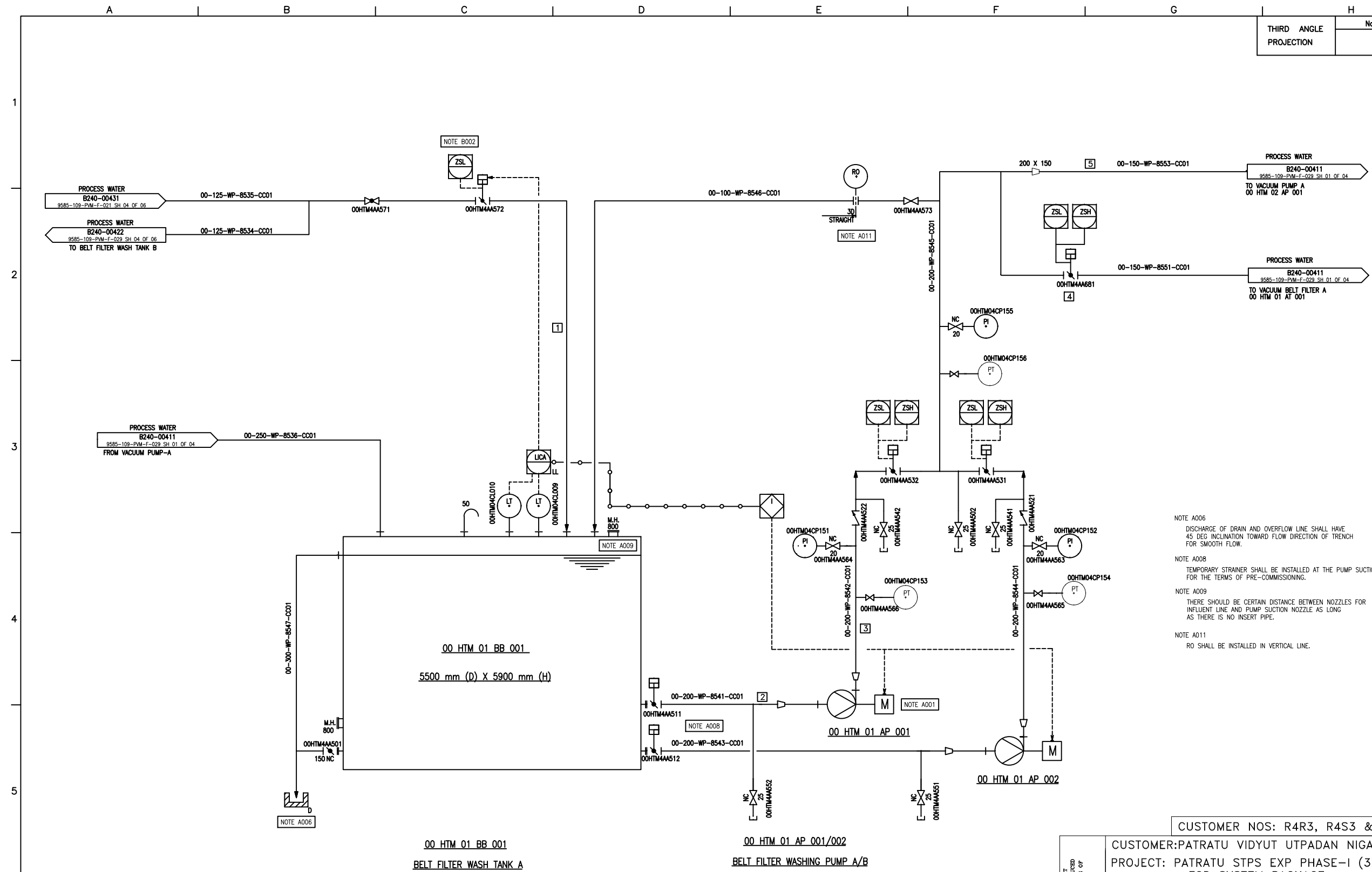


THIRD ANGLE
PROJECTION

No. REQ'D

A3

DRAWING No.



NOTE A006
DISCHARGE OF DRAIN AND OVERFLOW LINE SHALL HAVE
45 DEG INCLINATION TOWARD FLOW DIRECTION OF TRENCH
FOR SMOOTH FLOW.

NOTE A008
TEMPORARY STRAINER SHALL BE INSTALLED AT THE PUMP SUCTION
FOR THE TERMS OF PRE-COMMISSIONING.

NOTE A009
THERE SHOULD BE CERTAIN DISTANCE BETWEEN NOZZLES FOR
INFLUENT LINE AND PUMP SUCTION NOZZLE AS LONG
AS THERE IS NO INSERT PIPE.

NOTE A011
RO SHALL BE INSTALLED IN VERTICAL LINE.

S NO	SECTION	FLOW m3/hr	TEMP(C)	DENSITY kg/m3
1	Process water to belt filter tank	93.2	36	990
2	At the suction of belt filter wash pump	225.0	36	990
3	At the discharge of belt filter wash pump	225.0	36	990
4	Process water to belt filter wash	93.2	36	990
5	Vacumm pump Seal water	93.2	36	990



CUSTOMER NOS: R4R3, R4S3 & R4S4

CUSTOMER: PATRATU VIDYUT UTPADAN NIGAM LIMITED
PROJECT: PATRATU STPS EXP PHASE-I (3X800 MW)
FGD SYSTEM PACKAGE

DEPT CODE	NAME (BHEL)	DATE
DRN	R.PRASANTH	02.12.19
CHD	R.YUVARAJ	02.12.19
APPD	P.NAVEEN	02.12.19

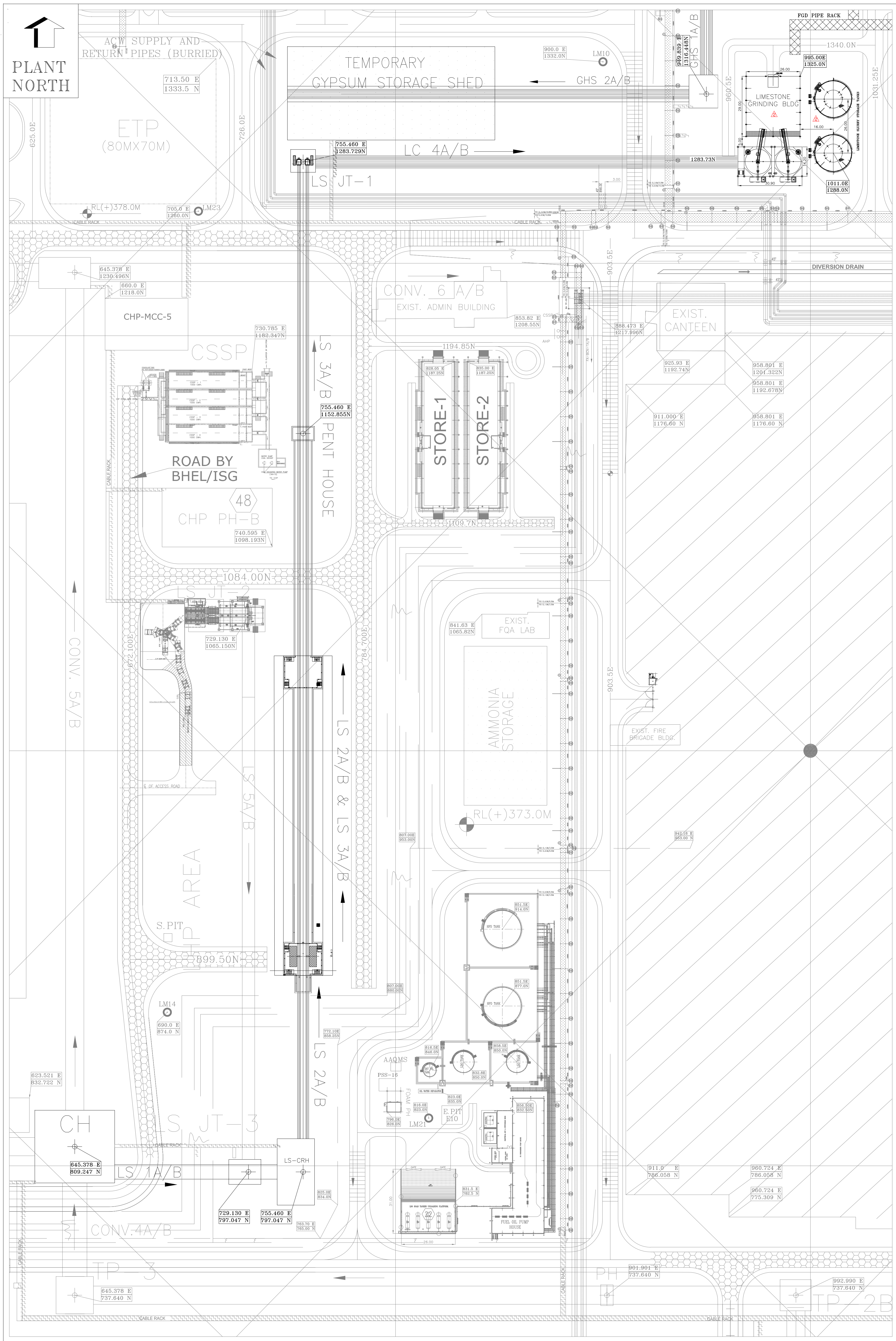
MITSUBISHI HITACHI POWER SYSTEMS, LTD.
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

**P & ID - VACUUM BELT FILTER
(BELT FILTER WASH TANK A)**

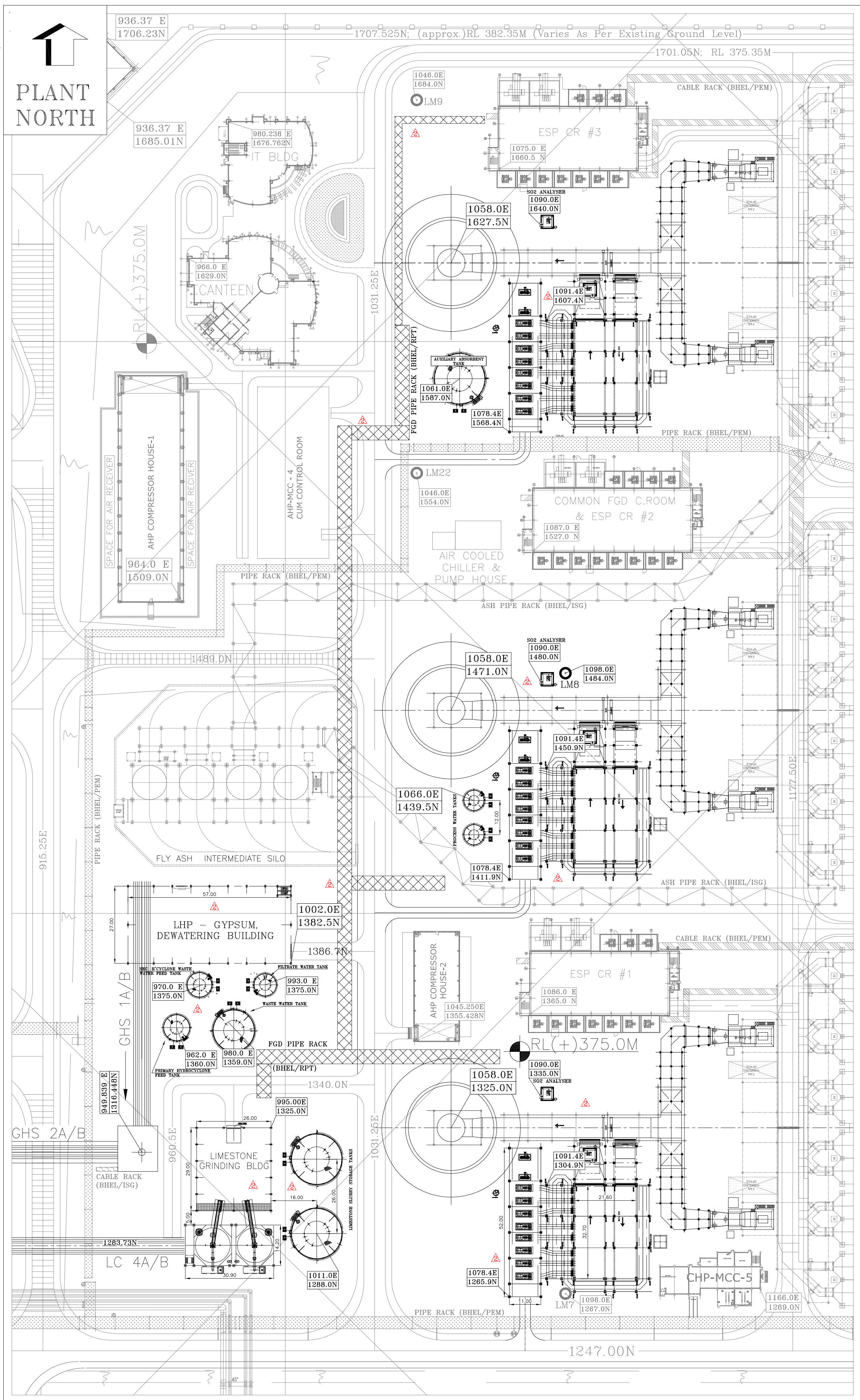
NTPC DRG NO. 9585-001-109-PVM-F-029		SH 03 of 04
BHEL DRG NO 3-FW-000-00570	FILE NO B240 - 00421	REV NO 02



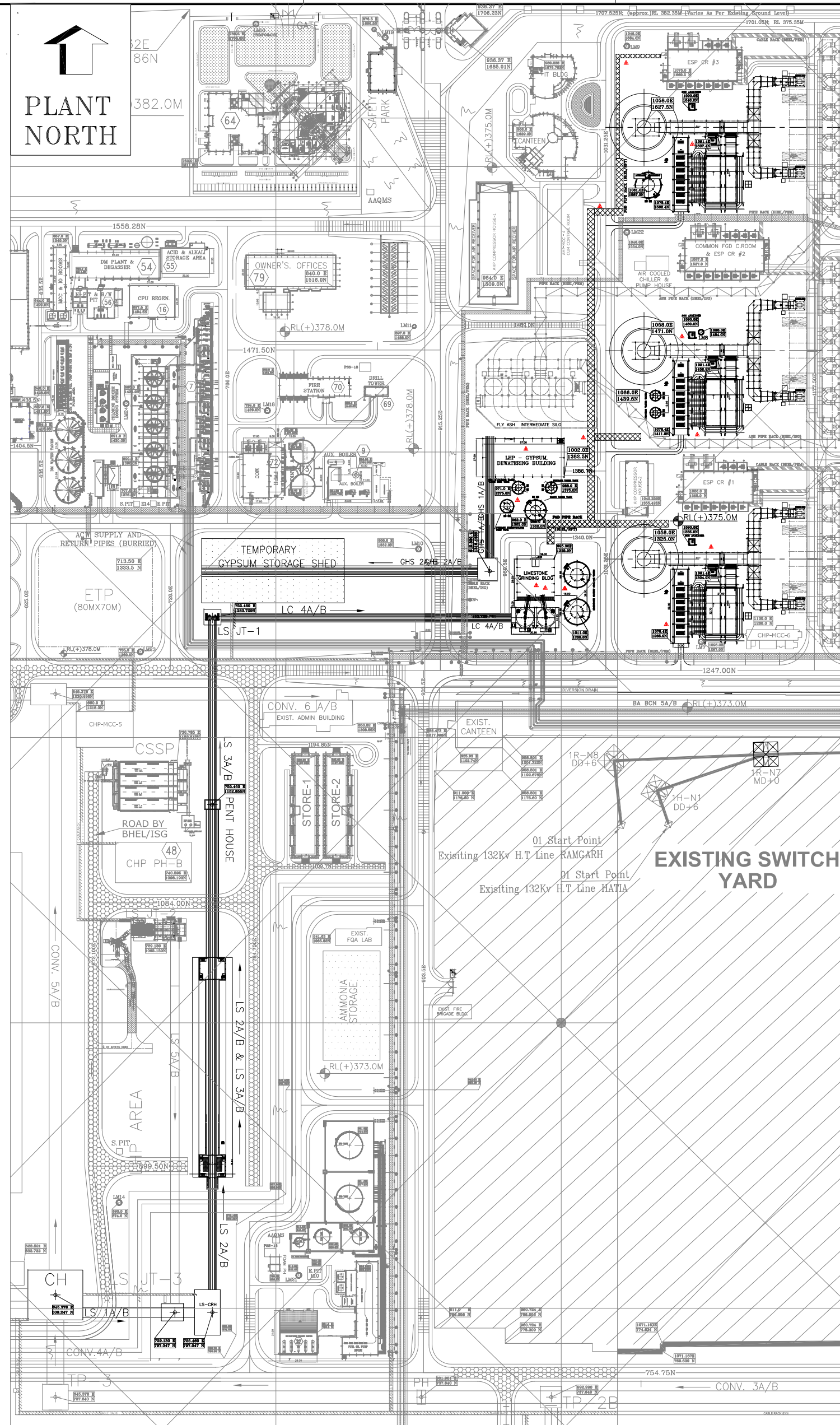
CUSTOMER NOS: R4R3, R4S3 & R4S4				
R: PATRATU VIDYUT UTPADAN NIGAM LIMITED				
PATRATU SPS EXP PHASE-I (3X800 MW)				
FGD SYSTEM PACKAGE				
ADV ELECTRICALS LIMITED, MILLER AUXILIARIES PLANT, RAMPET-632 406.	DEPT	NAME (BHEL)	DATE	
	CODE			
	M	DRN	R.PRASANTH	02.12.19
		CHD	R.YUVARAJ	02.12.19
APPD		P.NAVEEN	02.12.19	
UBISHI HITACHI POWER SYSTEMS, LTD.				
QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION				
D - VACUUM BELT FILTER (BELT FILTER WASH TANK B)			SCALE : NTS 	
O. 9585-001-109-PVM-F-029		SH	04 of 04	
000-00570	FILE NO	B240 - 00422	REV NO 02	



LHP & GHP AREA



ABSORBER AREA



KEY PLAN

LEGEND:-

FGL	FINISHED GROUND LEVEL
PFL	FINISHED FLOOR LEVEL
BMB	BALL MILL BUILDING
GDW	GYPHUM DEWATERING BUILDING
FWT	FILTER WATER TANK
LSST	LIMESTONE SLURRY STORAGE TANK (REAGENT TANK)
AAT	AUXILIARY ABSORBENT TANK
BUF	BOOST UP PAN
WWT	WASTE WATER TANK
SHFT	SECONDARY HYDRO CYCLONE FEED TANK
PWT	PROCESS WATER TANK
CLWT	CLARIFIED WATER TANK

- NOTES:
- ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS IN METRES
 - FINISH FLOOR LEVEL = RL (+375.50 M. CORRESPONDS TO PLANT EL 0.0M (GROUND FLOOR OF STG BUILDING) FINISHED GROUND LEVEL OF BOP AREA AS MARKED.

REFERENCE DRAWINGS:-

S.NO	DRAWING NAME	BHEL DWG. NO.	NTPC DWG. NO.
1.	PLOT PLAN	PE-DG-434-100-M001	9585-001-999-POC-F-001
2.	GA OF BALL MILL BUILDING	0-FW-000-01084	9585-001-109-PVM-B-047
3.	GA OF GYPHUM DEWATERING BUILDING	(HOLD)	(HOLD)
4.	GA OF GYPHUM STORAGE SHED	-	9585-001-155-PVM-B-069
5.	GA OF LIMESTONE CRUSHER HOUSE	-	9585-001-155-PVM-B-065
6.	GA OF DE SYSTEM FOR LIMESTONE SHED	-	9585-001-155-PVM-F-205

- HOLDS:
- GYPHUM DEWATERING BUILDING
 - TANKS
 - LIMESTONE HANDLING FACILITIES

CUSTOMER NOS: R4R3, R4S3, R4S4

NTPC DRG NO: 9585-001-109-PVM-F-001

CUSTOMER: NTPC LIMITED.

PROJECT: 3x800 MW PATRATU SUPER THERMAL

POWER PROJECT - FGD SYSTEM PACKAGE

DEPT: BARHAT HEAVY ELECTRICALS LIMITED, UNH-BHEL BARHAT PLANT, HARPETSI 408.

NAME: SURYA PRAKASH

CHD: LOCHANATHAN

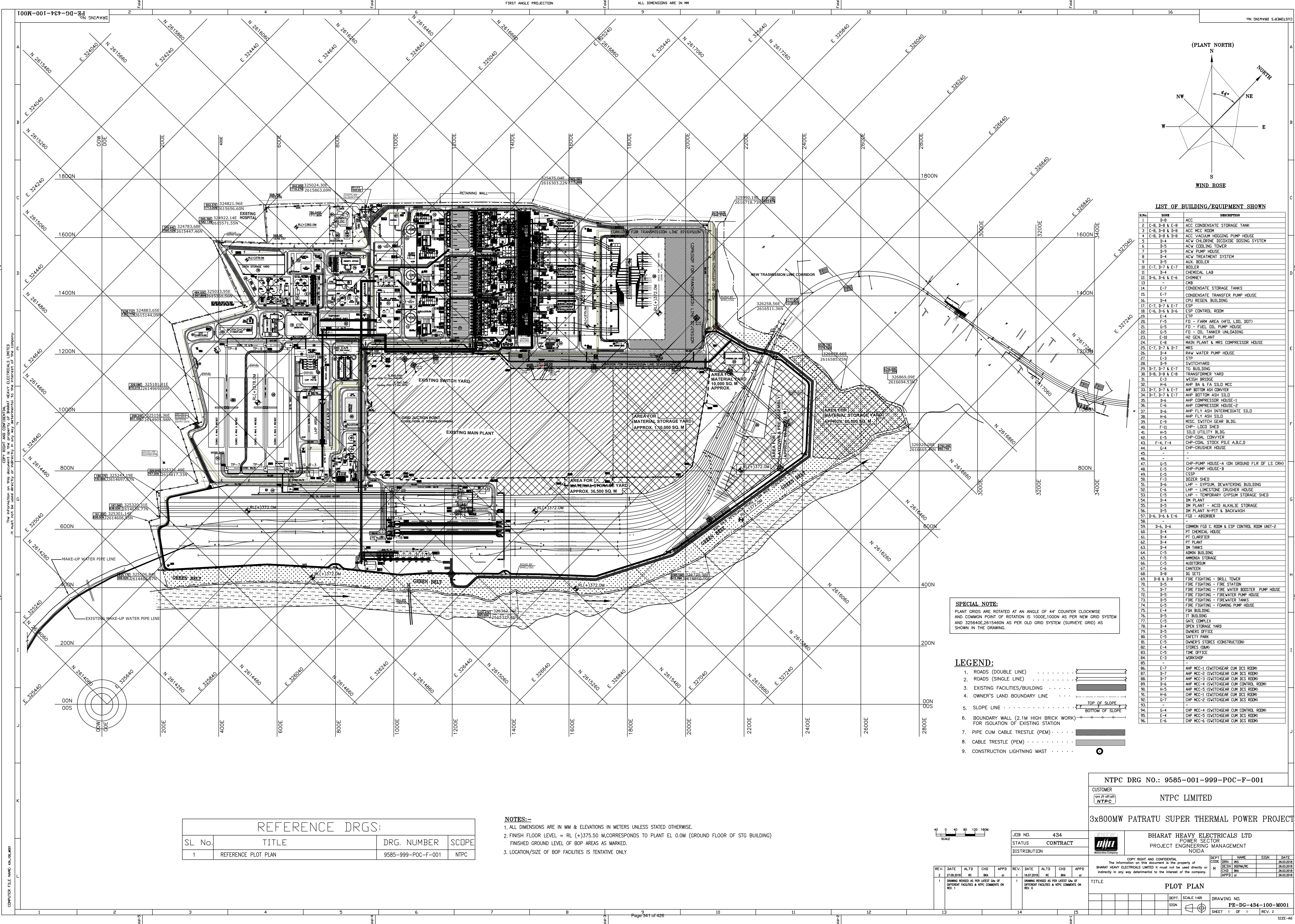
APPR: R S BALAJI

SCALE: NTS

DRAWING NO: 0-FW-000-00549

REV: 2

REV	DATE	ALT	CHK	APPD	REV	DATE	ALT	CHK	APPD
02	02/01/2020	RC	PADHI/BKA	C. GANESH	01	19/09/2019	RL	PADHI	C. GANESH
1. DRAWING REVISED AS PER NTPC COMMENTS & LATEST GA OF VARIOUS FACILITIES.					REVISED AS PER NTPC COMMENTS				
REVISION MARKED AS									



LIST OF BUILDING/EQUIPMENT SHOWN

No.	ZONE	DESCRIPTION
1	D-B	ACC
2	C-B, D-B & D-B	ACC CONDENSATE STORAGE TANK
3	C-B, D-B & D-B	ACC MCC ROOM
4	C-B, D-B & D-B	ACC VACUUM HGGING PUMP HOUSE
5	D-B	ACW COIL DRAIN DRAINAGE DRAINING SYSTEM
6	D-B	ACW COILING TOWER
7	D-B	ACW PUMP HOUSE
8	D-B	ACW TREATMENT SYSTEM
9	D-B	AUX BOILER
10	C-7, D-7 & E-7	BOILER
11	D-B	CHEMICAL LAB
12	D-6, D-6 & E-6	CHIMNEY
13		CMB
14	E-7	CONDENSATE STORAGE TANKS
15	E-7	CONDENSATE TRANSFER PUMP HOUSE
16	D-7	CPU REGN. BUILDING
17	C-7, D-7 & E-7	ESP
18	C-6, D-6 & D-6	ESP CONTROL ROOM
19	E-4	ETP
20	F-5	ETP - FARM AREA (HFD, LDD, BDT)
21	G-5	FD - FUEL OIL PUMP HOUSE
22	G-5	FD - OIL TANKER UNLOADING
23	E-10	HE GEN. PLANT
24	E-8	HMS PLANT & MRS COMPRESSOR HOUSE
25	C-7, D-7 & D-7	MRS
26	D-4	RAW WATER PUMP HOUSE
27	E-3	STP
28	D-9	SWITCHBOARD
29	D-7, D-7 & E-7	TG BUILDING
30	D-B, D-B & D-B	TRANSFORMER VARY
31	E-3	VECHA BRIDGE
32	H-6	AHP BA & FA SILD MCC
33	D-7, D-7 & E-7	AHP BOTTOM ASH SILD
34	D-7, D-7 & E-7	AHP BOTTOM GSH SILD
35	C-6	AHP COMPRESSOR HOUSE-1
36	C-6	AHP COMPRESSOR HOUSE-2
37	D-6	AHP FLY ASH INTERMEDIATE SILD
38	H-6	AHP FLY ASH SILD
39	E-9	MISC. SWITCH GEAR BLDG.
40	F-11	CHP- LDCD SHED
41	H-5	SILD UTILITY BLDG.
42	C-5	CHP-COAL CONVEYER
43	F-4, F-4	CHP-CDAL STOCK PILE A,B,C,D
44	D-6	CHP-CRUSHER HOUSE
45	-	-
46	-	-
47	-	-
48	G-5	CHP-PUMP HOUSE-A- CN GRND FLDR OF LS CR
49	E-5	CHP-PUMP HOUSE-B
50	E-5	CSSP
51	F-3	DOZER SHED
52	D-6	LHP - PUMPAGE, DEWATERING BUILDING
53	E-6	LHP - LINESIDE CRUSHER HOUSE
54	D-6	LHP - SECONDARY GROUND STORAGE SHED
55	D-6	DM PLANT
56	D-5	DM PLANT - ACID ALKALIE STORAGE
57	D-6	DM PLANT - PIPIT & BACKWASH
58	D-6, D-6 & E-6	FDG - ASSEMBLER
59	-	-
60	D-6, D-6	COMMON FGD C ROOM & ESP CONTROL ROOM UNIT-2
61	D-4	PT CLARIFIER HOUSE
62	D-4	PT CLARIFIER
63	D-4	DM TANKS
64	E-5	ADMS BUILDING
65	F-5	AMMONIA STORAGE
66	C-5	AUTORIUM
67	C-5	CANTEN
68	D-8	MS SETS
69	D-8 & D-8	FIRE FIGHTING - DRILL TOWER
70	D-5	FIRE FIGHTING - FIRE STATION
71	D-5	FIRE FIGHTING - FIRE WATER REESTER PUMP HOUSE
72	D-5	FIRE FIGHTING - FIREWATER PUMP HOUSE
73	D-5	FIRE FIGHTING - FIREWATER TANKS
74	D-5	FIRE FIGHTING - FIGHING PUMP HOUSE
75	E-4	FOA BUILDING
76	D-5	IT BUILDING
77	C-5	GATE COMPLEX
78	D-4	OPEN STORAGE YARD
79	D-5	OWNERS OFFICE
80	C-5	SAFETY PARK
81	E-5	OWNERS STORES (CONSTRUCTION)
82	E-4	STORES CAMP
83	C-5	TIME OFFICE
84	E-3	WORKSHOP
85	-	-
86	E-7	AHP MCC-1 (SWITCHGEAR CMC BCS ROOM)
87	D-7	AHP MCC-2 (SWITCHGEAR CMC BCS ROOM)
88	D-7	AHP MCC-3 (SWITCHGEAR CMC BCS ROOM)
89	D-7	AHP MCC-4 (SWITCHGEAR CMC BCS ROOM)
90	H-5	AHP MCC-5 (SWITCHGEAR CMC BCS ROOM)
91	H-6	CHP MCC-1 (SWITCHGEAR CMC BCS ROOM)
92	G-7	CHP MCC-2 (SWITCHGEAR CMC BCS ROOM)
93	-	-
94	G-4	CHP MCC-4 (SWITCHGEAR CMC CONTROL ROOM)
95	E-4	CHP MCC-5 (SWITCHGEAR CMC BCS ROOM)

SPECIAL NOTE:

PLANT GRIDS ARE ROTATED AT AN ANGLE OF 44° COUNTER CLOCKWISE
AND COMMON POINT OF ROTATION IS 1000E,1000N AS PER NEW GRID SYSTEM
AND 325640E,2615460N AS PER OLD GRID SYSTEM (SURVEY GRID) AS
SHOWN IN THE DRAWING.

LEGEND:

- PROPOSED**
- | | |
|--|--|
| 1. ROADS (DOUBLE LINE) | |
| 2. ROADS (SINGLE LINE) | |
| 3. EXISTING FACILITIES/BUILDING | |
| 4. OWNER'S LAND BOUNDARY LINE | |
| 5. SLOPE LINE | |
| 6. BOUNDARY WALL (2.1M HIGH BRICK WORK)
FOR ISOLATION OF EXISTING STATION | |
| 7. PIPE CUM CABLE TRESTLE (PEM) | |
| 8. CABLE TRESTLE (PEM) | |
| 9. CONSTRUCTION LIGHTNING MAST | |

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. FINISH FLOOR LEVEL = RL (+)375.50, CORRESPONDS TO PLANT EL 0.0M (GROUND FLOOR OF STG BUILDING)
FINISHED GROUND LEVEL OF BOP AREAS AS MARKED.
3. LOCATION/SIZE OF BOP FACILITIES IS TENTATIVE ONLY

REFERENCE DRGS:			
SL No.	TITLE	DRG. NUMBER	SCOPE
1	REFERENCE PLOT PLAN	9585-999-POC-F-001	NTPC

REV.	DATE	ALTD	CHD	APPD	REV.	DATE	ALTD	CHD	APPD
2	27.09.2018	RC	BKA	JJ	1	16.07.2018	RC	BKA	JJ
1	DRAWING REVISED AS PER LATEST GAs OF DIFFERENT FACILITIES & NTPC COMMENTS ON REV. 1				1	DRAWING REVISED AS PER LATEST GAs OF DIFFERENT FACILITIES & NTPC COMMENTS ON REV. 0			

JOB NO. 434					 NTPC Nuclear Power Corporation of India Nuclear Energy Commission		BHARAT HEAVY ELECTRICALS LTD							
STATUS CONTRACT							POWER SECTOR							
DISTRIBUTION							PROJECT ENGINEERING MANAGEMENT NOIDA							
COPY RIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.										DEPT M	CODE DRN CHD APPD	NAME DEPT/RA BHA JU	SIGN 	DATE 26.05.2018 26.05.2018 26.05.2018 26.05.2018
REV.	DATE	ALTD	CHD	APPD										
1	14.07.2018	NC	BHA	JU										
1 DRAWING REVISED AS PER LATEST G.A. OF DIFFERENT FACILITIES & NTPC COMMENTS ON R.O.														
TITLE					PLOT PLAN									
					DEPT.	SCALE 1:40	DRAWING NO.							
					SIGN		PE-DG-434-100-M001 SHEET 1 OF 1 REV. 1							
14					15					SHEET-40				



3x800 MW PATRATU TPS
GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-434-571-A001

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 6

SECTION-I

SUB-SECTION-D

ANNEXURE-V

MASTER DRAWING LIST WITH SCHEDULE OF
SUBMISSION



3x800 MW PATRATU TPS
GYPHUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-434-571-A001

SECTION : I

SUB-SECTION : D

REV 00

SHEET 2 OF 6

Sl.No.	Document required after award of contract	No. of hard copies after award of contract	Submission time*
1.	Drawing Schedule	6	2
2.	Plot Plan & Layout	6	2
3.	Process Flow Diagram	6	2
4.	Equipment List	6	2
5.	Utility Consumption	6	2
6.	Chemical List	6	2
7.	Duly filled technical datasheet	6	2
8.	P & I Diagram	6	2
9.	Performance Test Procedure & Report	6	8
10.	Outline Drawing of Equipment	6	6
11.	Fabrication Drawing of Equipment	6	8
12.	Warranted Performance curve of Machinery	6	6
13.	Platform Drawing	6	6
14.	Line Index	6	6
15.	Piping Material Specification	6	6
16.	Piping Arrangement Drawing	6	6
17.	Piping Support Arrangement Drawing	6	6
18.	Isometric Drawings	6	4
19.	Data sheet of Piping Parts	6	6
20.	Valve Drawing	6	8
21.	Instrument Schedule List	6	8



3x800 MW PATRATU TPS
GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-434-571-A001
SECTION : I
SUB-SECTION : D
REV 00
SHEET 3 OF 6

22.	Instrument Function Loop Diagram	6	8
23.	Interlock and Operation Description	6	8
24.	Interlock/ Sequence Logic Diagram	6	8
25.	Instrument Power Supply Diagram	6	8
26.	Instrument Set Point List	6	8
27.	Instrument Data Sheet	6	8
28.	Valve Data Sheet, including On-Off Valve	6	8
29.	Nozzle Elevation Plan for Level Instrument	6	8
30.	Specification and Drawing of Instrument	6	8
31.	Instruction Manual for Instrument	6	12
32.	Local Control Panel Specification	6	8
33.	Local Control Panel Drawing	6	8
34.	Cable Duct/Tray Routing Plan	6	8
35.	Fabrication Drawing for Cabinet Duct/Tray	6	8
36.	Plot Plan of Field Instrument	6	8
37.	Layout of Instrument Wiring	6	8
38.	Layout of Instrument Air Supply Piping and Signal tubing	6	8
39.	Hook-up Drawing for Instrument	6	8
40.	Instrument Connection List	6	8
41.	Instrument Cable Schedule	6	8
42.	Parts Drawing for Instrument Installation Materials	6	8
43.	Calculation Sheet for Flow Instrument	6	8



3x800 MW PATRATU TPS
GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-434-571-A001

SECTION : I

SUB-SECTION : D

REV 00

SHEET 4 OF 6

44.	Motor List	6	8
45.	Motor Data Sheet	6	8
46.	Outline drawing of Motor	6	8
47.	Loading Data	6	8
48.	Planning Drawing of Building	6	6
49.	Planning Drawing of Foundation	6	6
50.	Consumable Parts List	6	6
51.	Lubricant List	6	6
52.	Special Tool List	6	6
53.	Spare Parts List for Erection	6	6
54.	Spare Parts List for Commissioning	6	8
55.	Spare Parts List for 2 years of Operation	6	8
56.	Construction Work Specification	6	10
57.	Construction Manual List	6	10
58.	Painting Specification	6	10
59.	Transportation and Storage Specification	6	10
60.	Shop Inspection Specification	6	10
61.	Shop Inspection Report	6	12
62.	Site Inspection Specification	6	12
63.	Site Inspection Report	6	14
64.	Supply Item List for Package Verification at Site	6	12
65.	Packing List	6	12



3x800 MW PATRATU TPS
GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-434-571-A001
SECTION : I
SUB-SECTION : D
REV 00
SHEET 5 OF 6

66.	Sub-Vendor List	6	4
67.	Manufacturing Schedule	6	4
68.	Progress Report	6	4
69.	Spare Parts List for Erection	6	10
70.	Spare Parts List for Commissioning	6	10
71.	Detail drawings indicating the dimensions of the equipments.	6	6
72.	Detail drawings indicating the piping layouts	6	6
73.	Detail drawing of Gypsum dewatering building	6	6
74.	Erection drawings	6	8
75.	Operation & Maintenance (O&M) Manual	6	12
76.	Civil Loading details	6	4
77.	Quality plan & Safety Requirement	6	4

***Within No. of Weeks after the placement of LOI/PO**

Notes:

1. The above drawing list is tentative and shall be finalized with the successful bidder after placement of order. While some of the drawings indicated above may not be applicable, some additional drawings may also be required based on scope of work.
2. Drawings shall be prepared in Auto-Cad latest edition. Required no. of hard and soft copies (editable) of the drawings shall be furnished as per requirement specified elsewhere in the specification.
3. Only manual calculation with authentic supporting literature (e.g. extracts of hand Book/ standard/codes) shall be acceptable. All design calculations and drawings shall be in SI system only.
4. All the drawings and documents including general arrangement drawing, data sheet, calculation etc. to be furnished to the customer during detailed engineering stage shall include / indicate the following details for clarity w.r.t. Inspection, construction, erection and maintenance etc.:
 - a) All drawings and documents shall indicate the list of all reference drawings including General Arrangement.
 - b) 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 labeled and included in BOQ / BOM in tabular form.

	3x800 MW PATRATU TPS GYPSUM DEWATERING SYSTEM TECHNICAL SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-434-571-A001	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 6 OF 6	
c) Painting schedule shall also be made as a part of general arrangement drawing of each equipment / items indicating at least 3 trade names. d) All the drawings required to be furnished to customer during detailed engineering stage shall include technical parameters, details of paints and lubrication, hardness and BOQ / BOM in tabular form indicating all major components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc. e) Drawings/ documents to be submitted for purchaser’s review/ approval shall be under Revision A, B, C... etc. while drawings /documents to be submitted thereafter for customer’s approval after purchaser’s approval shall be under R-0, 1, 2, 3 etc. f) Drawings and documents not covered above but required to check safety of machines/ system, shall be submitted during detailed engineering stage without any commercial implication. g) All drawings shall include "B.O.M" and indicate quantity, material of construction, make along with IS/BS No., Technical parameters, dimensions, hardness, machining symbol and tolerance, requirement of radiography and hydraulic tests, painting details, elevation, side view, plan, skin section and blow-up view for clarity. h) All drawings shall be prepared as per BHEL's title block and shall bear BHEL's drawing No. Documents marked for submission to BHEL’s Customer shall also bear BHEL's Customer’s drawing No. i) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL’s/ Customer’s/ Consultant’s office for across the table resolution of issues and to get documents approved in the stipulated time. j) Bidder to follow the following the drawing submission schedule: k) 1st submission of drawings from date of LOI as per the submission schedule. l) Every revised submission incorporating comments – within 7 days. m) Bidder to submit revised drawings complete in all respects incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays attributable to bidder’s account. For any clarification/ discussion required to complete the drawings, the bidder shall depute his personal to BHEL for across the table discussions/ finalizations/ submissions of drawings.			



3x800 MW PATRATU TPS

**GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION**

PACKING PROCEDURE

SPECIFICATION No: PE-TS-434-571-A001

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 4

SECTION-I

SUB-SECTION-D

ANNEXURE-VI

PACKING PROCEDURE



3x800 MW PATRATU TPS

SPECIFICATION No: PE-TS-434-571-A001

**GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION**

SECTION : I

SUB-SECTION : D

REV 00

PACKING PROCEDURE

SHEET 2 OF 4

1.0	PACKING AND FORWARDING
1.	Proper packing to be ensured. Indigenous Supply: Gypsum Dewatering System & sub system assembly shall be wrapped in polythene bags & packed in a strong rigid wooden crate. Rain water should not enter into the pump internals during storage in the outer yard of power plant. Imported Supply: All imported supply should be packed as per Sea worthy packing standards Annexure-VII of this sub-section. All imported items should have Sea worthy packing. Liberal packing materials and struts shall be provided to arrest rolling and to protect from transit damages.
2.	Equipment and process materials shall be packed and semi-knocked down, to the extent possible, to facilitate handling and storage and to protect bearings and other machine surfaces from oxidation. Each container, box, crate or bundle shall be reinforced with steel strapping in such a manner that breaking of one strap will not cause complete failure of packaging. The packing shall be of best standard to withstand rough handling and to provide suitable protection from tropical weather while in transit and while awaiting erection at the site.
3.	Equipment and materials in wooden cases or crates shall be properly cushioned to withstand the abuse of handling, transportation and storage. Packing shall include preservatives suitable to tropical conditions. All machine surfaces and bearings shall be coated with oxidation preventive compounds. All parts subject to damage when in contact with water shall be coated with suitable grease and wrapped in heavy asphalt or tar impregnated paper.
4.	The entire system has to be supplied in containers and it should be suitable for storing in the outer yard of the plant for a minimum period of 12 months. Crates and packing material used for shipping will become the property of owner (PVUNL).
5.	Packaging or shipping units shall be designed within the limitations of the unloading facilities of the receiving ports and the ship will be used. It shall be the bidder's responsibility to investigate these limitations and to provide suitable packaging and shipping to permit transportation to site.
6.	Packing (tare) shall be part of the equipment cost and shall not be subject to return. The packing should ensure integrity and cohesiveness of each delivery batch of equipment during transportation. In case of equipment assemblies and unit's delivery in the packing of glass, plastics or paper the specification of packing with the material and weight characteristics are to be indicated.
7.	Each package should have the following inscriptions and signs stenciled with an indelible ink legibly and clearly: - Destination - Package Number - Gross and Net Weight - Dimensions - Lifting places - Handling marks and the following delivery marking

	3x800 MW PATRATU TPS		SPECIFICATION No: PE-TS-434-571-A001	
	GYPSUM DEWATERING SYSTEM TECHNICAL SPECIFICATION		SECTION : I	
			SUB-SECTION : D	
			REV 00	
	PACKING PROCEDURE		SHEET 3 OF 4	

8.	Each package or shipping units shall be clearly marked or stenciled on at least two sides with the DETAILED SHIPPING ADDRESS –TO BE PROVIDED LATER. In addition, each package or shipping unit shall have the symbol painted in red on at least two sides of the package, covering one fourth of the area of the side.
9.	Each part of the equipment which is to be shipped as a separate piece or smaller parts packed within the same case shall be legibly marked to show the unit of which it is part, and match marked to show its relative position in the unit, to facilitate assembly in the field. Unit marks and match marks shall be made with steel stamps and with paint.
10.	Each case shall contain a packing list showing the detailed contents of the package. When any technical documents are supplied together with the shipment of materials no single package shall contain more than one set of such documents. Shipping papers shall clearly indicate in which packages the technical documents are contained.
11.	The case number shall be written in the form of a fraction, the numerator of which is the serial number of the case and the denominator the total number of case in which a complete unit of equipment is packed.
12.	Wherever necessary besides usual inscriptions the cases shall bear special indication such as “Top”, “Do not turn over”, “Care” , “Keep Dry” etc. as well as indication of the center of gravity (with red vertical lines) and places for attaching slings (with chain marks).
13.	Marking for Safe handling: To ensure safe handling, packing case shall be marked to show the following: a. Upright position b. Sling position and center of Gravity position c. Storage category d. Fragile components (to be marked properly with a clear warning for safe handling)
14.	Each crate or package is to contain a packing list in a waterproof envelope. All items are to be clearly marked for easy identification against the packing List. All cases, packages etc. are to be clearly marked on the outside to indicate the total weight where the weight is bearing and the correct position of the slings are to bear an identification mark relating them to the appropriate shipping documents. All stencil marks on the outside of cases are either to be made in waterproof material or protected by shellac or varnish to prevent obliteration in transit.
15.	The packing slip shall contain the following information: - Customer name, Name of the equipment, Purchase Order number with Date, Address of the delivery site, Name and Address of the Sender, Serial Number of pump & accessories, BHEL item Code, Gross Weight and Net weight of Supplied items.
16.	Prior to transport from manufacturer’s work to destination, components of the unit shall be completely cleaned to remove any foreign particles. Flange faces and other machined surfaces shall be protected by an easily removable rust preventive coating followed by suitable wrapping.
17.	All necessary painting, corrosion protection & preservation measures shall be taken as specified in painting schedule. Supplier shall consider the coastal environment zone which is defined as “very severe” during final finishing/shipping.
18.	Successful bidder shall furnish the detail packing /shipment box details with information like packing box size, type of packing, weight of each consignment, sequence no. of dispatch, no. of consignment for each deliverable item against each billing break up units/ billable blocks.



3x800 MW PATRATU TPS

SPECIFICATION No: PE-TS-434-571-A001

**GYPSUM DEWATERING SYSTEM
TECHNICAL SPECIFICATION**

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PACKING PROCEDURE

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	Without these details the BBU shall not be approved during detail engineering. Also, complete billing break-up with above mentioned details shall be submitted to Purchaser within 10 days of placement of the LOI.
19.	All items/equipment shall be dispatched in properly packed condition (i.e. no item shall be dispatched in loose condition such that it becomes difficult to store/identify its location at site at a later stage).
20.	Cases which cannot be marked as above shall have metal tags with the necessary markings on them. The metal tags shall be securely attached to the packages with strong steel binding wire. Each piece, Skid, Case or package shipped separately shall be labelled or tagged properly.

BIDDER TO REFER SUB-SECTION C2-A FOR CUSTOMER SPECIFICATION IN THIS REGARD.

VOLUME IIB

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

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



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

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

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

2.0 SCOPE

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

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

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

3.0 Application

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

4.0 Definitions

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

5. General Information

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

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

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

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

6.0 Criteria for Selection of Packaging

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

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

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

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

Materials can be classified in following categories

- Hazardous Material
- Non-Hazardous Material
-

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

6.1 Hazardous Materials

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

6.2 Non-Hazardous GOODS

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

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7.0 Marking Instructions & Despatch details, Storage Code

7.1 Marking Instructions & despatch details

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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7.2 Storage Code

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

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

8.0 GUIDELINES FOR PACKING GOODS

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

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

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

IMPORTANT NOTE:

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

8.1.2 Pipe

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

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

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

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

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

8.1.3 Pipe Fittings, Flanges and Valves

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

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

8.1.4 Structural Steel

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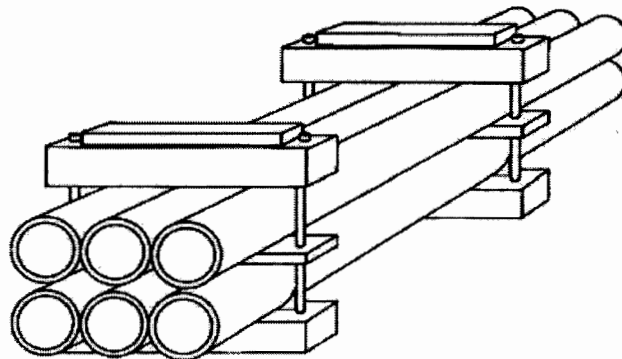
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

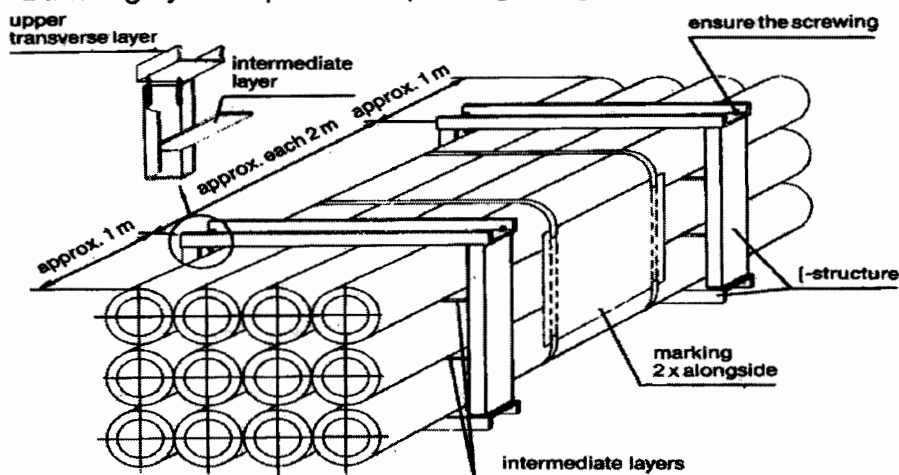
8.2.1 Type of Equipment

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

Packing category I



Bundling by U-shaped iron – packing category I A



8.2.2 Type of Construction

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

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

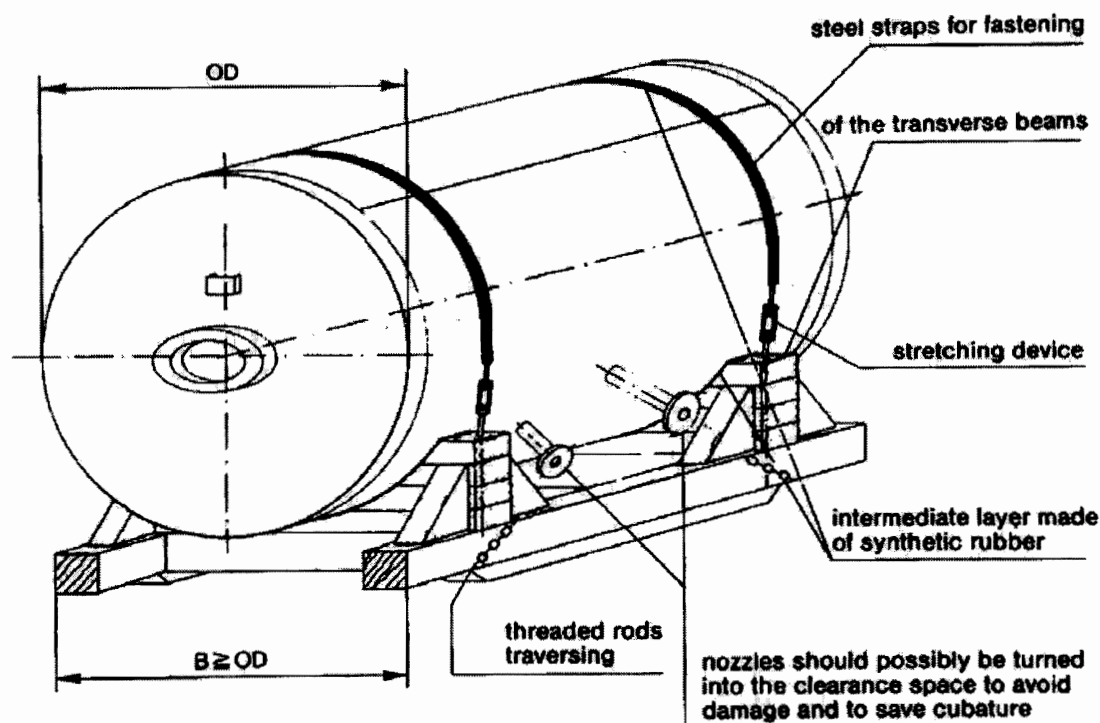
8.3.1 Type of Equipment

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

8.3.2 Type of Construction

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

PACKING CATEGORY-II



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8.4 Packing of GOODS in Wooden Crates/Cases/Boxes

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

8.4.1 Packing Category III

8.4.1.1 Type of Equipment

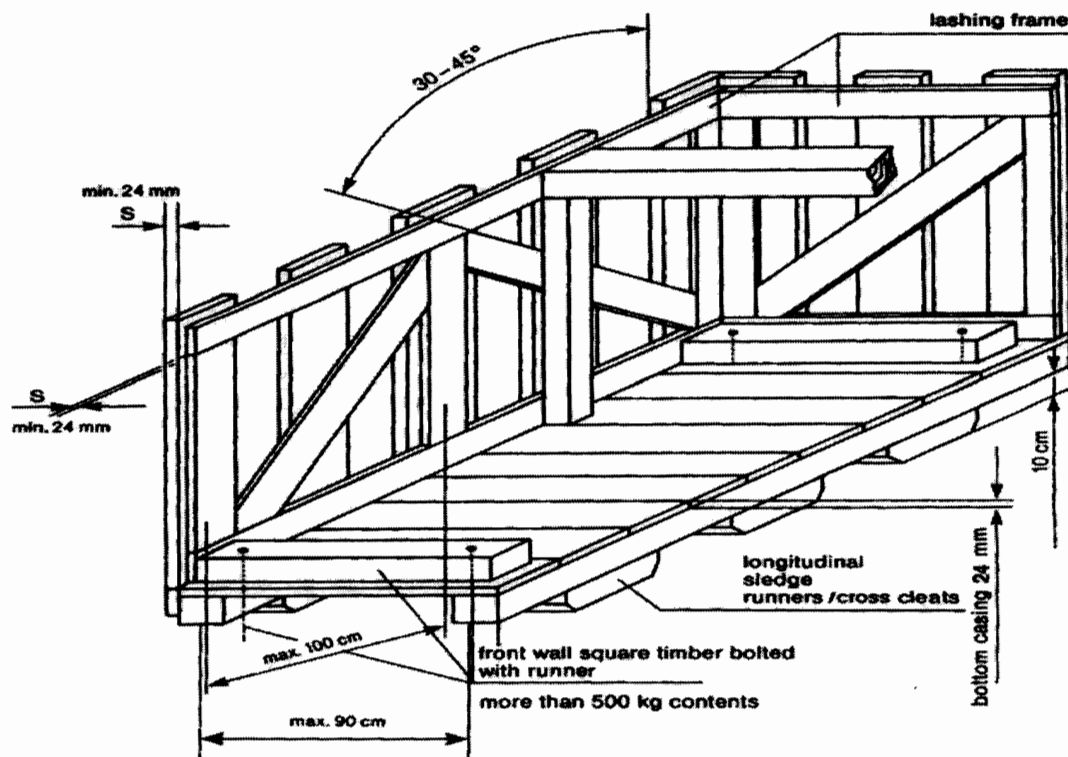
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

8.4.1.2 Type of Construction

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

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

Packing Category III



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8.4.2 Cases with Lining – Packing Category IV

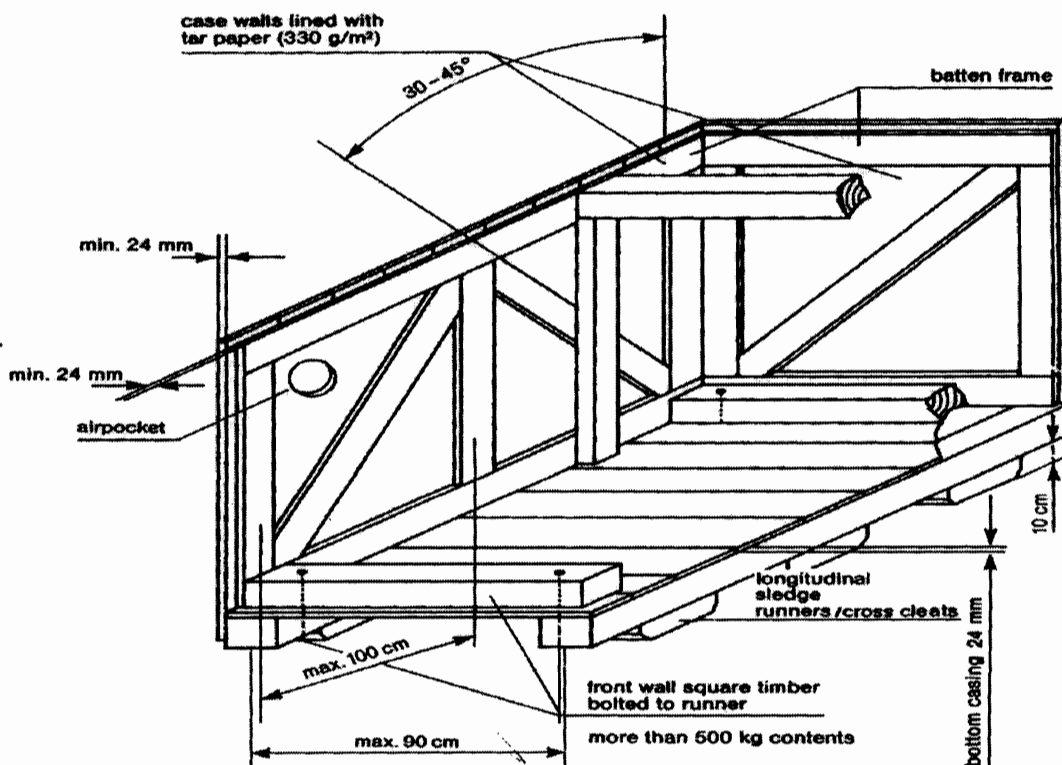
8.4.2.1 Type of Equipment

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

8.4.2.2 Type of Construction

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

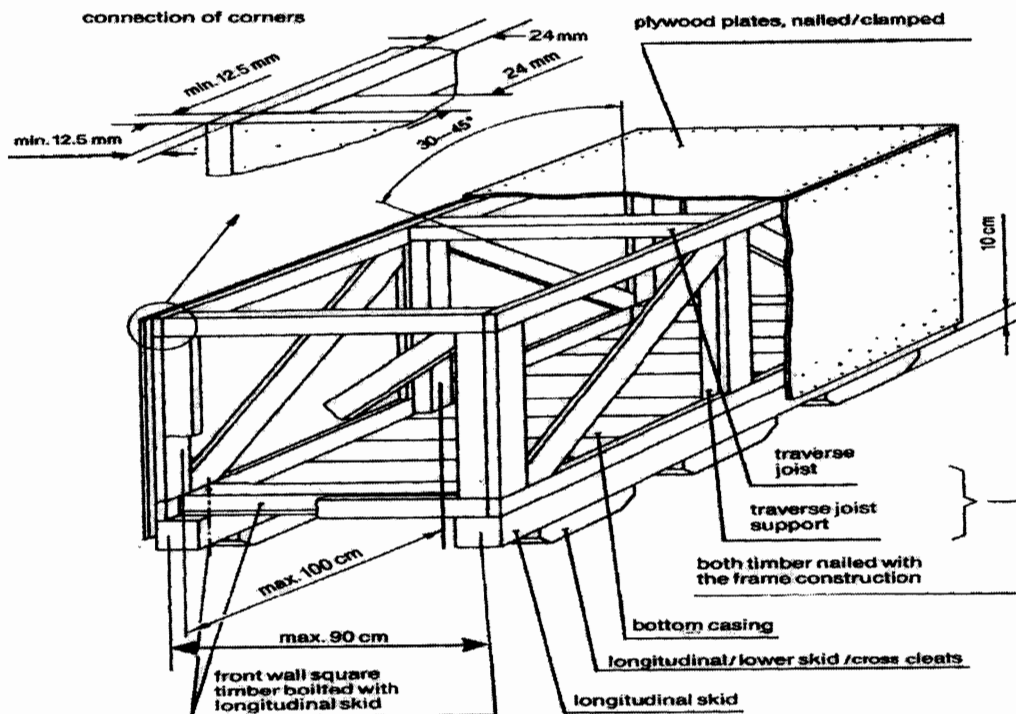
Packing Category IV



8.4.3 Cases with Alternative Surface Materials

8.4.3.1 Plywood Box – Packing Category IV A

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

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

8.4.4.1 Type of Equipment

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

8.4.4.2 Type of Construction

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

Additional marking:

- Case with desiccants.

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

8.4.5.1 Type of Equipment

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

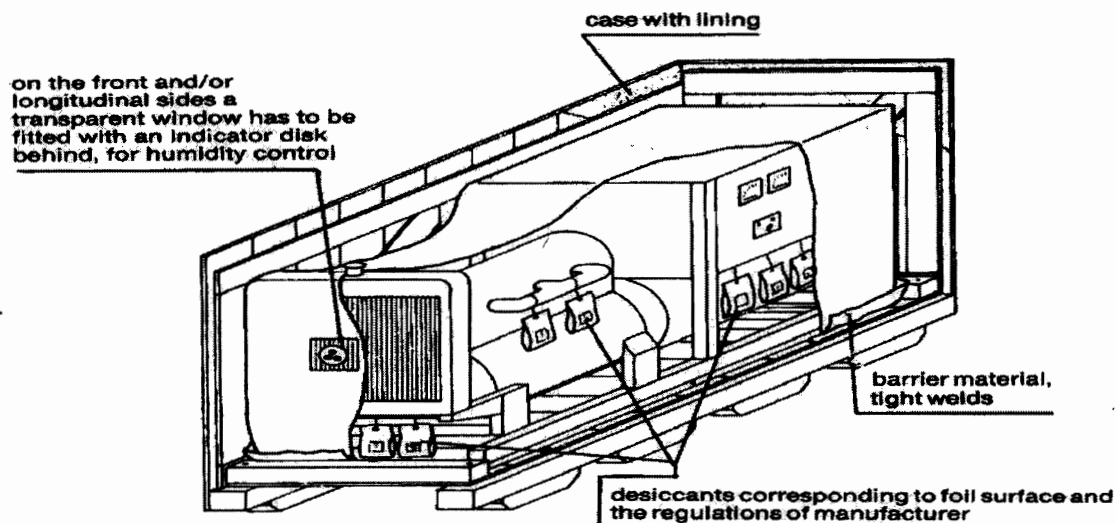
8.4.5.2 Type of Construction

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

Additional marking:

- Case with desiccants.

Packing Category V/VI



8.4.6 Double Case – Packing Category VII

8.4.6.1 Type of Equipment

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

8.4.6.2 Type of Construction

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

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8.4.7 Cable Drum – Packing Category VIII

8.4.7.1 Type of Equipment

All type of cables, wires, ropes, hoses.

8.4.7.2 Type of Construction

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

8.4.8 Hazardous Materials – Packing Category IX

8.4.8.1 Type of Equipment

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

8.4.8.2 Type of Construction

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

8.4.9 Wooden Floor as a Transport Support – Packing Category X

8.4.9.1 Type of Equipment

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

8.4.9.2 Type of Construction

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

8.5 Air Transport Packing

8.5.1 General

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

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

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8.5.2 Type of Packing

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

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

8.5.3 Dimensions

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

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

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

9.1 Technical specification for wood

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

9.2 Chemical Treatment of Wood:

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

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:

9.3.1 PACKING OF EQUIPMENTS

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

9.3.1.1 Bottom Frame

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The construction of bottom frame shall be as per Fig-2. The No. of slides/runners for bottom frames shall be selected depending upon the weight and overall dimensions of the load to be carried. The equipment shall be secured by fixing their base frame/plate with the help of bolt and nuts etc. to bottom frame of the wooden packing cases/crates. The equipment not provided with base frame/plate like cylindrical vessels, etc to be secured to the bottom frame of the wooden cases with "C" clamps fabricated from steel channels/ angle iron.

9.3.1.2 TOP FRAME

The construction of top frame shall be as per fig-3.

9.3.1.3 END PANELS

The dimension of the end and lateral panels shall be calculated according to overall dimensions of the items to be packed. Diagonal braces shall be used for packing cases having height exceeding 500mm. Details of bracings shall be as per fig 5 to 9.

9.3.1.4 Sling Plate

To facilitate lifting of cases, longitudinal under slide boards shall be fixed. To avoid damage to the box while lifting sling plates shall be provided. Refer fig-11.

9.3.1.5 Angle Iron Cleats

Angle iron cleats shall be used for strengthening the joints as indicated in fig-10

9.3.1.6 Other Requirements

- The thickness of planks for top, bottom, side and end panels shall be at least 25mm. Planks used for this purpose shall be joined with each other by tongue and groove joint. The groove dimension shall be such that tongue fits tightly into groove to make the joint.
- Runners/slides, traverse bars, etc shall be of single length i.e. without any joint. Planks for sheathing, diagonal bracing etc shall also be of single length up to 2400mm, proper jointing is permitted for planks for sheathing and diagonal bracings.
- Each equipment to be individually covered with double polyethylene petticoat. Sheet thickness of polythene sheet shall not be less than 0.175 mm (175 microns). The sealing shall be such so as not to allow moisture inside.
- The inner surface of 4 sides of shooks shall be nailed with bituminized water proof craft paper. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- All the inner sides of the box shall be nailed with bitumen coated HESSIAN POLYTHYLENE KRAFT PAPER. For top frame it shall project on all sides by 100mm and shall be nailed on sides. Wherever 2 pieces of kraft paper are used, joint shall have an overlap of minimum 20 mm.
- For delicate equipment like control panels and switchgears, lighting panels and lighting transformers, suitable cushioning material like rubberised coir (min. 50 mm thick and 100 mm wide) shall be provided on their bottom support and the gap between the panel and casing

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

- Switchgear cubicles, control panels and control desks shall be packed and shipped in separate convenient sections. The components e.g. circuit breakers relays and instruments etc. which are removed from panels for shipping purpose and shall be separately packed and shipped as per packing instructions in clause 10.4.
- Packing case for control panels and switchgear panels shall be finally covered with GI sheet of minimum thickness of 0.4mm.
- Packing cases shall be bound at edges by nailing MS clamps/brackets at sufficient intervals. Further heavier boxes shall be strapped with C clamps (ref fig-4) fabricated from steel channels/angles and lighter boxes shall be strapped with hoop iron strips.
- Silica gel is used for this purpose to protect contents over sufficiently long time from corrosion. Silica gel shall be indicating type confirming to IS-304 (1979) packed in cotton bags placed at different positions inside the packing for absorbing moisture and shall not come into directly contact with equipment/material inside the package. The quantity of silica gel shall be adequate for storage period of one year, however it shall not be less than 4 gm. per ltr. Volume of case subject to minimum 400 gm. Per case.



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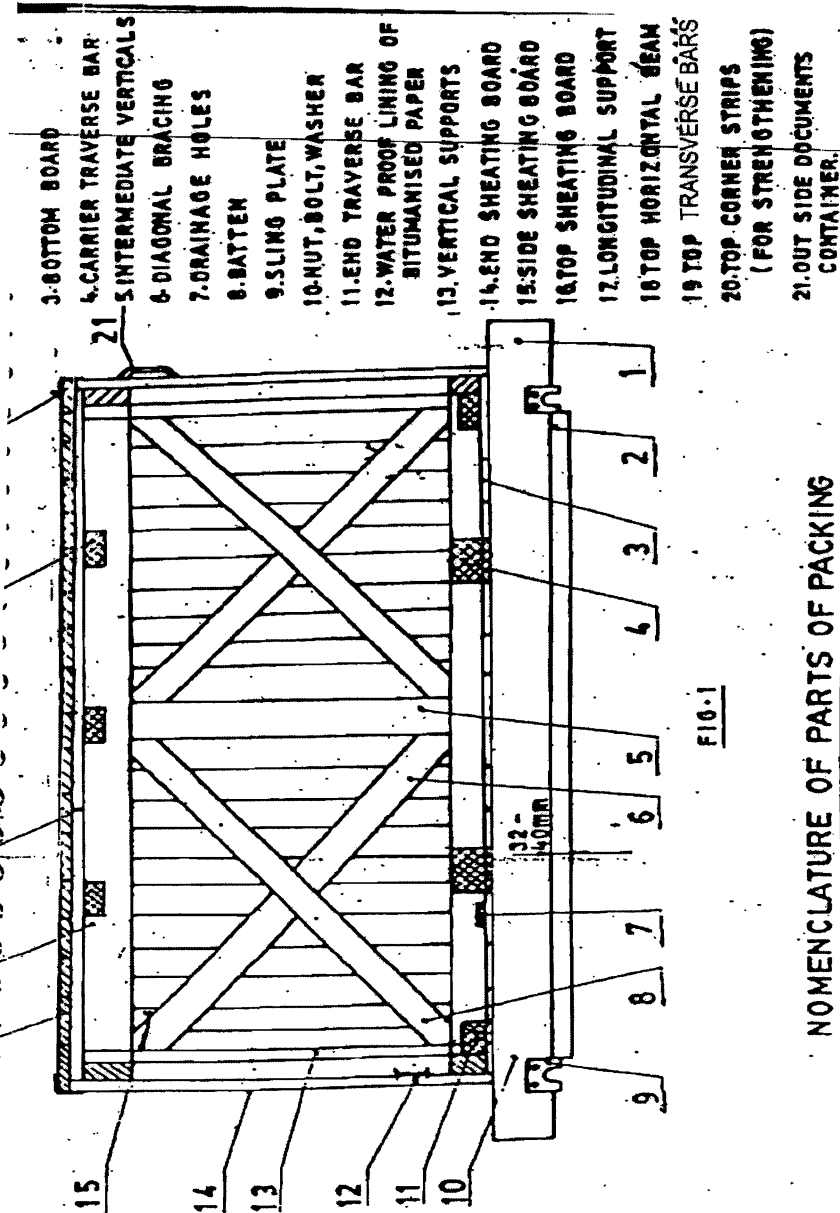
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NOMENCLATURE OF PARTS OF PACKING

CASES

FIG-1

EC-009



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BOTTOM FRAME ARRANGEMENTS

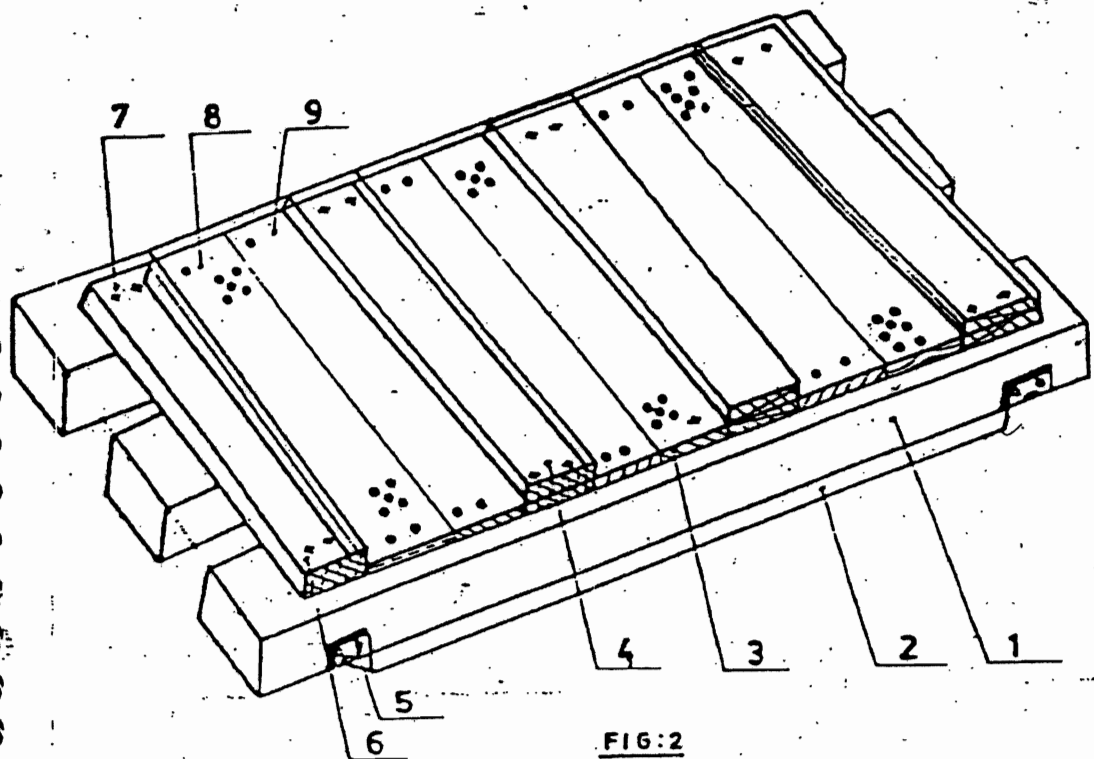


FIG:2

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

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

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TOP FRAME ARRANGEMENT

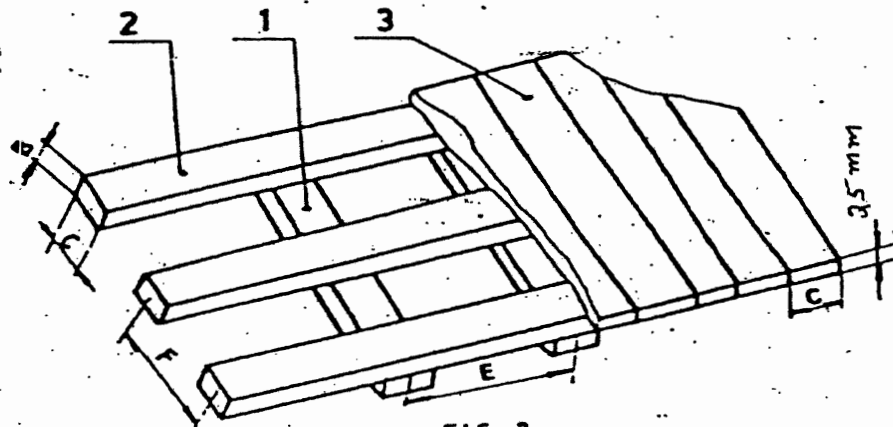
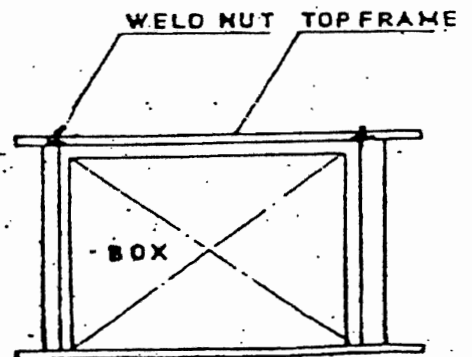
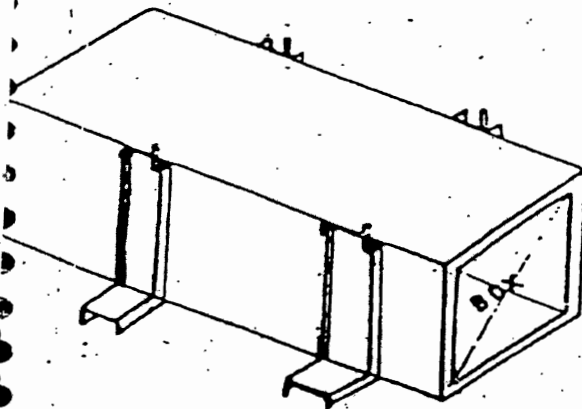


FIG-3

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

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

ARRANGEMENT OF C-CLAMPS AROUND CASES



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ARRANGEMENT OF DIAGONAL BRACING AND HORIZONTAL SUPPORT

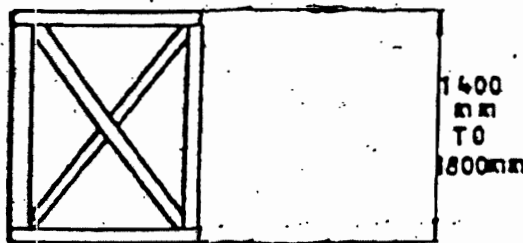


FIG:6

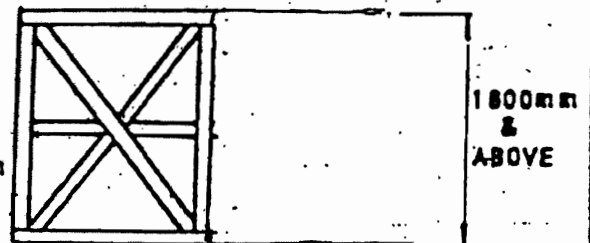


FIG:8

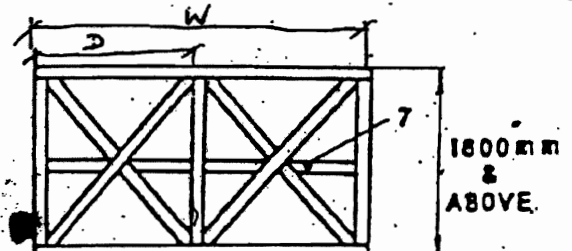


FIG:7

7- Middle Horizontal Support

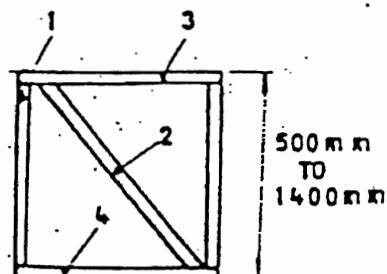


FIG:5

1- Vertical Support

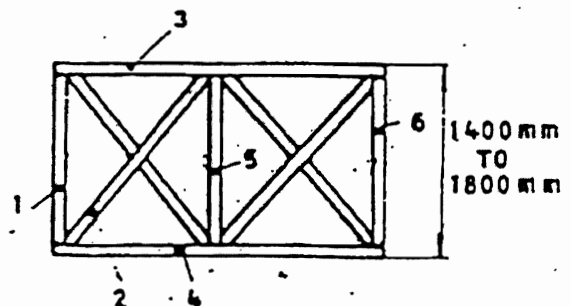


FIG:7

1, 5, 6 - Vertical Support

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**TITLE**

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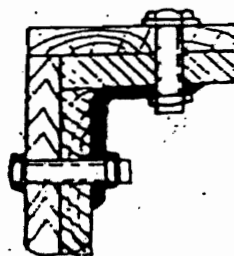
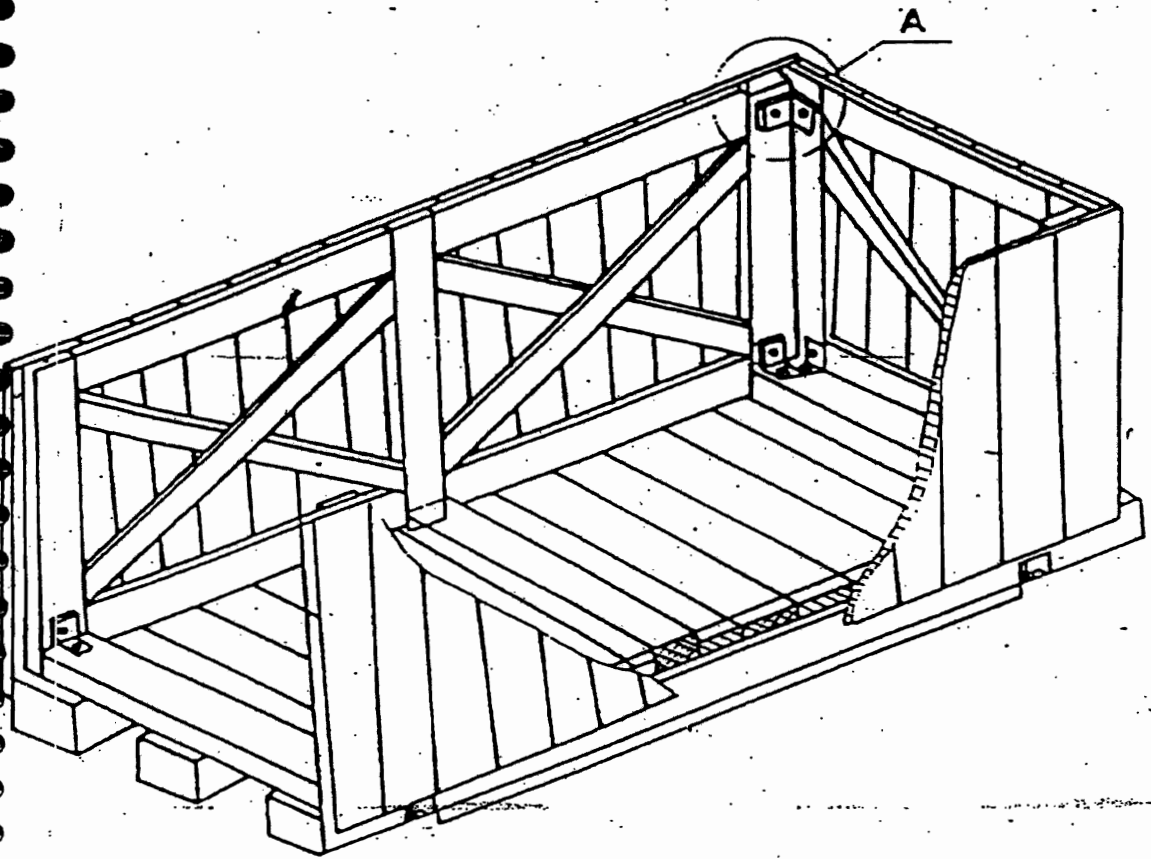
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ARRANGEMENT OF PACKING CASE



DETAIL-A

**HOLE DIAMETER
MUST CONFORM
TO BOLT DIA**

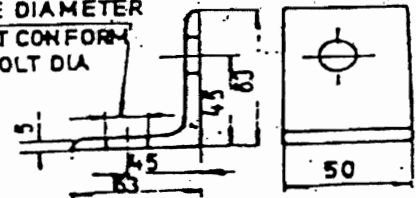
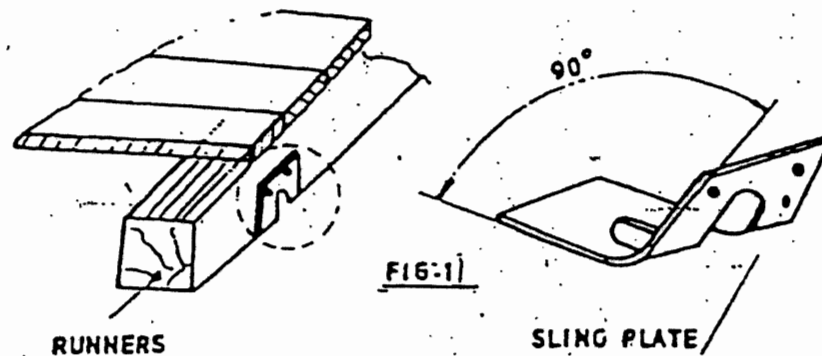


FIG:10

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ARRANGEMENT OF SLING & PLATE ON CASES



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TABLE-1

LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c				c b		
500	50 X 100	50 X 100	50 X 100	50 X 100	75 X 100	75 X 100	100 X 100
800	50 X 100	50 X 100	75 X 100	75 X 100	75 X 100	75 X 100	100 X 100
1000	75 X 100	75 X 100	75 X 100	100 X 100	100 X 100	100 X 110	100 X 150
1500	75 X 100	75 X 100	100 X 100	100 X 100	100 X 100	100 X 150	100 X 150
2000	75 X 100	100 X 100	100 X 100	100 X 150	100 X 150	100 X 150	150 X 150
2500	75 X 100	100 X 100	100 X 150	100 X 150	100 X 150	150 X 150	150 X 150
3000	100 X 100	100 X 150	150 X 150	150 X 150	150 X 150	150 X 150	150 X 150

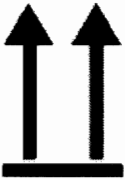
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Table-2

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

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INDICATION MARKS ON CASES/BOXES/CRATES

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

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

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

FIG-12