



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

SUB-VENDOR LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 1

ANNEXURE-I

1. REFER ELECTRICAL AND C&I SPECIFICATION FOR APPLICABLE SUB-VENDOR LIST FOR THE RELEVANT ELECTRICAL AND C&I ITEMS.
2. THE LIST OF ALL BOUGHT OUT ITEMS WITH MAKES AND PLACE OF ORIGIN AND CONTACT DETAILS OF THE MANUFACTURERS TO BE MENTIONED ALONG WITH OFFER TO BE SUBMITTED IN THE FORMAT ATTACHED IN SECTION III AS AN INFORMATION TO BHEL.
3. ACCEPTANCE OF MAKES SHALL BE SUBJECT TO BHEL/ END CUSTOMER ACCEPTANCE DURING THE DETAILED ENGINEERING WITHOUT COST AND DELIVERY IMPLICATION TO BHEL.

911/2020/PS-PEM-MAX



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

MANDATORY SPARES LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 5

ANNEXURE-II

MANDATORY SPARES LIST



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

MANDATORY SPARES LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 2 OF 5

I. MECHANICAL

Sl. No.	PARTICULARS	QUANTITY
A	Agitators (For Neutralisation tank)	
1.	Impeller Assembly	1 no. of each type
2.	Bearing Assembly	1 no. of each type
3.	Motor	1 no. of each type
4.	Belt and Pulley (If applicable)	2 no. of each type
5.	Gear Box Assembly (If Applicable)	1 no. of each type
6.	Agitators shaft assembly	2 no. of each type and size
7.	Complete Agitator Assembly	1 no. of each type and size
B	Slurry Pumps	
1.	Impeller Assembly	6 no. of each type and size
2.	Casing Liners (where replaceable liners are provided)	2 Set*
3.	Seals	6 set of each type and size
4.	Bearings	4 no. of each type and size
5.	Motor	1 no. of each type and size
6.	GEAR BOX	1 No. for each type and size of pump
7.	Motor-Pump Coupling	1 no. of each type
C	For Integral Piping As Defined In Specification	
1.	Slurry Valves	6 no. of each type & size
2	Slurry Line Bends	6 no. of each type & size

Any change in size, material, design etc., which obviates one to one replacement of the part shall be considered a different type.

*Unless otherwise stated, a set shall mean complete replacement for one equipment.

Note (s):

1. One set means 100% complete replacement of the particular component/equipment, as mentioned i.e., Set for the particular equipment, would include all components required to replace the item. For example, a set of bearing shall include all hardware normally required while replacing the bearings. It is further, intended that the assembly / sub-assembly which have different orientation (like left hand or right hand, top or bottom), different direction of rotation or mirror image positioning or any other reasons which result in maintaining two different sets of the spares to be used for the subject assembly / sub-assembly, these shall be considered as different types of assembly/sub-assembly.

2. Wherever the quantities have been indicated for each type, size, thickness, material, radius, range etc. these shall cover all the items supplied and installed.



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

MANDATORY SPARES LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 3 OF 5

3. In case spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.

4. Any item which is quoted as “not applicable” in the above list (in price schedule) and is found to be “applicable” at a later date shall be supplied by the Bidder without any commercial implications. The Bidder shall note that if there is any change/ variation in equipment/ system during detail engineering which causes any change/ variation in the essential spares quantity, the same shall be supplied without any commercial implications. The price indicated for the mandatory spares shall be considered for the purpose of evaluation.

5. Mandatory spares shall not be dispatched before dispatch of corresponding main equipment. The spares shall be treated and packed for a long storage under the climatic condition prevailing at site.

6. All spares supplied under this contract shall be strictly interchangeable with parts for which they are intended for replacements. These spares should include all mounted accessories like components, boards, add on items, fitting, connectors etc. and be complete in all respects so that the replacement of the main items by these spares does not require any additional item. The vendors must conform the pair to pair compatibility of each electrical spares modules with the modules should be supplied in the original package. All electronic modules should be pre-set and/or pre-programmed for ready use at site. Alternatively, suitable instruction sheet indicating the details of required PCB jumper position, BCD which is setting, EPROM/PROM listing etc should be packed along with each module. Also a caution mark sign should be put on all such module which needs pre-setting/pre-programming before putting them in to service. The spare shall be treated and properly packed for long term storage.

7. Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.

II. MANDATORY SPARES - CONTROL & INSTRUMENTATION

SI. NO.	PARTICULARS	QUANTITY
1.01.00	MEASURING INSTRUMENTS	
1.01.01	(i) Transmitters of all types and model no. (For measurement of pressure, differential pressure, flow, level, temp, etc.). This shall include magnetic/ electromagnetic flow meter, mass flow meter also.	10% or 1 no. of each type and model, whichever is more.
1.01.02	(i) Process Actuated Switches (Pressure, Differential pressure, flow, level, temp) (ii) Limit switches (for pneumatic and manual valves)	10% or 2 no. of each type and model, whichever is more. 10% or 2 no. of each type and model, whichever is more.
1.01.03	Local Gauges for Pressure, Differential pressure, flow, level, temp	5% or 1 no. of each type, model and range, whichever is more.



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

MANDATORY SPARES LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 4 OF 5

1.02.00	OTHER RELATED CONTROL AND INSTRUMENTATION SYSTEMS / EQUIPMENTS	
a.	Set of gaskets/O-rings/ seals	200% of each type, model, rating and size
b.	Filters, light source, sensor, detector, etc.	100% of each type, model and rating
c.	Complete Probe with shield assembly (Not applicable for In situ-path)	1 no. of each type and model
d.	Electronic card assembly/ PCBs, moisture/condensate monitor, power supply modules	10% of each type, model and rating
1.03.00	PROCESS CONNECTION PIPING (For Impulse Piping / Tubing and Air Supply Piping as Applicable)	
a.	Valves of all types and models	10% or 1 no. of each type, class, size and model whichever is more.
b.	2 way, 3way, 5way valve manifolds	10% or 1 no. of each type, class, size and model whichever is more.
c.	Fittings	10% or 1 packet of each type, class, size and model whichever is more.
d.	Purge meters	5% of each model or 1 no. whichever is more.
e.	Filter regulators	20% of each model or 2 nos. whichever is more.
1.04.00	CONTROL VALVES, ACTUATORS & ACCESSORIES (Following items shall be provided under this clause for all modulating control valves being supplied under this package)	
a.	Pneumatic and electro-hydraulic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
b.	Valve trim (including cage, plug, stem, seat rings, guide bushings etc.)	1 set for each type of control valve.
c.	Diaphragms, O' rings, seals etc. of all types make etc.	1 set for each type and rating
d.	Pressure Gauges of all types, make, rating etc.	10% or 2 nos. of each type whichever is more
e.	Solenoid valves (if applicable)	10% or 2 nos. of each type whichever is more
f.	Positioner units (complete unit)& accessories (link assembly)	10% or 1 no. of each type whichever is more
g.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
h.	Air lock relays	10% or 2 nos. of each type whichever is more



**4X250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

MANDATORY SPARES LIST

SPECIFICATION NO. PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 5 OF 5

1.05.00	PNEUMATICS ISOLATION / BLOCK VALVES, ACTUATORS & ACCESSORIES (For all ON/OFF valves supplied under this package)	
a.	Pneumatic actuator assembly	10% or 1 no. of each type, model and rating, whichever is more.
b.	Diaphragms, O' rings, seals etc. of all types make etc.	1 no of each type and rating
c.	Limit switches (complete unit) & accessories (link assembly)	10% or 2 Nos., whichever is more
d.	Pneumatic air-filter/Regulator of each type, make rating etc.	10% or 2 Nos., whichever is more
e.	Solenoid valves	10% or 2 nos. of each type whichever is more
1.06.00	ELECTRICAL ACTUATORS	
a.	Actuators	1 no of each type and rating
b.	Electronic PCB of all types	10% of each type & model
c.	Absolute Encoder (replaceable part)	5% of each type & model
d.	Electronic Torque sensor	5% of each type & model
NOTES:		
1	Wherever set is mentioned, one set of the spares of that item shall be for complete replacement of that particular item for one equipment.	
2	Any fraction of an item shall mean the next higher.	
3	Wherever quantity has been specified as percentage (%), the quantity of mandatory spares to be provided by contractor shall be the specified percentage (%) of the total population of the plant. In case, the quantity so calculated happens to be fraction, the same shall be rounded off to next higher whole number.	
4	Wherever the quantities have been indicated for each type, size, thickness, material, radius, range, etc., these shall cover all the items supplied and installed and the breakup for these shall be furnished in the bid.	
5	In case, spares indicated in the list are not applicable to the particular design offered by the bidder, the bidder should offer spares applicable to offered design with quantities generally in line with the approach followed in the above list.	



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
INSPECTION AND TESTING

SPECIFICATION No: PE-TS-463-571-A102
SECTION : I
SUB-SECTION : D
REV 00
SHEET 1 OF 7

ANNEXURE- III

1.01.00 INSPECTION AND TESTS DURING MANUFACTURE

- 1.01.01 The method and techniques to be used by the Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner.
- 1.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.
- 1.01.03 Before any item of plant or equipment leaves its place of manufacture, the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.
- 1.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend, the Bidder may proceed with manufacturing having forwarded to the Owner duly certified copies of his own inspection and test results.
- The owner's representative shall have at all reasonable times access to bidder's or his sub-vendor's premises and shall have power to inspect/ examine materials and workmanship or equipment under manufacture.
- The Bidder shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Further nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere in the specification.
- For electrical equipment, routine tests as per relevant IS/International standard as detailed in the specification are to be carried out on all equipment. Type tests are also to be carried out on selected equipment as detailed in the specifications of the electrical equipment concerned.
- 1.01.05 Under no circumstances, any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.
- 1.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced at the works. Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to dispatch from place of manufacture.
- 1.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material. Equipment or parts coming under any statutory Regulations shall be certified by a Competent Authority under the regulations in the specified format.

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION INSPECTION AND TESTING	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 2 OF 7	

1.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.

1.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

1.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnaflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major but welding joints shall be radiographed unless otherwise stipulated.

Statutory payments in respect of IBR approvals including inspection shall be made by the bidder. Bidder's scope shall include to preparation of all necessary documents, co-ordination and follow-up for above approval. Owner shall only forward assistance/endorsement of documents /design /drawings /reports/records to be submitted for approval as stipulated/ required by Statutory Authorities till registration of the unit and clearance for commercial operation.

1.02.00 PERFORMANCE TESTS AT SITE

1.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Bidder on site under normal operating conditions. The Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

1.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

1.02.03 The Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

All Statutory testing / clearance is in Bidder's scope including payment of all fees, etc. as required.



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
INSPECTION AND TESTING

SPECIFICATION No: PE-TS-463-571-A102
SECTION : I
SUB-SECTION : D
REV 00
SHEET 3 OF 7

A)	Minimum Test requirements
	• Dimensional checks • Material test certificates • No load trial run of the equipment to be done at vendor works. • Performance test.
B)	General Inspection requirements to be considered are as below:
1.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BRBCL prior to manufacture. Inspection of above mentioned tests by BHEL representative at bidder's works is envisaged.
2.	Items of Lime Feeding/Dosing system will be inspected at the Bidder's works before dispatch or where the test facilities are available.
3.	Acceptance tolerance shall be as per applicable standard.
4.	Items for Lime Feeding/Dosing system shall not be released for shipment, until tests/inspection have been approved by BHEL/BRBCL.
5.	BHEL shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.
6.	Bidder to arrange all calibrated gauges, Instruments during inspection.

1.03.00	SPECIFIC INSPECTION REQUIREMENT FOR COMPONENTS/EQUIPMENTS
1.	Bucket Elevator / Screw Conveyor
a.	Dimensional checks
b.	Material test certificates
c.	No load trial run of the equipment to be done at vendor works.
d.	Performance test.
2.	Pumps :
e.	All pressure parts shall be hydraulically tested at 150% of the shut-off head or 200% of rated head, whichever is higher for 30 minutes. No leakage is allowed.
f.	Impeller and rotor shall be first statically balanced and then dynamically balanced according to ISO 1940 (in the case of impellers this shall be done before and after mounting of the service rotor shaft).
g.	Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions.



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION

INSPECTION AND TESTING

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 4 OF 7

h.	List of Non-Destructive test over and above the material test are as follows: Casing: Material test, Magnetic particle (MPI), DP and Hydro test, as applicable Impeller- DPT and MPI as applicable Shaft- Ultrasonic (UT), DPT and MPI Sleeve- DP and Hardness test/ Manufacturer's recommendation Mechanical Seal- Manufacturer's recommendation. Base Plate- Stress relieving of weld. Replaceable Rubber liner- Shore Hardness, Class and Type certificate			
i.	Vibration test and Noise level test shall be witnessed at shop. (as already stated above.)			
j.	Mechanical running and the performance test shall be conducted for Pump at the Bidder's works before dispatch or where the test facilities are available. All pumps to be performance tested as per Hydraulic Institute Standard/Indian Standard. Performance test to include check for noise, vibration level and temperature rise.			
k.	The Bidder shall conduct performance test for the remaining pump and submit the reports.			
3.	General Inspection Requirements to be considered are as below:			
	Sl.No.	Item	Inspection & Test Item	Remarks
	1.	Pumps	Material certificate check	Shaft & impeller only
			Dimensional inspection	
			Non-destructive testing	DPT on shaft & impeller
			Hydrostatic test	
			Balancing Test	Static & dynamic
			Performance test	Incl. Noise & Vibration
	2.	Motors	Material certificate check	
			Non Destructive Testing	
			Dimensional inspection	
			Balancing Test	Static & dynamic
			Function test	
	3.	Vent Fan	Material certificate check	
			Dimensional inspection	
			Performance Test	
	4.	Conveyor & Silo Extraction Device	Material certificate check	
			Dimensional inspection	
			Function Test	Short time no load test
	5.	Rubber lining Pipe	Dimensional inspection	



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION

INSPECTION AND TESTING

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 5 OF 7

			Visual Inspection	
			Spark Test	
	6.	Flow Nozzles	Material certificate check	
			Dimensional Inspection	
	7.	Control Panel	Insulation Resistance Test	
			Dielectric Strength Test	
			Function Test	
			Dimensional Inspection	
	8.	Control valves	Material certificate check	
			Hydrostatic test	
			Seat leak test	
			Function test	
			Dimensional Inspection	
	9.	RTD	Material certificate check	
			Performance test	
			Hydrostatic test	
	10.	Shut off valve	Material certificate check	
			Hydrostatic test	
			Seat Leak test	
			Function Test	
			Dimensional Inspection	
	11.	Flow meter	Material certificate check	
			Calibration Test	
			Dimensional Inspection	
			Hydrostatic test	
	12.	Butterfly Valve	Material Certificate check	
			Non-destructive testing	
			Hydrostatic test	
			Operation test	Motorized valve only
4.	Valves and Specialties shall be tested as per relevant standards / codes. Seat Leakage and hydraulic test to be carried out as per relevant standards /codes.			

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION INSPECTION AND TESTING	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 6 OF 7	
5.	Pipes and fittings shall be tested as per relevant standards/ codes		
6.	MQP (Manufacturing Quality Plan) shall be submitted by the bidder along with the technical offer. Above mentioned item-wise inspection requirement is tentative only and shall be mutually discussed and finalized during detail engineering.		
7.	Bidder shall furnish written copies of shop production, fabrication and quality test procedures and drawings to be used for review by BHEL / BHEL's Customer prior to manufacture. Inspection of above mentioned tests by BHEL/ BHEL's Customer representative at bidder's works is envisaged		
8.	The Bidder shall furnish performance test procedure along with standard. The test procedure will be reviewed and approved by the BHEL / BHEL's Customer.		
9.	A dynamic balancing certificates stating that the rotating assembly has been balanced dynamically shall be sent to BHEL/ BHEL's Customer within one (1) week of the successful completion of balancing.		
10.	Vibration levels shall be measured during shop running/performance tests.		
11.	For surfaces with rubber lining, Welding shall be visually inspected to verify the absence of rough area and unacceptable transition between surfaces which prevent the adequate adherence of rubber. The acceptance criteria shall be as per latest standard.		
12.	For surfaces with rubber lining, degree of cleaning shall be visually checked before the application of the coating. There must be no area with oxidation, dirt or partially or generalized corrosion defects.		
13.	Test certificates shall be issued for each lot of raw material used in the coating, corresponding to specific weight and traction resistance.		
14.	For surfaces with rubber lining, adherence test shall be conducted on production samples. Adherence test shall be conducted on the actual surface through hammering. In order to verify the absence of air pockets (or) surface without adherence.		
15.	For surfaces with rubber lining, Coating thickness shall be checked at 100%. A High voltage porosity test will be conducted on 100 % of the coated surface.		
16.	Equipment shall not be released for shipment, until shop tests data and performance tests curves have been approved by Owner.		
17.	Bidder should furnish performance guarantee as per applicable standard guarantee for the design, manufacture, material and safe operation of the equipment's.		
18.	BHEL/BHEL's Customer of their authorized third party inspection agency representative shall witness the test at Bidder's works and a notice of minimum three (3) weeks shall be given for attending the inspection.		
19.	Bidder to arrange all calibrated gauges, Instruments during inspection at works and also during performance test at site. All inspection, measuring and test equipment(s) used by Bidder shall be calibrated (<i>at accredited laboratory, as applicable</i>) periodically depending on its use and criticality of the test/measurement to be done. The Bidder shall maintain all the relevant records of periodic calibration and instrument identification, and shall produce the same for inspection by the Owner. Wherever asked specifically, the Bidder shall re-calibrate the measuring/test equipment in the presence of Project Manager/Inspector.		
20.	Mechanical running test shall be carried out for Bucket Elevator & Lime Slurry Pump. Bidder to arrange Motor for the shop test and inspection.		
21.	Bidder/supplier to note that no order is to be placed on any foreign vendor (i.e. supplies		



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION

INSPECTION AND TESTING

SPECIFICATION No: PE-TS-463-571-A102	
SECTION : I	
SUB-SECTION : D	
REV 00	
SHEET 7 OF 7	

from outside India), and all supplies for lime dosing/feeding system shall be indigenous (so as to aid in promotion of Make in India initiative). For all supplies related to the Lime Feeding/Dosing System, vendor will tie-up with BHEL approved inspection agency on their own cost and carry out inspection as per the Quality Plan approved by BHEL/ BHEL's Customer. Vendor shall furnish BHEL the inspection reports and other documents required as per approved Quality plan duly signed by the Inspection Agency after their witness for our review and acceptance.

QAP FORMAT

[illegible]

The Quality Plan shall be finalized during the detailed engineering.



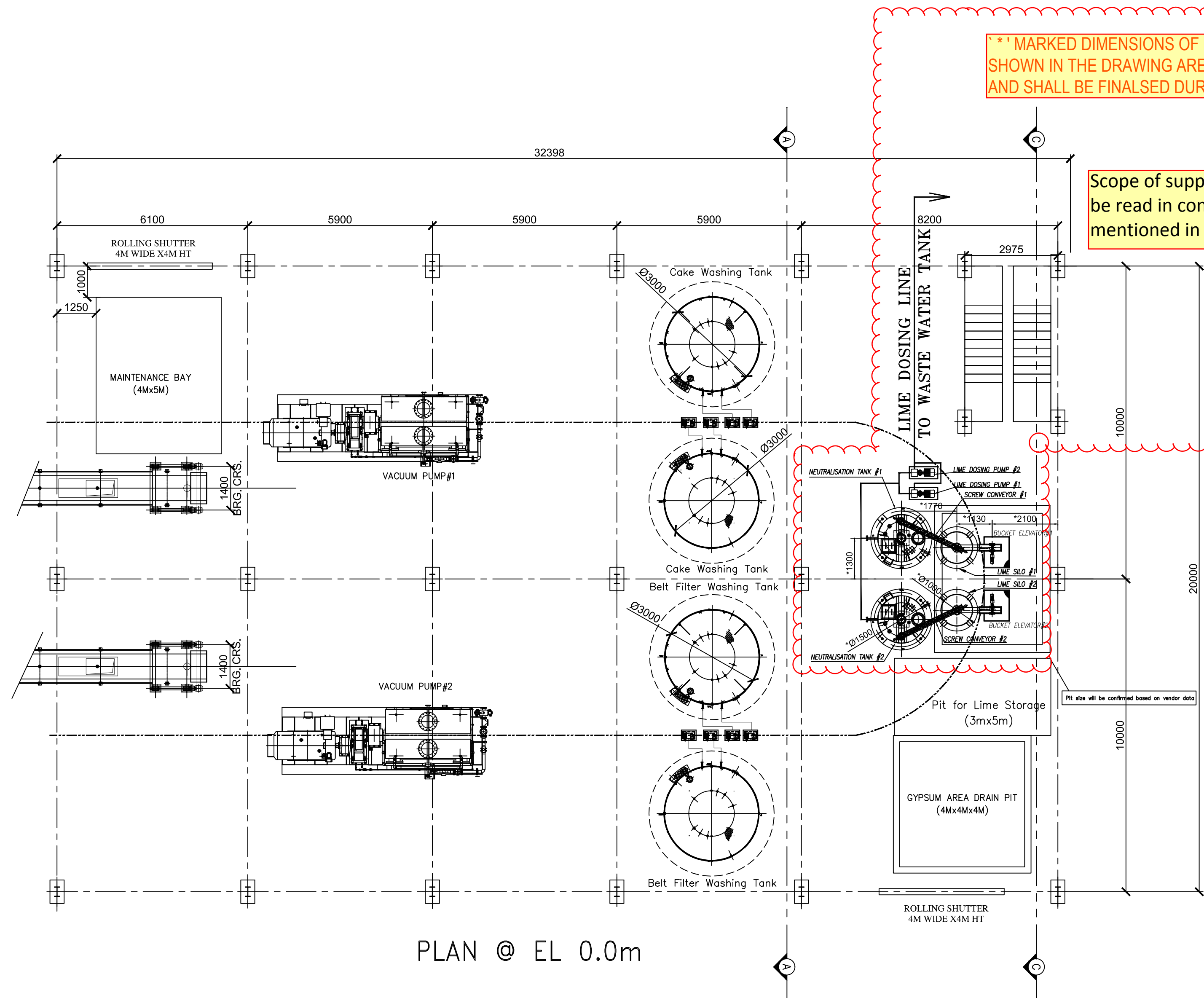
4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
INPUT DRAWING LIST

SPECIFICATION No: PE-TS-463-571-A102
SECTION : I
SUB-SECTION : D
REV 00
SHEET 1 OF 1

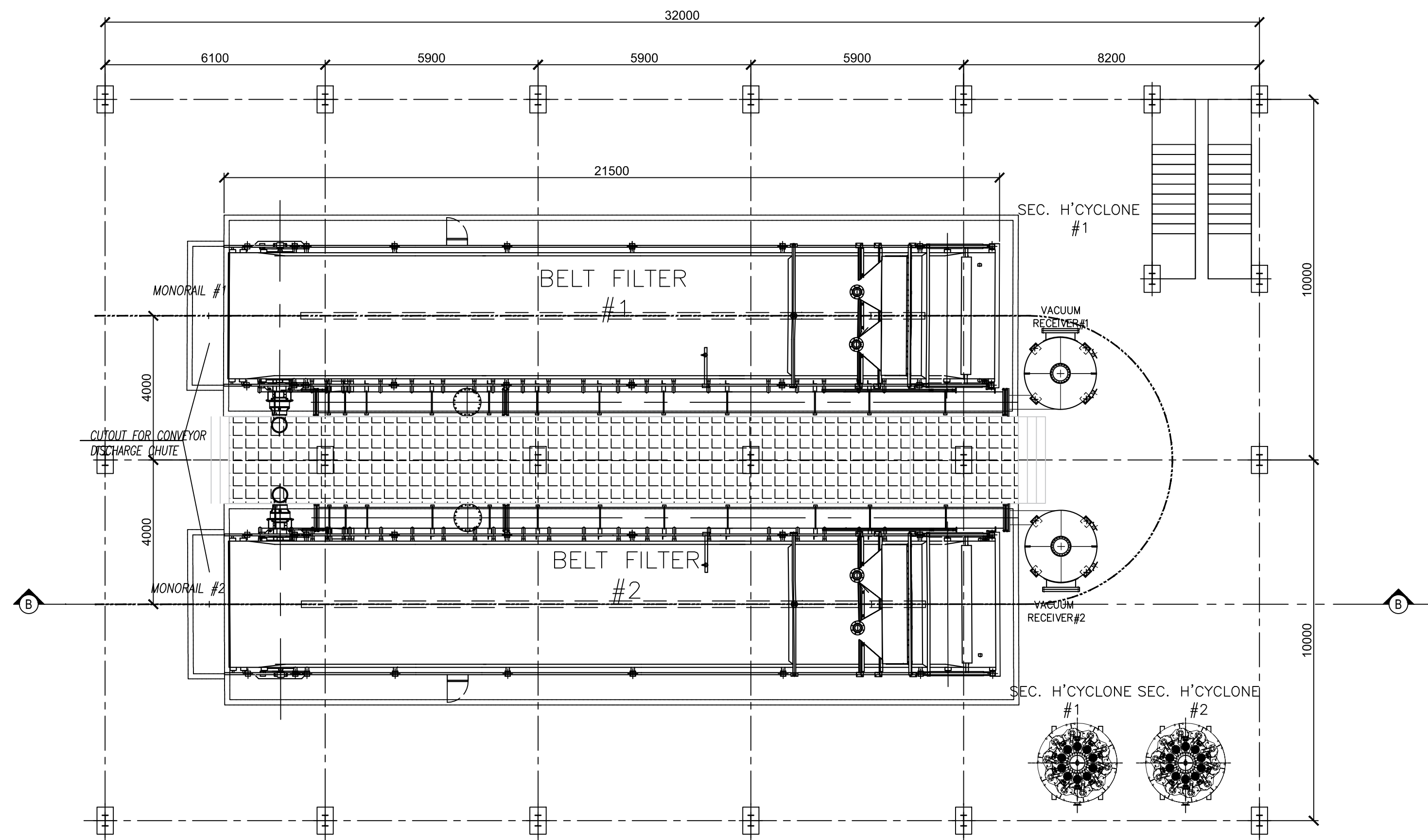
ANNEXURE-IV

INPUT DRAWINGS BY BHEL

Sl.No.	Drawing Title	NTPC/BHEL Drawing No.
1.	General Arrangement of Gypsum Dewatering System (2- sheets)	0270-109-PVM-B-047
2.	P&ID - Legends & Notes (2-Sheets)	0270-109-PVM-F-020 / 3-FW-000-01095
3.	P&ID-Waste Water System (Covering Lime Feeding /Dosing system) (3-Sheets)	0270-109-PVM-F-020 / B-240-00449, 00450, 00451
4.	Layout of FGD System (1-Sheet)	0270-109-PVM-F-044 / 0-FW-000-01393



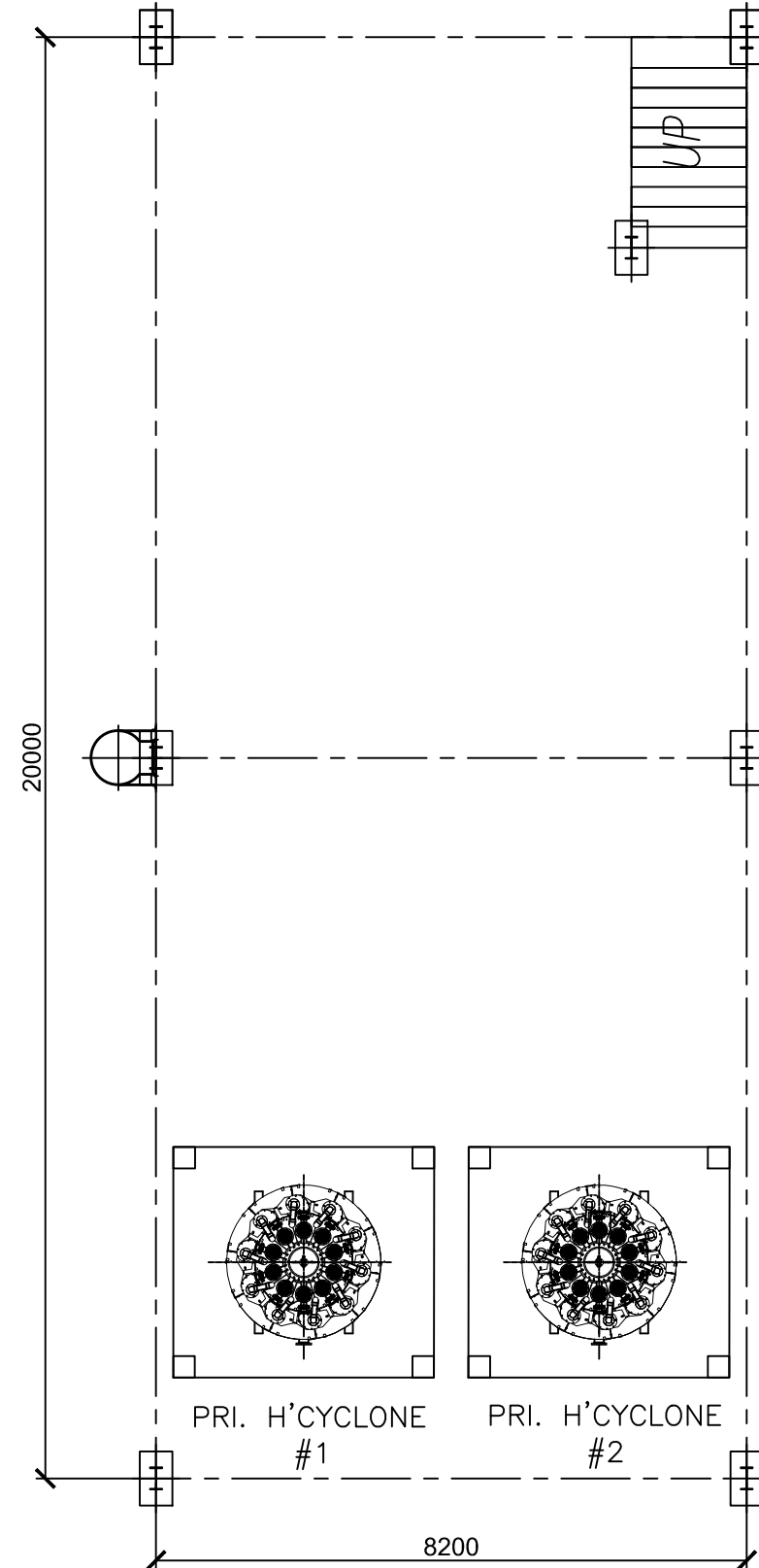
PLAN @ EL 0.0m



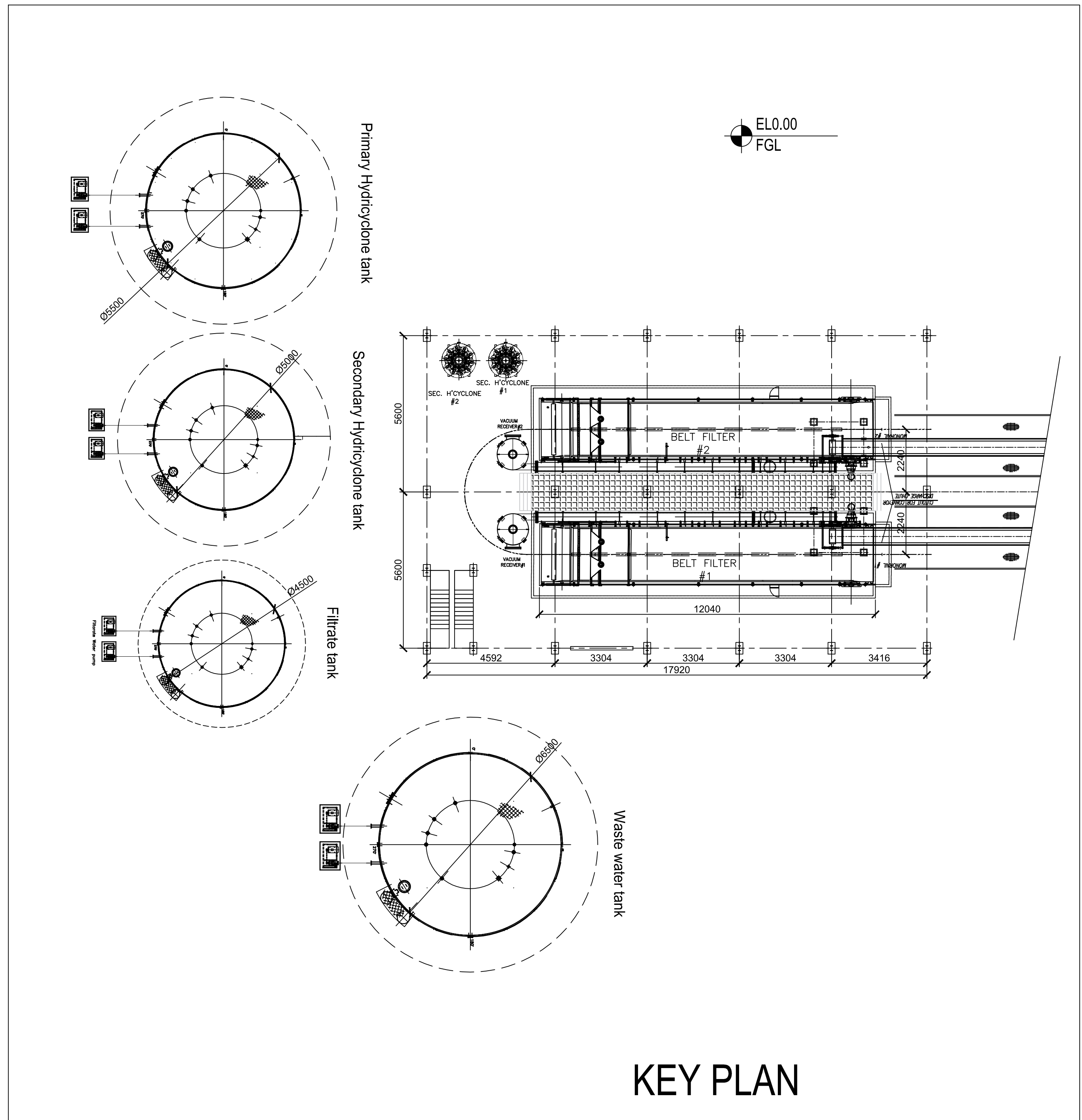
PLAN @ EL +15.0m

** MARKED DIMENSIONS OF LIME DOSING/FEEDING SYSTEM SHOWN IN THE DRAWING ARE FOR GUIDANCE PURPOSE ONLY AND SHALL BE FINALISED DURING DETAIL ENGG. BY VENDOR.

Scope of supply as per clouded portion, to be read in conjunction with scope of supply mentioned in 'Section-I, Sub-section-C1'



PLAN @ EL +23.5m



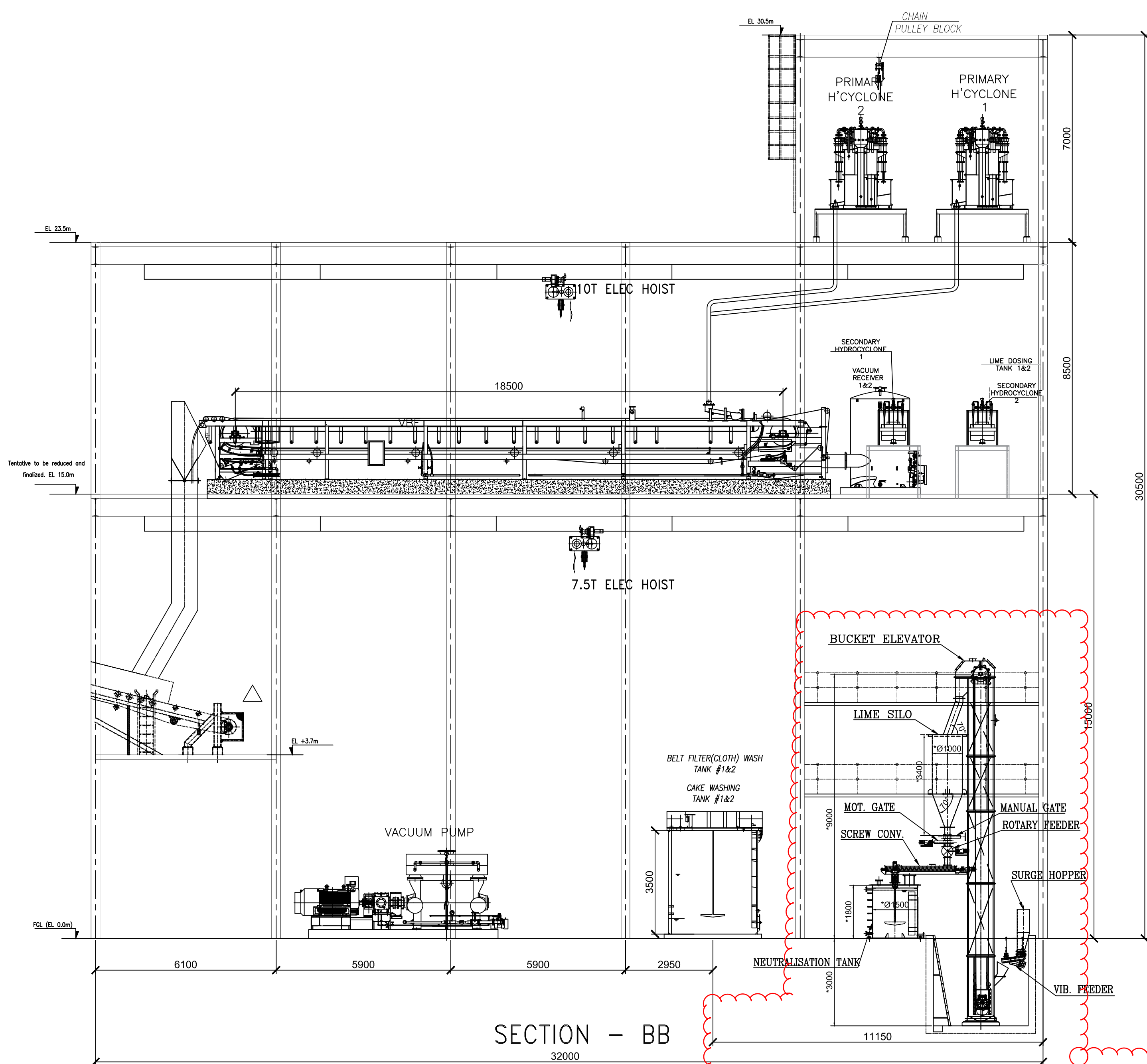
KEY PLAN

Notes:

- All Dimensions are in millimeters and elevations in meters.
- EL 0.0m corresponds to RL +271.5M
- GDWS building is at RL 269m
- The equipment machinery sizes showing in the drawing is indicative only and will be confirmed after vendor data.The maximum anticipated size is provided in the drawing.
- Floor openings,pipe crossings shall be confirmed during detail engineering.
- Details of staircase,suitable doors,windows,ventilators shall be considered by civil designer for GDWB.

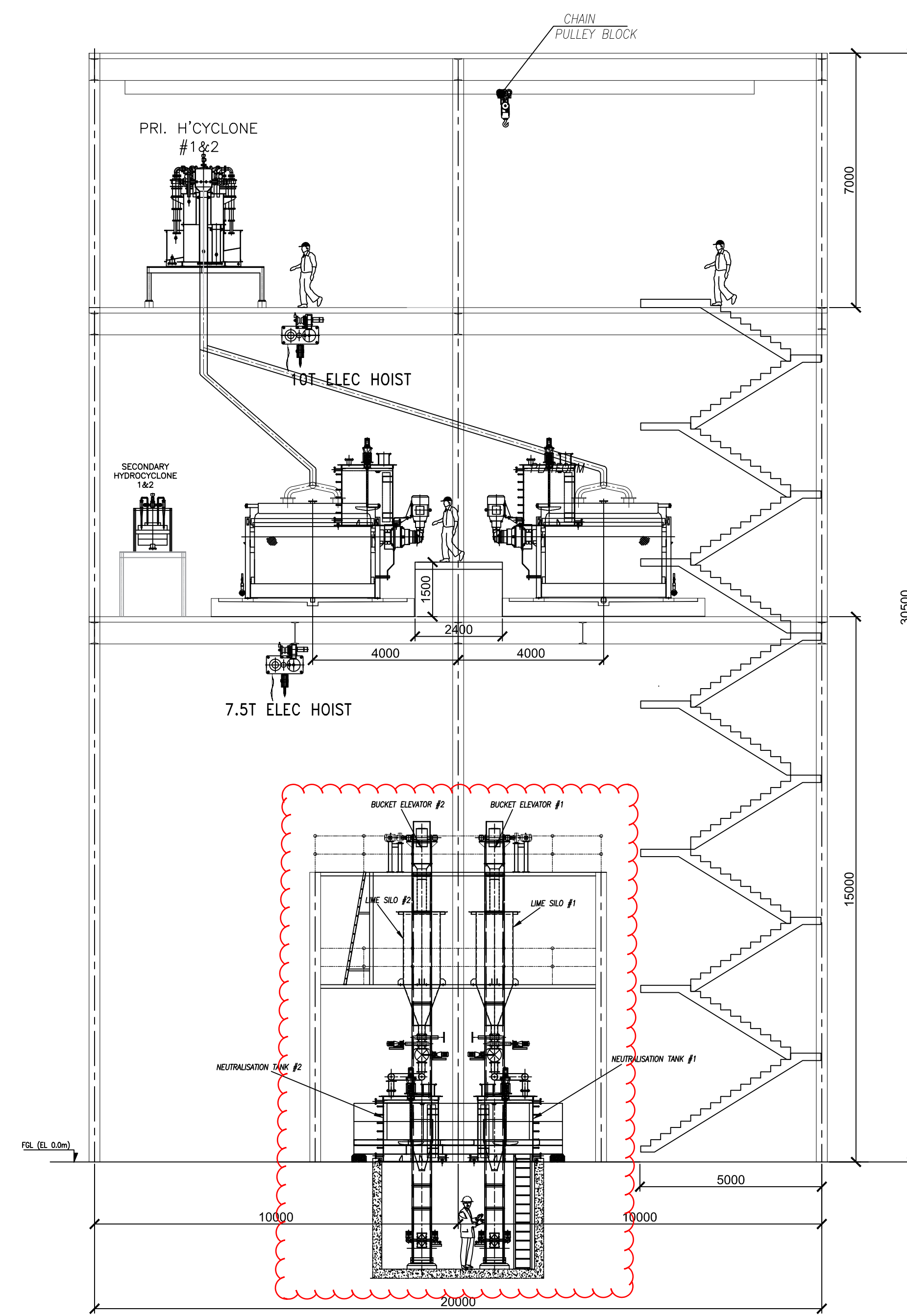
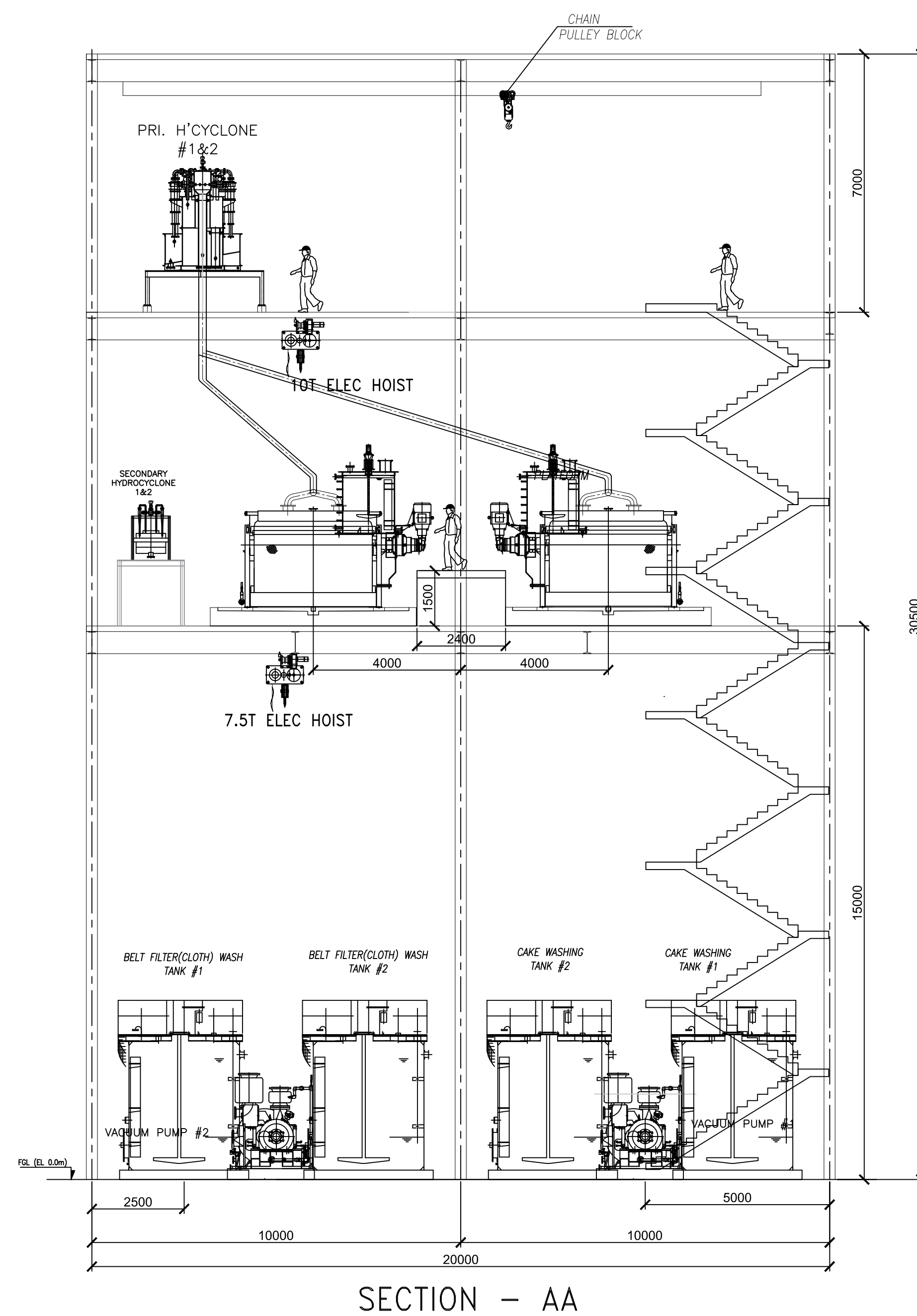
00	08.12.19	MNK	KBP	VVS	Based on ISG comments
00	04.12.19	MNK	KBP	VVS	Initial release
Rev	Date	Drawn	Checked	Approved	Remarks

CAUTION: The information on this drawing is for guidance only and shall not be used for construction without the approval of the company.		TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		NABINAGAR STPP 4x250MW	
05-237/D		Bharat Heavy Electricals Ltd		CUST.NO-G503 & G504	
BOILER AUXILIARIES PLANT		RANIPET-632 406		REV	
DEPT AACS		SCALE 1:100		WEIGHT (kg)	
CODE 862		REF TO ASD / OLD DWG		REV	
TITLE		DRAWING NO :		REV	
GA of GDWS		U 01		0270-109-PVM-B-047	
Sh 01 of 02		Size A0		00	



* * MARKED DIMENSIONS OF LIME DOSING/FEEDING SYSTEM SHOWN IN THE DRAWING ARE FOR GUIDANCE PURPOSE ONLY AND SHALL BE FINALISED DURING DETAIL ENGG. BY VENDOR.

Scope of supply as per clouded portion, to be read in conjunction with scope of supply mentioned in 'Section-I, Sub-section-C1'



00	06.12.19	MNK	KBP	VVS	Based on ISG comments
00	04.12.19	MNK	KBP	VVS	Initial release
Rev	Date	Drawn	Checked	Approved	Remarks

CAUTION: The information on this document is the property of Bharat Auxiliary Electricals Ltd. and is to be used directly or indirectly in any form for the interest of any third party.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		NABINAGAR STPP, 4x250MW		CUST NO - C503 & G504	
	05-297/D		Bharat Heavy Electricals Ltd		DATE: 04.12.19	
	BOILER AUXILIARIES PLANT		ORD. NO. MNP		DATE: 04.12.19	
	RANIPET-632 406		CHD KKB		DATE: 04.12.19	
APPO YVS		DATE: 04.12.19		REV NO: 01 / 02		DATE: 04.12.19
APPO YVS		DATE: 04.12.19		DATE: 04.12.19		DATE: 04.12.19

THIRD ANGLE PROJECTION	No. REQ'D

LINE SYMBOLS

SYMBOLS	NAME
	PIPE LINE
	CAPILLARY TUBING
	ELECTRIC SIGNAL
	SOFTWARE LINK
	PRESSURE LEAD
	DUCT

PIPING VALVE SYMBOLS

SYMBOLS	NAME
	GATE VALVE (NOR.CLOSED)
	GLOBE VALVE (NOR.CLOSED)
	BALL VALVE (NOR.CLOSED)
	BUTTERFLY VALVE (NOR.CLOSED)
	DIAPHRAGM VALVE (NOR.CLOSED)
	PINCH VALVE (NOR.CLOSED)
	NEEDLE VALVE (NOR.CLOSED)
	CHECK VALVE
	CHECK VALVE (WAFER)
	PRESSURE RELIEF VALVE

INSTRUMENT VALVE SYMBOLS

SYMBOLS	NAME
	ACTUATED BY AIR
	ACTUATED BY MOTOR
	AIR CONTROL VALVE
	SOLENOID ACTUATOR
	SELF REGULATING VALVE
	SELF REGULATING VALVE

TRENCH SYMBOLS

SYMBOLS	NAME
	TO ABSORBER AREA DRAIN SUMP
	TO GYPSUM AREA DRAIN SUMP
	TO LIMESTONE AREA DRAIN SUMP

SYMBOLS FOR PIPING PARTS
& INSTRUMENT PARTS

SYMBOLS	NAME
	STEAM TRAP
	AIR TRAP
	Y-STRAINER
	T-STRAINER
	TEMPORARY STRAINER
	REDUCER
	EXPANSION JOINT
	DUCT EXPANSION JOINT
	FLEXIBLE HOSE
	SPOOL PIECE
	VENT
	HOSE CONNECTION
	BLIND FLANGE
	REDUCING FLANGE
	CAP (BW)
	CAP (SCR)
	TRENCH
	SIGHT GLASS
	SILENCER
	ORIFICE
	DIAPHRAGM
	MAGNETIC FLOW METER
	VORTEX FLOW METER
	PH METER
	FILTER
	MANHOLE
	INSPECTION HOLE
	PITOT TUBE
	SAMPLING POT
	SAMPLING NOZZLE
	RESTRICTION ORIFICE

SYMBOLS FOR VALVE OPERATION

SYMBOLS	NAME
	FAILURE OPEN (THE VALVE OPENS WHEN AIR OR ELECTRICITY FOR ACTUATOR FAILS.)
	FAILURE CLOSE (THE VALVE CLOSES WHEN AIR OR ELECTRICITY FOR ACTUATOR FAILS.)

INSULATION SYMBOLS

SYMBOLS	DESCRIPTION
H10	THERMAL INSULATION (100°C & LOWER)
H15	THERMAL INSULATION (101°C ~ 150°C)
H20	THERMAL INSULATION (151°C ~ 200°C)
H25	THERMAL INSULATION (201°C ~ 250°C)
H30	THERMAL INSULATION (251°C ~ 300°C)
H35	THERMAL INSULATION (301°C ~ 350°C)
HF	INSULATION FOR ANTI FREEZING
ET	ELECTRIC TRACE
ST	STEAM TRACE (LOW PRESSURE STEAM)
P10	PERSONAL PROTECTION (100°C & LOWER)
P15	PERSONAL PROTECTION (101°C ~ 150°C)
P20	PERSONAL PROTECTION (151°C ~ 200°C)
P25	PERSONAL PROTECTION (201°C ~ 250°C)
P30	PERSONAL PROTECTION (251°C ~ 300°C)
P35	PERSONAL PROTECTION (350°C ~ 400°C)

DELIVERY LIMITS

SYMBOLS	NAME
	BETWEEN CLIENT AND CONTRACTOR
	BETWEEN SUB CONTRACTOR AND VENDOR

SYSTEM

NUMBER	NAME
1	FLUE GAS SYSTEM
2	SO ₂ ABSORPTION OXIDATION SYSTEM
3	REHEATING SYSTEM
4	GYPSUM DEWATERING HANDLING SYSTEM
5	LIMESTONE PREPARATION SYSTEM
6	BLANK
7	SUMP SYSTEM
8	UTILITY SYSTEM

FLUID NAME

FLUID SYMBOL	FLUID NAME	FLUID SYMBOL	FLUID NAME
AA	ANTIFOAM AGENT	WCS	COOLING WATER SUPPLY
AC	COMPRESSED AIR	WCR	COOLING WATER RETURN
AF	FLUIDIZER AIR		
AI	INSTRUMENT AIR	WP	PROCESS WATER
AO	OXIDATION AIR	WR	RAW WATER
AS	SEAL AIR	WW	WASTE WATER
DD	DUCT DRAIN	VG	VACUUM PUMP VENT
FS	FILTRATE SLURRY	VBG	BELT FILTER VENT GAS
GS	GYPSUM SLURRY	LD	LIMESTONE DEDUSTING
LS	LIMESTONE SLURRY	LOL	LUBE OIL (LOW PRESSURE)
		LOH	LUBE OIL (HIGH PRESSURE)

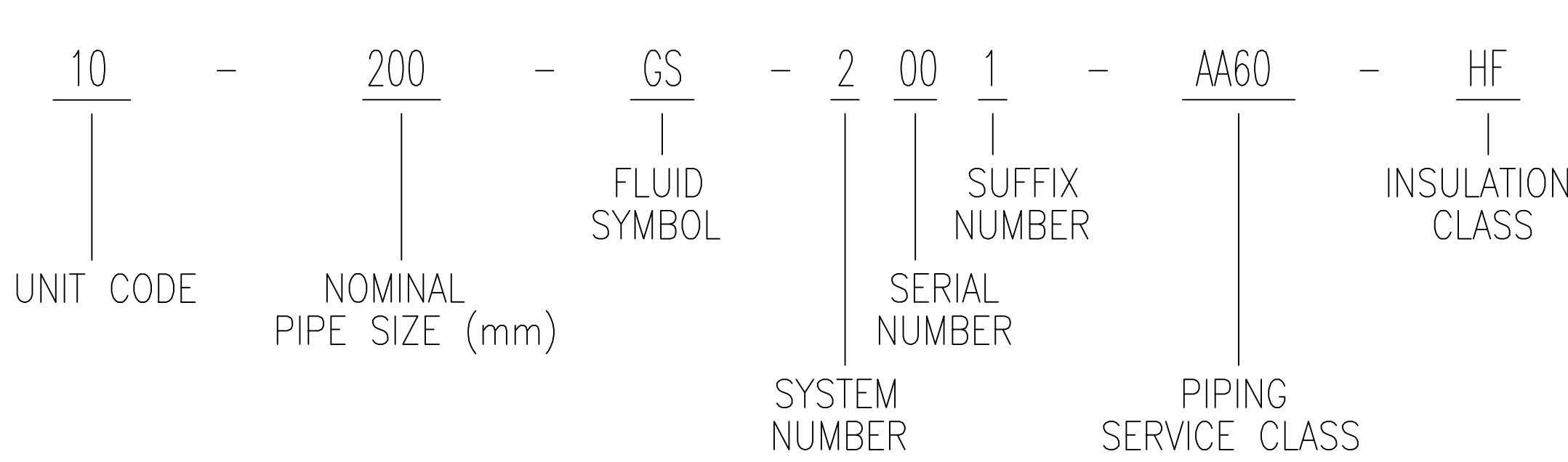
SERVICE CLASS

SERVICE CLASS	MATERIAL	FLUID SYMBOL
AA40	IIR RUBBER LINED PIPING	LS, WP, WC
AA60	IIR RUBBER LINED PIPING	GS,FS,WW,DD
BA01	Gr.304 STAINLESS STEEL / GI PIPING	AI, LOL
BA02	Gr.304 STAINLESS STEEL / GI PIPING	LOH
BA03	Gr.316L STAINLESS STEEL PIPING	WP, AO
CA01	CARBON STEEL GENERAL PIPING	AS,AO,AC,AF,LD
CC01	CARBON STEEL PRESSURE PIPING	WP,WR,WCS,WCR, VG, AA

UNIT CODE

SYMBOLS	UNIT IDENTIFICATION
00	COMMON
10	UNIT-1 FGD SYSTEM AND AUXILIARIES

EXPRESSION OF PIPING LINE



CUSTOMER NOS: G201,G202,G203,G204

CUSTOMER: NTPC LIMITED.
PROJECT: NABINAGAR (4X250MW)
FGD SYSTEM PACKAGE

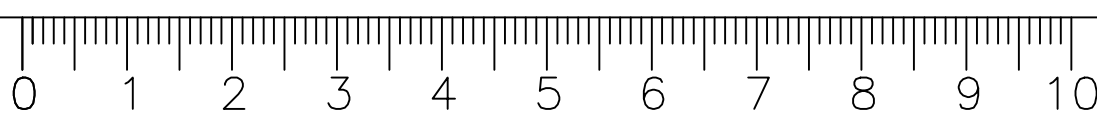
	BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET:632 406.		DEPT CODE	NAME (BHEL)	DATE
			DRN	KABILASH	14.01.2020
			M	CHD	MANOJ KT
			APPD	PN REDDY	14.01.2020

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

TITLE: P & ID – LEGENDS AND NOTES	SCALE : NTS
--------------------------------------	-----------------

NTPC DRG NO: 0270-109-PVM-F-020	SH 01 of 15
BHEL DRG NO 3-FW-000-01095	FILE NO B240-00601
	REV NO 01

CAUTION: THE DRAWING IS THE PROPERTY OF BHARAT
HEAVY ELECTRICALS LTD. AND IS NOT TO BE REPRODUCED
OR USED TO FURNISH ANY INFORMATION FOR MAKING OF
DRAWINGS OF APPARATUS EXCEPT WHERE PROVIDED
FOR AGREEMENT WITH SAID COMPANY.



A3

DRAWING No.

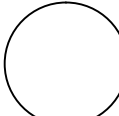
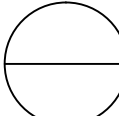
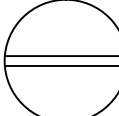
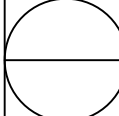
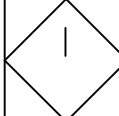
THIRD ANGLE
PROJECTION

No. REQ'D

INSTRUMENT ABBREVIATION

	FIRST-LETTER		SUCCEEDING-LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		BLANK	BLANK	BLANK
C	BLANK			CONTROL	
D	BLANK	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	BLANK		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	BLANK	MOMENTARY			MIDDLE, INTERMEDIATE
N	BLANK		BLANK	BLANK	BLANK
O	BLANK		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT(TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

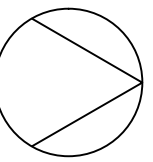
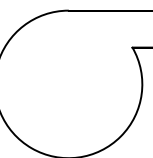
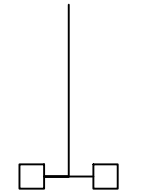
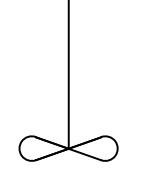
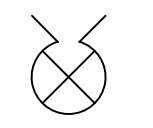
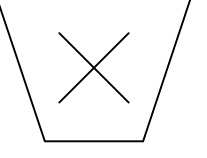
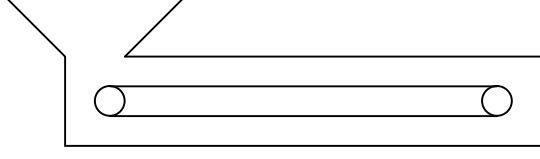
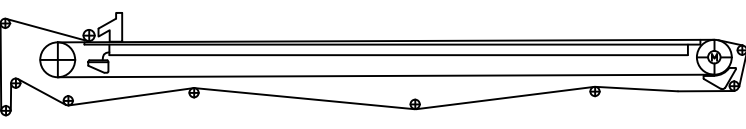
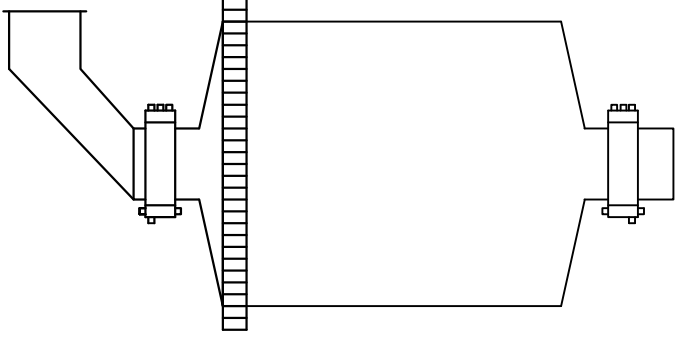
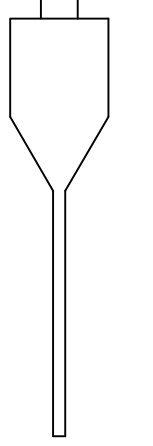
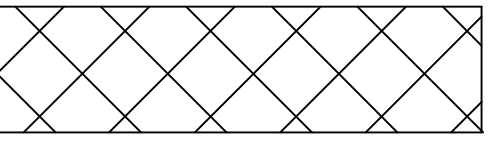
INSTRUMENT SYMBOLS

SYMBOLS	NAME
	FIELD MOUNTED
	FOR CONTROL ROOM
	FOR LOCAL CONTROL PANEL
	FOR DCS
	INTERLOCK LOGIC

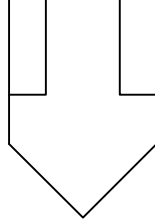
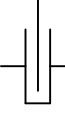
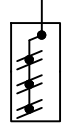
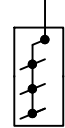
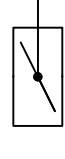
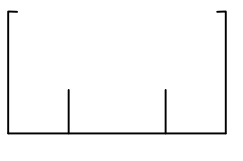
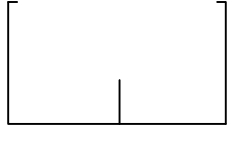
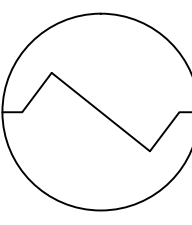
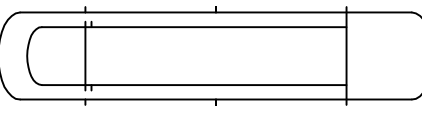
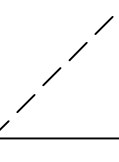
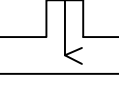
PNEUMATIC VALVE ACTUATOR

CODE NO.	ACTUATION
FLXXWA-D	DOUBLE SOLENOID NO LIMIT SWITCH
FLXXWA-DL	DOUBLE SOLENOID WITH LIMIT SWITCH
FLXXWA-S	SINGLE SOLENOID NO LIMIT SWITH
FLXXWA-SL	SINGLE SOLENOID WITH LIMIT SWITCH

MACHINARY SYMBOLS

SYMBOLS	NAME
	PUMP
	FAN / BLOWER
	AGITATOR (FLAT BLADE)
	AGITATOR (PROPELLOR)
	ROTARY VALVE
	CRUSHER
	BELT FEEDER
	BELT FILTER
	BALL MILL
	CYCLONE
	MIST ELIMINATOR

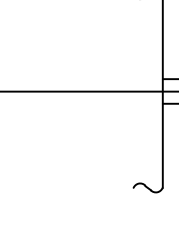
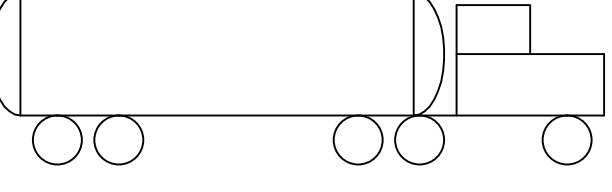
EQUIPMENT SYMBOLS

SYMBOLS	NAME
	BAG FILTER
	SILO
	SLIDE GATE
	TANDEM LOUVER DAMPER (MULTIVANE)
	SINGLE STAGE LOUVER DAMPER (MULTIVANE)
	LOUVER DAMPER (SINGLE VANE)
	DISTRIBUTION BOX (3WAY)
	DISTRIBUTION BOX (2WAY)
	SUMP
	HEAT EXCHANGER
	SHELL AND TUBE HEAT EXCHANGER
	AIR DRYER
	FILTER
	SPRAY NOZZLE

DRIVER SYMBOLS

SYMBOLS	NAME
	AIR MOTOR
	ELECTRIC MOTOR

OTHER SYMBOLS

SYMBOLS	NAME
	INSERT PIPE / LANCE
	CHUTE
	TRUCK

CUSTOMER NOS: G201,G202,G203,G204

CUSTOMER: NTPC LIMITED.
PROJECT: NABINAGAR (4X250MW)
FGD SYSTEM PACKAGE

DEPT CODE	NAME (BHEL)	DATE
DRN	KABILASH	14.01.2020
CHD	MANOJ KT	14.01.2020
APPD	PN REDDY	14.01.2020

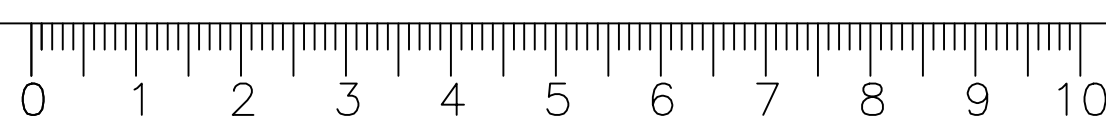
 **MITSUBISHI HITACHI POWER SYSTEMS, LTD.**
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

TITLE: P & ID – LEGENDS AND NOTES	SCALE : NTS 
--------------------------------------	--

NTPC DRG NO: 0270-109-PVM-F-020 SH 02 of 15

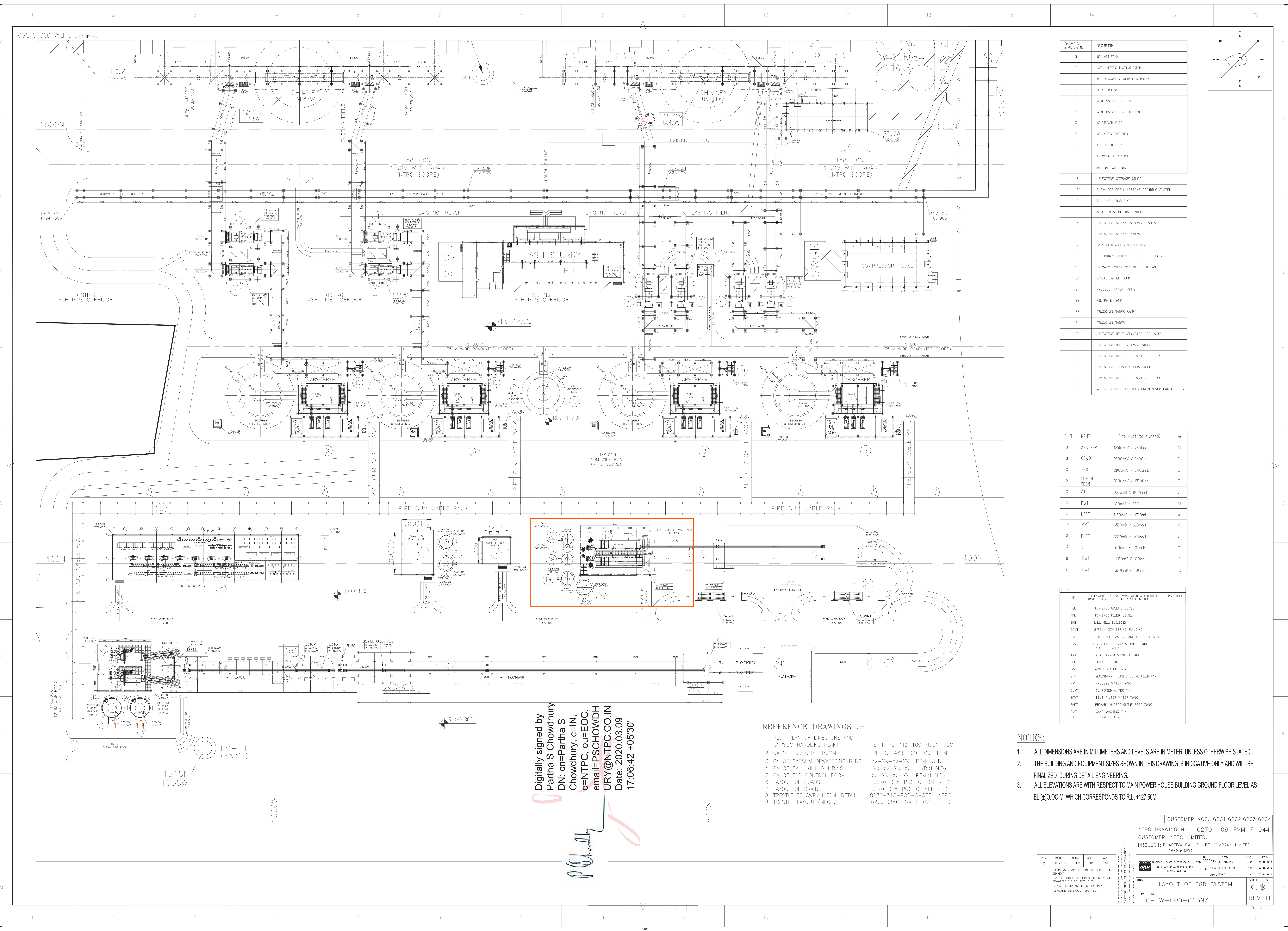
BHEL DRG NO 3-FW-000-01095	FILE NO B240-00602	REV NO 01
-------------------------------	-----------------------	--------------

CAUTION: THE DRAWING IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. AND IS NOT TO BE REPRODUCED OR USED TO FURNISH ANY INFORMATION FOR MAKING OF DRAWINGS OF APPARATUS EXCEPT WHERE PROVIDED FOR AGREEMENT WITH SAID COMPANY.









EQUIPMENT/STRUCTURE NO.	DESCRIPTION
01	NEW WET STACK
02	WET LIMESTONE DEDUST ABSORBER
03	HC PUMPS AND DEDUST BLOWER HOUSE
04	BOOST UP FAN
05	AUXILIARY ABSORBENT TANK
06	AUXILIARY ABSORBENT TANK PUMP
07	COMPRESSOR HOUSE
08	ACK & LEAK PUMP SHED
09	FGD CONTROL ROOM
10	ELEVATOR FOR ABSORBER
11	PIPE AND CABLE RACK
12	LIMESTONE STORAGE SILDS
12A	ELEVATOR FOR LIMESTONE GRINDING SYSTEM
13	BALL MILL BUILDING
14	WET LIMESTONE BALL MILLS
15	LIMESTONE SLURRY STORAGE TANKS
16	LIMESTONE SLURRY PUMPS
17	GYPSUM DEWATERING BUILDING
18	SECONDARY HYDRO CYCLONE FEED TANK
19	PRIMARY HYDRO CYCLONE FEED TANK
20	WASTE WATER TANK
21	PROCESS WATER TANKS
22	FILTRATE TANK
23	TRUCK UNLOADER RAMP
24	TRUCK UNLOADER
25	LIMESTONE BELT CONVEYER LBC-1A/1B
26	LIMESTONE BULK STORAGE SILDS
27	LIMESTONE BUCKET ELEVATOR BE-1A/2
28	LIMESTONE CRUSHER HOUSE ILCH
29	LIMESTONE BUCKET ELEVATOR BE-3A/4
30	WEIGH BRIDGE FOR LIMESTONE/GYPSUM HANDLING SYS

S.NO	NAME	Size (not to exceed)	No.
01	ABSORBER	13900mm X 7900mm L	04
02	GDWB	20000mm X 2400mm L	01
03	BMB	20000mm X 2400mm L	01
04	CONTROL ROOM	3000mm X 12000mm L	01
05	ATT	9500mm X 10300mm H	01
06	PWT	6000mm X 6700mm H	02
07	LSST	11500mm X 11700mm H	02
08	WWT	6500mm X 6600mm H	01
09	PHFT	5500mm X 6400mm H	01
10	SHT	5000mm X 5000mm H	01
11	FWT	4500mm X 5000mm H	01
12	CWT	3000mm X 3500mm H	02

KEY	DESCRIPTION
FGS	FINISHED GROUND LEVEL
FFL	FINISHED FLOOR LEVEL
BMB	BALL MILL BUILDING
GDWB	GYPSUM DEWATERING BUILDING
FWT	FILTRATE WATER TANK (INSIDE GDWB)
LSST	LIMESTONE SLURRY STORAGE TANK (REAGENT TANK)
AAT	AUXILIARY ABSORBENT TANK
BUF	BOOST UP FAN
WWT	WASTE WATER TANK
SHT	SECONDARY HYDRO CYCLONE FEED TANK
PWT	PROCESS WATER TANK
CLWT	CLARIFIED WATER TANK
PHFT	PRIMARY HYDROCYCLONE FEED TANK
CWT	CAKE WASHING TANK
FT	FILTRATE TANK

- NOTES:
- ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METER, UNLESS OTHERWISE STATED.
 - THE BUILDING AND EQUIPMENT SIZES SHOWN IN THIS DRAWING IS INDICATIVE ONLY AND WILL BE FINALIZED DURING DETAIL ENGINEERING.
 - ALL ELEVATIONS ARE WITH RESPECT TO MAIN POWER HOUSE BUILDING GROUND FLOOR LEVEL AS EL.(±)0.00 M. WHICH CORRESPONDS TO R.L. +127.00M.

REFERENCE DRAWINGS :-	
1. PLOT PLAN OF LIMESTONE AND GYPSUM HANDLING PLANT	IS-1-PL-743-100-M001 ISG
2. GA OF FGD CTRL. ROOM	PE-DG-463-100-E001 PEM
3. GA OF GYPSUM DEWATERING BLDG	XX-XX-XX-XX PEM(HOLD)
4. GA OF BALL MILL BUILDING	XX-XX-XX-XX HYD(HOLD)
5. GA OF FGD CONTROL ROOM	XX-XX-XX-XX PEM(HOLD)
6. LAYOUT OF ROADS	0270-315-POC-C-701 NTPC
7. LAYOUT OF DRAINS	0270-315-POC-C-711 NTPC
8. TRESTLE TO AWP/H FDN. DETAIL	0270-315-POC-C-538 NTPC
9. TRESTLE LAYOUT (MECH.)	0270-999-POM-F-072 NTPC

Digitally signed by Partha S Chowdhury
DN: cn=Partha S Chowdhury, c=IN, o=NTPC, ou=EOC, email=PSCHOWDHURY@NTPC.CO.IN
Date: 2020.03.09 17:06:42 +05'30'

CUSTOMER NOS: G201,G202,G203,G204	
NTPC DRAWING NO : 0270-109-PVM-F-044	
CUSTOMER: NTPC LIMITED.	
PROJECT: BHARTIYA RAIL BULEE COMPANY LIMITED (4X250MW)	
REV. 01	DATE 21.02.2020
ALTD. SLINDER	CHD. GYM
APPRO. SK	DATE 21.02.2020
LIBRARY: REVISED IN LINE WITH CUSTOMER COMMENTS	
SWEEP: BRIDGE FOR LIMESTONE & GYPSUM DEWATERING FACILITIES SHOWN	
EXISTING ROAD/NTPC SITES UPDATED	
DRAWING GENERALITY UPDATES	
DRAWING NO. 0-FW-000-01393	
REV: 01	



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION
 MASTER DRAWING LIST WITH SCHEDULE
 OF SUBMISSION

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 8

SECTION-I

SUB-SECTION-D

ANNEXURE-V

MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 2 OF 8

1. DOCUMENTS TO BE SUBMITTED ALONG WITH THE OFFER/AWARD OF CONTRACT:

The Bidder shall submit all documents, drawings, diagrams and all such information, which are necessary to fully understand the offer for techno – commercial evaluation as per Annexure-V. The above documents are required for proper evaluation purpose and vendors are requested to comply with above in all respect.

S.No	Description	Along with offer	After Award of Contract
1	Compliance of Specification	Yes	--
2	Deviation List	Yes	--
3	Data Sheet & General Assembly Drawing of complete Lime feeding System	Yes	Yes
4	Manufacturing Drawing & Part Drawing	--	Yes
5	Data sheet & Performance curve	Yes	Yes
6	Sub Vendor List	Yes	Yes
7	Test certificates	--	Yes
8	Erection check list	--	Yes
9	Pre commissioning check list	--	Yes
10	Scope of supply	Yes	--
11	Quality plan	Yes	Yes
12	Operation & Maintenance manual	--	Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language.
13	Spare list (Recommended)	Yes	Yes
14	Startup & Commissioning spare	Yes	Yes
15	List of special tools	Yes	Yes
16	Delivery Schedule	Yes	Yes
17	Test & Inspection Procedure	--	Yes
18	Catalogue	Yes	--



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION

SPECIFICATION No: PE-TS-463-571-A102
SECTION : I
SUB-SECTION : D
REV 00
SHEET 3 OF 8

2. DOCUMENTS TO BE SUBMITTED AFTER AWARD OF CONTRACT:

The Successful bidder shall submit necessary data, documents and drawings for review, approval with requirements specified here under. However as minimum the following shall be submitted as per Annexure-IV.

Drawings that are reviewed by the BRBCL / BRBCL's Consultant will be returned to bidder with a transmittal letter with any comments and / or questions marked on the drawings or noted in the letter. All comments and questions must be resolved before a resubmission of drawings / documents. If the design has not developed enough to resolve some of the comments or questions, bidder shall place a "hold" on those items or areas of design. BRBCL / BRBCL's Consultant (NTPC) reserves the right to return drawings unprocessed to bidder if there exists any evidence that bidder has not acknowledged all comments and questions.

All necessary GA drawings, sections, sub-assembly drawings, specifications of main and sub components and necessary set of operation & maintenance manual as asked by BRBCL must be furnished by bidder in soft and hard copy forms. For all documents softcopy format shall be searchable pdf, however in addition all drawings, diagrams like P&IDs shall be supplied in ACAD or other editable format and all lists in Excel format. Further break up of technical documents will be discussed during finalization of the purchase contract.

Unless agreed otherwise, Ten (10) hard copies and five (05) sets of electronic copies of all documents are to be submitted in the English language. 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). Especially P&IDs shall be submitted as DWG files and PDF files. Bidder to ensure submission of hard copies as per BRBCL's requirement for all engineering drg/doc and for all subsequent revisions along with a soft copy through email to concerned project team. However, all the engineering related information shall be furnished in soft form to BHEL.

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. #	Duly filled technical datasheet	6	2
7. #	P & I Diagram	6	2
8.	Performance Test Procedure & Report	6	8
9.	Outline Drawing of Equipment	6	6



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

**TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION**

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 4 OF 8

10.	Fabrication Drawing of Equipment	6	8
11.	Warranted Performance curve of Machinery	6	6
12.	Platform Drawing	6	6
13.	Line Index	6	6
14.	Piping Material Specification	6	6
15.	Piping Arrangement Drawing	6	6
16.	Piping Support Arrangement Drawing	6	6
17.	Isometric Drawings	6	4
18.	Data sheet of Piping Parts	6	6
19.	Valve Drawing	6	8
20.	Instrument Schedule List	6	8
21.	Instrument Function Loop Diagram	6	8
22.	Interlock and Operation Description	6	8
23.	Interlock/ Sequence Logic Diagram	6	8
24.	Instrument Power Supply Diagram	6	8
25.	Instrument Set Point List	6	8
26.	Instrument Data Sheet	6	8
27.	Valve Data Sheet, including On-Off Valve	6	8
28.	Nozzle Elevation Plan for Level Instrument	6	8
29.	Specification and Drawing of Instrument	6	8
30.	Instruction Manual for Instrument	6	12
31.	Local Control Panel Specification	6	8

911/2020/PS-PEM-MAX

**4x250 MW BRBCL NABINAGAR TPP****LIME FEEDING / DOSING SYSTEM**

**TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION**

SPECIFICATION No: PE-TS-463-571-A102**SECTION : I****SUB-SECTION : D****REV 00****SHEET 5 OF 8**

32.	Local Control Panel Drawing	6	8
33.	Cable Duct/Tray Routing Plan	6	8
34.	Fabrication Drawing for Cabinet Duct/Tray	6	8
35.	Plot Plan of Field Instrument	6	8
36.	Layout of Instrument Wiring	6	8
37.	Layout of Instrument Air Supply Piping and Signal tubing	6	8
38.	Hook-up Drawing for Instrument	6	8
39.	Instrument Connection List	6	8
40.	Instrument Cable Schedule	6	8
41.	Parts Drawing for Instrument Installation Materials	6	8
42.	Calculation Sheet for Flow Instrument	6	8
43.	Motor List	6	8
44.	Motor Data Sheet	6	8
45.	Outline drawing of Motor	6	8
46.	Loading Data	6	8
47.	Planning Drawing of Building	6	6
48.	Planning Drawing of Foundation	6	6
49.	Consumable Parts List	6	6
50.	Lubricant List	6	6
51.	Special Tool List	6	6
52.	Spare Parts List for Erection	6	6
53.	Spare Parts List for Commissioning	6	8



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

**TECHNICAL SPECIFICATION
MASTER DRAWING LIST WITH SCHEDULE
OF SUBMISSION**

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 6 OF 8

54.	Spare Parts List for 2 years of Operation	6	8
55.	Construction Work Specification	6	10
56.	Construction Manual List	6	10
57.	Painting Specification	6	10
58.	Transportation and Storage Specification	6	10
59.	Shop Inspection Specification	6	10
60.	Shop Inspection Report	6	12
61.	Site Inspection Specification	6	12
62.	Site Inspection Report	6	14
63.	Supply Item List for Package Verification at Site	6	12
64.	Packing List	6	12
65. #	Sub-Vendor List	6	4
66.	Manufacturing Schedule	6	4
67.	Progress Report	6	4
68.	Spare Parts List for Erection	6	10
69.	Spare Parts List for Commissioning	6	10
70. #	Detail drawings indicating the dimensions of the equipments.	6	6
71.	Detail drawings indicating the piping layouts	6	6
72.	Erection drawings	6	8
73.	Operation & Maintenance (O&M) Manual	6	12
74.	Civil Loading details	6	4
75.	Quality plan & Safety Requirement	6	4

Indicates Primary drawings.

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

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 7 OF 8	

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.
 - 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:

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION MASTER DRAWING LIST WITH SCHEDULE OF SUBMISSION	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 8 OF 8	
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.			



**4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

PACKING PROCEDURE

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 1 OF 4

SECTION-I

SUB-SECTION-D

ANNEXURE-VI

PACKING PROCEDURE

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION PACKING PROCEDURE	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 2 OF 4	

1.0	PACKING AND FORWARDING
1.	Proper packing to be ensured. Indigenous Supply: Lime Dosing/Feeding 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 (BRBCL).
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: a. Destination b. Package Number c. Gross and Net Weight d. Dimensions e. Lifting places f. Handling marks and the following delivery marking

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : I	
		SUB-SECTION : D	
		REV 00	
		SHEET 3 OF 4	
PACKING PROCEDURE			
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.		



**4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION**

PACKING PROCEDURE

SPECIFICATION No: PE-TS-463-571-A102

SECTION : I

SUB-SECTION : D

REV 00

SHEET 4 OF 4

	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.

SECTION-I, SUB-SECTION-D
Annexure-VII- SEAWORTHY PACKING PROCEDURE

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	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 1	OF 52

1.0 Purpose

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

2.0 SCOPE

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

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

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

3.0 Application

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

4.0 Definitions

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

5. General Information

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

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

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

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

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

6.0 Criteria for Selection of Packaging

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

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

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

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

Materials can be classified in following categories

- Hazardous Material
- Non-Hazardous Material
-

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

6.1 Hazardous Materials

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

6.2 Non-Hazardous GOODS

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

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

7.0 Marking Instructions & Despatch details, Storage Code

7.1 Marking Instructions & despatch details

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

7.2 Storage Code

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

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

8.0 GUIDELINES FOR PACKING GOODS

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

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

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

IMPORTANT NOTE:

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

8.1.2 Pipe

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

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

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

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

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

8.1.3 Pipe Fittings, Flanges and Valves

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

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

8.1.4 Structural Steel

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

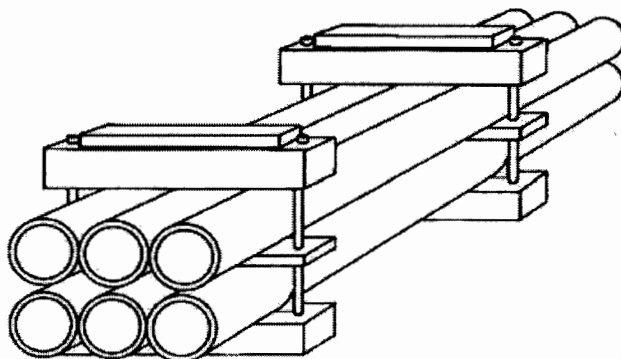
Structural Steel, reinforcing rods, bars, etc., should be packed in bundles of uniform length. Refer to articles 8.1.2, for strapping requirements. Bundle weight not normally to exceed 2,000 kg. Fabricated structures and structural steelwork, etc, should be bundled and packed using wooden beams and long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

8.2 Bundling – Packing Category I

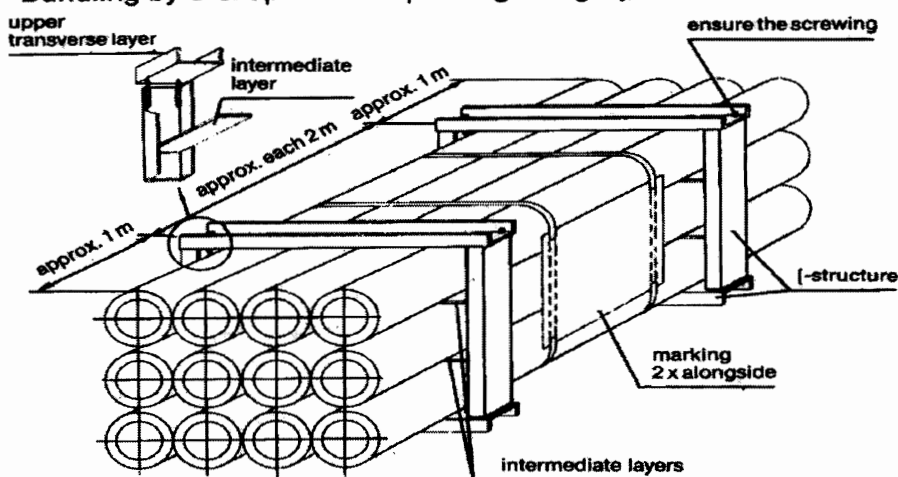
8.2.1 Type of Equipment

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

Packing category I



Bundling by U-shaped iron – packing category I A



8.2.2 Type of Construction

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

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

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

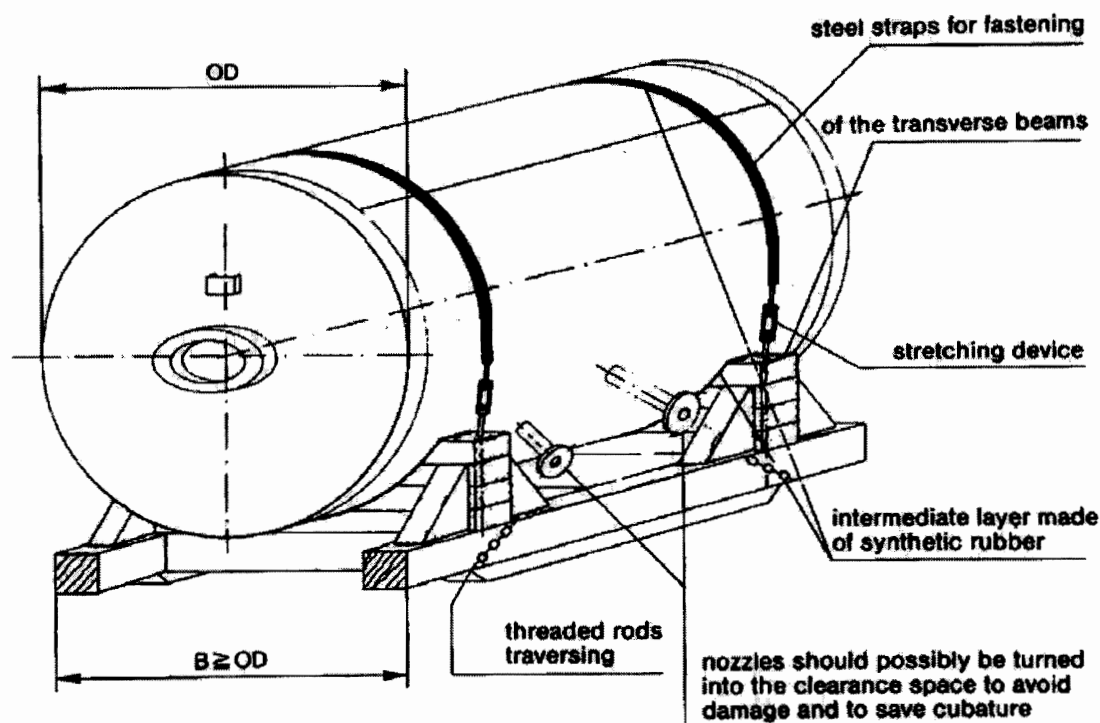
8.3.1 Type of Equipment

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

8.3.2 Type of Construction

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

PACKING CATEGORY-II



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

8.4 Packing of GOODS in Wooden Crates/Cases/Boxes

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

8.4.1 Packing Category III

8.4.1.1 Type of Equipment

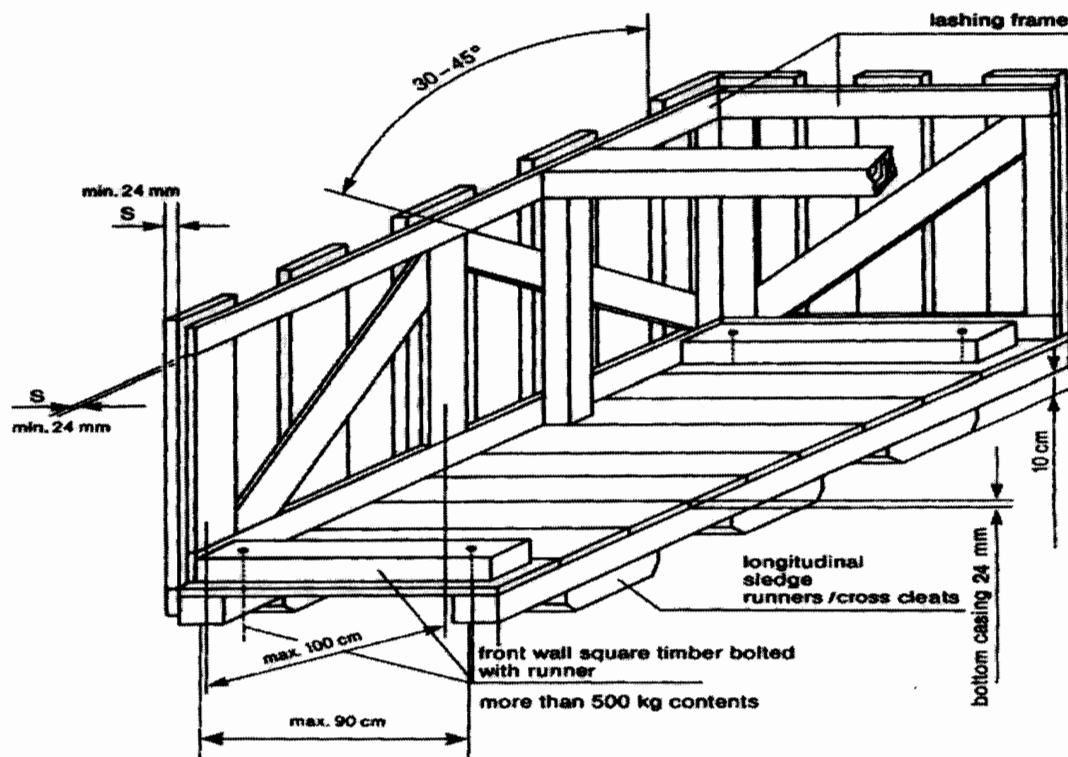
Fabricated equipment, which cannot be transported on cradles; frame-works, prefabricated piping and fittings, mechanical and electrical assemblies. *This type of packing is recommended where many parts of the equipment/component/assembly are not protruding out.*

8.4.1.2 Type of Construction

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

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

Packing Category III



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

8.4.2 Cases with Lining – Packing Category IV

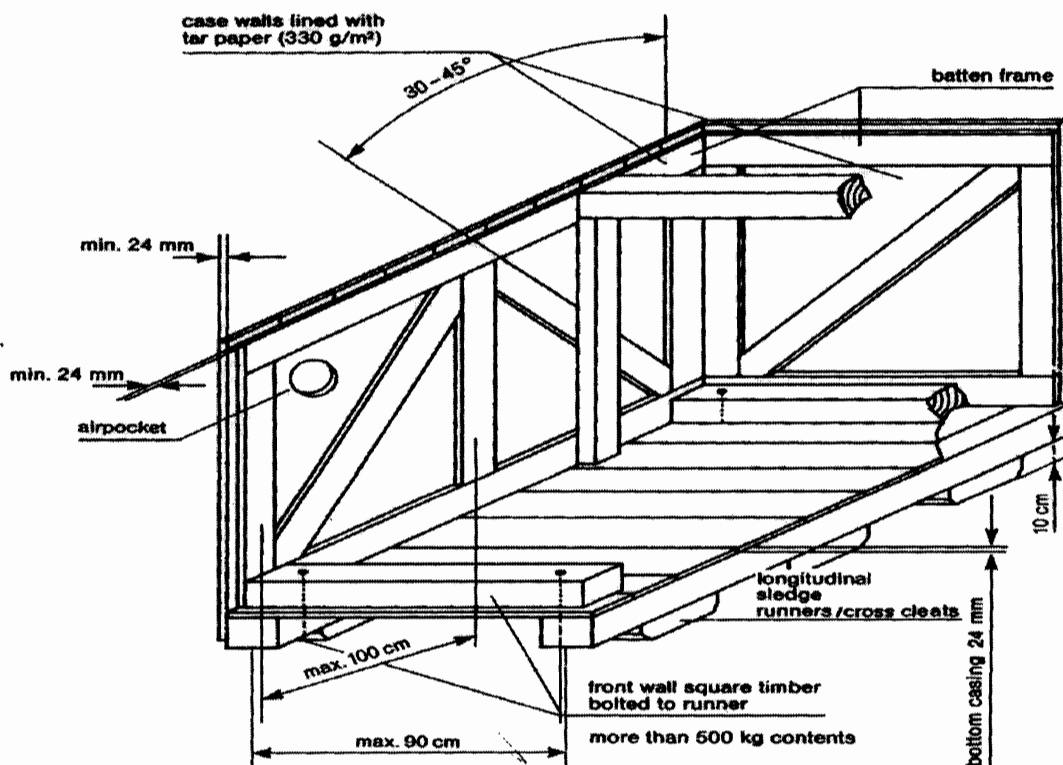
8.4.2.1 Type of Equipment

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

8.4.2.2 Type of Construction

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

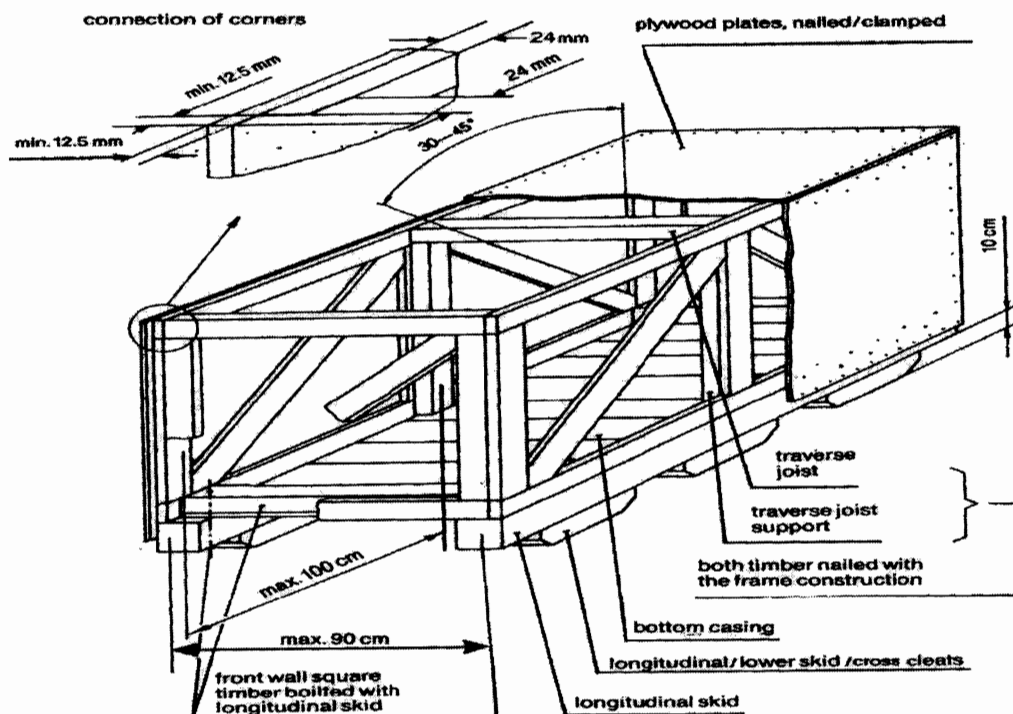
Packing Category IV



8.4.3 Cases with Alternative Surface Materials

8.4.3.1 Plywood Box – Packing Category IV A

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



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

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

8.4.4.1 Type of Equipment

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

8.4.4.2 Type of Construction

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

Additional marking:

- Case with desiccants.

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

8.4.5.1 Type of Equipment

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

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

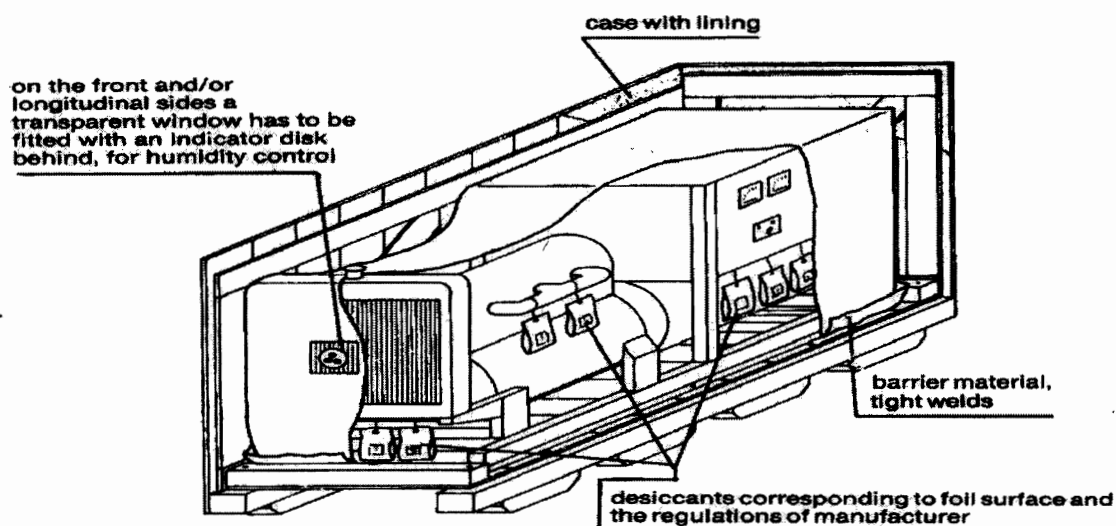
8.4.5.2 Type of Construction

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

Additional marking:

- Case with desiccants.

Packing Category V/VI



8.4.6 Double Case – Packing Category VII

8.4.6.1 Type of Equipment

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

8.4.6.2 Type of Construction

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

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

8.4.7 Cable Drum – Packing Category VIII

8.4.7.1 Type of Equipment

All type of cables, wires, ropes, hoses.

8.4.7.2 Type of Construction

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

8.4.8 Hazardous Materials – Packing Category IX

8.4.8.1 Type of Equipment

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

8.4.8.2 Type of Construction

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

8.4.9 Wooden Floor as a Transport Support – Packing Category X

8.4.9.1 Type of Equipment

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

8.4.9.2 Type of Construction

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

8.5 Air Transport Packing

8.5.1 General

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

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

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

8.5.2 Type of Packing

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

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

8.5.3 Dimensions

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

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

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

9.1 Technical specification for wood

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

9.2 Chemical Treatment of Wood:

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

9.3 TYPE, DESIGN & DIMENSION OF WOODEN PACKING CASES:

9.3.1 PACKING OF EQUIPMENTS

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

9.3.1.1 Bottom Frame

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

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

9.3.1.2 TOP FRAME

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

9.3.1.3 END PANELS

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

9.3.1.4 Sling Plate

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

9.3.1.5 Angle Iron Cleats

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

9.3.1.6 Other Requirements

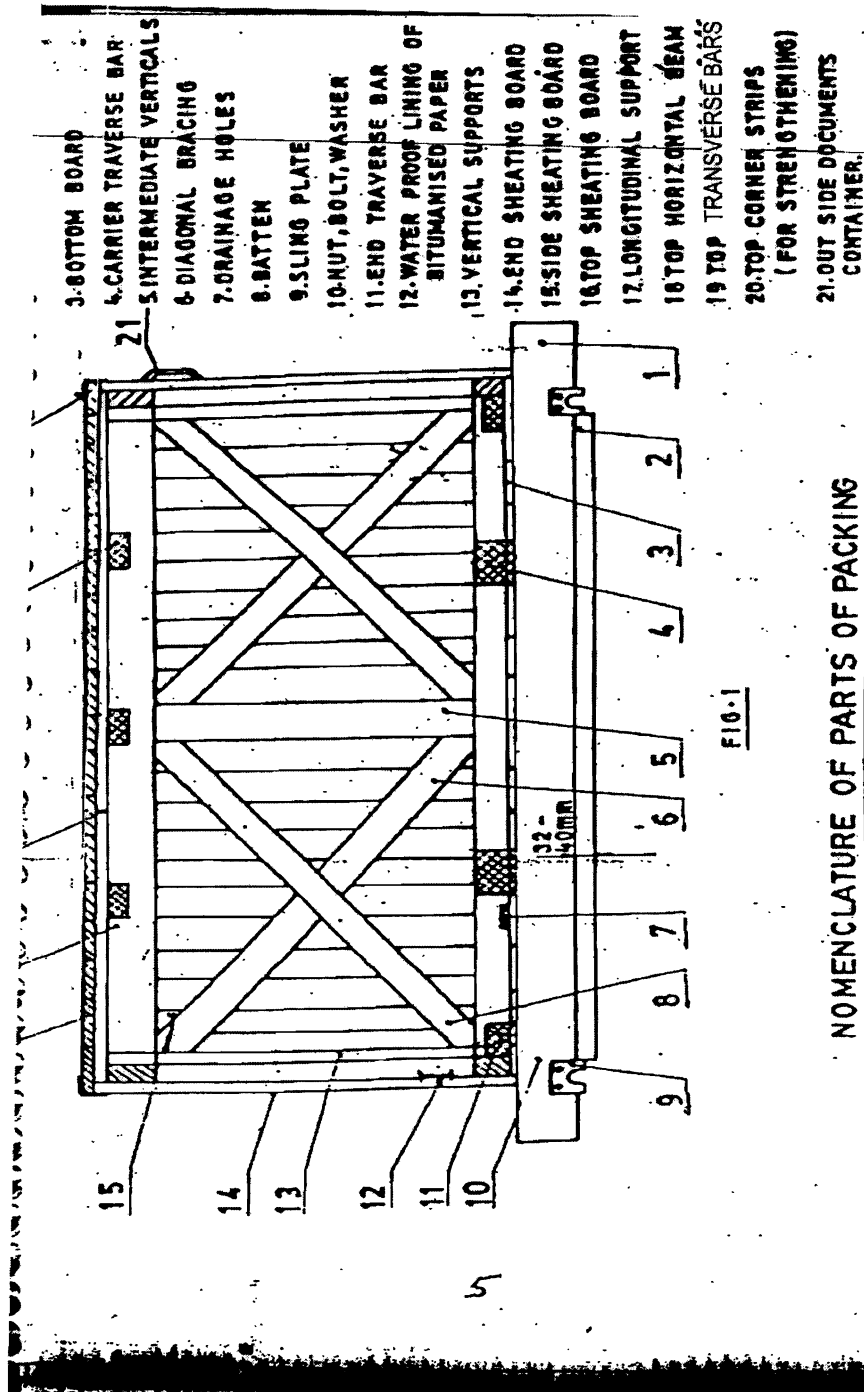
- The thickness of planks for top, bottom, side and end panels shall be at least 25mm. Planks used for this purpose shall be joined with each other by tongue and groove joint. The groove dimension shall be such that tongue fits tightly into groove to make the joint.
- Runners/slides, traverse bars, etc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

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

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

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 15	OF 52



EC-009

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

BOTTOM FRAME ARRANGEMENTS

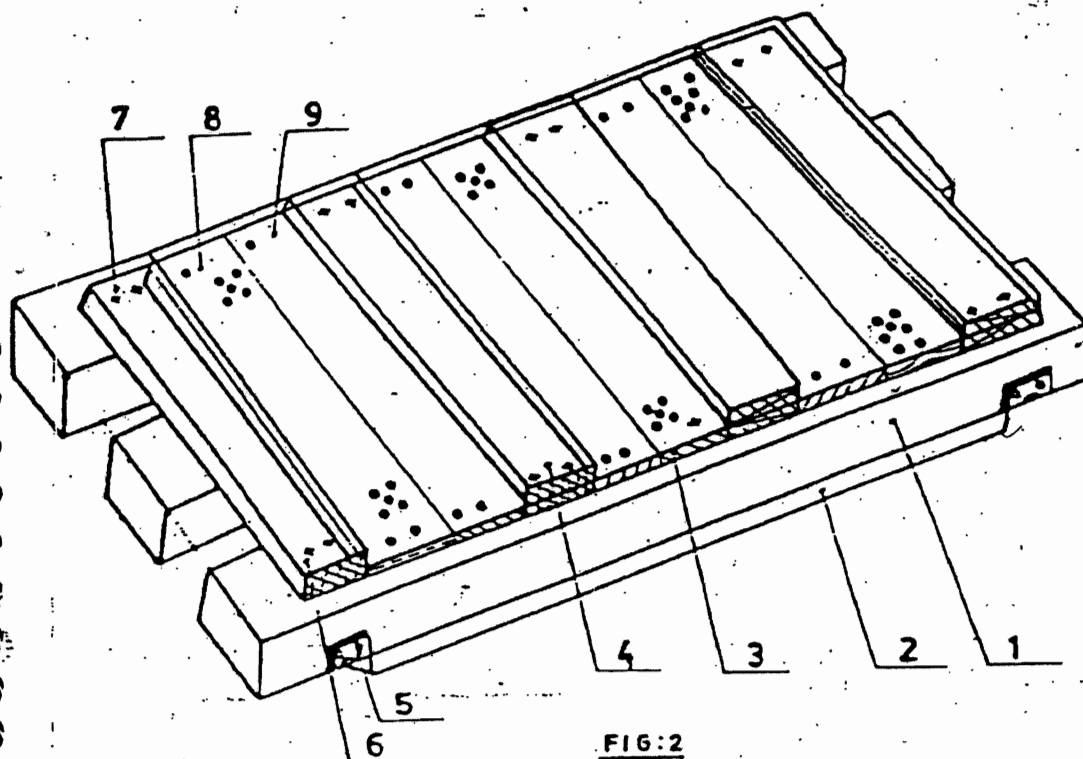


FIG:2

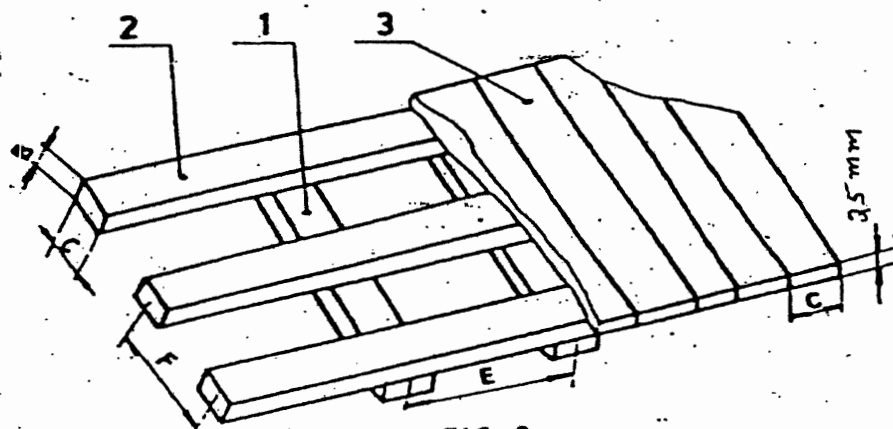
Nos. of slides: Minimum 2 Nos.
For length more than 1800 mm or
load more than 1000kg, nos. of
slides shall be minimum 3 Nos.
For dimensions of slides, refer Table 1
Cross section of end traverse bar; 100 X 100 mm.
(minimum)

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

027

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

TOP FRAME ARRANGEMENT

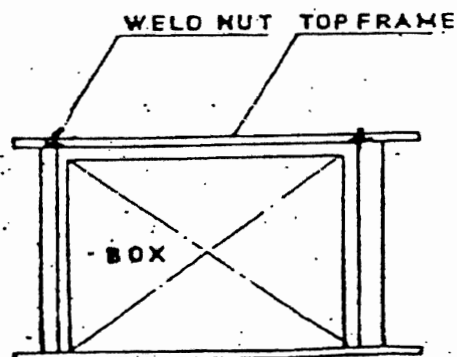
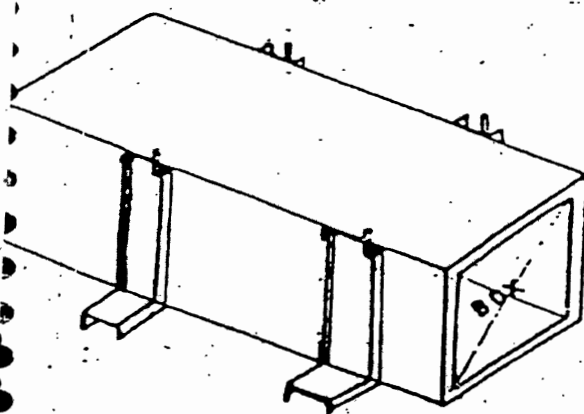


F : 700 t. 1000 mm
 E : 500 t. 900 mm
 30x100 mm.

FIG-3

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

ARRANGEMENT OF C-CLAMPS AROUND CASES



628

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

ARRANGEMENT OF DIAGONAL BRACING AND HORIZONTAL SUPPORT

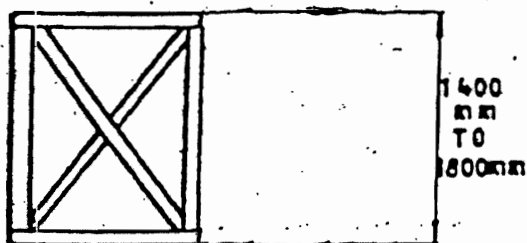


FIG:6

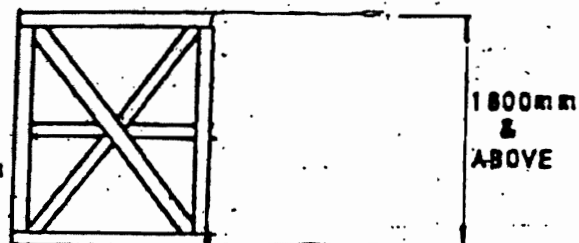


FIG:8

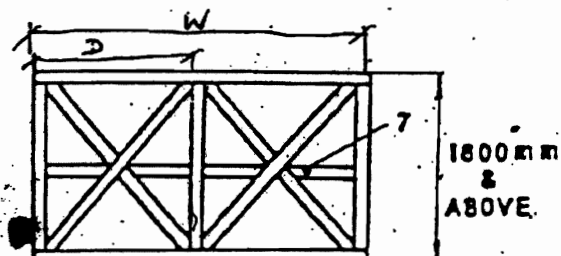


FIG:7

7- Middle Horizontal Support

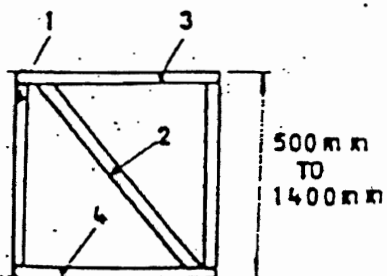


FIG:5

1- Vertical Support

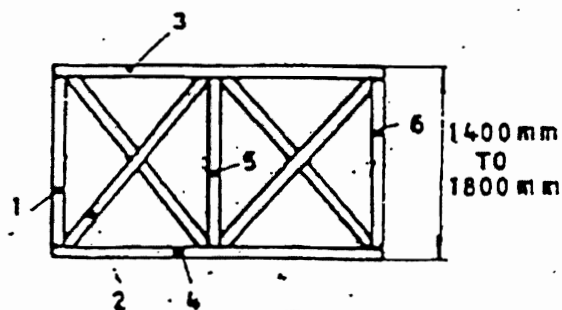


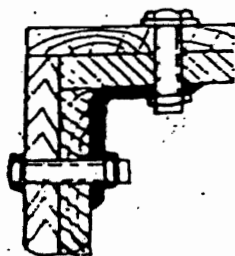
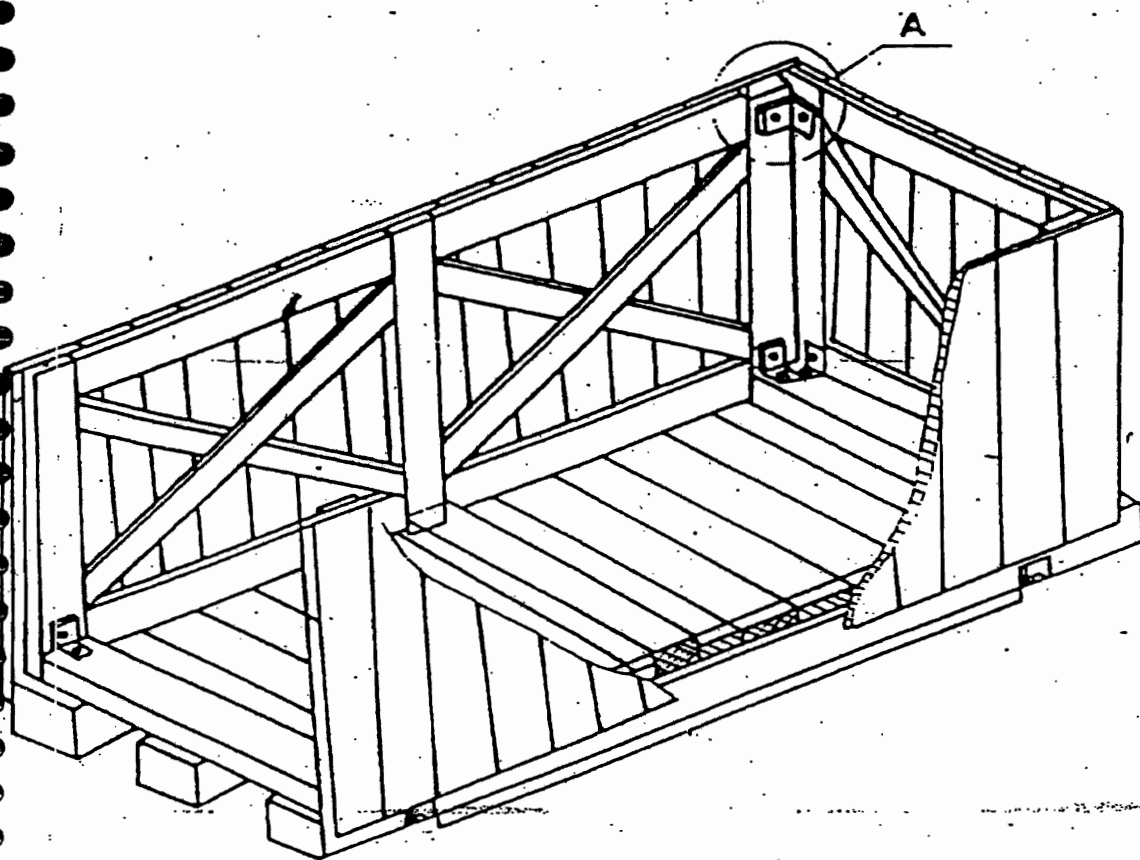
FIG:7

1, 5, 6 - Vertical Support

029

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 19	OF 52

ARRANGEMENT OF PACKING CASE



DETAIL-A

HOLE DIAMETER
MUST CONFORM
TO BOLT DIA

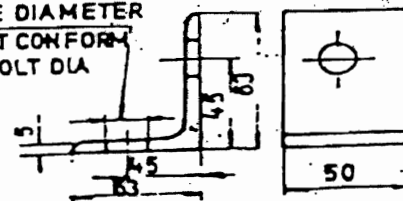
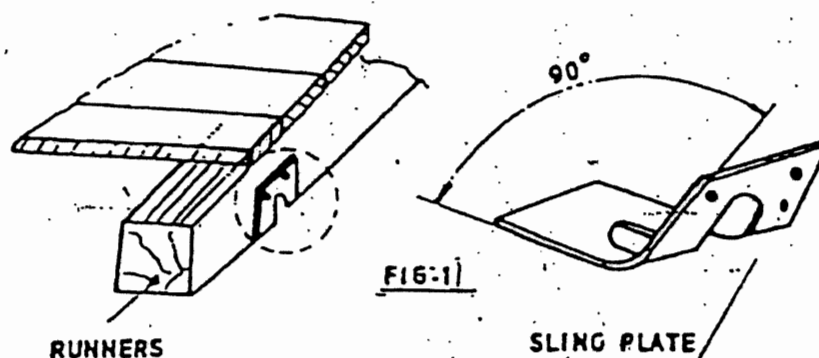


FIG:10

030

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

ARRANGEMENT OF SLING & PLATE ON CASES



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

TABLE-1

LOADS	LENGTHS OF SLIDES						
	600	800	1000	1200	1300	1500	2000
	Cross section b x c				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

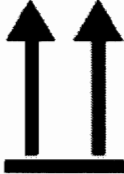
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 22	OF 52

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

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

INDICATION MARKS ON CASES/BOXES/CRATES

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

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

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

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

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

FIG-12

	TITLE		SPECIFICATION NO. PE-TS-888-100-A001	
			VOLUME II B	
			SECTION D	
			REV. NO. 0	DATE 10/08/2010
	TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS		SHEET 26	OF 52

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

FIG-13: MARKING PLATE

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

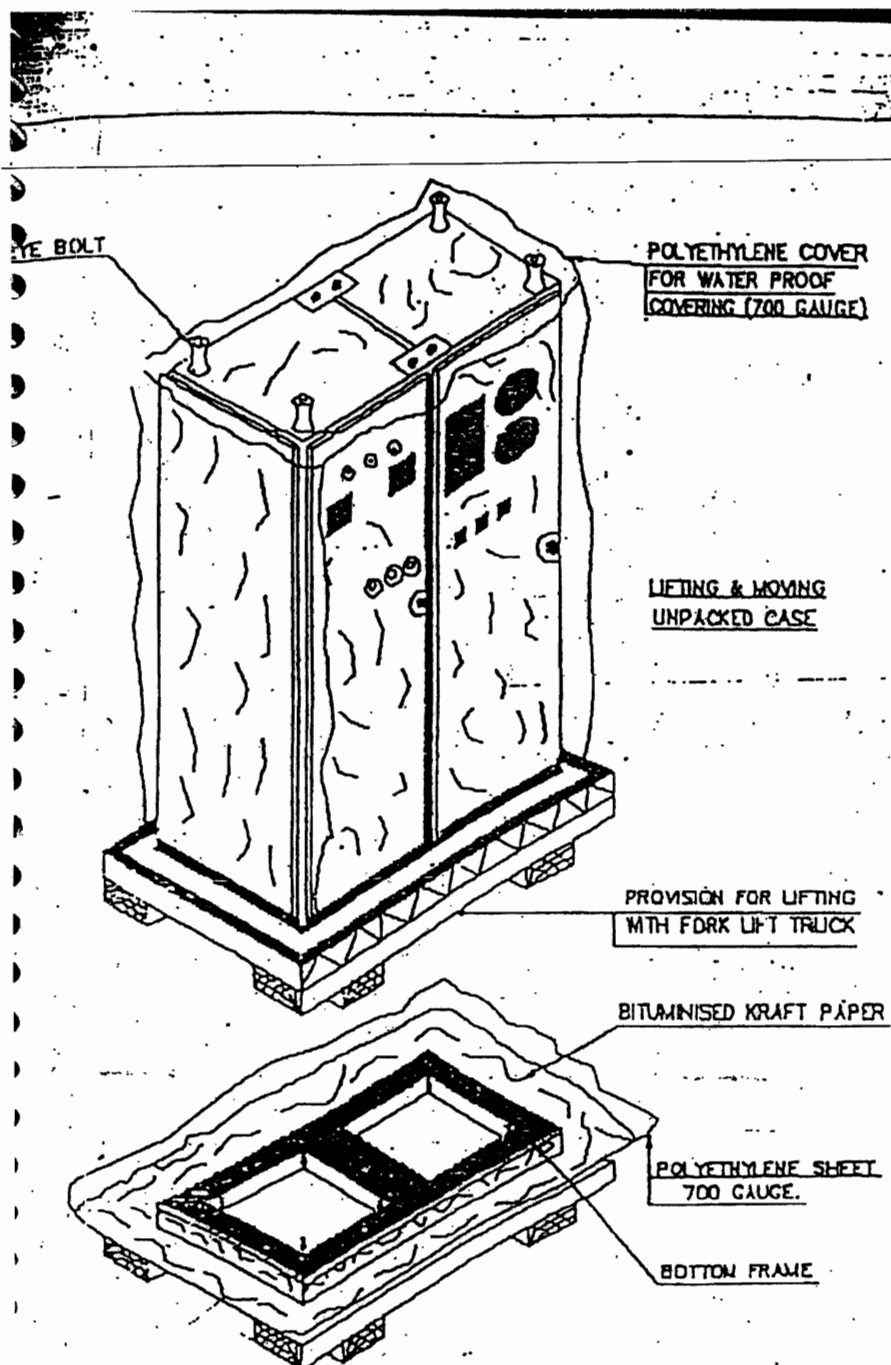


FIGURE-14

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

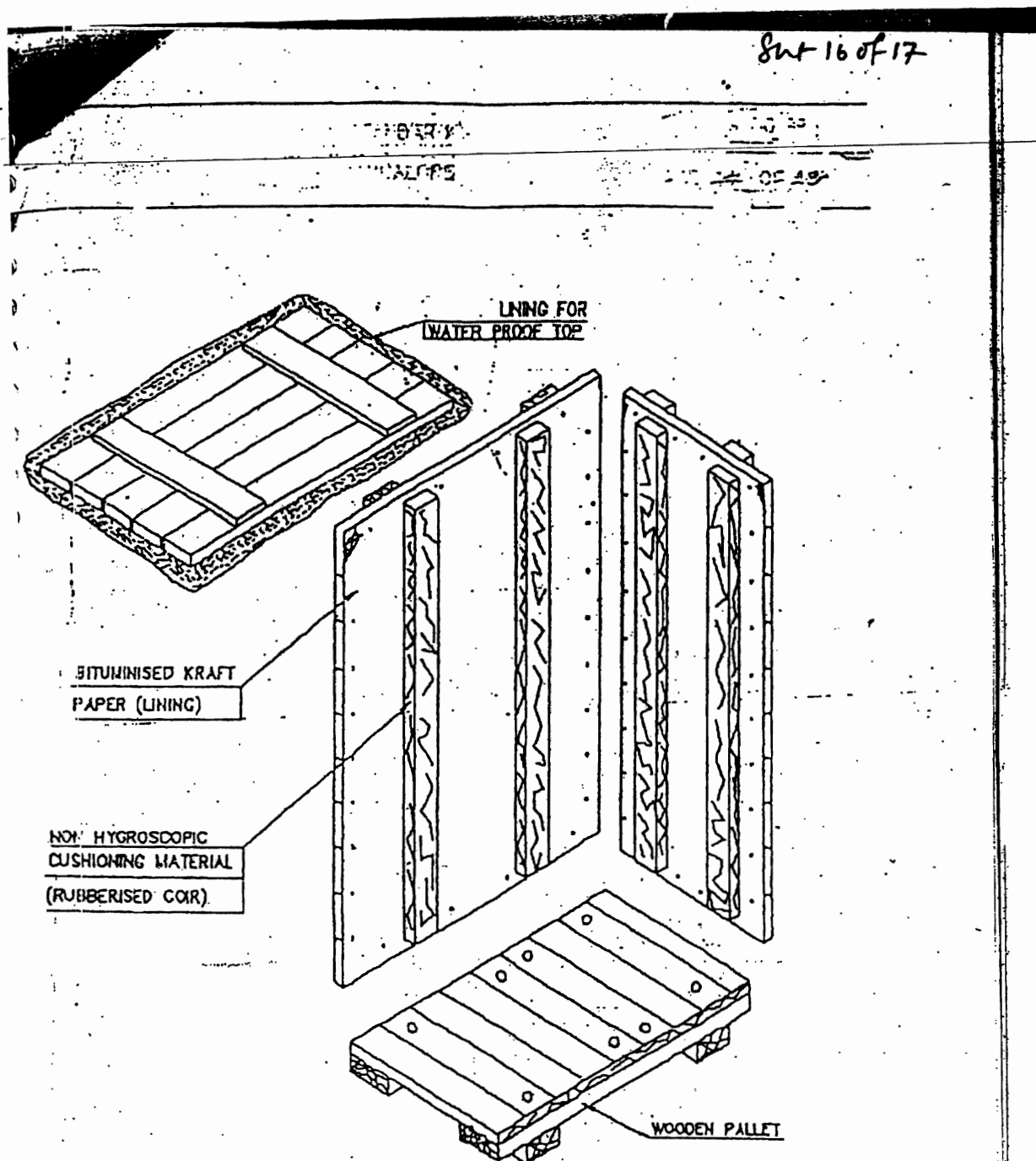


FIGURE-15

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

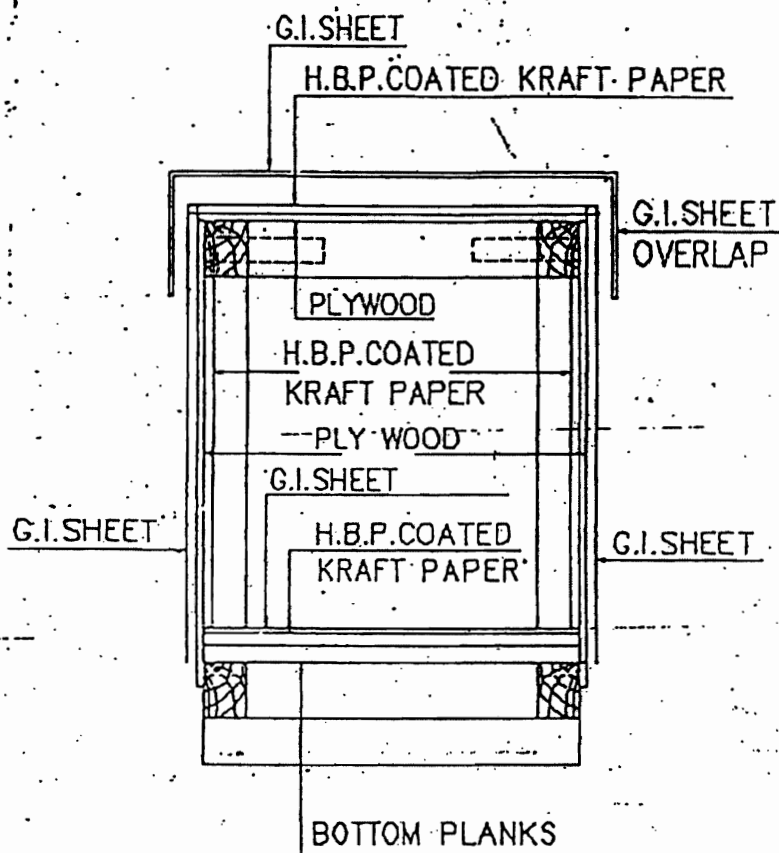


**FIG-16 : CLOSED PACKING CASE WITH G.I.SHEET
SHOWING LAYERS OF PACKING MATERIALS.**

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

10.0 TYPICAL PACKING DETAILS/PROCEDURE FOR MECHANICAL ITEMS

10.1 INSULATION MATERIAL (MINERAL WOOL MATTRESSES)

This specification covers the requirements of seaworthy packing and marking for bonded mineral (rock) wool mattresses having metallic hexagonal wire netting as facing on one or both sides.

10.1.1 TYPE OF CONSTRUCTION

Mattress shall be packed in Polythene (of 0.2 mm thickness) all around and sealed to prevent moisture absorption during transit and storage. Further it shall be wrapped with Bitumen coated Polythene bonded/lined Hessian and stitched and then packed in 5 ply DFC carton box.

Silica gel is used for this purpose to protect contents over sufficiently long time from corrosion. Silica gel shall be of indicating type conforming to IS:304-1979 packed in cotton bags placed at different positions inside the packing for absorbing moisture and shall not come into direct contact with the material inside the package. The quantity of silica gel shall be enough for storage period of one year. However, it shall not be less than 4 gms per litre volume of case subject to minimum of 400 gms per case.

Each mattress as well as the packages shall be serial numbered. Also, printed sheets indicating the nominal thickness, density and wire netting details (i.e. material and size) shall be placed below the wire netting.

Following details shall be legibly written on the packages. The details shall also be typed on a sheet of paper & kept in a sealed Polythene cover, inside the packages

- Project Name
- Purchase Order No.
- Sl. No. of package
- Size of mattress (Thickness x Length x Width)
- Density
- Wire netting material and size
- Weight of the package

10.2 INSULATION MATERIAL (ALUMINIUM COIL)

Heavy Gauge Aluminium Coil Packaging are done by Eye-to-Sky packaging or by Eye to eye packaging as per the proven practice being followed by manufacturer of Aluminium sheets.

10.2.1 Type of construction for Eye to Sky packaging

- Strapping of coil with polyester strap around circumference at one place.
- Putting paper I. D. Edge protector.
- Wrapping the coil with VCI stretch film after putting silica gel bags (4 nos.) Inside the coil.
- Wrapping the coil with HDPE film.
- Covering the coil including its build up & bore with masonite / particle board.
- Putting metallic I. D on coil.
- Putting O.D edge protector (paper) on coil.

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

- h. Putting circumferential polyester strap (3 nos.) & eye polyester strap (4 nos.).
- i. After placing the coil on coil tilter ply wood (10mm thick) of suitable size along with wooden pallet is to be put at the bottom side of the coil.
- j. Coil is to be tilted to eye-to-sky position.
- k. Final strapping with metallic strap to unit coil and skid at 2 places with top cover of plywood.
- l. Fixing the coil with wooden blocks at 4 corners.
- m. Labeling 2 nos.(one metallic & one adhesivetype) For specification, net wt. & gross wt.

10.2.2 Type of construction for Eye to Eye packaging

- a. Strapping of coil with polyester strap around circumference at one place.
 - b. Putting paper I. D. Edge protector.
 - c. Wrapping the coil with VCI stretch film after putting silica gel bags (4 nos.) Inside the coil.
 - d. Wrapping the coil with HDPE film.
 - e. Covering the coil including its build up & bore with masonite / particle board.
 - f. Putting metallic I. D on coil.
 - g. Putting O.D edge protector (paper) on coil.
 - h. Putting circumferential polyester strap (3 nos.) & eye polyester strap (4 nos.).
 - i. Placing of coil on wooden skid Coil is to be tilted to eye-to-sky position.
 - j. Final strapping of coil and skid at 2 places with steel strap. Fixing the coil with wooden blocks at 4 corners.
- Labeling 2 nos.(one metallic & one adhesive type) For specification net wt. & gross wt.

10.3 Packing Procedure for Online Tube Cleaning System and accessories

This procedure is applicable for the shipment of Onload Tube Cleaning System and accessories by sea.

10.3.1 Packing details:

- The Packing case shall be made of treated rubber wood. The design of the case shall be as per Annexure IIIA & IIIB.
- The Equipments shall be placed on the wooden base of the Packing case and fastened if required to arrest the movement of the same.
- Equipment shall be covered by Polythene sheet and inside wall surfaces of the wooden cases also shall be covered by polythene sheet.
- All Nozzles shall be closed with plywood dummies.
- All electrical components assembled or loose shall be covered with polythene sheets along with silica gel pack.
- Silica gel desiccants shall be kept inside each case in sufficient quantities in order to absorb the moisture.

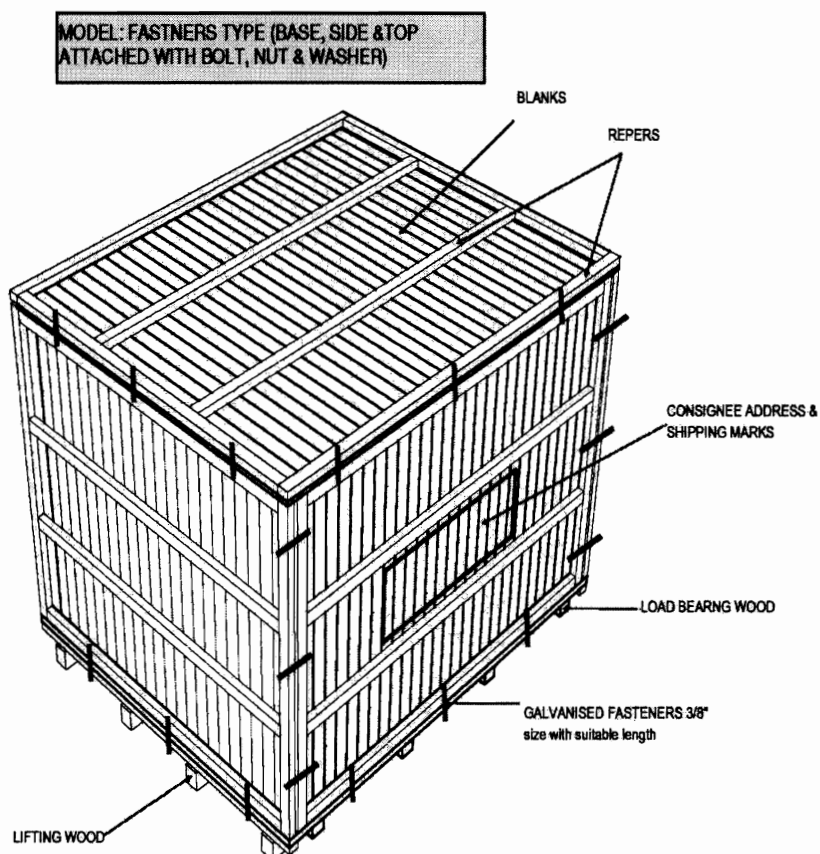
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 32	OF 52

- Thermocol packing shall be made for glass items like Ball vessel sight glass, Vpiece
- sight glass & pressure gauge.
- Silica gel desiccants shall be kept inside of each case to absorb the moisture.
- A Packing list covered in a polythene envelope shall be fixed inside and outside of each packing case.
- Shipping marks and consignee address shall be painted on the outer surface of the case.
- All handling instruction required for the case like top, sling, rain, handle with care etc, shall be marked on the case as per the symbol attached.
- Machined surface will be applied with Anti rust oil and covered by polyurethane sheet to protect from external oxidation.
- All valves will be closed with dummies to protect the internals and placed in the wooden case which will covered by polyurethane sheet.

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

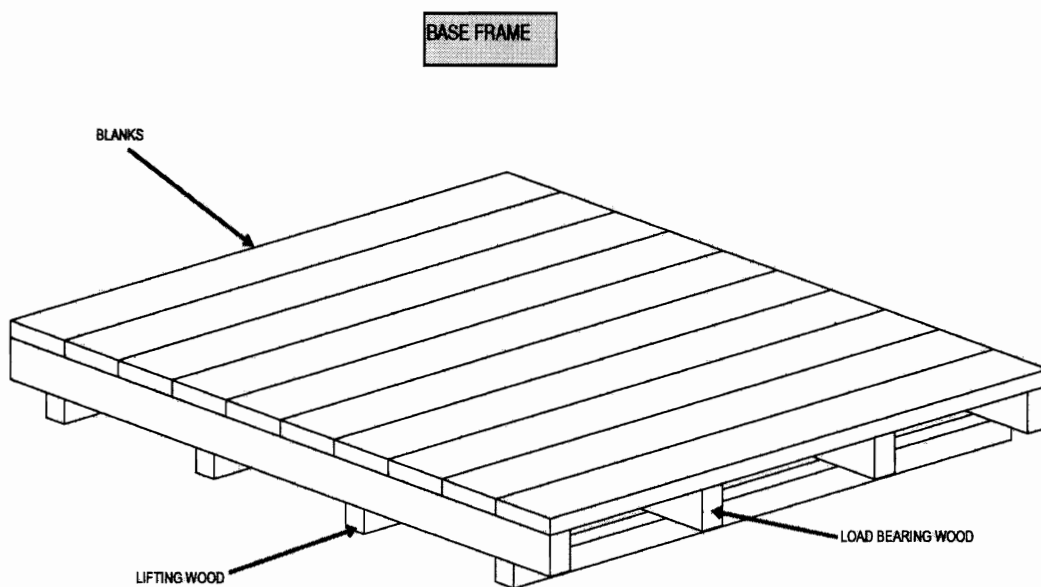
This Type of case to be used for following items:

1. BALL SEPERATOR
2. BALL COLECTOR SKID



SHEET 05 of 10

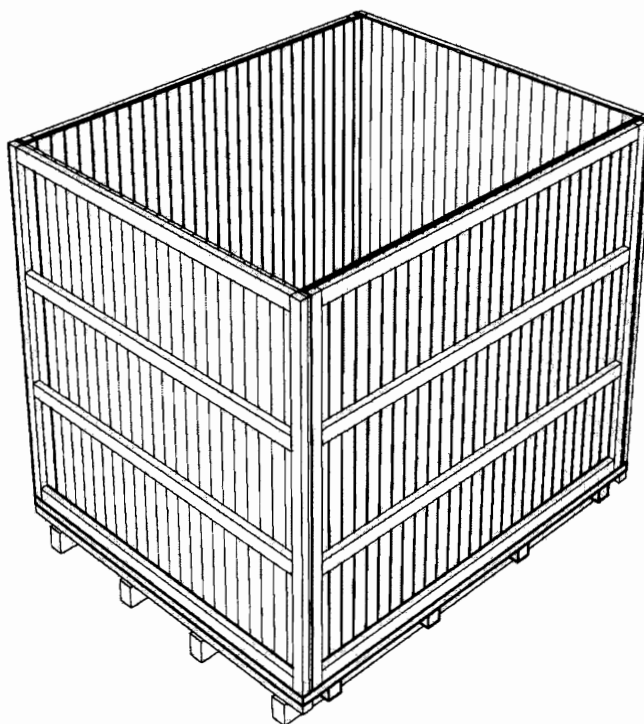
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001			
		VOLUME II B			
		SECTION D			
		REV. NO. 0	DATE 10/08/2010		
		SHEET	34	OF	52



SHEET 06 of 10

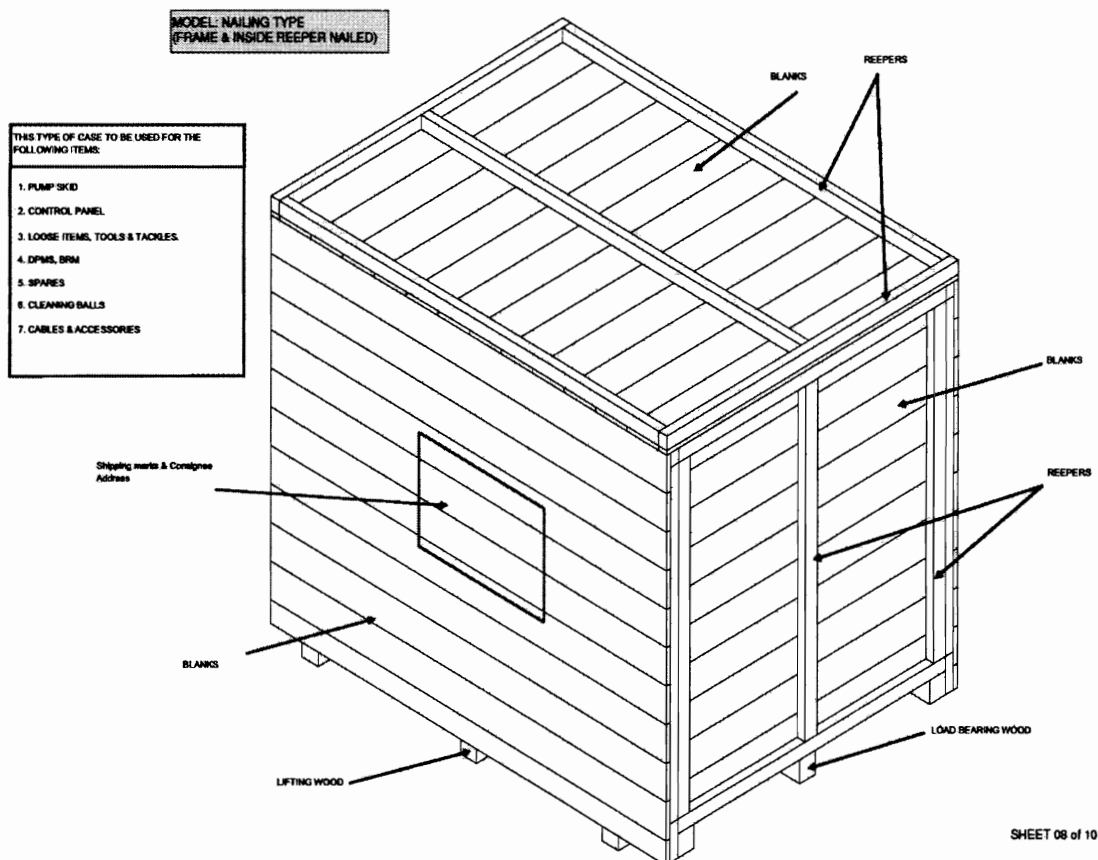
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 35	OF 52

MODEL: FASTNERS TYPE - WITHOUT TOP



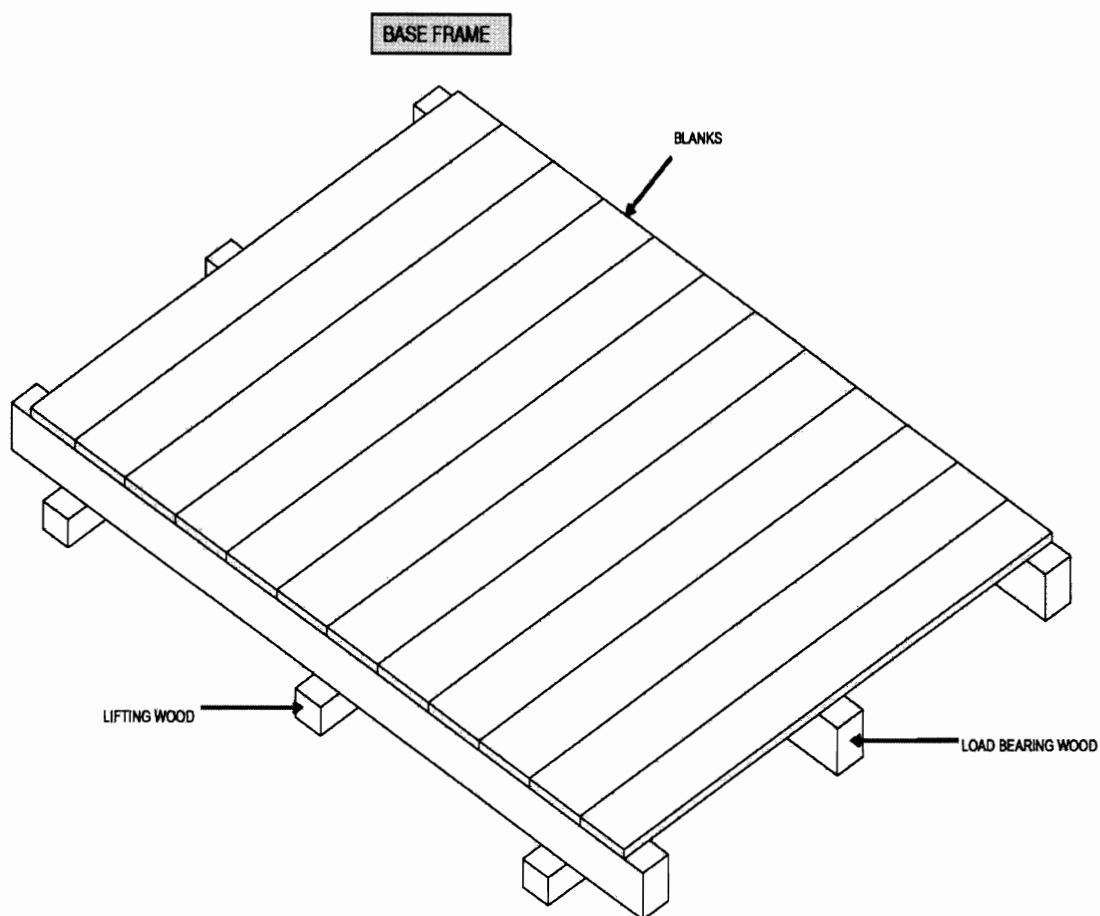
SHEET 07 of 10

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 36	OF 52



SHEET 08 of 10

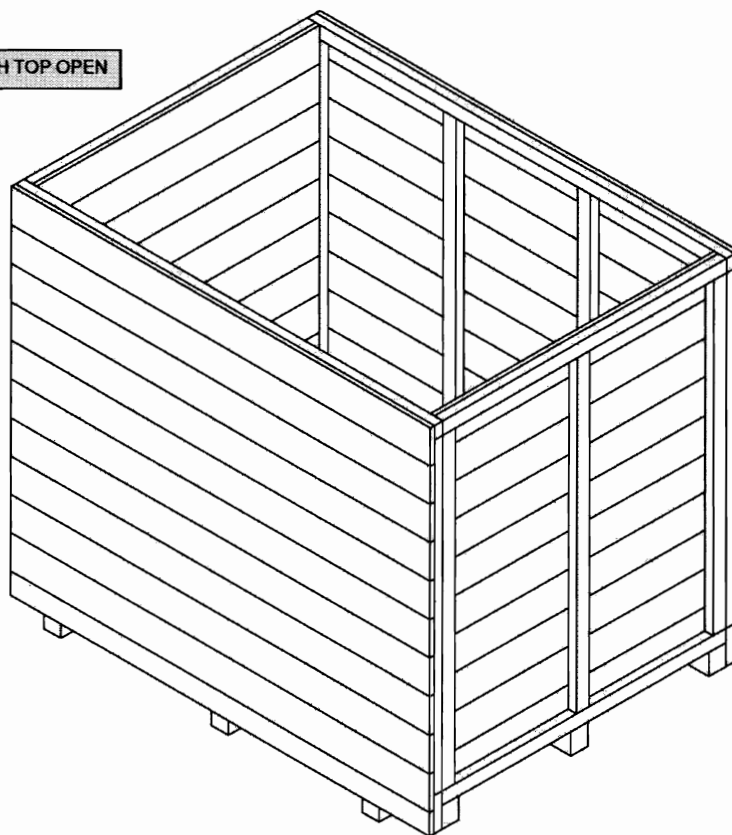
	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 37	OF 52



SHEET 09 of 10

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

NAILING TYPE MODEL WITH TOP OPEN



SHEET 10 of 10

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

10.4 PACKING OF LOOSE ITEMS

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

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

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

11.0 PACKING OF ELECTRICAL ITEMS

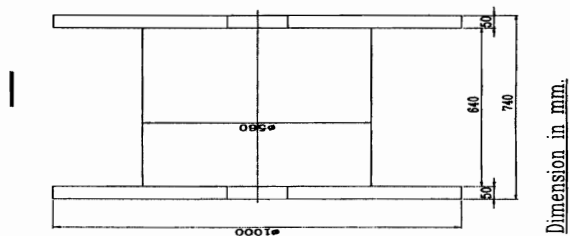
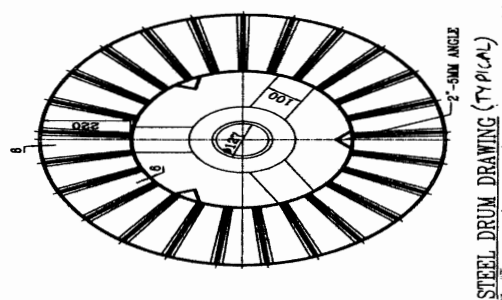
11.1 CABLES

11.1.1 **Type of Equipment** All type of cables..

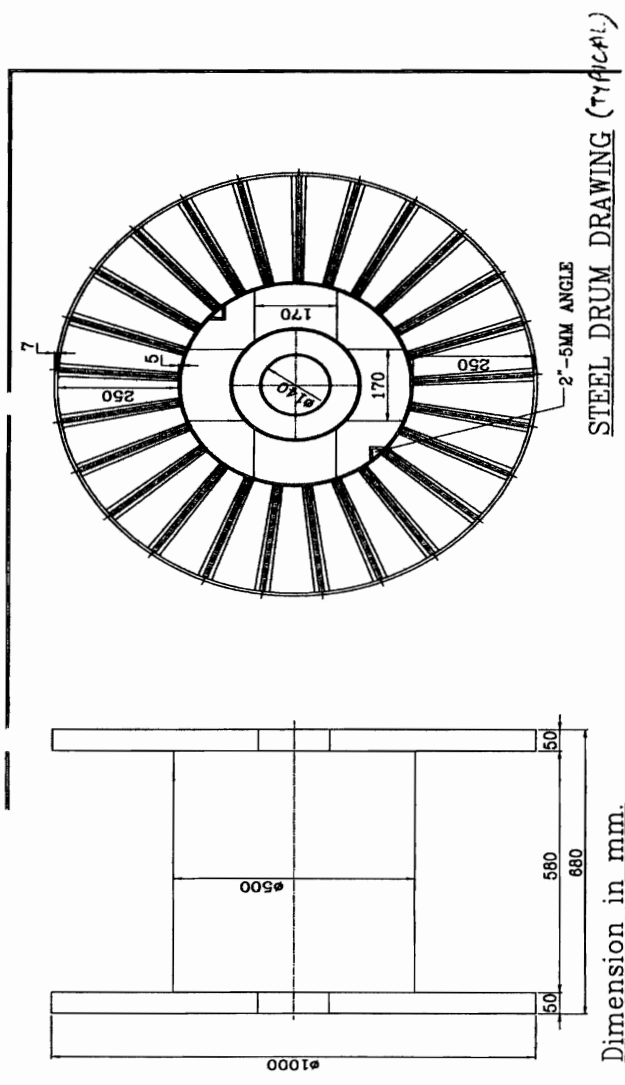
11.1.2 **Type of Construction**

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 40	OF 52



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



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

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

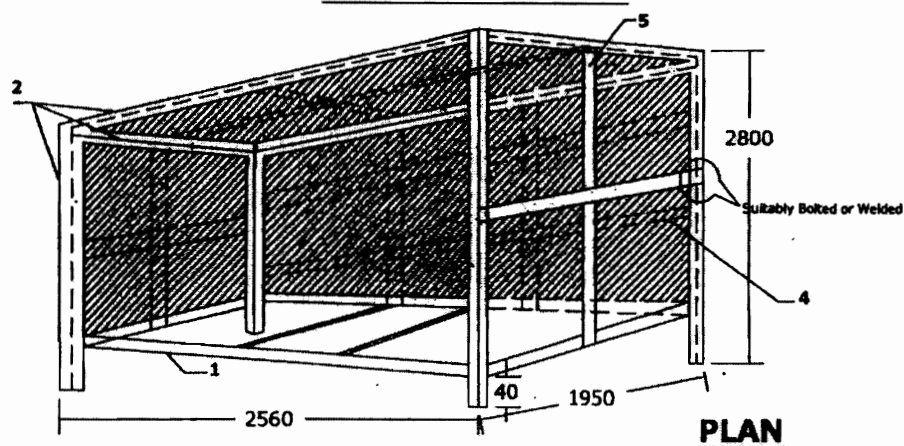
- 1) All Dimensions are in "mm" unless otherwise stated.
- 2) Packing Box shall be fabricated using 50x50x6mm MS Angle, 50x3mm Flat, 2.5 mm thick C Channel, 1mm & 1.6mm Thick sheet.
- 3) Finish of Packing Box Shall be Galvanized.
- 4) Angle & Channel Section forming part of the Main frame shall be welded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

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

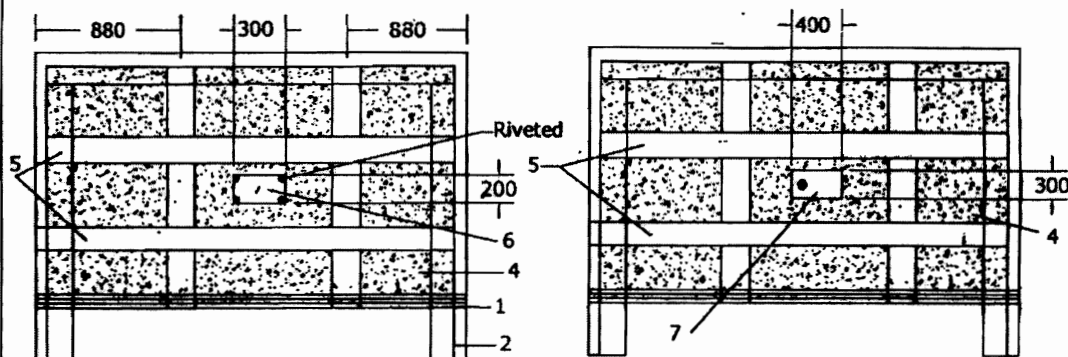
- 6) Welding Portion on galvanized surfaces shall be painted with Zinc Rich Paint.
- 7) Dispatch details such as consignor/consignee address, contract and case details, 'country of origin, port of delivery, stacking instructions shall be written on one of the side of boxes. An anodized aluminium plate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

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

STEEL PACKING (TYPICAL DETAILS)

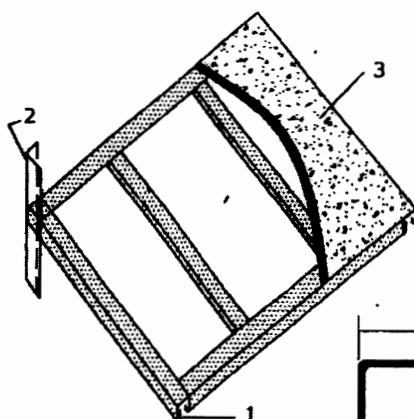


PLAN



FRONT SIDE OF BOX

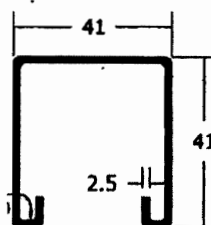
BACK SIDE OF BOX



BOTTOM FRAME ARRANGEMENT

Note:

1. "C" Channel to be used on Bottom Frame.
2. 50x50x6 Angle to be used Vertically on four sides of the Box and Horizontally on four sides on the top Frame.
3. 1.6mm thick sheet (plain) on Bottom Plate.
4. 1.0mm thick sheet to cover top & four sides of BOX.
5. 50x3 Flat as additional cross members to be used Horizontally & Vertically on top & Four Sides of Box.
6. Anodised Aluminium Plate for Marking.
7. Hinged Inspection Window.



DETAILS OF "C" CHANNEL

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

11.3 PACKING FOR STATION LIGHTING SYSTEM

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

11.3.1 For LIGHTING TRANSFORMER, DISTRIBUTION BOARDS, LIGHTING PANELS,

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

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

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

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

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

11.3.3 For CONDUIT PIPE

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

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

11.3.4 For POLES

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

11.3.5 For STRUCTURAL STEEL

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

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

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

	TITLE TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS	SPECIFICATION NO. PE-TS-888-100-A001	
		VOLUME II B	
		SECTION D	
		REV. NO. 0	DATE 10/08/2010
		SHEET 46	OF 52

PACKING PROCEDURE FOR CONDUIT PIPE

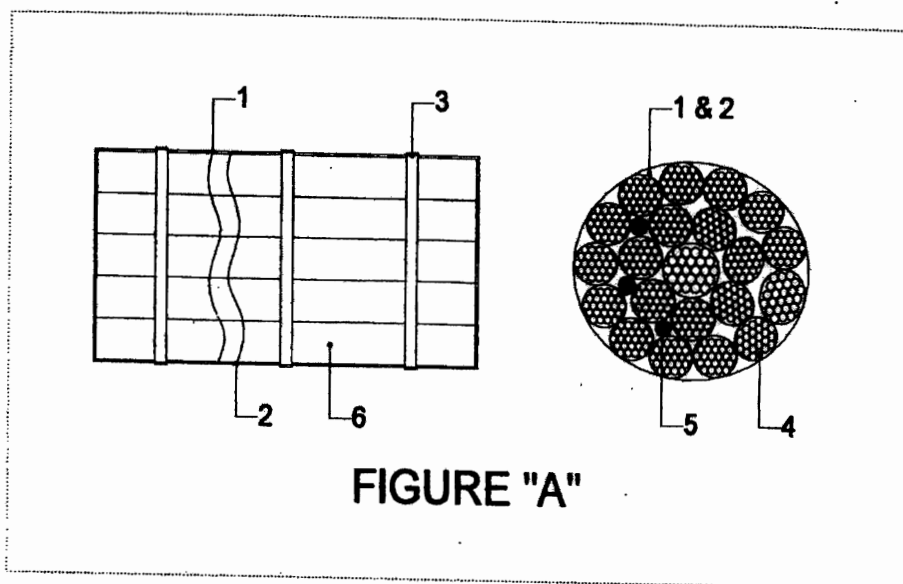


FIGURE "A"

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

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

PACKING PROCEDURE FOR STRUCTURAL STEEL

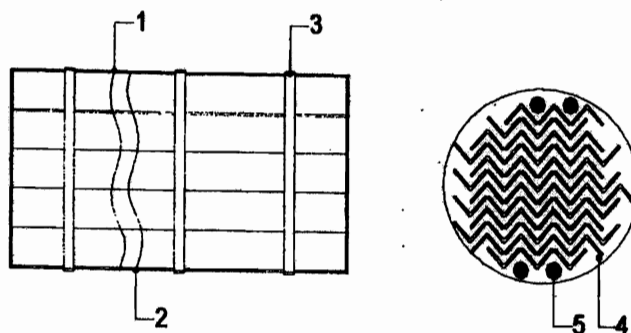
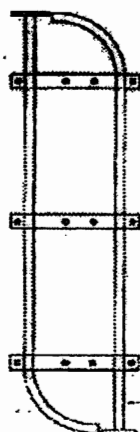


FIGURE "B"

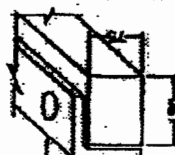
- 1) LAYER OF BITUMEN COATED HESSIAN KRAFT PAPER.
- 2) LAYER OF POLYTHENE SHEET.
- 3) METAL STRAPPING.
- 4) STRUCTURAL STEEL.
- 5) SILICA GEL POUCHES.

	TITLE		SPECIFICATION NO. PE-TS-888-100-A001	
	TECHNICAL SPECIFICATION FOR SEAWORTHY PACKING FOR EXPORT JOBS		VOLUME II B	
			SECTION D	
	REV. NO. 0	DATE 10/08/2010		
	SHEET 48	OF 52		

packing procedure for poles



POLES WRAPPED WITH POLYETHYLENE SHEET &
EXTRUDING COATED HESSIAN CLOTH



TOP WOODEN BATTEN TO BE
FIXED WITH L50x80x6 MM ON TOP
OF IT FOR TIEING THE ROD
25 MM DIA



BOTTOM WOODEN BATTEN TO BE
FIXED ON L50x80x6 MM ANGLE

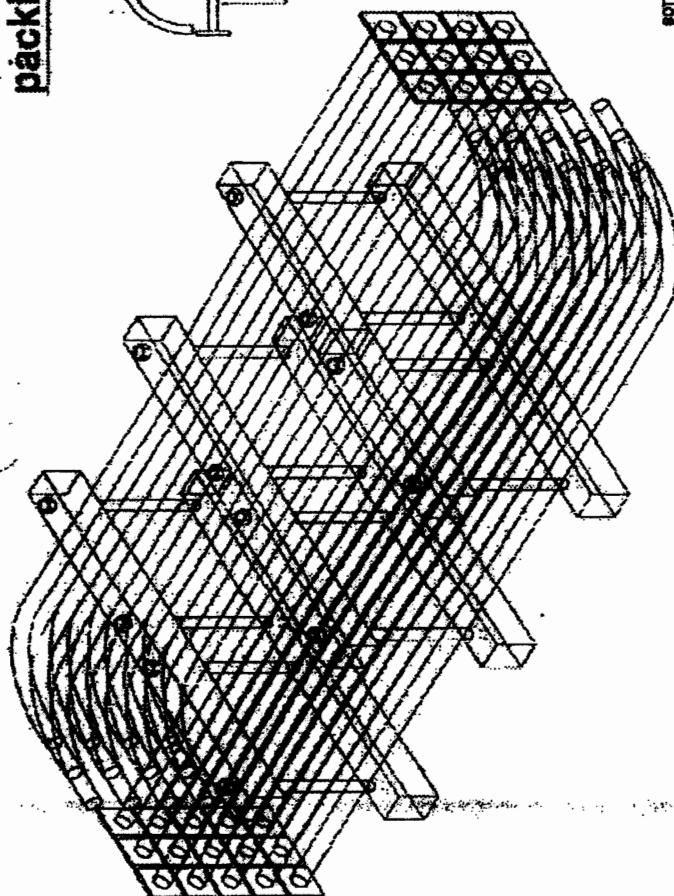


FIGURE "C"

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

11.4 PACKING FOR DC BATTERY

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

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

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

11.5 PACKING OF SERVICE TRANSFORMERS(OIL FILLED) & ACCESSORIES

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

11.5.01 PACKING DETAILS :

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

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

- d small / delicate items such as glass thermometer, door keys shall be packed in separate box.
- d In case original box is found damaged, suitable alternate box or packing method using felt or foam sheet and polythene wrap to be used.
- e These boxes are then placed in identified wooden boxes. Inside of such boxes are lined with a layer of polythene sheet, packing wool / grass and another layer of polythene sheet before placing the boxes. All boxes are then wrapped with this polythene sheet before closing the box. Fragile items shall not be placed loose, one above the other inside the case.
- f All wiring cables, connection flats of non-ferrous materials, CTs, valves bellows shall also be packed.
- g Items like CTs, Oil communicating bushings, insulators, wired equipments and housings such as RTCC Panel, M. Box, Drive Mechanism, thermometers, gauges shall be wrapped in polythene from all around.
- h Buchholz relay and OSR relay openings will be blanked using covers, before putting them in the box
- i Items shall be carefully lowered and arranged inside the crate / case and each item shall be locked from all sides in such a way to avoid its movement in any way. Wooden stoppers and separators shall be provided for this and nailed to the crate / case wood.
- j Wooden planks and batons in contact with fragile items shall be provided with kit foam at the locations of contact.
- k Oil communication bushings shall be packed in separate case on V or U shape wooden felted supports, as in case of condenser bushings.
- l While placing and arranging the items inside the crates / cases, these shall be verified for correctness and then the packing note shall be signed. The cover top of the crate / case shall then be closed.
- m The main equipment like transformer tank shall be packed suitably to prevent any damage during transit / storage. Support structures like frame, header supports etc. shall be crated. Conservator headers shall also be crated. Radiators pipe work and other instruments & components shall be packed in cases. All the cases shall be lined with polythene from inside.

11.6 ALTERNATIVE PACKING CASES FOR CONTROL PANELS AND SWITCH GEARS

For Control and switch gear panels, construction of wooden packing cases may be provided as per fig 14 & 15 and as detailed below.

Thickness of planks for all sides, binding and jointing battens shall be at least 25 mm. Width of the plank shall be at least 125mm and that of binding and jointing planks shall be at least 100mm.

Top frame shall be suitable so that it does not collapse due to sandwiching between slings while lifting. Longitudinal and traverse bars for the bottom wooden pallet to be suitably selected.

Diagonal bracings shall be as per cl 9.3.1.3 and all other requirements shall be as per clauses 9.3.1.4 to 9.3.1.6.

12.0 Containerization

As required by BHEL, the VENDOR shall stuff the GOODS into 20 or 40 foot containers (dry, open top, flat racks, etc.).

The maximum inside dimensions of containers are to be considered:

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

- 40 foot containers: 11.80 m x 2.20 m x 2.05 m
- 20 foot containers: 5.80 m x 2.20 m x 2.05m
-

The present definition of containerization is valid for sea containers only. Vendor to check the size of containers before start of packing of equipment.

12.1 Protection of Cases/Crates

Since shipping containers are in general not water tight, packing in contact with the floor of the container shall be raised in order to prevent it from being damaged by the accumulation of water.

12.2 Mechanical Constraints

The mechanical constraints for "general use" closed containers are of a different nature (height of "stacking" being limited inside the containers), the packing for the GOODS may be of a lighter structure. However, it is necessary that the packing be appropriate so as to protect the GOODS on site during the storage period, as required after discharging of the GOOD'S from the containers.

Note:

It is the responsibility of the VENDOR to ensure that the cases/crates are stowed, secured and fastened inside the container. The VENDOR will take all necessary precautions to conform to the maximum weight allowed and the centre of gravity of the container. The securing and fastening of the cases/ crates can be carried out by nailing timbers on the bottom or on the vertical sides of the container.

13.0 Other Services to be provided by Vendor

In addition to the packing and shipping documents, VENDOR must also carry out the following services, which shall be included in his quotation:

Carriage of VENDOR's sub-contracted equipment and material, which must be re-grouped in VENDOR's or PACKER's workshops, whilst waiting for packaging.

BHEL reserves the right to postpone the shipping of the GOODS. In this event, any storage and insurance costs during the first ninety (90) days shall be borne by the VENDOR.

Loading, including lifting, securing, lashing, and stowing, of all cases, crates, or packages onto means of transportation such as, but not limited to, trailers, containers, etc.

14.0 Responsibilities and Guarantees

VENDOR is responsible for the choice of category for packing according to the transport facilities used, and on the basis of the present document. In case of doubt or disagreement regarding the choice, VENDOR must inform BHEL prior to packing and await BHEL's approval. All phases of packaging, marking, loading, etc. will be subject to BHEL inspection.

BHEL reserves the right to reject the packing when the packing does not conform to these instructions and/or when the packing does not ensure perfect protection of the GOODS. VENDOR is responsible for the weights and dimensions declared, and the marking of the packages.

The documents must be in strict conformity with the packing contents.

The packing specified in these "Packing, Marking and Shipping Instructions" is guaranteed for a twelve (12) months storage period after delivery on site.

VENDOR is responsible for providing storage recommendation adapted to the GOODS. According to this guarantee, VENDOR is held responsible in the event of goods becoming

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

useless, damaged or broken, as a result of poor packing and/or stowing, or due to corrosion, subsequent to insufficient or inadequate protection. All direct or indirect costs resulting thereof, will be back-charged to VENDOR.

SPECIFICATION No: PE-TS-457-571-A102

SECTION : I

SUB-SECTION : D

REV 00

Annexure VIII - Pipe & Valve Material Specification (6 Pages)

Page 1 of 6

1. General

This specification covers the basic requirements for the design and materials of process and utility piping for the Flue Gas Desulfurization Plant.

2. Material Selection

- 1) Basically, rubber lined pipes are selected to prevent the corrosion and erosion for process service, namely slurry line and other line possible to contact with raw gas.
- 2) Class AA60 is applied according to process line conditions.
- 3) For utility services, other classes are applied.
- 4) In principle, piping material will conform to ASTM, but ASTM equivalent material specified by other authorized code may be applied.
- 5) Non-asbestos type shall be used for Packing and Gasket.

3. Design of Piping Component

- 1) In principle, each component of all piping will be selected from ANSI ASME or international standard in the dimensions and other requirements.
- 2) Metric series are applied to the bolt thread.
- 3) Nozzle weld tees or extruded tees are used as branch connection in lined piping, in general.
- 4) Short radius elbow may be used for 550mm or larger size piping.
- 5) Fittings for 50 and smaller galvanized piping shall be of screwed type.

4. Piping Material

1) Symbols of Piping Service Class

Piping service class name is composed of the following symbols.

Example: A A 60

Suffix Number

Second Pipe Material Symbol

First Pipe Material Symbol

Note:

First Pipe Material Symbol	
A: Lining	AA: Rubber Lining
B : Stainless Steel	BA: 304 Stainless steel
C: Carbon Steel	CA: A53 Gr.B Welded
	CC: A53 Gr.B or A106 Gr.B/C
	CG: Galvanized

2) Class No. and Fluid Designation

CLASS NO.	FLUID NAME	SYMBOL	
AA60	Gypsum Slurry	GS	
	Filtrate Slurry	FS	
	Waste Water	WW	
	Duct Drain	DD	
	Beltfilter Vent Gas	VBG	
BA01	Instrument Air	AI	
	Lube Oil (Low Pressure)	LOL	
CC01	Process Water	WP	Note 1
	Raw Water	WR	
	Cooling Water Supply	WCS	
	Cooling Water Return	WCR	
	Vacuum Pump Vent	VG	
	Antifoam Agent	AA	

Note I

Class AA60 shall be applied for process water service line in contact with corrosive and abrasive media.

3) Abbreviations

Abbreviations used throughout this specification are as follows:

BB	:	Bolted Bonnet
BC	:	Bolted Cover
BE	:	Bevel End
BW	:	Butt Weld
CAL	:	Calculation
CR	:	Chloroprene Rubber
E	:	Electric Resistance Weld
EPDM	:	Ethylene Propylene Diene Methylene Rubber
Eq	:	Equal
FE	:	Flange End
FF	:	Flat Face
G. OP	:	Gear Operation
Gal.	:	Galvanized
HEX.	:	Hexagon
IIR	:	Isobutylene Isoprene Rubber

ISRS	:	Inside Screw Rising Stem
La	:	Larger
L.OP	:	Lever Operation
NB	:	Nominal Bore
NW	:	Nozzle Weld
OS&Y	:	Outside Screw & York
PE	:	Plane End
PP	:	Poly Propylene
PTFE	:	Poly Tetra Fluoro Ethylene
RF	:	Raised Face
R/L	:	Rubber lined or rubber seated
S	:	Seamless
SB	:	Screw Bonnet
SC	:	Screw Cover
SCH	:	Schedule No.
SCR'D	:	Screwed
Sm	:	Smaller
SO	:	Slip On
St.	:	Stelliting
SW	:	Socket Weld
W	:	Weld
WN	:	Welding Neck
W/LINING	:	With Lining
V#	:	Valve No.
13 CR	:	13% CHROMIUM

CLASS	Max. Press. (MPaG)		1.1		C. A. mm	CLASS
AA60 (1/1)	Max. Temp. (degC)		65			AA60 (1/1)
FLUID	GYPSUM SLURRY					
ITEM	Size	Thickness	Specification			ITEM No.
PIPING	DN25 – DN50	SCH40	A53-B SML PE (I:R/L) ASME			
	DN65 – DN150	SCH40	A53-B E. R. W BE (I:R/L) ASME			
	DN200 – DN300	SCH20	A53-B E. R. W BE (I:R/L) ASME			
	DN350 – DN400	SCH10	A53-B E. R. W BE (I:R/L) ASME			
	DN450 – DN500	SCH10	A53-B E. R. W BE (I:R/L) ASME			
	DN550 – DN1000	7.9T	A134 (A283-C) EFW BE (I:R/L) ASME			
	DN1100– DN1200	9.5T	A134 (A283-C) EFW BE (I:R/L) ASME			
FITTING	DN25 – DN50	Suit to PIPE	BW A234-WPB (I:R/L) ASME-B16.9			
	DN65 – DN150	Suit to PIPE	BW A234-WPBW (I:R/L) ASME-B16.9			
	DN200 – DN300	Suit to PIPE	BW A234-WPBW (I:R/L) ASME-B16.9			
	DN350 – DN500	Suit to PIPE	BW A234-WPBW (I:R/L) ASME-B16.9			
	DN550 – DN1000	Suit to PIPE	BW A134 (A283-C) EFW (I:R/L) ASME-B16.9			
	DN1100– DN1200	Suit to PIPE	BW A134 (A283-C) EFW (I:R/L) ASME-B16.9			
SMOOTH BEND	DN25 – DN80	Suit to PIPE	BW A53-B (I:R/L)			
FLANGE	DN25 – DN600		SO A105 ASME150 SO FF (I:R/L) ASME-B16.5			
	DN650 – DN1800		SO A105 AWWA CL.B SO FF (I:R/L) AWWA-C207			
PINCH VALVE	DN25 – DN150		PN 16 A126-B TRIM-13CR SLEEVE-CR LINING-IIR FF HAND WHEEL			
GASKET	DN25 – DN600		V-2000 RUBBER RUBBER OR EQ. ASME150 2.0T FLAT RING			
	DN650 – DN1800		V-2000 RUBBER RUBBER OR EQ. AWWA CL.B 2.0T FLAT RING			
BOLT & NUT	ALL SIZE		STUD U HEAVY NUT A307-GR.B/A563-GR.A FINISHED			
Note: I: R/L - Replaceable Wear Resistant Natural Rubber Lining of minimum 6mm thickness. Additional thickness of 2 mm rubber lining shall be provided in bends.						

CLASS	Max. Press. (MPaG)	1		C. A. mm
BA01 (1/1)	Max. Temp. (degC)	45		
FLUID	INSTRUMENT AIR, LUBE OIL			
ITEM	Size	Thicknes s	Specification	
PIPING	DN6- DN50	SCH40S	A312-TP304 SML PE ASME	
	DN65-DN250	SCH20S	A312-TP304 E. R. W BE ASME	
FITTING	DN6 - DN50	Suit to PIPE	3000LB SW A182-F304 ASME-B16.11	
	DN65 - DN250		BW A403-WP304 ASME-B16.9	
FLANGE	DN6 - DN50	Suit to PIPE	SW GR. 304 GR. 304 ASME150 SW RF ASME-B16.5	
	DN65 - DN250		LOOSE A105 ASME150 LOOSE ASME-B16.5	
GATE VALVE	DN6 - DN50		API-602 PN 16 A182-F304 AISI304 SW BB, OS&Y HAND WHEEL	
	DN65 - DN250		ASME-B16.34 PN 16 A351-CF8 AISI304 RF BB, OS&Y HAND WHEEL	
GASKET	DN6 - DN150		V-6500 NON-ASBESTOS OR EQ. ASME150 1.5T FLAT RING	
	DN200- DN250		V-6500 NON-ASBESTOS OR EQ. ASME150 3.0T FLAT RING	
BOLT & NUT	ALL SIZE		STUD U HEAVY NUT A307-GR. B/A563-GR. A FINISHED	

CLASS	Max. Press. (MPaG)	0.11	0.85		C. A. mm
CC01 (1/1)	Max. Temp. (degC)	155	45		
FLUID	WATER, VENT GAS				
ITEM	Size	Thickness	Specification		
PIPING	DN6 - DN50	SCH80	A53-B SML PE ASME		
	DN65 - DN150	SCH40	A53-B E. R. W BE ASME		
	DN200 - DN300	SCH20	A53-B E. R. W BE ASME		
FITTING	DN6 - DN50		3000LB SW A105 ASME-B16.11		
	DN65 - DN150	Suit to PIPE	BW A234-WPB ASME-B16.9		
	DN200 - DN300		BW A234-WPB ASME-B16.9		
FLANGE	DN6 - DN150	Suit to PIPE	SO A105 ASME150 SO RF ASME-B16.5		
	DN200 - DN300		SO A105 ASME150 SO RF ASME-B16.5		
GATE VALVE	DN6 - DN50		API-602 PN16 A105 13CR SEAT STL SW BB, OS&Y HAND WHEEL		
	DN65 - DN300		ASME-B16.34 PN16 A395 13CR RF BB, OS&Y HAND WHEEL		
GLOBE VALVE	DN6 - DN50		API-602 PN16 A105 13CR SEAT STL SW BB, OS&Y HAND WHEEL		
	DN65 - DN300		ASME-B16.34 PN16 A395 13CR RF BB, OS&Y HAND WHEEL		
CHECK VALVE	DN6 - DN50		API-602 PN16 A105 13CR SEAT STL SW BC, LIFT		
	DN65 - DN300		ASME-B16.34 PN16 A395 13CR RF BC, SWING		
BALL VALVE	DN6 - DN100		ASME-B16.34 PN16 A105 AISI304 RF BALL LEVER. FULL BORE		
BUTTERFLY VALVE	DN50 - DN150		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER LEVER.		
	DN50 - DN150		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER AIR CYLINDER W/L. SWITCH		
	DN50 - DN150		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER ELECTRIC MOTOR W/L. SWITCH		
	DN200 - DN300		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER WHEEL WITH GEAR		
	DN200 - DN300		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER AIR CYLINDER W/L. SWITCH		
	DN200 - DN300		ASME-B16.34 PN16 A216-WCB 13CR EPDM RF WAFER WAFER ELECTRIC MOTOR W/L. SWITCH		
GASKET	DN6 - DN150		V-6500 NON-ASBESTOS OR EQ. ASME150 1.5T FLAT RING		
	DN200 - DN300		V-6500 NON-ASBESTOS OR EQ. ASME150 3.0T FLAT RING		
BOLT & NUT	ALL SIZE		STUD U HEAVY NUT A307-GR. B/A563-GR. A FINISHED		



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION

SPECIFICATION No: PE-TS-463-571-A002

SECTION: II

REV. 00

SECTION - II



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
LIST OF DOCUMENTS TO BE SUBMITTED WITH BID

SPECIFICATION No: PE-TS-463-571-A102

SECTION : II

ANNEXURE : 1

REV: 00

SHEET 1 OF 1

ANNEXURE - 1

DRAWINGS / DOCUMENTS TO BE SUBMITTED WITH THE BID

Bidder should submit the filled up (wherever applicable), signed and stamped copy of the following documents along with the offer/ bid for technical evaluation:

Sl. No.	Reference	Description
1.	Annexure-2	COMPLIANCE CUM CONFIRMATION CERTIFICATE
2.	Annexure-3	PRE BID CLARIFICATION SCHEDULE
3.	Annexure-4	DEVIATION SHEET (COST OF WITHDRAWAL)
4.	Annexure-5	SCHEDULE OF GUARANTEES
5.	Annexure-6	LIST OF MAKES OF SUB VENDOR ITEMS
6.	Annexure-7	LIST OF TOOLS & TACKLES
7.	Annexure-8	EQUIPMENT DATA SHEET/ SCHEDULE (TO BE FILLED BY BIDDER)
8.	Annexure-9	A) LIST OF COMMISSIONING SPARES B) LIST OF RECOMMENDED SPARES
9.	-	UNPRICED SCHEDULE IN THE PRICE FORMAT ISSUED ALONG WITH TENDER (including GPC FORMAT)

	4x250 MW BRBCL NABINAGAR TPP	SPECIFICATION No: PE-TS-463-571-A102
	LIME FEEDING / DOSING SYSTEM	SECTION : II
	TECHNICAL SPECIFICATION	ANNEXURE : 2
	COMPLIANCE CUM CONFIRMATION	REV. NO. 00
	CERTIFICATE	SHEET: 1 OF 2

COMPLIANCE-CUM-CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

- a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.
- b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'.
- c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.
- d) All drawings/ data-sheets / calculations etc. submitted along with the offer, if not sought/required for bid evaluation shall not be taken cognizance off.
- e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements, the same shall be resolved by the bidder during the pre-bid discussions, otherwise BHEL/Customer's decision shall be binding on the bidder, whenever the deficiency is pointed out.

For components where materials are not specified, the same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same are deemed to be included in the base price.
- g) All sub-vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee/Warranty for plant/equipment shall be as per relevant clause of GCC / SCC / other Commercial Terms & Conditions
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break-up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site

	4x250 MW BRBCL NABINAGAR TPP	SPECIFICATION No: PE-TS-463-571-A102
	LIME FEEDING / DOSING SYSTEM	SECTION : II
	TECHNICAL SPECIFICATION	ANNEXURE : 2
	COMPLIANCE CUM CONFIRMATION	REV. NO. 00
	CERTIFICATE	SHEET: 2 OF 2

commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account.

j) Schedule of drawings/documents/quality plans submission, comment incorporation & approval shall be as stipulated elsewhere in the specification. 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.

k) As-built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tampered with this compliance-cum-confirmation certificate and if at any stage any tampering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

m) Successful bidder shall furnish detailed erection/installation manual for each of the equipment supplied under this contract as per the schedule of submission of documents and well before the scheduled erection of the equipment / component concerned.

n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and shall require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

911/2020/PS-PEM-MAX



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION

PRE-BID CLARIFICATION SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102

SECTION : II

ANNEXURE : 3

REV. NO. 00

SHEET: 1 OF 1

PRE-BID CLARIFICATION SCHEDULE

S. NO.	SECTION/CLAUSE/PAGE NO.	STATEMENT OF THE REFERRED CLAUSE	CLARIFICATION REQUIRED

The bidder hereby clarifies that above mentioned are the only clarifications required on the technical specification for the subject package.

Signature: _____

Name: _____

Designation: _____

Company: _____

Date: _____

Company Seal

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION DEVIATION SCHEDULE	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : II	
		ANNEXURE : 4	
		REV: 00	
		SHEET 1 OF 1	

DEVIATION SHEET (COST OF WITHDRAWAL)

**(TO BE FILLED UP BY BIDDER IN THE FORMAT ATTACHED AS
 ANNEXURE –II OF GENERAL CONDITIONS OF CONTRACT ISSUED
 ALONG WITH TENDER. ANY DEVIATION QUOTED ELSEWHERE/ IN
 OTHER FORMAT SHALL NOT BE CONSIDERED)**

911/2020/PS-PEM-MAX

	4x250 MW BRBCL NABINAGAR TPP LIME FEEDING / DOSING SYSTEM TECHNICAL SPECIFICATION SCHEDULE OF GUARANTEES	SPECIFICATION No: PE-TS-463-571-A102	
		SECTION : II	
		ANNEXURE : 5	
		REV: 00	
		SHEET 1 OF 2	

SCHEDULE OF GUARANTEES



4x250 MW BRBCL NABINAGAR TPP

LIME FEEDING / DOSING SYSTEM

TECHNICAL SPECIFICATION

SCHEDULE OF GUARANTEES

SPECIFICATION No: PE-TS-463-571-A102

SECTION : II

ANNEXURE : 5

REV: 00

SHEET 2 OF 2

1.0 PERFORMANCE GUARANTEE

All performance tests for LDS shall be carried out in accordance with the relevant latest international codes/standards.

- 1) Bidder shall furnish Performance guarantee for the design, manufacture, material, safe and trouble-free operation of the LDS and its accessories.
- 2) Bidder shall furnish guaranteed power consumption for the Lime Dosing/Feeding System. Guaranteed Power Consumption in the applicable format shall be submitted in sealed envelope along with price bid as part of techno commercial offer. However along with unpriced format, bidder shall furnish guaranteed power consumption format indicating "Quoted" in the table provided in Annexure-IV of the price schedule.
- 3) Vendor shall Guarantee and demonstrate Bucket Elevator design capacity (1 TPH). Further satisfactory operation of the downstream system of bucket elevator shall also be demonstrated by bidder in line with design capacities mentioned in the technical specifications.
- 4) Noise level ≤ 85 dB (A) at 1 m horizontal distance from equipment/enclosures & 1.5m above operating floor is to be guaranteed.
- 5) Vibration levels measured on the non-rotating parts shall not exceed the zone limit "B" as defined in ISO 10816 at steady conditions and shall not exceed the zone limit "C" as defined in ISO 10816 at transient conditions.
- 6) Acceptance tests to be carried out as per the procedure defined by the bidder which shall be submitted for BHEL/ BRBCL approval.
- 7) In the event that the performance test is unsuccessful, bidder shall take necessary remedial action at his cost and the performance test shall be repeated.

Bidder is required to submit signed & stamped copy of this document.



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
SUB-VENDOR LIST

SPECIFICATION NO. PE-TS-463-571-A102
SECTION : II
ANNEXURE : 6
REV 00
SHEET 1 OF 1

LIST OF MAKES OF ITEMS

<u>S.N.</u>	<u>ITEM NAME</u>	<u>MANUFACTURER</u>	<u>LOCATION</u>



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
LIST OF SPECIAL TOOLS & TACKLES

SPECIFICATION No: PE-TS-463-571-A002

SECTION : II

ANNEXURE : 7

REV 00

SHEET 1 OF 1

LIST OF SPECIAL TOOLS & TACKLES

S.N.	ITEMS	QUANTITY



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 1 OF 7

EQUIPMENT DATA SHEET/SCHEDULE

S.NO	DESCRIPTION	DATA
I	GENERAL	
1.	Client	BHEL-PEM, Noida
2.	Project	4x250 MW BRBCL NABINAGAR TPP
3.	End Customer	BRBCL/Consultant: NTPC
4.	Location	Aurangabad, Bihar
5.	Service	Continuous
6.	Installation	Inside the Building
7.	Quantity for all 3 FGD units	2 sets (1W+1S) of Lime Feeding/Dosing System
II	MANUFACTURER DETAILS	
1.	a. Model	Bidder to Provide
2.	b. Type	Bidder to Provide
III	OPERATING CONDITION	
	Medium to be handled	Bulk Lime / Lime slurry
IV	TECHNICAL DATA	
A	BUCKET ELEVATOR	
1.	Qty.	2 Nos.
2.	Type	Continuous discharge type
3.	Material to be handled	Lime powder
4.	Bulk density	450 kg/m ³ (volumetric) 640 kg/m ³ (load/structural)
5.	Capacity Rated / Design (TPH)	0.25 / 0.5
6.	Speed (m/sec)	Bidder to specify
7.	Lift height (m)	To suit layout/ 12-14m approx. (Invert level of Pit below Finish Floor Level to Top of Lime Silo- As per enclosed drg). Bidder to accommodate ± 5 % variation in lift height without any price implication.
8.	Bucket type	Bidder to specify
9.	Bucket size	Bidder to specify
10.	Bucket thickness / MOC	4 mm thk./ SS 304



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 2 OF 7

11.	Belt Specifications	Bidder to specify
12.	Casing material of construction	MS, 6 mm thick. Top/ bottom casing, 4mm thk. Middle and hood casing
13.	Pulley type	Bidder to specify
14.	Head /Boot Pulley dia.	Bidder to specify
15.	Bearing type	Spherical roller bearing of suitable size
16.	Take up type	Bidder to specify
17.	Motor type	As per Motor Specification
18.	Motor KW	Bidder to specify
19.	Gear box	Bidder to specify
20.	Gear box ratio	Bidder to specify
21.	High Speed coupling	Bidder to specify
22.	Low Speed coupling	Bidder to specify
23.	Hold back	Bidder to specify
24.	Drive base frame	Bidder to specify
25.	Zero Speed Switch	Required.
B LIME SILO		
1.	Qty.	2 Nos. (1W+1S)
2.	Service/Application	Lime powder handling
3.	Location	Indoor (Gypsum Dewatering Building)
4.	Operating Pressure	Atmospheric
6.	Design Temperature	60 °C
7.	Design Code	IS 9178
9.	Silo Capacity	1 m ³ each/ To suit system requirement
10.	Silo Cylinder Diameter	1 m
11.	Silo Cylinder Height	1.8-2.0 m
12.	Total Silo Height	3.4-3.6 m
13.	Silo Bottom Cone Angle	70 °
14.	Material for Shell & Bottom Cone	IS 2062: 2011 E250 Quality BR
15.	Thickness of shell	10 mm (Min.) + 3 mm (min. corrosion allowance)
16.	Material of Silo cone internal lining (conical portion)	SS304



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 3 OF 7

17.	Thickness Of SS lining	4 mm
18.	Outlet of Cone Silo	To suit Screw conveyor
10.	Moisture contain in Lime powder	8%
11.	Lime Powder Particle size	During detailed engineering
12.	Bulk density of material	450 kg/m ³ (volumetric) 640 kg/m ³ (load/structural)
C CHUTES AND HOPPERS		
1.	Minimum Valley Angle	Bidder to Provide
2.	Material :	Bidder to Provide
	i) Chute work	Bidder to Provide
	ii) Sliding zones & adjacent sides	Bidder to Provide
	iii) No striking/ Non sliding zones	Bidder to Provide
	iv) Chute with valley angle 80	Bidder to Provide
	v) In the zone of magnetic field	Bidder to Provide
	vi) In the zone of flap gates	Bidder to Provide
	vii) Discharge Hoods overhead pulleys	Bidder to Provide
3.	Inspection Doors	Bidder to Provide
4.	Chute Construction	Bidder to Provide
	i) Corners	Bidder to Provide
	ii) Joints Bolted	Bidder to Provide
	iii) Bolt size	Bidder to Provide
	iv) Bolts spacing	Bidder to Provide
D a) SCREW CONVEYOR (DUTY PARAMETERS)		
1.	Orientation of screw Axis	Horizontal
2.	Length of Screw Conveyor from Feed to Discharge end	2.5-3.0 m (approx.)/ To suit layout requirement
3.	Quantity of Lime to be handled (Rated/ Design) TPH	To suit Process requirement / 30 kg/hr
4.	Material to be handled	Hydrated Pulverized Lime
5.	Impurities	Traces of chloride
6.	Type of Inlet feed	Vertical
7.	Abrasiveness type	abrasive
8.	Shape of dust	Spherical.
9.	Hardness	Bond index = 3
10.	Moisture contain	8%



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 4 OF 7

11.	Particle size	200 mesh
12.	Bulk density of material	550 kg/m ³
13.	Design Temperature	45°C
14.	Type of operation	Batch/ continuous
15.	Place of application	Gypsum Dewatering Building
16.	Type of Screw	Continuous helical spirally welded on central pipe.
17.	Type of Trough	" U" Trough
18.	Length of the screw flight and outlet spout size	Vendor to confirm
19.	Saddle supports for Trough	To be provided throughout the length of Trough.
20.	Hanger bearing	Not to be used.
21.	Diameter of the Screw and Pitch of the flight	Vendor to confirm
22.	Trough Ends	Trough end to be provided at both drive and tail ends to support the central screw, and bearings with Plummer block (anti friction type) and to hold the sealing arrangement to avoid air ingress.
23.	Seal type	Split gland type to be provided
24.	Moisture content	8% (approx)
25.	Ambient Temperature	As per details in Project Information
26.	Angle of repose for the dust	70 degree
27.	Type of operation	Batch Operation
28.	Measure for prevention of explosion	Not required
29.	Whether Hygroscopic	Yes
30.	Whether corrosive	Yes
D	b) SCREW CONVEYOR (MOC)	
1.	Trough	3.15mm. thick min. SS304 (suitable MS supports to be provided)
2.	End plate	SS304, thickness not less than 8mm
3.	Screw flight	SS304, 3.15 thick minimum.
4.	Central pipe (Holding the screw)	SS304, 3.15 thick minimum.
5.	End shaft	EN24 shrink fitted with central pipe and welded.
6.	Type of bearings	Spherical Roller Bearings



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 5 OF 7

7.	Drive and tail end bearings	Anti-friction bearings with plumper block. Vendor to specify.
8.	Make of bearings	SAF/FAG/NTN / SIBCO / Equivalent
9.	Drive, Driven & Tightened Sprocket	EN24 (Forged with hardness 450 –500 BHN)
10.	Top cover with inspection door(for extension outside portion Flanged Type)	SS304
11.	Gasket	EPDM Rubber (5Thk)/ equivalent
12.	Connecting Chute	SS304
13.	Chain and sprocket should be of reputed make. Chain – EN24 Forged Hardness 350-400 BHN Sprocket – EN24 Forged Hardness 450-500 BHN	
E	DETAILS OF DRIVE & DRIVE MOTOR (SCREW CONVEYOR)	
1.	Type of drive	Geared motor directly coupled to screw end or connected by chain and sprocket with suitable chain adjuster.
2.	Type of gear box	Helical gear box (The gear motor assembly shall be of integral with flange mounted motor)
3.	Whether zero speed switch/monitor Required.	No.
4.	Support for Drive system	To be provided.
5.	Safety Guards	To be provided
6.	Drive Rating	To be indicated by the vendor. Necessary backup calculation substantiating the same to be furnished along with the offer
F	NEUTRALISATION TANK	
1.	Qty.	2 Nos. (1W+1S)
2.	Service/Application	Lime Neutralisation Tank
3.	Location	Indoor
4.	Operating Pressure	Atmospheric
5.	Design Pressure	Design Liquid Level
6.	Design Temperature	60 °C
7.	Design Code	IS: 803
8.	Hydro Test	Full of Water
9.	Tank Capacity Normal/Maximum	1.8 m ³ / 2.3 m ³ each To suit system requirement
10.	Tank Diameter	1.5 m



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 6 OF 7

11.	Tank Height	1.8 m / To suit
12.	Tank Top Style	Flat
13.	Tank Bottom Style	Flat
14.	Material for Shell, top & Bottom	IS 2062: 2011 E250 Quality BR
15.	Thickness of shell	As calculated from IS: 803 + 3 mm (min. corrosion allowance)
16.	Material of Tank internal lining	Chlorobutyl/Bromobutyl Rubber
17.	Thickness Of lining	5 mm
18.	Nozzle Schedule & Orientation	1 no. Inlet for service water, 1 no. outlet for Waste water tank & other nozzles as required in GA drg.
G AGITATOR		
1.	Qty.	2 Nos. (1 no per neutralization tank)
2.	Type	Top entry
3.	Location	Indoor (over Neutralisation Tank)
3.	MOC	Impeller & Shaft - Alloy 926
4.	Impeller Tip Speed	Must not exceed 12m/s
6.	Reduction Gear	To be provided
H LIME SLURRY DOSING PUMPS		
1.	Qty.	4 Nos. (1W+1S in each neutralization tank)
2.	Type	Radial Split, Centrifugal, Continuous Duty
3.	Location	Indoor
4.	Rated Capacity Flow (m ³ /hr)	Bidder to Provide
5.	Rated Capacity Head (mWCI)	Bidder to Provide
6.	Rated Capacity Power (KW)	Bidder to Provide
7.	Power consumption (KW)	Bidder to Provide
8.	Pump Speed (rpm)	Bidder to Provide
9.	Motor Rating (KW)	Bidder to Provide
10.	Motor Speed (rpm)	Bidder to Provide
11.	Margins (Flow/Head) (%/%)	Bidder to Provide
12.	Operation Pressure	Bidder to Provide
13.	Design Pressure	Bidder to Provide
14.	Material of Base plate	Bidder to Provide
15.	Material of Casing	Bidder to Provide
16.	Material of Shaft	Bidder to Provide
17.	Material of Impeller	Bidder to Provide
18.	No. of Bearings	Bidder to Provide



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
EQUIPMENT DATA SHEET/SCHEDULE

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 8
REV 00
SHEET 7 OF 7

19.	Type Of Bearings	Heavy duty ball bearings
20.	Type of coupling	Bidder to Provide
I	SLURRY PIPES	
1.	Pipe size (mm)	Bidder to Provide
2.	Type of Joints	Bidder to Provide
	Pipe to Pipe/Pipe to Fittings	Bidder to Provide
	Fittings	Bidder to Provide
3.	Material / Thickness (mm) of Pipe	MSRL/ for pipes size lower than 3 inch abrasive resistant FRP material (silicon carbide coating on slurry exposed surface)
4.	Material Thickness of lining	Bidder to Provide
5.	Estimated Life of liners (hrs.)	Bidder to Provide
6.	Slurry Solid concentration (w/w)	Bidder to Provide
7.	Slurry Settling Velocity (m/s)	Bidder to Provide
8.	Pipe Velocity (m/s)	Bidder to Provide
J	SUPPORTING STEEL STRUCTURE, PLATFORMS, RAILINGS, LADDERS	
1.	Qty.	As per system requirements (for 2 no Lime Feeding/Dosing System)



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
LIST OF COMMISSIONING SPARES

SPECIFICATION No: PE-TS-463-571-A102
SECTION : II
ANNEXURE : 9
REV 00
SHEET 1 OF 2

A) LIST OF COMMISSIONING SPARES

S.No.	ITEMS	QUANTITY



4x250 MW BRBCL NABINAGAR TPP
LIME FEEDING / DOSING SYSTEM
TECHNICAL SPECIFICATION
LIST OF COMMISSIONING SPARES

SPECIFICATION No: PE-TS-463-571-A102

SECTION : II

ANNEXURE : 9

REV 00

SHEET 2 OF 2

B) LIST OF RECOMMENDED SPARES

S.No.	ITEMS	QUANTITY