–	–	–
	3	24	10	10	8	104	50	38	16	42	–	4	168	46	–	–	–	–	–	–	–	–	–	–
	4	34	14	14	11	147	71	59	23	60	–	5	239	65	–	–	–	–	–	–	–	–	–	–
B	1	5	5	–	–	50	33	–	–	–	–	2	84	25	–	–	–	–	–	–	–	–	–	–
	2	7	7	–	–	71	47	–	–	–	–	3	119	36	–	–	–	–	–	–	–	–	–	–
	3	10	10	–	–	100	66	–	–	–	–	4	168	50	–	–	–	–	–	–	–	–	–	–
	4	14	14	–	–	142	94	–	–	–	–	5	239	71	–	–	–	–	–	–	–	–	–	–
C	1	4	3	–	–	66	–	–	–	–	–	2	80	39	19	5	11	–	–	–	–	–	–	6
	2	6	4	–	–	85	–	–	–	–	–	3	114	55	27	7	16	–	–	–	–	–	–	9
	3	8	6	–	–	120	–	–	–	–	–	4	160	78	38	10	22	–	–	–	–	–	–	12
	4	11	9	–	–	170	–	–	–	–	–	5	227	110	54	14	31	–	–	–	–	–	–	17
D	1	6	–	–	–	30	–	–	–	–	–	4	148	–	–	–	–	–	–	–	30	30	10	–
	2	9	–	–	–	42	–	–	–	–	–	5	209	–	–	–	–	–	–	–	42	42	14	–
E	1	3	–	–	–	69	47	10	–	–	16	2	91	26	–	–	–	17	8	11	–	–	–	–
	2	4	–	–	–	98	67	15	–	–	23	3	128	33	–	–	–	24	11	16	–	–	–	–
	3	6	–	–	–	138	94	20	–	–	32	4	182	62	–	–	–	34	16	22	–	–	–	–

Black and Red Marking Ink to IS: 1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink.

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its Package No. as given in shipping list. All caution signs shall be stencilled in higher quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel (AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks. Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: In case the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

15 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

15.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.

15.2 Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.

15.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.

15.4 For critical items, where specified, special handling fixtures shall be used for lifting.

15.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.

15.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

15.7 Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.

15.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH:

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

– The markings showing the upright position.

– The markings showing the sling position

– Markings showing the fragile contents.

– Other required markings as per Clause No. 12

15.8.1 Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15º.

15.8.2 Handling and lifting should be done without jerks or impacts.

15.8.3 Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.

15.8.4 On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.

15.8.5 Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

15.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

16 GI SHEET

The packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per the Figure-3 (GI sheet covering is applicable for all closed type of wooden packing).

17 Treatment of Wood & Application and use of the mark

For seaworthy export packing, treatment of wood has to be carried out as below subject to BHEL Engg & QC approval.

As per customer requirement for export packing, wood to be treated as applicable should be done as per International Standards for Phytosanitary Measures ISPM: 15 to control the growth stages viz. egg to adult of structural insects (beetles, borers, bugs, fleas, flies, lice, moths, roaches, termites) and other pests (mice, rats, spiders) etc. in stored products.

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in Annex 2 of ISPM 15.

17.1 Heat treatment using a conventional steam or dry kiln heat chamber (treatment code for the mark: HT)

When using conventional heat chamber technology, the fundamental requirement is to achieve a minimum temperature of 56 °C for a minimum duration of 30 continuous minutes throughout the entire profile of the wood (including its core).

This temperature can be measured by inserting temperature sensors in the core of the wood. Alternatively, when using kiln-drying heat chambers or other heat treatment chambers, treatment schedules may be developed based on a series of test treatments during which the core temperature of the wood at various locations inside the heat chamber has been measured and correlated with chamber air temperature, taking into account the moisture content of the wood and other substantial parameters (such as species and thickness of the wood, air flow rate and humidity). The test series must demonstrate that a minimum temperature of 56 °C is maintained for a minimum duration of 30 continuous minutes throughout the entire profile of the wood.

Treatment schedules should be specified or approved by the National Plant Protection Organisation (NPPO). Treatment providers should be approved by the NPPO.

17.2 Heat treatment using dielectric heating (treatment code for the mark: DH)

Where dielectric heating is used (e.g. microwave), wood packaging material composed of wood not exceeding 20 cm when measured across the smallest dimension of the piece or the stack must be heated to achieve a minimum temperature of 60 °C for 1 continuous minute throughout the entire profile of the wood (including its surface). The prescribed temperature must be reached within 30 minutes from the start of the treatment.

Treatment schedules should be specified or approved by the NPPO.

17.3 Methyl bromide treatment (treatment code for the mark: MB)

Wood packaging material containing a piece of wood exceeding 20 cm in cross-section at its smallest dimension must not be treated with methyl bromide.

The fumigation of wood packaging material with methyl bromide must be in accordance with a schedule specified or approved by the NPPO (National Plant Protection Organisation) that achieves the minimum concentration-time product (CT) over 24 hours at the temperature and final residual concentration specified in Table 1. This CT must be achieved throughout the profile of the wood, including its core, although the concentrations would be measured in the ambient atmosphere. The minimum temperature of the wood and its surrounding atmosphere must not be less than 10 °C and the minimum exposure time must not be less than 24 hours. Monitoring of gas concentrations must be carried out at a minimum at 2, 4 and 24 hours from the beginning of the treatment. In the case of longer exposure times and weaker concentrations, additional measurement of the gas concentrations should be recorded at the end of fumigation.

If the CT is not achieved over 24 hours, corrective action needs to be taken to ensure the CT is reached; for example, the treatment is restarted or the treatment time extended for a maximum of 2 hours without adding more methyl bromide to achieve the required CT (see the footnote to Table 2).

Table 2 – Minimum CT over 24 hours for wood packaging material fumigated with methyl bromide

Temperature (°C)	CT (g·h/m^3) over 24 h	Minimum final concentration (g/m^3) after 24 h#
21.0 or above	650	24
16.0 – 20.9	800	28
10.0 – 15.9	900	32

In circumstances when the minimum final concentration is not achieved after 24 hours, a deviation in the concentration of ~5% is permitted provided additional treatment time is added to the end of the treatment to achieve the prescribed CT.

One example of a schedule that may be used for achieving the specified requirements is shown in Table 3.

Table 3 – Example of a treatment schedule that achieves the minimum required CT for wood packaging material treated with methyl bromide (initial doses may need to be higher in conditions of high sorption or leakage)

Temperature (°C)	Dosage (g/m^3)	Minimum concentration (g/m^3) at:		
		2 h	4 h	24 h
21.0 or above	48	36	31	24
16.0 – 20.9	56	42	36	28
10.0 – 15.9	64	48	42	32

Treatment providers should be approved by the NPPO.

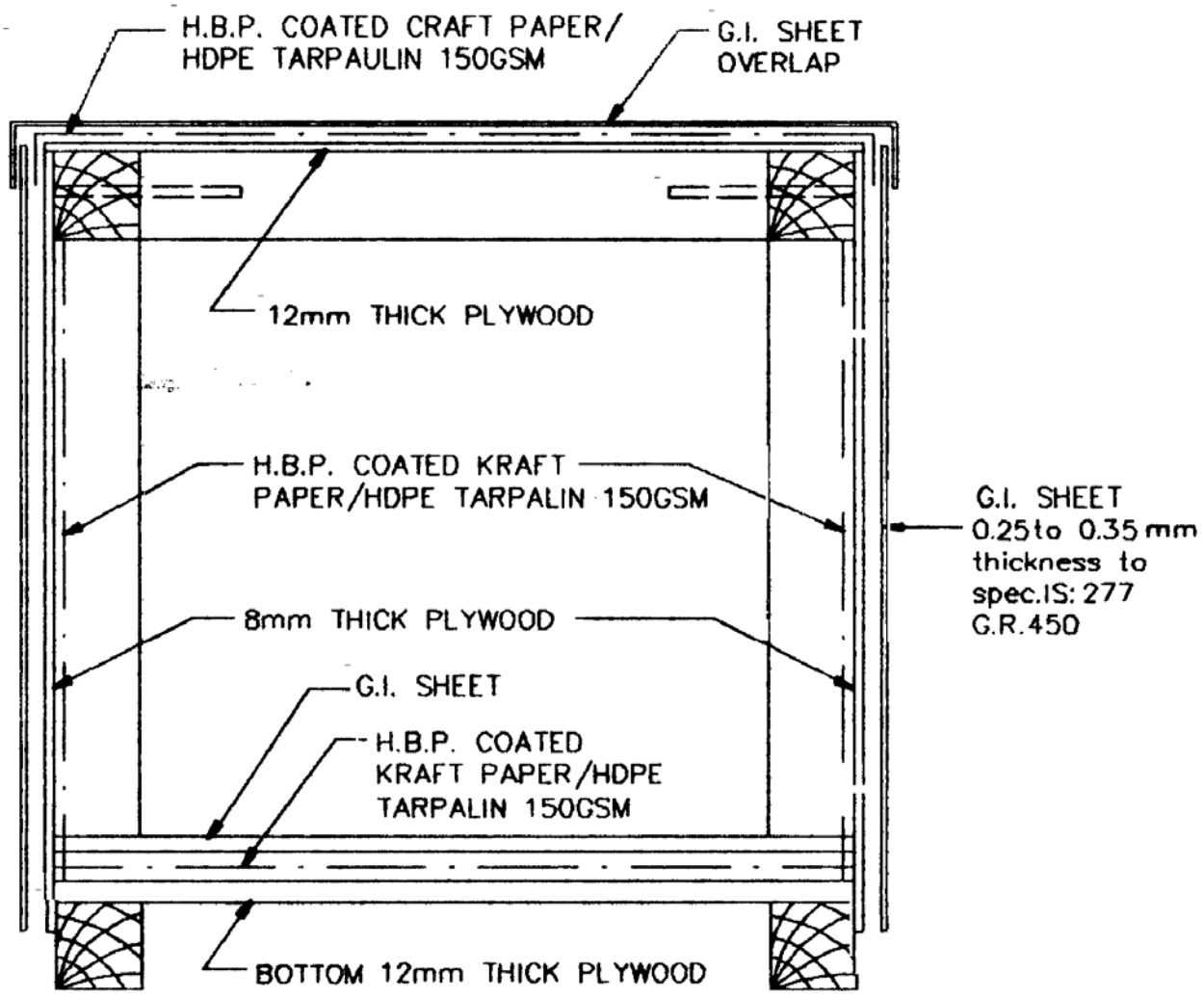
17.4 Marking

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in ISPM 15.

18 PROVISION FOR INSPECTION

This clause is applicable only where contractual requirement of customer is there. For other packings this is not applicable.

Each transportable packing's shall have provision for inspection by customer authority etc. during transport from origin of dispatched till destination. This inspection may require opening of the package and subsequently closing it again. For this purpose suitable designed opening with bolted cover shall be provided. Such an opening shall be clearly marked as "OPENING" with clear instruction for opening & closing written on this cover. For large consignment the size of the opening shall be suitable to facilitate entry of personnel.



CLOSED PACKING CASE WITH
G.I.SHEET SHOWING LAYERS
OF PACKING MATERIALS

Figure 3

Table 2 – Example of a treatment schedule that achieves the minimum required CT for wood packaging material treated with methyl bromide (initial doses may need to be higher in conditions of high sorption or leakage)

Temperature (°C)	Dosage (g/m^3)	Minimum concentration (g/m^3) at:		
		2 h	4 h	24 h
21.0 or above	48	36	31	24
16.0 – 20.9	56	42	36	28
10.0 – 15.9	64	48	42	32

Treatment providers should be approved by the NPPO.

12.4 Marking

The specified marks applied to wood packaging material treated in accordance with ISPM 15 must conform to the requirements described in ISPM 15.

13 PROVISION FOR INSPECTION:

This clause is applicable only where contractual requirement of customer is there. For other packings this is not applicable.

Each transportable packing's shall have provision for inspection by customer authority etc. during transport from origin of dispatched until destination. This inspection may require opening of the package and subsequently closing it again. For this purpose, suitable designed opening with bolted cover shall be provided. Such an opening shall be clearly marked as "OPENING" with clear instruction for opening & closing written on this cover. For large consignment, the size of the opening shall be suitable to facilitate entry of personnel.

14 REFERRED STANDARDS (Latest publications including amendments):

1) AA51401	2) IS:303	3)IS:710	4)AA10166
5)ISPM:15	6)AA51420	7)AA51423	8)55619
9)AA51406	10)AA51416	11)AA51426	12)AA56126