

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 1 of 25	

COPYRIGHT AND CONFIDENTIAL
The information on this document is the property of **BHARAT HEAVY ELECTRICALS LIMITED**,
It must not be used directly or indirectly in any way detrimental to the interest of the company.

TECHNICAL SPECIFICATION FOR FOAM PUMP WITH DRIVES

PROJECT	1X660 MW BHUSAWAL TPS UNIT-6
CUSTOMER	MAHARASHTRA STATE POWER GENERATION CO. LTD., ,BHUSAWAL
CONSULTANT	DEVELOPMENT CONSULTANTS PVT. LTD., CONSULTING ENGINEERS,VASHI,MUMBAI

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
	 RAJEEV JAIN	 GIRISH PRASAD PALO	 SURYA SATYA NAGESH M	12.06.2020

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 2 of 25	

INDEX

S. No.	DESCRIPTION
1.0	Intent of Specification
2.0	Special Instructions to Bidders
3.0	Project Information
4.0	Application of System
5.0	Technical Details/Requirements
6.0	Scope of Supply
7.0	Optional Prices
8.0	Equipment qualification criteria (EQC)
9.0	Quality Plan & Inspection Agency & Testing
10.0	Painting
11.0	Packing and Forwarding
12.0	Sub Vendors
13.0	Documentation
14.0	Price Bid Format
15.0	Pre-Bid Clarifications
16.0	Variant table

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 3 of 25	

LIST OF ENCLOSURES	
	Annexure 1 – A: P&ID for Pump & Drive assembly Annexure 1 – B: Layout (Typical) Annexure 1 – C: Exhaust Piping layout
	Annexure 2 - Pump-Motor-Engine datasheet
	Annexure 3 - Price bid Format
	Annexure 4 - Checklist
	Annexure 5- Customer/Consultant specification Annexure 5- A: Technical Specification For Fire Protection System(Diesel Engine) Annexure 5- B: Technical Specification For A.C. & D.C. Motors Annexure 5 – C: General Electrical Specification Annexure 5- D: C&I Specification Annexure 5- E: Misc Specification
	Annexure 6 - Void
	Annexure 7 - QAP Guide Line & Formats
	Annexure 8- Sub-vendor List
	Annexure 9 - Master DOC List Format
	Annexure 10- Deviation Format
	Annexure 11- Pre-bid clarification format

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 4 of 25	

DOCUMENTS TO BE SUBMITTED WITH THE BID:

The bidder must submit the following documents along with their bid to enable BHEL to evaluate their offer.

- i. Duly filled in Foam Pump-Motor-Diesel Engine datasheet (**Annexure-2**)
- ii. Tentative GA Drawings for Foam Pump & Drive assembly
- iii. Performance curves for Pump
- iv. Un-priced copy of price in attached BHEL price bid formats (**Annexure-3**) indicating quoted/ not quoted against each row & column.
- v. Checklist as per (**Annexure-4**)
- vi. Equipment qualification criteria / PTR / Reference Lists as per (**Annexure-6**)
- vii. Bidder shall submit **NO DEVIATION certificate** along with their offer. Any specific deviations, which are impractical, shall be raised in form of pre-bid queries as per Annexure-11 before submission of Techno Commercial offer.

In case the above-mentioned documents are not submitted with the offer, the offer of the bidder may be liable for technical rejection.



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet 5 of 25

1. INTENT OF SPECIFICATION

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, Testing at manufacturer's works and Delivery of properly packed and painted **Foam Pumps** including drive assembly with all accessories as specified in the scope of work and as required for the safe and trouble-free operation of equipment to be installed at site.

2. SPECIAL NOTES TO BIDDERS

- 2.1** This specification shall be read in conjunction with its enclosures. In case of any discrepancy arising between this specification & its enclosures, the most stringent of all shall be followed and shall over-ride others. Further, if a requirement in this specification or its enclosures, calls for decision of owner/BHEL, it shall be bidder's sole responsibility to clearly bring out the same distinctively in his technical tender offer, so as to enable owner/BHEL to furnish their decision. If such a requirement is not duly addressed by bidder during tender stage and same comes out during order execution stage, it shall be binding on the bidder to comply with the decision furnished by owner/BHEL then, without any cost, delivery, or any other commercial implications.
- 2.2** Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.
- 2.3** The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipment's. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the Pump unit is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.
- 2.4** Bidder shall quote strictly as per the scope of supply and requirements of this specification.
- 2.5** Bidder offer shall be strictly as per these specification requirements. Unsolicited or Alternate offers from the bidders will not be entertained.
- 2.6** In case bidder feels that it is necessary to exclude some components of scope of supply or some of the features of specification requirements due to any technical constraints, bidder shall bring the same to the notice of purchaser during pre-bid stage and take their prior approval before submission of their bid.
- 2.7** Incase Bidder is unable to offer due to any specific requirement of specification, Bidder shall bring out the same in their regret letter. Otherwise, it will be considered that non-participation by the bidder is attributable to reasons other than any specification requirements.



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet 6 of 25

3. PROJECT INFORMATION

Sl. No.	Owner	MAHARASHTRA STATE POWER GENERATION CO. LTD.
1.	Project	BHUSAWAL THERMAL POWER STATION 1 X 660 MW UNIT-6 PROJECT
2.	Owner's consultant	M/s PROCON ENGINEERS (DIV. OF NIMOTO CONSULTING ENGINEERS PVT. LTD.)
3.	Location	Site is located in Dipnagar near Bhusawal, Maharashtra, India
4.	Nearest Airport	Aurangabad
5.	Nearest Railway Station	Bhusawal
6.	Longitude/latitude	75°51'10" East/21°02'30" North
7.	Lowest temperature recorded (deg. C)	13
8.	Highest temperature recorded (deg. C)	48.7
9.	Elevation above MSL	210 m
10.	Wet bulb temperature (deg. C)	27 (Maximum)
11.	Maximum Ambient temperature for Electrical equipment / system (deg. C)	50
12.	Minimum Ambient temperature for Electrical equipment / system (deg. C)	13
13.	Seismic Zone	Zone III as per IS :1893

Note: Any data required for designing the equipment, bidder may ask prior to the submission of bid.

4. APPLICATION OF SYSTEM

1 No. of Electric motor driven and 1 No. of Diesel Engine driven Foam Pump (Gear Pump) [Total : 2 Nos.] is envisaged for supplying foam to foam system from the foam storage tank.

5. DESIGN PARAMETERS/TECHNICAL DETAILS/REQUIREMENTS**5.1. Design Parameters and Technical Details/Requirements of Foam Pump**

Sl. No.	Description	Foam Pump
1	Number of Pumps & Drive	2 Nos. [1 No. Motor Driven + 1 No. Diesel Engine Driven]
2	Drives (Pump Supplier Scope)	1 No. Motor & 1 No. Diesel Engine



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet 7 of 25

3	Application	To transfer Foam in Fire fighting System
4	Pump Type	Gear Pump
5	Pump Standard	As per Manufacturing Standard duly taking care of TAC requirement
6	Motor Standard	Relevant Indian Standards and as Per TAC duly taking care of attached Customer Specification for Motor
7	Diesel Engine Standard	As Per TAC
8	Design Pump Capacity	4.1 m3/hr
9	Discharge Pressure	12.1 Kg/cm ² (g)
10	Fluid Handled	1. Type : Aqueous Film Forming Foam Concentrate 3% 2. Concentration ratio : 3% 3. Appearance : Clear Amber Liquid 4. pH : 6.5 - 8.5 at 20 deg. C 5. Specific Gravity : 1.02 +/- 0.02 at 20 deg. C 6. Viscosity : Less than 10 cst at 20 deg C 7. Storage : Storage temperature is lower than 49° C.
11	Available Pressure at Center line of Suction nozzle of Pump	1.0 Kg/cm ² (a)
12	NPSH (A) at pump suction flange	Flooded suction
13	Power Supply to Motor	3 phase, 415V, (+/- 10%), 50Hz (+/- 5%)
14	Material of construction for Pump	Casing (Pump body) : CF8M Rotor Gear : SS 316 Rotar Shaft : SS 431 End cover : SS 316 Wearing Plates : Ph Bronze (LTB 2) Sealing : Mechanical Seal Gland : SS 316 Bearing Cover : SS316 Base plate : MS Fabricated Integral relief valve : SS 316/CF8M Fasteners: SS-316 Companion Flange : SS316 Expander and reducer : SS 316 Foundation bolt : MS Coupling : SS 316 Coupling Guard : Aluminum
15	Area classification	Safe Area

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 8 of 25	

6. SCOPE OF SUPPLY

The scope of supply for this enquiry is as given below:

Please refer to the enclosed P&ID for Foam Pumps (Annexure-1) for general clarity on scope of supply. The system shall be provided as per Annexure-1 taking into all requirements including for testing, painting, documentation, sub vendor list, equipment specifications etc., specified in this specification and enclosures.

Quantity of Pump & Drive Assembly:

2 Nos. of Foam Pump sets [1 No Motor Driven +1 No Engine Driven].

The scope of supply for each Pump & Motor/ Diesel Engine drive assembly is as given below.

6.1. Pump

Gear Pump complete with all accessories as per specification.

Performance requirement, Design and construction of the Pump shall be as per Manufacturing Standard duly taking care of TAC recommendations & as per enclosed annexures.

Integral relief valve shall be as per OEM standard. However, MOC shall be SS 316/CF8M.

6.2. Drives for pumps [Motor and Diesel Engine]

6.2.1. Motor

Performance requirement, Design and construction of the Motor shall be relevant Indian Standards and as per TAC.

Voltage levels for Motors: 415 V

6.2.2. Diesel Engine

Performance requirement, Design and construction of the diesel engine shall be guided by the TAC recommendations and as per enclosed annexures.

- a) The continuous engine brake horse power rating (after accounting for all auxiliary power consumption) at the site conditions shall be at least 20% greater than the brake horse power required to drive the pump at its duty point at rated R.P.M. and in no case less than the brake horse power required to drive the pump @ 110% Relief valve pressure at any condition of operation of pump.
- b) Deaerating Factors considered by the manufacturer to arrive at the shaft power of the diesel engine at site, shall not be less than the following:
 - 3% for each 305 meter elevation above MSL



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet 9 of 25

- 1% for each 5.6° C rise in air temperature above 15.6° C

- c) The base power rating of the diesel engine shall be referred to any accepted datum like BS/SAE Standard condition or equivalent. In any case, horsepower rating shall not be higher than the limit set by Tariff Advisory Committee.
- d) The engine shall be capable of operating continuously on full load at the site conditions for a period of at least six (6) hours.

Instrumentation & Control

The diesel engine shall be provided with adequate instrumentation. These shall include but not limited to the following:

- i. Temperature indicator (contact type) in cooling water inlet and outlet.
- ii. Temperature indicator in lubricating oil outlet from the oil cooler.
- iii. Pressure gauges (contact type) for lubricating oil system.
- iv. Differential pressure gauges (contact type) across strainers/ filters.
- v. Speed indicator.
- vi. Running hour meter.
- vii. Dip. Stick type lubricating oil sump level indicator.
- viii. Gauge glass type Fuel Oil Tank level indicator.
- ix. Voltmeter & Ammeter in dynamo type battery-charging circuit.
- x. Instrument hook-up materials (root valves, connectors, elbow and etc.) for the instruments supplied by bidder shall be in bidder scope of supply.

6.2.3. Diesel Engine Control Panel:

PLC based Diesel Engine Control panel meeting to the requirements of TAC for each engine shall be included in bidder scope of supply.

The engine shall be capable of both automatic and manual start.

Automatic cranking shall be effected by a battery driven D.C. motor having high starting torque to overcome full engine compression. Starting power shall be supplied from two (2) sets of storage batteries. One (1) set of battery is for automatic starting of the engine and the other provided for manual starting. A selector switch shall be provided at the automatic starting control panel to select any of the two (2) sets of battery for manual/auto starting of the engine.

The automatic starting arrangement shall include, as a safeguard, a "Repeat Start" feature so that if the pinion of the starting motor does not engage the flywheel at the first attempt, it is automatically retracted and after a short pause again will advance towards the flywheel. This repeat start cycle will continue until five (5) kicks after which there will be suitable annunciation. The battery capacity shall be adequate for ten (10) consecutive starts without recharging with a cold engine under full compression.

Arrangement for both trickle and booster charge of the batteries shall be provided. When the engine starts running, provision should be kept to ensure that the charger is automatically disconnected and the battery is charged by engine dynamo.



Each diesel engine shall be provided with two (2) battery charger units of air-cooled design. Each charger unit shall be capable of charging one (1) set of battery at a time. Provision shall, however, be kept so that any of the charger units of a particular engine can be utilized for charging any one of the two (2) batteries of that engine.

The Control panel shall be Stand mounted. Bidder to provide suitable stand and all fixing accessories for mounting control panel.

Bidder to submit Soft copy and hard copy of logics executed in PLC for uploading the same by end customer later.

All cabling [control/signal/power] from engine to control panel, panel to battery and engine to battery selector switch shall be in bidder scope of supply. Control panel, battery charger and battery selector switch is located within 5 m radius of pump skid. Pls refer annxure-1 for layouts for calculation of cable BOQ. Final Pump house layout shall be provided during detail engineering stage. Accordingly, bidder to consider suitable margin on required cabling based on their experience. Bidder to furnish cable BOQ, electrical load list, cable schedule and cable interconnection diagram.

Technical details of local control panel are indicated in **Annexure-4**.

Software:

Bidder to submit Soft copy and hard copy of logics executed in Controllers for uploading the same by end customer later.

6.2.3.1. Terminal point for power supply

BHEL shall provide 1 no of DOL feeder [415 V, (+/-) 10%, 3 phase, 50 Hz] for Motor of Motor driven Foam Pump. Required cable glands, lugs shall be in bidder scope of supply

BHEL shall provide 1 no of feeder [240 V, (+/-) 10%, 3 phase 50 Hz] for each Diesel Engine Control Panel. Further distribution shall be in bidder scope of supply.

6.2.3.2. Diesel Engine Fuel Tank

Fuel oil tank having storage capacity sufficient to run the engine at full load for at least six (6) hours, Level transmitter or Switch as per indicated in Annexure-1, Level Gauge and required inlet/outlet/recirculation piping [5 m length minimum each] & valves [from tank to engine and engine to tank] for engine (as per Annexure-1) shall be included in bidder scope. Valve in the fuel feed pipe between the fuel tank and the engine shall be placed adjacent to the tank and it shall be locked in the open position. Pipe joints shall not be soldered and plastic tubing shall not be used.

Tanks shall be securely mounted on noncombustible supports. Accordingly, bidder to supply Fuel Tank mounting structure, all fixing accessories. Bidder to ensure sufficient leg height for flow of fuel from tank to Engine up to minimum level of fuel and ensuring engine manufacturer's fuel pump static head pressure limits not be exceeded when the level of fuel in the tank is at a maximum.

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 11 of 25	

6.2.3.3. Diesel Engine Exhaust System

The exhaust system shall be gas tight throughout the operating range of exhaust temperatures and pressures. It shall be designed with an outlet connection to readily duct exhaust gases outside the engine room and away from air-intake systems. The system shall be sized in accordance with the manufacturer's recommendations, and arranged to preclude the entry of water into the pump room. The exhaust manifold and turbocharger housing (when provided by the drive manufacturer) shall be suitably guarded, insulated, or cooled to prevent fire hazards and injury to operators. Each diesel engine foam pump driver in a multiple engine room shall have an independent exhaust system.

Bidder to consider suitable length of exhaust piping with silencer, SS metal expansion below & insulation with required number of bends. However, As a minimum bidder to consider 15 m of exhaust piping with silencer, SS metal expansion below & insulation with 6 Nos. of bends. The exhaust piping shall consist of bends, hood, bird screen etc. [For Additional Details please refer Annexure-1, preliminary layout]. Final layout shall be furnished during detailed engg stage.

6.2.3.4. Starting & Charging System

Starting & charging system shall be as per NFPA-20 Standard.

Starting system:

- i. Two (2) sets (1 working & 1 standby, 100% capacity) of 24 or 12 Volt (as applicable) Automotive type battery with charger for each diesel engine driven foam pumps shall be provided primarily for starting the engine and control power supply to local control panel.
- ii. Each engine shall be provided with 2 Nos. Lead-acid plante battery units as per IS. Battery shall be sized to Cater for the following without any charging in between
 - a. Crank the engine twelve times (10) consecutive starts [each for a duration of 10 sec.] without recharging with a cold engine under full compression,
 - b.** Control panel stand by load requirements for 72 hours.
- iii. Storage batteries shall be rack supported above the floor, secured against displacement, and located where they will not be subject to excessive temperature, vibration, mechanical injury, or flooding with water. Accordingly, bidder to provide suitable stand/structure for mounting the battery.

**Charging system:**

- i. Each diesel engine shall be provided with two (2) battery charger units of air cooled design. Each charger unit shall be capable of charging one (1) set of battery at a time. Provision shall, however, be kept so that any of the charger units of a particular engine can be utilised for charging any one of the two (2) batteries of that engine.
- ii. Arrangement for both trickle and booster charger of the batteries shall be provided. When the engine starts running, provision should be kept to ensure that the charger is automatically disconnected and the battery is charged by engine dynamo.

All other details shall be as per TAC guidelines.

6.3. Coupling Between Pump and Drives [Motor/engine]

Flexible Coupling as per OEM recommendation.

The coupling shall be selected to ensure that it is capable of transmitting the horsepower of the driver and does not exceed the manufacturer's maximum recommended horsepower and operating speed.

6.4. Mechanical Seal

Sealing arrangement shall be Mechanical seal as per OEM Standard.

6.5. Baseframe

Common base frame with fixing bolts for each Pump & its drives. The Pumping set(s) shall be securely mounted on a robust bedplate and shall be free from vibration at all variations of load.

6.6. Interconnecting Piping & Instrumentation

Interconnecting piping and instrumentation as per P&ID [Annexure-1] & relevant standards as mentioned in this specification.

Reducer/expander, Flanges & Counter flanges with necessary gaskets & bolts at all terminal points as per annexure-1. Suction Reducer/expander shall be eccentric type. All counter flanges shall be of weld neck type.

Pipes: Stainless steel to ASTM A-312, TP-304, Sch.- 10.

Flanges: Plate fabricated to ASTM A-240, TP-304

Fittings: SS forged to ASTM-A-182, F-304 for sizes 15NB to 40NB and S.S. seamless to ASTM-A- 403, WP-304, Schedule-40 for sizes 50NB & above.



Gasket: CAF as per IS:2712, Gr.W3.

The fittings shall be galvanized as per IS 4736 for galvanized pipe application

6.7. Necessary Foundation Bolts, Nuts, Shims/Grouting Pads Etc.

6.8. First Fill of Lubricant & Consumables

Excluded from bidder scope of supply. However, bidder to furnish detailed requirement of first fill of lubricants and consumables.

6.9. Complete Unit Test:

1) Motor driven Foam Pump:

Pump shall be tested with Job motor, Job coupling, and Job base plate etc.

2) Engine driven Foam Pump:

Pump shall be tested with done with Job engine, Job coupling, and Job base plate etc. Power Vs Flow need not to be drawn considering the limitation of estimating the power absorbed.

6.10. All other items necessary for safe and smooth running of Pump & accessories required to make the supplied equipment complete in all respect.

6.11. Commissioning Spares

- i. One set of commissioning spares for Pump with drive motor shall be quoted as per manufacturer's recommendation. Commissioning spares shall contain minimum 1 Set of O rings & gaskets for each Pump & 1 Set of Commissioning Spares for Motor as per Manufacturer recommendation.
- ii. One set of commissioning spares for Pump with Diesel Engine shall be quoted as per manufacturer's recommendation. Commissioning spares shall contain Minimum 1 Set of O rings & gaskets for each Pump & 1 Set of Commissioning Spares for Engine, Panel, and Battery etc as per Manufacturer recommendation.

1 set stands for requirement for one no. of skid. Bidder to furnish the list along with the offer. Bidder shall include all the required commissioning spares in their scope of supply and ensure that the erection and commissioning of the plant is not delayed for want of Commissioning spares.

Prices for the commissioning spares shall be part of main scope of supply. No separate price shall be offered for the same.

Any leftover (unused) spares after commissioning, out of those included by vendor, shall be handed over to the owner.



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet **14** of **25**

Note: Any commissioning spare consumed over and above the recommended commissioning Spares, during commissioning shall be supplied free of cost by the equipment vendor.

6.12. Mandatory Spares:

6.12.1. For Pump

Nil

6.12.2. For Motor

Sl. No.	Description	Quantity
1	Bearings(DE+NDE)	2 Sets for each type/Size/Rating of Motor
2	Coupling Between Pump And Motor & Coupling Guards	1 Set for each type/Size/Rating

6.12.3. For Engine

Sl. No.	Description	Quantity
1	Packings And Gaskets	Two (2) Sets
2	Fuel Oil Filter Elements With Seals	Eight (8) Sets
3	Fuel Oil Filter Assembly	One (1) Set
4	Lubrication Oil Filter Elements With Seal	Eight (8) Sets
5	Solenoid Coil For Fuel Valve	One (1) Set
6	Corrosion Inhibitor (If Provided)	One (1) Set
7	Big End & Small End Bearing Of Connecting Rod	One (1) Set
8	Speedometer Wire	One (1) Set
9	Rubber Hoses Of Water Line With Mounting Clamps	Two (2) Sets
10	Cranking Starter Assembly Complete	One (1) Set
11	Lubrication Oil And Fuel Oil Hoses With End Connectors	Two (2) Sets
12	Water Pump Belts	Two (2) Sets

6.12.4. For Gear Box(If Applicable):

Sl. No.	Description	Quantity
1	Bearings	One (1) Set for each type/Size/Rating
2	Gears (Drive & Driven)	One (1) Set for each type/Size/Rating
3	Lubrication Oil Heat Exchanger	One (1) Set for each type/Size/Rating

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 15 of 25	

6.12.5. For Panel

Sl. No.	Description	Quantity
1	Control supply transformer	One (1) of each type
2	Relay and timer	One (1) of each type
3	Contactors	One (1) of each type
4	Ammeter and Voltmeter	One (1) of each type
5	Electronic Cards	Two (2) of each type
6	LED's	Four (4) of each type
7	Control Switches	One (1) of each type
8	Push Button complete with contact elements	One (1) of each type
9	Control fuse base with carrier complete set for panel	Two (2) of each type
10	Bi-metallic overload relays	One (1) of each type
11	Alarm buzzer	Two (2) of each type

6.12.6. For Instrumentation

Sl. No.	Description	Quantity
1	Pressure gauges	Five (5)
2	Temperature gauges	Two (2)
3	Level Indicator	Two (2)
4	Pressure switches	Five (5)

Special notes for Mandatory spares:

- The word "set" means the quantity required for full replacement of that part in one machine.
- The word "TYPE" means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.
- Wherever % age is identified, bidder shall supply next rounded figure.
- Part Description is the commonly used name of the part and may vary from manufacturer to manufacturer.
- Mandatory spares as indicated above do not cover commissioning spares.
- Mandatory spares as indicated above do not cover two year O&M spares.
- All Mandatory spares should be supplied separately with green color painted box.
- Loose items sent by Vendor to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items.
- A packing list covering items having shelf life are to be intimated to site. In addition, shelf life items shall be packed separately in black color painted box for easy identification at site.
- Spare rotors shall be boxed in a metal containers for vertical storage with nitrogen purging. Storage container shall be property of the owner.

6.13. Void

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 16 of 25	

6.14. Special Tools And Tackles

2 Sets of Special tools and tackles for Pump & Drive assembly.

[1 set each for Pumps with Motor assembly & Pumps with Diesel Engine assembly]

One set (1 Set) of Special tools and tackles comprises of special tools, wrenches etc. with necessary tools boxes as required for operation and maintenance (disassemble, assemble, or maintaining the unit) of the Pump and Drive [Motor/Engine] assembly shall be quoted as per manufacturer's recommendation.

1 set stands for requirement for one no. of skid. Bidder to furnish the list along with the offer.

Prices for Special tools and tackles shall be part of main scope of supply. No separate price shall be offered for the same.

6.15. Supervision of Erection & Commissioning:

Supervision of erection, commissioning of the supplied system shall be included in bidder's scope of service.

Bidder to note that the supervision charges for erection & commissioning shall consists of the following:

- Per day supervision charges of an Engineer including all other expenses like boarding, lodging, local travel, insurance etc.
- Travel expenses (inclusive of any clearance charges like Visa fee etc, insurance) from / to vendor works to site.

Per diem charges shall be applicable from the day bidder's representative reports to site, up to the day certified by BHEL's site.

For the purpose of tender evaluation Five Man-days for Pump, Motor, Diesel Engine & Control Panel and One Visit shall be considered: [For details Please price bid format]

Notes:

- i. However, either or both of the number of man days or number of visits may change on either side based on the actual site requirement.
- ii. All payments towards supervision of E&C shall be made only after BHEL-site certification.
- iii. Bidder to mobilize concerned competent person for supervision of Erection & commissioning activities within a period of 7 days of receipt of intimation in this regard by BHEL.
- iv. Bidder to quote supervision of erection and commissioning activities strictly as per BHEL's price format

6.16. Conflicts in Specification Requirement:

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 17 of 25	

In case of any conflict between this specification and Annexures stringent of the requirement will govern.

7. OPTIONAL PRICES

Please Refer to Attached Price Bid Format. Bidder to furnish the following as optional prices:

Bidder to furnish optional prices for 2 year recommended spares as per equipment manufacturer's recommendations. [The Bidder shall quote separately with optional price for the recommended list of spare parts for operation, with recommended quantities for the equipment covered under this specification. Bidder shall furnish such a list along with offer. The list of spares shall be as per Bidder's experience.

Engine Revalidation spares:

Revalidation spares are those spares, which are required at the time of commissioning of Engine, in case the scheduled commissioning of engine is delayed beyond the permissible duration as recommended OEM.

Bidder to quote revalidation spares required for Engine as per OEM practice under optional prices as indicated in price bid format, sl no II-A.

Bidder shall furnish list of revalidation spares along with their offer.

8. EQUIPMENT QUALIFICATION CRITERIA (EQC)

A) OEM as a Bidder :

1. At least 2 Nos. Foam Pump Package [1 No. of Motor Driven + 1 No. of Engine Driven] of the offered pump model should have completed Five (5) Years of satisfactory operation/trouble free operation at site, as on enquiry submission due date.

2. The reference(s) furnished by the bidder against Sl. No. 1 should also meet the following criteria:

- Flow variation between offered pump model and reference furnished should be within 70% to 130%
- Differential head variation between offered pump model and reference furnished should be within 70% to 130%
- Flow medium shall be Foam.

3. The bidder should have designed, engineered, manufactured, packaged, tested and supplied at least 2 Nos. Foam Pump Package [1 No. of Motor Driven + 1 No. of Engine Driven] of offered pump model from his manufacturing plant in last 5 years. The offered model shall be of proven design.

B) Packager as a Bidder:



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet **18** of **25**

1. The Pump model selected shall meet the above criteria as mentioned in Sl. No. A.1) and A.2) above.

2. The Packager should have engineered, packaged, tested and supplied at least 2 Nos. Foam Pump Package [1 No. of Motor Driven + 1 No. of Engine Driven] of offered pump model in last 5 years.

The bidders shall furnish following documents for assessing Bidder's pre-qualifications as indicated at Sl. No. A&B above along with technical offer:

- a) Bidder's reference list in enclosed format –Annexure-6
- b) Documentary evidence like copies of Purchase Order and Inspection Release Note (IRN) or
 Satisfactory Performance feedback certificates from End User indicating salient features like Project name, date of supply & commissioning.

9. QUALITY PLAN & INSPECTION AGENCY & TESTING

For details, pl refer annexure- 4&7.

9.1. Quality Plan

Quality plan will be reviewed during detailed Engineering stage with respect to Inspection, standard Engineering practices & Specification Requirements and various tests and stages of inspection and appropriate agencies for Inspection will be Intimated. Bidder to abide by the same.

For guidelines& format: Refer **Annexure-7**, ITPs for Pump, Motor, Engine, Panel etc. In addition, Annexure-7 & enclosed datasheets, specifications and applicable Standard shall be referred.

9.2. Inspection Agency

BHEL/Third Party appointed by BHEL/Customer.

The various review/witness/observation stages by individual agencies (or) Group of Agencies as above will be in line with approved quality plan. Also refer Annexure-07.

9.3. Testing

The design and Testing Standards of the Pumps shall conform to the standards as indicated in the TAC recommendation.

However, Performance tolerance shall be as mentioned below:

- i. Rated head at rated flow: Zero negative tolerance
- ii. Shut-off head: Zero negative tolerance. Maximum 5% Positive tolerance permitted.
- iii. Permissible tolerance in efficiency at rated capacity: No negative tolerance

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 19 of 25	

- iv. Rated BkW: Zero positive tolerance. Positive tolerance permitted till motor rating meets end of the curve condition.

10. PAINTING

Painting for Pump, Motor, Engine and all other accessories shall be as per annexure -5.

Final shade for Pump, Motor and Engine shall be informed during detail engineering stage.

11. PACKING AND FORWARDING

Bidder to note that Packing and Forwarding shall be suitable for as per manufacturing standard meeting the requirement(Sea Worthy Packing) is acceptable. Packing shall be suitable for outdoor storage: More than 12 months. For details Pl. refer Annexure -4.

12. SUB VENDORS

Bidder shall follow sub vendors list enclosed as Annexure-8. In case of any specific practical difficulty, bidder is requested to bring out the same with proper reason for not following vendor list. For other items for which sub vendors are not specified, bidder can follow their standard vendors. However, they have to ensure the Proven Track record of the sub vendors and Bidder to take prior approval of BHEL for the same.

13. DOCUMENTATIONS

Please refer to enclosed Master Documentation List [MDL] for the list of DOCUMENTS / DRAWINGS to be submitted by the bidder as part of documentation. Bidder shall ensure submission of all documentation as per the MDL, Annexure: 9.

Bidder to note that the dates of submission of all the documents shall be finalized based on PO date. It shall be solely bidder's responsibility to get approval on the entire document from purchaser to meet project schedule.

DEFINITION OF VENDOR DOCUMENT REVIEW STATUS ASSIGNED BY BHEL

The guidelines listed below are followed in assigning the document status code to the vendor documents: Final submittal of vendor documents will not be required as long as the document status code is 1 or 4 and the "AS-BUILT" condition of the component agrees with the current document.

Permission to proceed does not constitute acceptance or approval of design details, calculations, analyses, test methods, or materials developed or selected by the vendor and does not relieve the vendor from full compliance with contractual obligations.

Code-1: Work may proceed

The document conforms to procurement document requirements. The document requires no changes or additions. Matters remaining to be resolved do not require document change and



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet **20** of **25**

will be handled by correspondence. Where it is known that the design information on a vendor document is not complete and re-submittals will be required, e.g., due to "hold" areas, the document is assigned another status code.

Code-2: Revise and resubmit

Work may proceed subject to resolution of indicated comments. The document is in basic conformance with procurement document requirements. Minor deviations from procurement document requirements have been noted or other minor technical or physical changes in the equipment are required. The vendor shall resolve comments and resubmit documents prior to shipment of commodity.

Code-3: Rejected. Revise and resubmit

The document:

- Does not conform to the procurement requirements,
- Is of a design that is technically unacceptable without significant changes,
- Does not meet project requirements, i.e., orientation of equipment, nozzles, conduit connections, etc.,
- Does not conform to project criteria or with proposal documents or data, or
- Does not meet minimum submittal requirements.

This submittal rejection does not relieve vendor of any schedule commitments.

Code-4: Review not required

The document is not subject to BHEL review. Typical uses for this status are in the review of items that are vendor standard products, small internal parts of major equipment, or vendor standardized data.

DRAWINGS REVIEW & APPROVALS:

Each drawing submitted by the bidder shall be with a title block furnished by BHEL during detailed design stage.

All drawings / documents shall be thoroughly checked, duly signed, and stamped by the vendor including drawing /documents of sub-vendor, before submission to BHEL. Documents, which are unchecked, unsigned, and without revisions marked clearly, shall be returned without review. Any delay on account of this shall be to the vendor's account. After first review of documents, vendor to submit all the further revisions of documents along with comment resolution sheet. Successive documents submitted without comment resolution sheet shall be returned without review.

The approval and /or review by BHEL /End customer shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

Documents once reviewed in Code-1 shall not be submitted (incorporating some changes) again for review, however if some change is really necessary, the same shall be brought to the notice of BHEL separately through design change note for review / information. Finally, As-built drawings, duly updated, shall be submitted.



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet **21** of **25**

During detailed engg stage, BHEL shall furnish detailed format for datasheet of Pump, Motor, Engine and check list reg minimum contents in GA drawing. Bidder to submit duly filled in respective datasheets for Pump, Motor, Engine and submit GAD [duly incorporating all requirements as per the check list] along with signed checklist. GAD shall not be reviewed without duly filled in checklist signed by the bidder.

NO. OF COPIES OF EACH DOCUMENT TO BE FURNISHED:

All the documents shall be submitted as given below:

SL NO.	DESCRIPTION	NO. OF COPIES / PIECES TO BE SUBMITTED	WHEN TO SUBMIT
1)	Initial drawings/documents under approval and information	Soft copy only	Within 2 weeks of placement of order
2)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
3)	*Revised drawings/documents along with compliance sheet incorporating all BHEL comments. <i>*Vendor to incorporate all BHEL comments so that further revisions can be minimized.</i>	Soft copy only	Within 1 weeks of receipt of commented Drawings from BHEL
4)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
5)	Final Drawings/documents	12	Within 2 months of placement of order.
6)	Erection Documentation	5	1 month before dispatch of equipment. The list of documents identified under master document list for erection to be furnished in 5 no's of folders

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 22 of 25	

7)	Draft O & M Manuals for BHEL review. <i>Note: Bidder to furnish final hard copy of O&M only after getting concurrence on soft copy.</i>	Soft copy	At least 2 months before the delivery date of equipment
8)	Revised O & M Manuals with Test Certificates to be submitted to BHEL (Hyderabad)	12	Within one month before the delivery date of equipment
9)	Final O&M manuals in a CD	4	Within one month after dispatch of equipment after BHEL concurrence on soft copy.

Notes:

The O&M manuals shall contain the following as minimum:

- The identification details of the equipment like BHEL P.O. No., Vendor's Job Identification No., full contact address with telephone, fax, & e-mail details.
- Brief description of the system.
- All approved documents [Drawings, documents & test procedures as per MDL]
- Bill of material, BBU, LO schedule, sub vendor list, Mandatory & commissioning spares list etc.
- Operation, Instruction & maintenance manuals of all equipments / items fo the complete package
- System unloading, storage erection, start up, commissioning, shut down requirements.
- Operational & environmental safety instructions.
- Test reports and certificates.
- Catalogues of the equipment & instrumentation.

14. PRICE BID FORMAT

Bidder to indicate his offer as per Price Bid format enclosed as Annexure-3.

All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications as per annexure-11, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

The equipment supplied shall be complete in all respects. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment. Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be in bidder scope Only.



PRODUCT STANDARD
BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY51639

Rev. No.

00

Sheet **23** of **25**

Main offer consists of those items, which will be part of main order after successful bidder is identified. Optional Items consists of those items, which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format. Prices quoted by the bidder shall remain firm till the successful handing over of the entire package to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL.

The Priced Bid shall be submitted in Original (without any copy) duly signed and stamped on each page in a separate sealed envelope super scribing "Price Bid –Do not Open" This shall not contain any condition whatsoever failing which the Bids shall be liable to be rejected. In case of any correction, the bidder shall put its signature and its stamp. Eraser fluid will not be allowed for making any correction.

Bidder shall confirm to the un-priced bid as part of their offer.

15. PRE-BID CLARIFICATIONS

Bidders shall comply with various requirements of this specification. It may please be noted that the requirements specified here in this specification are the standard practices being followed by the bidders. However, same things are presented in a structured form so that it can be ensured that the requirements of ultimate customer are complied with.

Bidders can bring out only those deviations which are impractical to meet, for our review in pre bid clarification only.

Bidders may also please note that the data sheets for valves, instruments etc., submitted along with the offer will be considered as indicative only, as the requirements specified in the specification are standard in nature. These will not be reviewed by BHEL before award of contract. Same will be reviewed during order execution stage in line with the requirements of specification and agreed deviations.

All pre-bid clarifications & deviations shall be clear bring as per Annexure 11 only.

In case bidder doesn't bring any clarification/deviation in prebid stage, the same shall be brought in their offer with following conditions:

- a) Any deviations to Customer specifications, same are acceptable provided these deviations are also regularly accepted by Customer for their direct orders on bidders. In such cases, proof of the same shall be furnished along with the offer.
- b) Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.
- c) Price implication due to non-acceptance [by BHEL/Customer] of the deviations considered by bidder will not be permitted.
- d) Deviations [if any] shall be clear bring as per Annexure 10 only.

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 24 of 25	

16. VARIANT TABLE:

Variant	Item	Material Code
01	Foam Pump Motor Driven with CS and ST	PY9751639018
02	Foam Pump engine driven with CM and ST	PY9751639026
03	Foam Pump mandatory spare	PY9751639034
04	Supervision of E& C of Foam Pump assembly	PY9851639044

ESP-001- 2A Rev.00		PRODUCT STANDARD BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51639	
			Rev. No.	00
			Sheet 25 of 25	

RECORD OF REVISIONS				
Rev. No.	Date	Revision Details	Revised By	Approved By
00	12.06.2020	First Issue	-----	Surya Satya Nagesh M

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-1 (P&ID FOR FOAM SYSTEM,LAYOUT FOR FOAM SYSTEM)

Revisions: Refer to record of revisions				

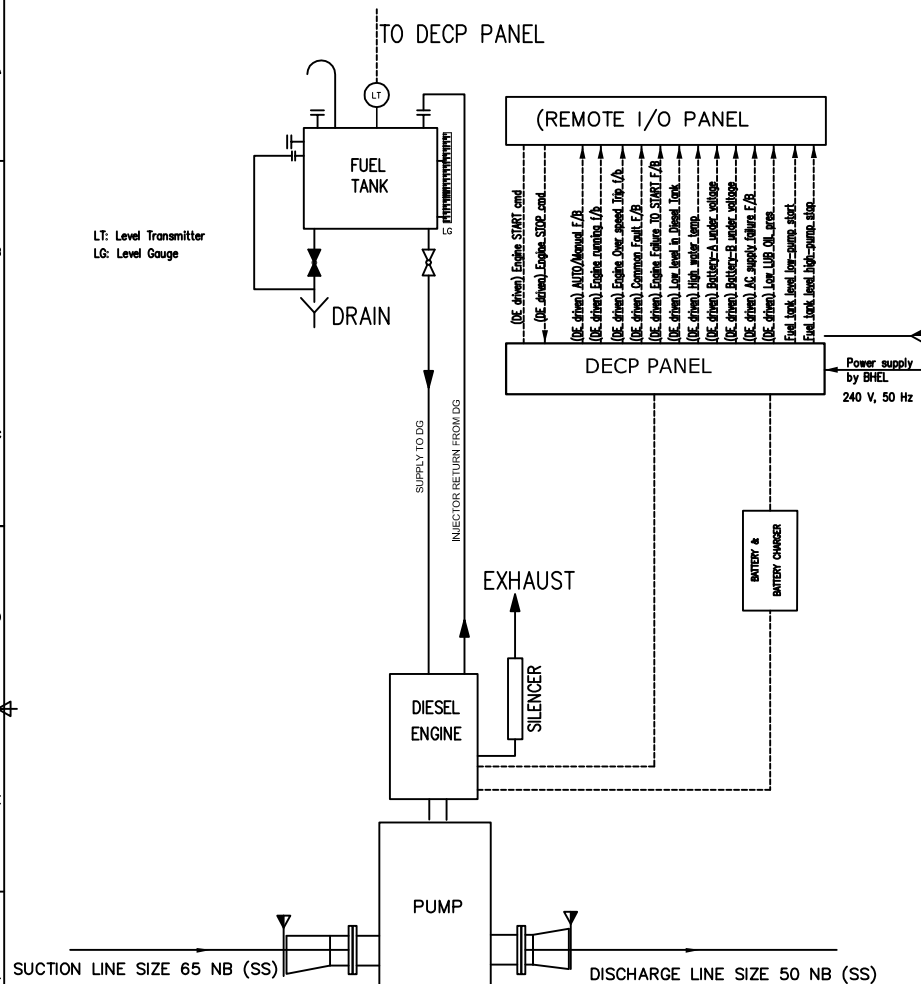
FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

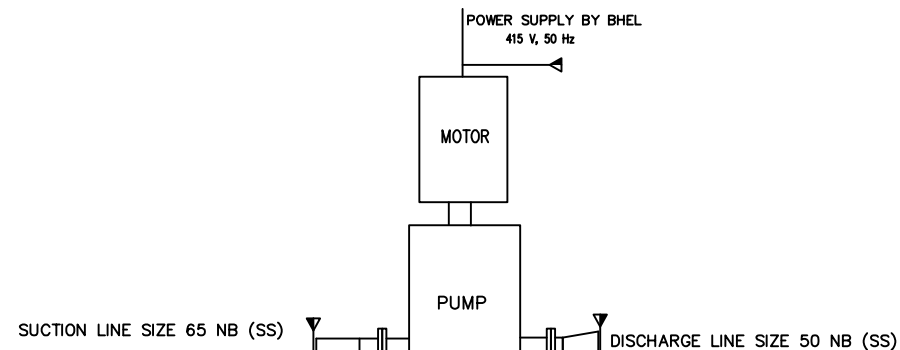
ANNEXURE-1

Notes:

- For scope of supply specification shall be referred.
- This is typical schematic of Foam Pump set.
- Suitable Reducer/Expander to meet BHEL pipe sizes shall be in bidder scope of supply.
- Following standards shall be applicable:
 - Pipe: Stainless steel to ASTM A-312, TP-304, Sch.-10
 - Pipe Fitting: SS forged to ASTM-A-182, F-304 for sizes 15NB to 40NB and S.S. seamless to ASTM-A-403, WP-304, Schedule-40 for sizes 50NB & above.
 - Flanges/Companion Flanges: Plate fabricated to ASTM A-240, TP-304
 - Gasket: CAF as per IS:2712, Gr.W3.
- In case of HE cooled Diesel Engine, required Piping, valves etc shall be bidder scope of supply
- Layout shall be referred for deciding BOQ for fuel piping, Exhaust piping, cabling etc. which are in bidder scope of supply.



TYP. FOR ENGINE DRIVEN FOAM PUMP



TYP. FOR MOTOR DRIVEN FOAM PUMP

BHEL SCOPE



VENDOR SCOPE

CUSTOMER: MAHARASHTRA STATE POWER GENERATION CO. LTD.
(MAHAGENCO)PROJECT: 1X660 MW BHUSAWAL TPS UNIT-6, BHUSAWAL,
MAHARASHTRACONSULTANT: DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS, VASHI, NAVI MUMBAI

भारत भारती  BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME DRN. RJ CHD. GPP APPD. MSSN		SIGN. —SD— —SD— —SD—		DATE 12.06.20 12.06.20 12.06.20		NO. OF V.A. N.A. N.A. N.A.			
DEPT. PE&SD CODE 450		UNTOL. DIMS. GR. 9/11/1 		SCALE N.T.S		WEIGHT (KG) N.A.		REF. TO ASSY. DRG. N.A.		ITEM NO. N.A.		NO. OF ITEMS N.A.	
TITLE P&ID FOR FOAM PEAK & DRIVE ASSEMBLY						CARD CODE NA		DRG. NO. PESD/BHUSAWAL/01 CUST. DRG. NO. 00					
						SHT. NO. 01		1		NO. OF SHT. 01			

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. PY-VP-1-M102-8315-01

LEGEND:

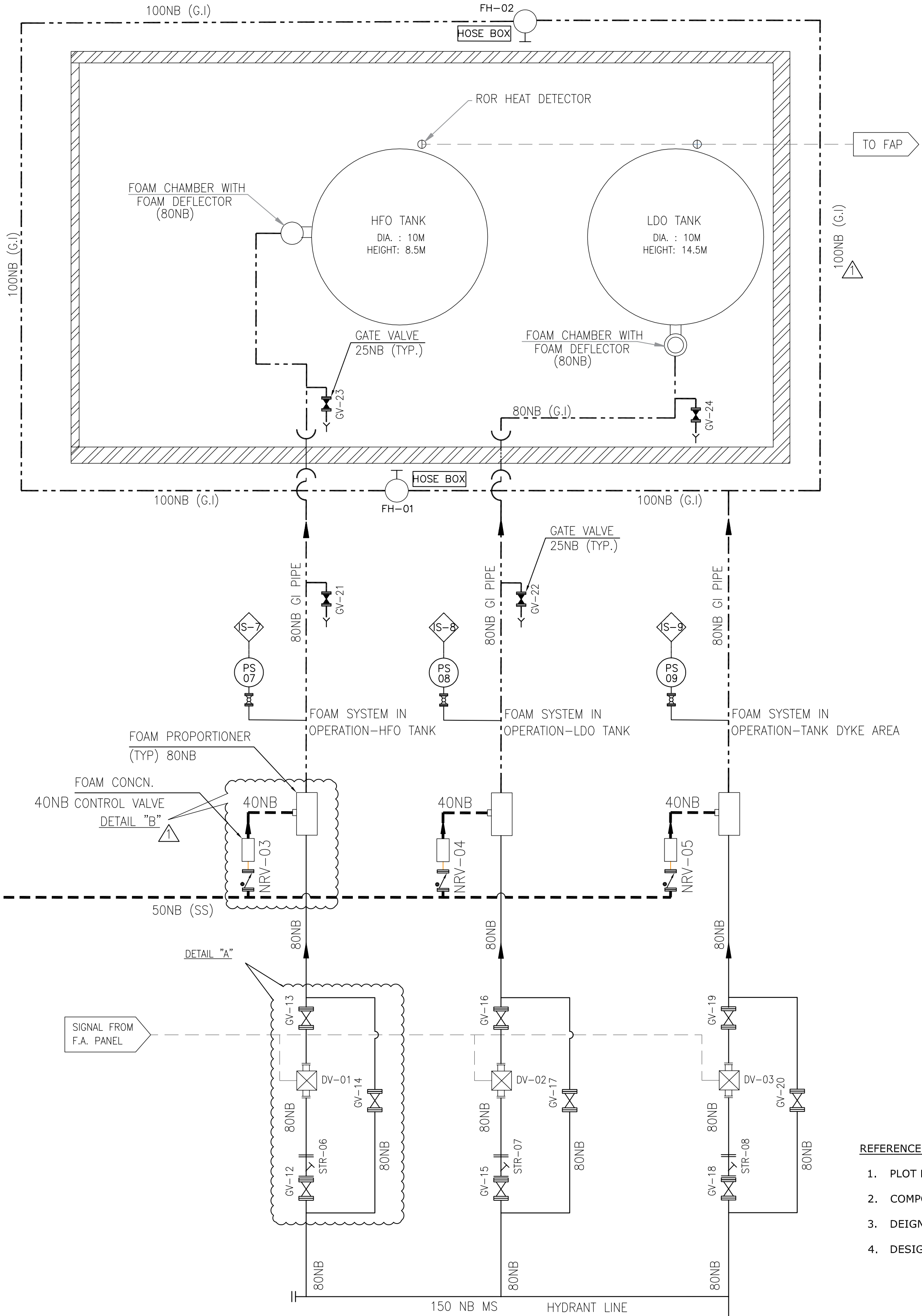
	WATER LINE		DELUGE VALVE
	FOAM LINE (SS PIPE)		SAFETY RELIEF VALVE
	CONTROL CABLE		DRAIN
	POWER CABLE		PROBE TYPE HEAT DETECTOR
	GATE VALVE(NORMALLY OPEN)		FOAM PUMP
	GATE VALVE(NORMALLY CLOSED)		MOTOR
	NON RETURN VALVE		DIESEL ENGINE
	BUTTERFLY VALVE		SOLENOID VALVE(N/C)
	PRESSURE GAUGE		LEVEL INDICATOR
	PRESSURE SWITCH		FIRE ALARM PANEL
	ALARM/INDICATOR IN PLC SYSTEM		FIRE ALARM PANEL
	FOAM HYDRANT (FH)		DIESEL ENGINE CONTROL PANEL
	LEVEL SWITCH		CONC. REDUCER
	FOAM CHAMBER		FOAM SOLUTION LINE (GI)

NOTES:

1. FOAM CONCENTRATE USED IN FOAM SYSTEM SHALL BE "AFF (AQUEOUS FILM FORMING FOAM".
2. THE FOAM TANK SHALL BE OF MS WITH 2MM FRP LINING.
3. PIPING DOWNSTREAM OF DELUGE VALVE SHALL CONFIRM TO M.S. GALVANISED ERW AS PER IS1239,PART-1, HEAVY Gr.
4. THE CAPACITY OF DIESEL TANK SHALL BE SUFFICIENT TO RUN THE ENGINE CONTINUOUSLY FOR A PERIOD OF 60 MIN.
5. 25 NB DRAINS AND VENTS SHALL BE PROVIDED FOR PIPE SIZES UP TO 350NB AS PER LAYOUT CONSIDERATION.
6. ALL PRESSURE TAPPINGS AND ROOT VALVES SHALL BE OF 15NB.
7. A MINIMUM DISTANCE OF 6 METER SHALL BE MAINTAINED FROM THE TANK TO THE DELUGE VALVE SHED.
11. "PUMP RUNNING" FEED BACK SHALL BE TAKEN FROM MCC AS PER APPROVED "DRIVE CONTROL PHILOSOPHY".
12. DELUGE VALVE IN FOAM SYSTEM SHALL BE OF SOLENOID OPERATED TYPE. SOLENOID WILL REMAIN NORMALLY CLOSED, BUT IN THE EVENT OF FIRE SOLENOID WILL BE ENERGISED TO OPEN THE DELUGE VALVE.
13. REMOTE I/O PANEL OF FOAM SYSTEM SHALL BE LOCATED INSIDE FUEL OIL PUMP HOUSE. PLC PANEL SHALL BE LOCATED INSIDE FIRE WATER PUMP HOUSE.
14. EACH HOSE BOX SHALL CONTAIN 2 NOS. OF 63MM INSIDE DIA & 15M LENGTH FIRE HOSES AND ONE NO. OF FOAM BRANCH PIPE.

ABBREVIATION

DV	DELUGE VALVE
STR	STRAINER
BFV	BUTTERFLY VALVE
FH	FOAM HYDRANT
GV	GATE VALVE
NRV	NON RETURN VALVE
SOV	SOLENOID VALVE
FP	FOAM PUMP
DE	DIESEL ENGINE
MS	MILD STEEL
SS	STAINLESS STEEL
GI	GALVANIZED IRON



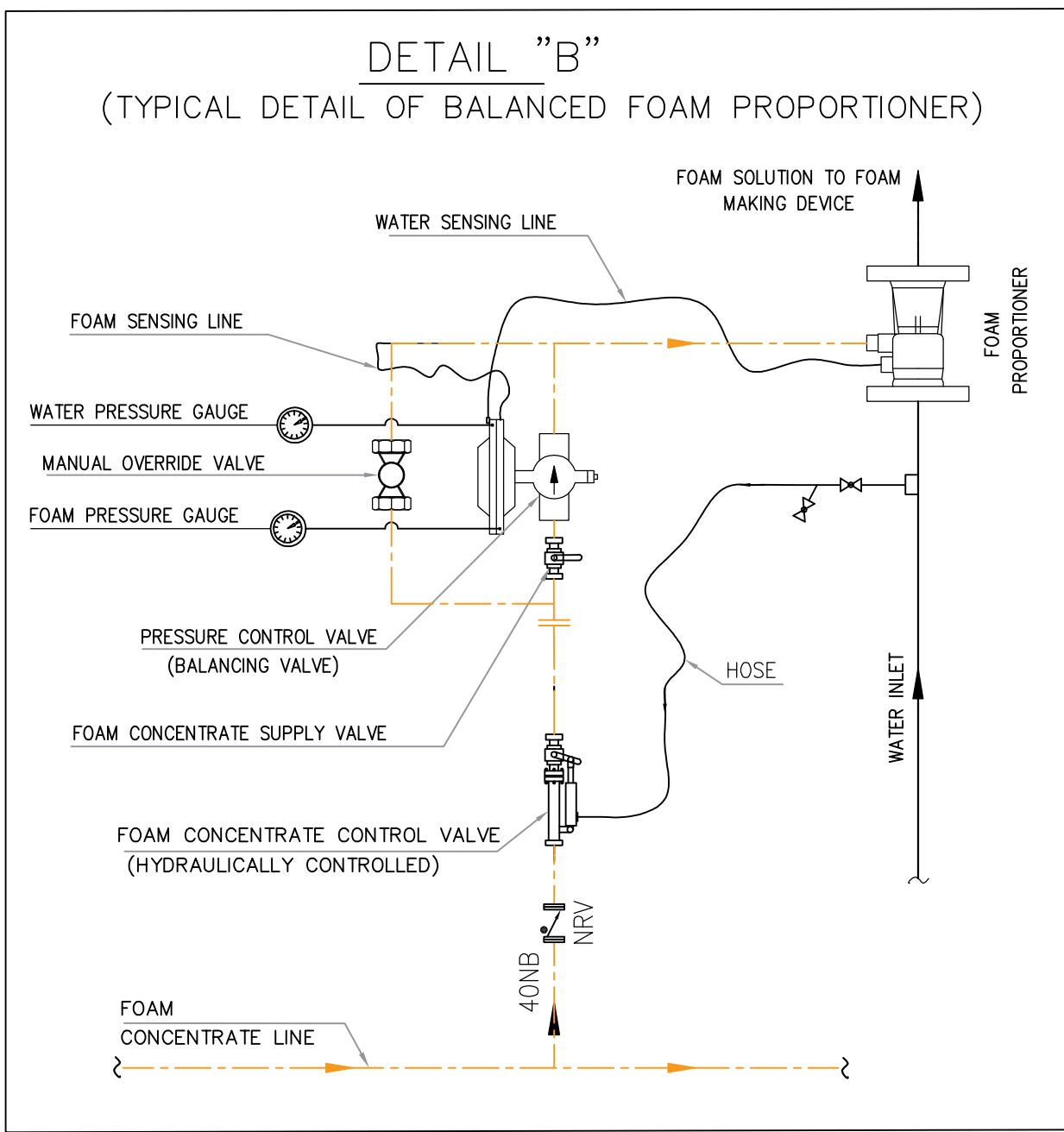
REFERENCE DRAWINGS:

1. PLOT PLAN : PE-DG-415-100-M001
2. COMPOSITE LAYOUT OF HYDRANT & SPRAY : PY-LP-1-M102-8315-01
3. DEIGN PHILOSOPHY OF FOAM SYSTEM : PY-VC-1-M102-8315-01
4. DESIGN BASIS DOCUMENT OF FPS - PY-SZ-4-M102-8315-01

PROJECT	1x660 MW BHUSAWAL TPS UNIT-6					
CUSTOMER		MAHARASHTRA STATE POWER GENERATION CO. LTD.				
CONSULTANT		DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI				
	BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING AND SYSTEMS DIVISION R.C. PURAM, HYDERABAD-32			NAME	SIGN	DATE
			DRN.	AVIRAL	-SD-	10.02.20
			CHD.	AMIT KUMAR	-SD-	10.02.20
			APPD.	SEKHAR	-SD-	10.02.20
TITLE : P&ID OF FOAM SYSTEM						
UNIT :	SCALE :		BHEL DWG. NO. : PY-VP-1-M102-8315-01		SHEET NO 01 NO. OF SHEET 02	REV. 02

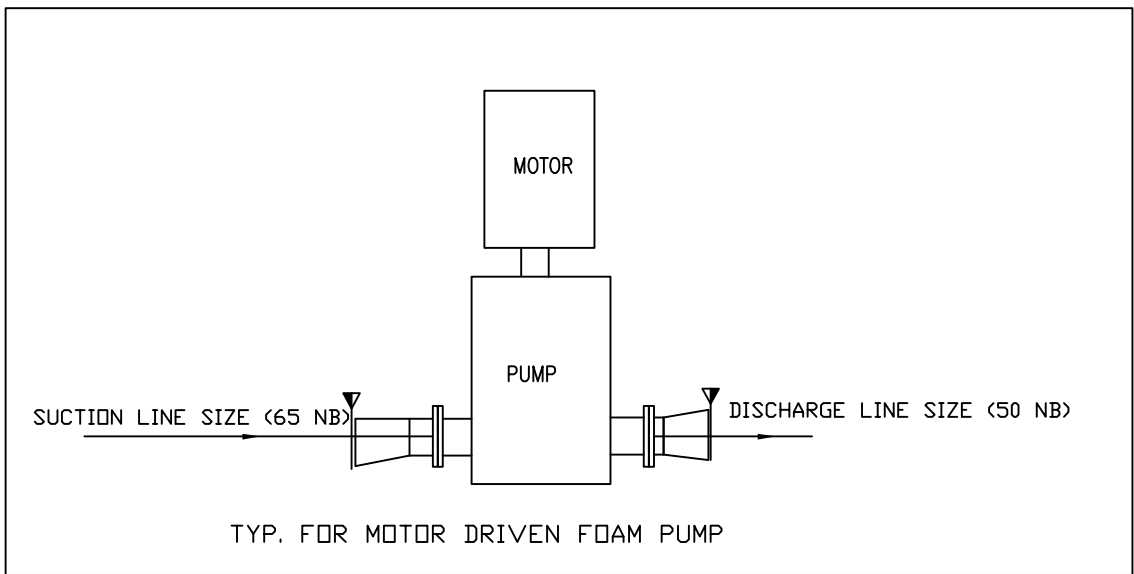
REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	AVIRAL	REV.	DATE	ALTERED	AVIRAL
		CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD			CHD/APPD	AMIT/ PCS		20.03.2020	CHD/APPD	AMIT/ PCS
ZONE			ZONE			ZONE			ZONE			ZONE			ZONE			NO REVISION ON THE DRAWING. ONLY COMPLIANCE REPORT SUBMITTED WRT COMMENTS	ZONE			REVISED AS PER CUSTOMER COMMNTS

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

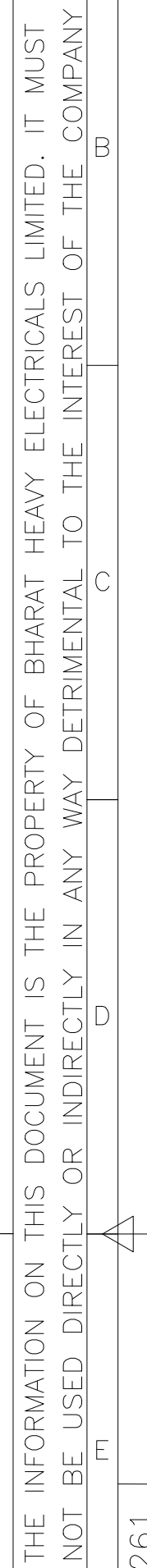


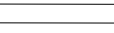
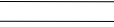
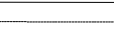
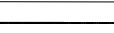
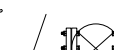
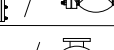
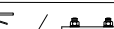
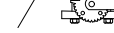
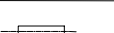
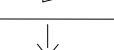
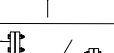
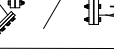
SCHEDULE OF INSTRUMENT 				
TAG NO.	TYPE OF INSTRUMENT	LOGIC NO	SET PRESSURE LEVEL	ANNUNCIATION
PS-01	PRESSURE SWITCH	IS-1	3.5	FOAM PUMP(FP-M-01) FAILS TO START
PS-02	PRESSURE SWITCH	IS-2	3.5	FOAM PUMP(FP-D-01) FAILS TO START
PS-04	PRESSURE SWITCH	IS-4	3.0	MAIN FOAM PUMP START SIGNAL TO MCC/FPS PLC.
PS-05	PRESSURE SWITCH	IS-5	3.0	MAIN FOAM PUMP START SIGNAL TO MCC/FPS PLC.
PS-06	PRESSURE SWITCH	IS-6	3.0	MAIN FOAM PUMP START SIGNAL TO MCC/FPS PLC.
PS-07	PRESSURE SWITCH	IS-7	3.5	TD DVLCP FOAM SYSTEM IN OPERATION AT HFO TANK
PS-08	PRESSURE SWITCH	IS-8	3.5	TD DVLCP FOAM SYSTEM IN OPERATION AT LDD TANK
PS-09	PRESSURE SWITCH	IS-9	3.5	TD DVLCP FOAM SYSTEM IN OPERATION AT TANK DYKE AREA
PS-10	PRESSURE SWITCH	IS-10	8.0	FOAM DELIVERY LINE CLOGGED CONDITION STATUS
PS-03	PRESSURE SWITCH	IS-03	7.0	START STANDBY PUMP IF FIRST PUMP IS RUNNING AND HEADER PRESSURE IS < 7 Kg/CM2(g)
LS-01 LS-02	LEVEL SWITCH		1/3 OF TANK HEIGHT	FOAM TANK LOW LEVEL
NOTE: PUMP RUNNING SIGNAL SHALL BE TAKEN FROM MCC AS PER APPROVED DRIVE CONTROL PHILOSOPHY.				

LIST OF EQUIPMENTS 				
S. NO.	EQUIPMENT	QTY	TAG NO.	CAPACITY/SIZE
1	FOAM PUMP {MOTOR DRIVEN}	1	FP-M-01	4.2 M3/HR
2	FOAM PUMP {DIESEL ENGINE DRIVEN}	1	FP-DE-01	4.2 M3/HR
3	FOAM TANK {MS TANK WITH 2MM FRP LINING}	2 {1W+1S}	-	2500 LITERS
4	DELUGE VALVE	3	-	80 NB
5	FOAM PROPORTIONER	3	-	80 NB
6	FOAM CHAMBER WITH DEFLECTOR	2	-	80 NB
7	FOAM HYDRANT VALVE	2	FH-01, FH-02	-



PROJECT	1x660 MW BHUSAWAL TPS UNIT-6				
CUSTOMER		MAHARASHTRA STATE POWER GENERATION CO. LTD.			
CONSULTANT		DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI			
	BHARAT HEAVY ELECTRICALS LTD.		NAME	SIGN	DATE
	DRN.	AVIRAL	—SD—		10.02.20
	CHD.	AMIT KUMAR	—SD—		10.02.20
	APPD.	SEKHAR	—SD—		10.02.20
PROJECT ENGINEERING AND SYSTEMS DIVISION R.C. PURAM, HYDERABAD-32					
TITLE : P&ID OF FOAM SYSTEM					
UNIT :	SCALE :	BHEL DWG. NO. : PY-VP-1-M102-8315-01	SHEET NO 02 NO. OF SHEET 02		REV. 02

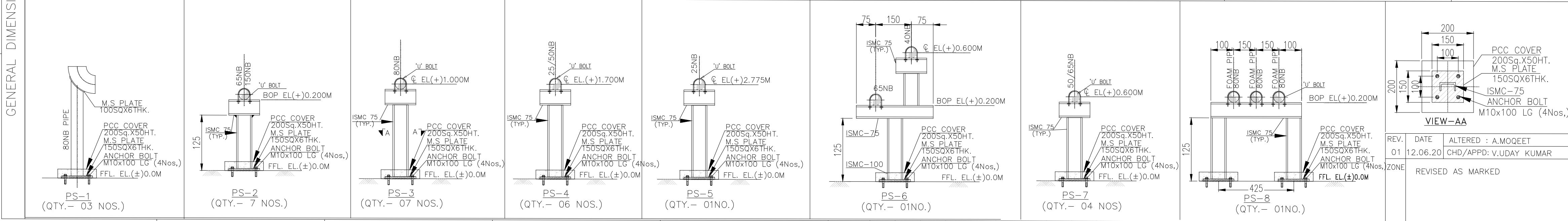
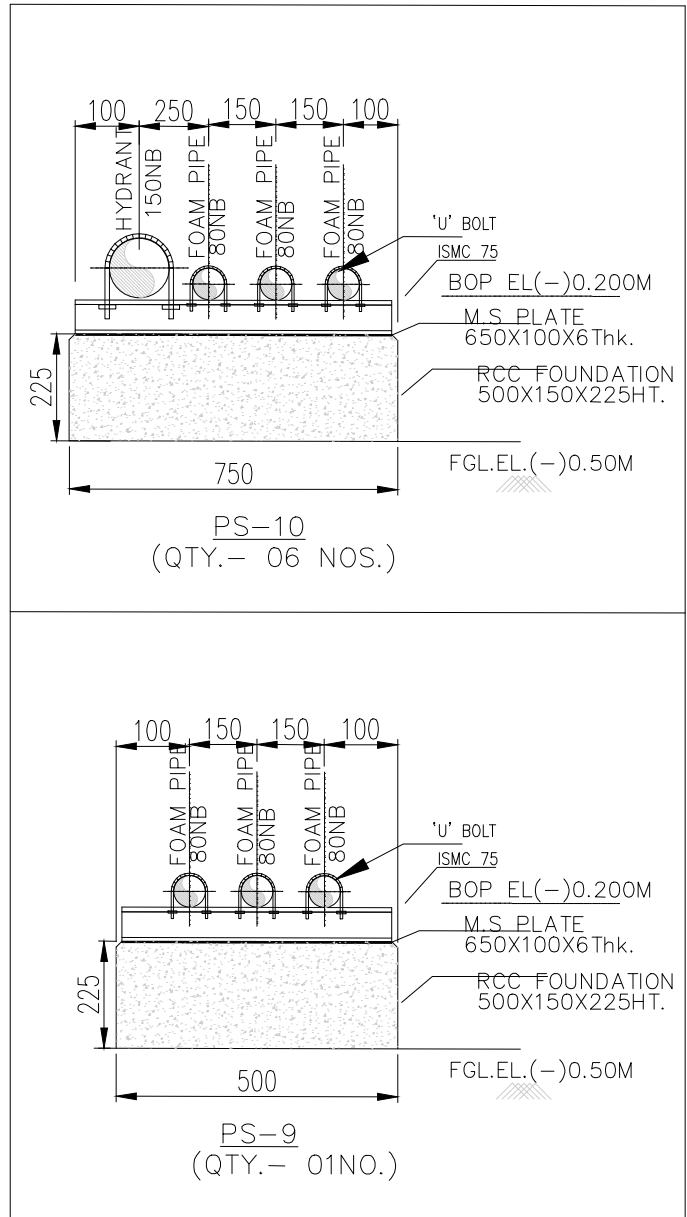


LEGEND	
SYMBOLS	DESCRIPTIONS
	FOAM SOLUTION LINE (GI)
	HYDRANT/SPRAY LINE (MS)
	EXISTING HYDRANT/SPRAY LINE
	FOAM LINE (SS)
	GATE VALVE (GV)
	DELUGE VALVE (DV)
	BUTTERFLY VALVE (BFV)
	PIPE SUPPORT
	CONC. REDUCER
	DRAIN
	'Y' STRAINER
	INLINE BALANCE PRESSURE FOAM PROPORTIONER
	NON RETURN VALVE (NRV)
	FOAM CONCENTRATE CONTROL VALVE (CV)

ABBREVIATION	
DV	DELUGE VALVE
STR	STRAINER
BFV	BUTTERFLY VALVE
BOP	BOTTOM OF PIPE
PS	PIPE SUPPORT
GV	GATE VALVE
RED	REDUCER
FFL	FINISH FLOOR LEVEL
FGL	FINISH GROUND LEVEL
NRV	NON RETURN VALVE
CV	FOAM CONCENTRATE CONTROL VALVE
FP	FOAM PUMP
DE	DIESEL ENGINE
MS	MILD STEEL
SS	STAINLESS STEEL
GI	GALVANIZED IRON
LPBS	LOCAL PUSH BUTTON SWITCH

1. ALL DIMENSIONS ARE IN MILLIMETRES AND ELEVATIONS ARE IN METRES.
2. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION $\pm 0.00M$ WHICH CORRESPONDS TO RL. (+)209.0M.
3. ALL PIPE ELEVATIONS ARE OF CENTRELINE OF PIPE UNLESS NOTED OTHERWISE. THIS DRG. TO BE REFERRED FOR MECH. EPGTS. & PIPING DETAILS. FOR ELECTRICAL DETAILS, REFER RESPECTIVE ELECTRICAL DRAWING.
4. SUITABLE COUNTER FLANGES & FASTENERS FOR PUMPS SHALL BE SUPPLIED ALONGWITH PUMPS BY VENDOR.
5. MATERIAL OF CONSTRUCTION:
 - i. PIPING DOWNSTREAM OF DELUGE VALVE SHALL CONFORM TO M.S. GALVANIZED ERW AS PER IS:1239 (HEAVY GRADE).
 - ii. THE MOC OF FOAM TANK SHALL BE MILD STEEL AS PER IS: 2062.
 - iii. FOAM CONCENTRATE PIPING SHALL BE STAINLESS STEEL.
6. A MINIMUM RUNNING PRESSURE OF 10.0KG/CM² SHALL BE MADE AVAILABLE AT TAP-OFF POINT.
7. THE TYPE OF FOAM CONCENTRATE USED IN FOAM SYSTEM SHALL BE 'AFF'.
 8. THE SYSTEM IS DESIGNED AS PER TAC/NFPA.
 9. CONCRETE PEDESTALS/EPs AS SHOWN IN THIS DRAWING TO BE PROVIDED BY CIVIL.
 10. PUMP & FOAM TANK FOUNDATION DIMENSIONS SHOWN ARE TENTATIVE ONLY AND THE SAME SHALL BE UPDATED AFTER RECEIPT OF GA DRAWING.
1. WALL OPENINGS ARE ON HOLD
0. TRENCH DETAILS ARE ON HOLD.

S.No.	DRAWING NO.	TITLE
1.	PY-VP-1-M102-8315-01	P & I DIAGRAM OF FOAM SYSTEM
2.	PY-LP-1-M102-8315-01	COMPOSITE LAYOUT OF HYDRANT & SPRAY PIPING-FPS



PROJECT :

MAHAGENCO

MAHARASHTRA STATE POWER GENERATION CO.LTD.

BHUSAWAL T.P.S. UNIT-6 : 1 X 660 MW PROJECT

PWC CONSULTANT:

(View Website Information)

DEVELOPMENT CONSULTANTS PVT. LTD.

CONSULTING ENGINEERS

VASHI, NAVI MUMBAI

BHARAT HEAVY ELECTRICALS LTD.

HYDERABAD

DEPT. PESD CODE. 450 UNTLT. DIMS. GR SHA SCALE 1:40 WEIGHT (KG) —N.A.—		NAME	SIGN.	DATE	NO. OF VAR.	
		DRN.	M.A.MOOEET	—	25.04.20	
		CHD.	V.UDAY KUMAR	—	25.04.20	—N.A.—
		APPD.	G.SRIKANTH	—	25.04.20	

REF. TO ASSY. DRG.	ITEM NO.	NO. OF ITEMS
—N.A.—	—N.A.—	—N.A.—

TITLE

EQUIPMENT AND PIPING LAYOUT

OF FOAM PUMP HOUSE

CARD CODE

N.A.

DRG. NO. PY-PF-1-M102-8315-03

CUST. DRG. NO.

—

SHT. NO 01

REV.

01

No. OF SHT. 02

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

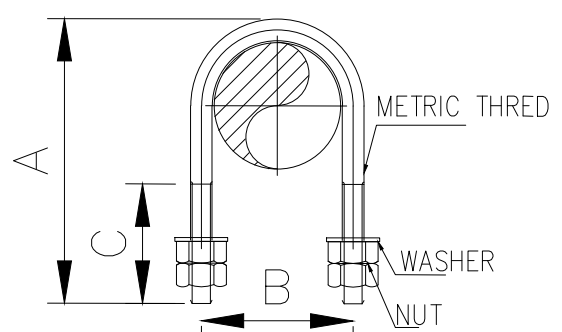
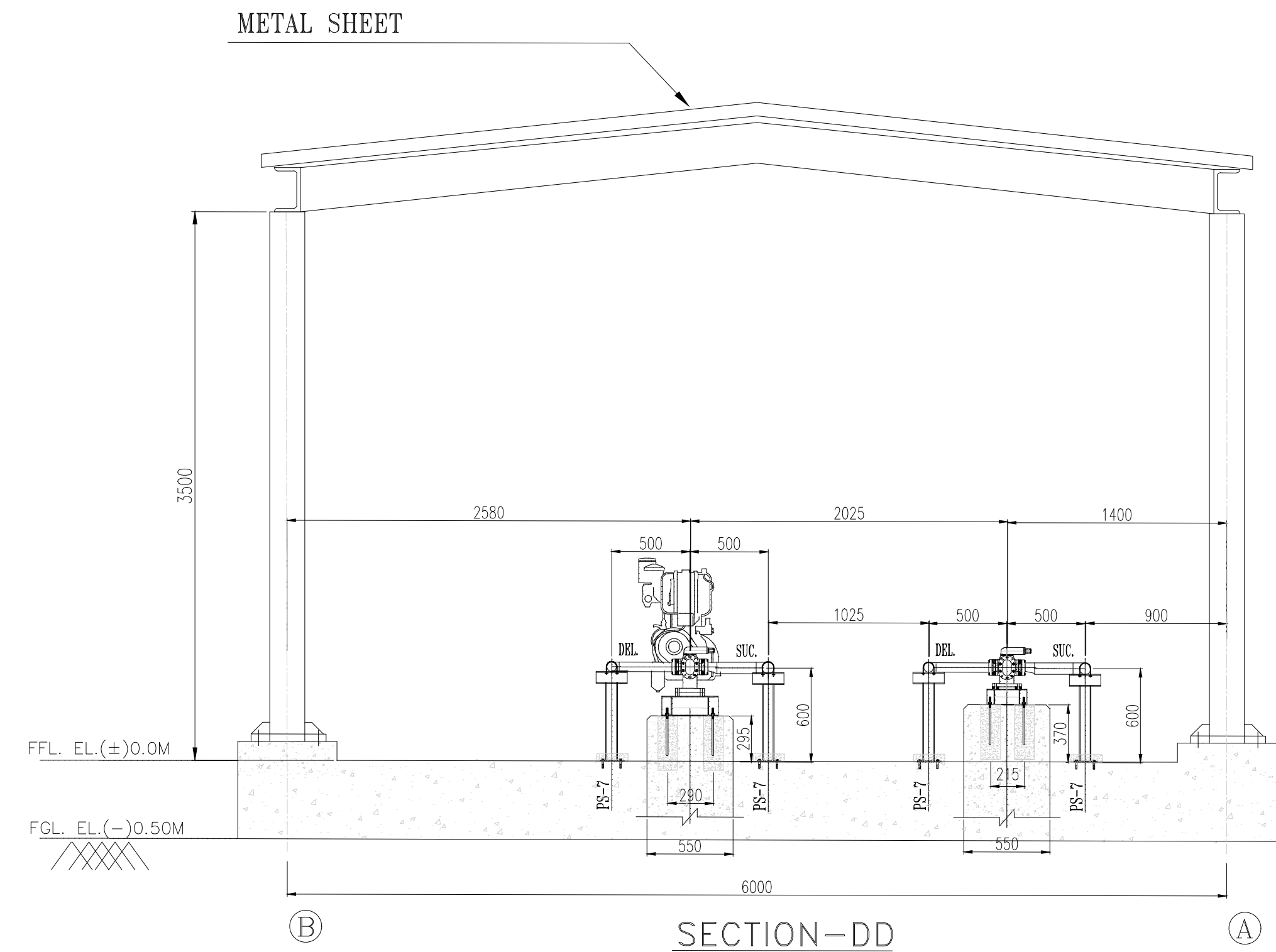
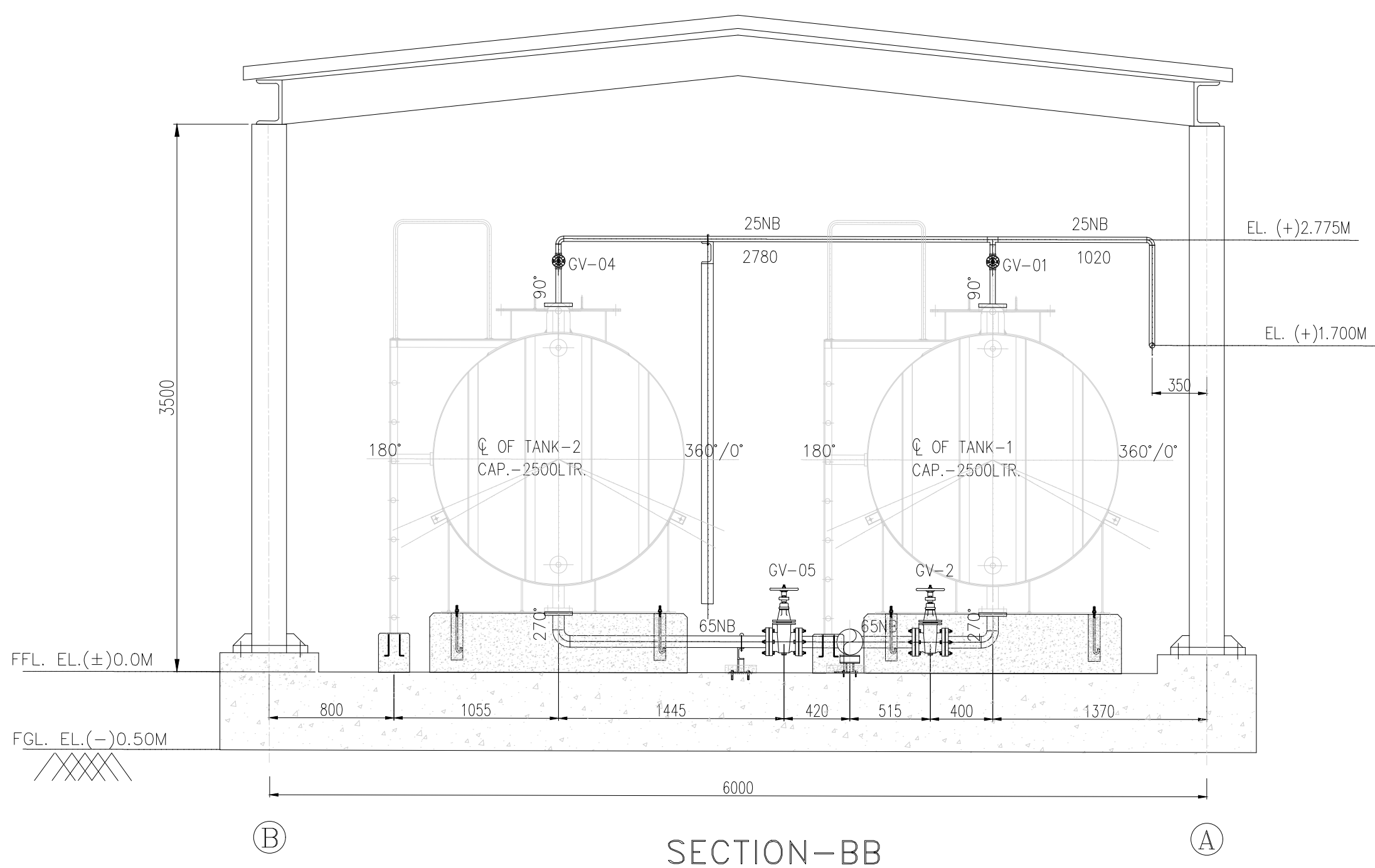
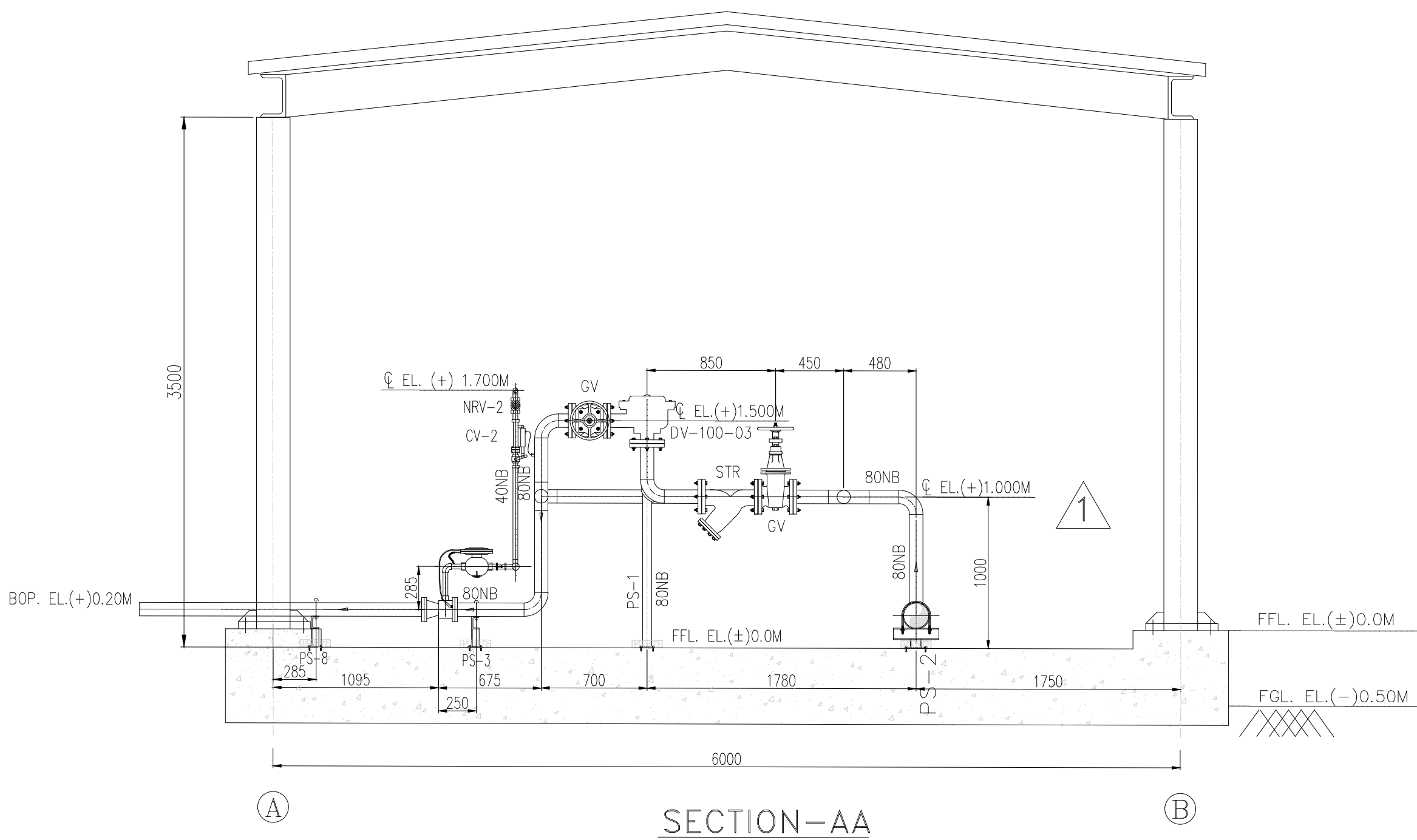
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. PY-VF-1-M102-8315-03

SHT. 2 OF 2



DETAIL OF STANDARD 'U' BOLT

PIPE SIZE	ROD DIA ODmm	A MM	B MM	C MM
25	12	95	50	55
40	12	110	64	56
50	12	130	76	70
65	12	155	92	70
80	12	160	106	70
100	16	190	136	80
150	16	240	192	80

REV.	DATE	ALTERED BY	MAJOREEET
01	12.06.20	CHD/APPD	UDAY KUMAR
ZONE	REVISED AS MARKED		

PROJECT : MAHAGENCO		MAHARASHTRA STATE POWER GENERATION CO.LTD. BHUSAWAL T.P.S. UNIT-6 : 1 X 660 MW PROJECT						
PMC CONSULTANT: Use White Impression		DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS VASHI, NAVI MUMBAI						
		BHARAT HEAVY ELECTRICALS LTD.		NAME		SIGN.	DATE	NO.OF VAR.
		HYDERABAD		DRN. M.A.MOGEET		-	25.04.20	
				CHD. V.UDAY KUMAR		-	25.04.20	-N.A.-
				APPD. G.SRIKANTH		-	25.04.20	
DEPT. P.E.S.D. CODE. 450	UNTO. DIMS. OR G.M.F.		SCALE 1:30	WEIGHT (KG) -N.A.-	REF. TO ASSY. DRG. -N.A.-		ITEM NO. -N.A.-	NO.OF ITEMS -N.A.-
TITLE EQUIPMENT AND PIPING LAYOUT OF FOAM PUMP HOUSE				CARD CODE N.A.	DRG. NO.PY-VF-1-M102-8315-03 CUST. DRG. NO. -		REV. 01	
				SHT. No 02		NO. OF SHT. 02		

ESP-001- 2A Rev.00		BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number
				Annexure-2
				Rev. No. 00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-2 (DATA SHEET FOR PUMP-MOTOR-ENGINE)
--	---

Revisions: Refer to record of revisions				

PROJECT : 1X600 MW BHUSAWAL TPS UNIT-6,
CUSTOMER:MAHARASHTRA STATE POWER GENERATION CO. LTD., ,BHUSAWAL,
CONSULTANT:DEVELOPMENT CONSULTANTS PVT. LTD.,CONSULTING ENGINEERS,VASHI,MUMBAI

ANNEXURE-2 : DATA SHEET FOR FOAM PUMP -MOTOR-DIESEL ENGINE			
Sl.no.	Description	BHEL Requirement	Bidder's Details
GENERAL DATA			
1	Service	Foam Pump : For supplying the foam to the foam system from the foam tank	
2	Number of Pumps	2 Nos [1 Motor driven +1 Diesel Engine driven]	
3	Location	Indoor	
4	Duty	Motor driven - Continuous Engine driven - Intermittent	
5	Drives	Motor & Diesel Engine	
6	Fluid Handled	1. Type : Aqueous Film Forming Foam Concentrate 3% 2. pH : 6.5 - 8.5 at 20 deg. C 3. Specific Gravity : 1.02 +/- 0.02 at 20 deg. C 4. Viscosity : Less than 10 cst at 20 deg C	
7	Fluid temp Deg C	Ambient	
PUMP PERFORMANCE & OTHER DETAILS			
8	Pump Type	Gear Pump	
9	Design Standard of pump	As per Manufacturing Standard duly taking care of TAC requirement	
10	Rated Flow (m ³ /hr)	4.1	
11	Rated Discharge Pressure in Kg/cm ² (g)	12.1	
13	Pump Model No.	Pump model shall be interchangeable for both Motor & Engine driven pump. Bidder to indicate pump mode	
14	Pump end connection	Side Suction Side Discharge	
16	Rated Speed of Pump (rpm)	Bidder To Furnish	
17	Rated speed of Motor (rpm)	Bidder To Furnish	
18	Rated speed of Engine (rpm)	Less than 2300 rpm	
19	Pump Efficiency in %	Bidder To Furnish	
20	Available Pressure at centre line of Suction nozzle of Pump in kg/cm ² (a)	1.0	
21	NPSH(A) at pump suction nozzle (mlc)	Flooded suction	
26	Material of Construction: Casing (Pump body) : CF8M Rotor Gear : SS 316 Rotor Shaft : SS 431 End cover : SS 316 Wearing Plates : Ph Bronze (LTB 2) Sealing : Mechanical Seal Gland : SS 316 Bearing Cover : SS316 Base plate : MS Fabricated Integral relief valve : SS 316/CF8M Fasteners: SS-316 Companion Flange : SS316 Expander and reducer : SS 316 Foundation bolt : MS Coupling : SS 316 Coupling Guard : Aluminum		
27	Type of main bearings for pump	Bidder To Furnish	
28	Main bearings lubrication	Bidder To Furnish	
29	Direction of rotation of Pump	Bidder To Furnish	
30	Direction of rotation of Motor	Bidder To Furnish	
31	Direction of rotation of Engine	Bidder To Furnish	
31	Sealing arrangement	Mechanical seal as per OEM Standard	
COUPLING			
32	Coupling standard	Bidder To Furnish	

PROJECT : 1X600 MW BHUSAWAL TPS UNIT-6,
CUSTOMER:MAHARASHTRA STATE POWER GENERATION CO. LTD., ,BHUSAWAL,
CONSULTANT:DEVELOPMENT CONSULTANTS PVT. LTD.,CONSULTING ENGINEERS,VASHI,MUMBAI

33	Type of coupling	Flexible Coupling. Bidder to furnish details	
34	Non sparking type Al couplign guard	Bidder to provide	
35	Service factor for the coupling	1.5 minimum	
PERFORMANCE TEST STANDARD FOR PUMPS			
36	Performance test standard	As per Manufacturing Standard duly taking care of TAC requirement	
37	Maximum Allowed Working Pressure (MAWP) in Kg/cm ² g	Bidder To Furnish	
38	Hydraulic test pressure of casing Kg/cm ² (g)	Bidder To Furnish	
39	Noise level for Pump and motor assembly	85 DBA at 1 m distance, in any direction	
40	Noise level for Pump and engine assembly	105 DBA at 1 m distance, in any direction	
41	Vibration for Pump	As ISO 10816	
PUMP TERMINAL POINT DETAILS			
43	Pump Suction nozzle - Size - Rating - Standard - Facing	Bidder To Indicate	
44	Pump Discharge nozzle - Size - Rating - Standard - Facing - Location	Bidder To Indicate	
	Expander/Reducer meeting BHEL suction pipe size of 65 NB	Bidder to provide	
44	Expander/Reducer meeting BHEL discharge pipe size of 50 NB	Bidder to provide	
MOTOR DETAILS FOR MOTOR DRIVEN PUMPS [For More Details Please refer enclosed annexures]			
45	Drive/Installation	Motor/Horizontal	
46	BKW at the rated point	Bidder To Indicate	
47	BKW at 110% of Relief Valve set Pressure	Bidder To Indicate	
48	Selected drive rating in kW: Continuous drive motor rating (at 50 degree C ambient) shall be Drive Unit Power rating for the pumps shall be selected such that it is equal to higher of the following conditions: (i) 115% of the duty point power requirement. iii) Motor Input power required at 110% Relief Valve set Pressure	Bidder to mention motor kW rating for the motor duly taking care of requirements.	
49	Design Standard of Motor	Relevant Indian Standards and as per TAC.	
50	Manufacturer	As per attached subvendor list	
51	Ambient Temperature	50 Deg C All motors shall be designed to operate in humid atmosphere with a maximum ambient temperature of 50 Deg C.	
52	Area classification for motor	Safe Area	
53	Rated Voltage & Frequency	415 V & 50 Hz	
54	Permissible variations in Voltage/Frequency/Combined	Voltage: (+/-)10% Frequency:(+/-)5% Combined: (+/-)10% combined variation of voltage and	
55	No of poles / synchronous speed	Bidder To Furnish	
56	Energy efficient class	IE3	
57	Starting Current as % of FLC	Bidder To Furnish	
58	Method of Starting	DOL	
59	Method of cooling	Bidder To Furnish	
60	Winding and Insulation	All motors shall have class F insulation but limited to class B temperature rise	
61	Temp. rise	All motors shall have class F insulation but limited to class B temperature rise	

PROJECT : 1X600 MW BHUSAWAL TPS UNIT-6,
CUSTOMER:MAHARASHTRA STATE POWER GENERATION CO. LTD., ,BHUSAWAL,
CONSULTANT:DEVELOPMENT CONSULTANTS PVT. LTD.,CONSULTING ENGINEERS,VASHI,MUMBAI

62	Degree of protection/Canopy Required	IP 55/Yes	
63	TB Short time-Current & Short time-Time	50 kA , 1 Sec	
64	Cable, Cable glands & Lugs	Suitable double compression Nickel plated brass cable glands and Tinned copper lugs to be provided by the bidder.	
65	No. of Starts	Motor shall be capable of three equally spread starts per hour, two starts in quick succession from cold condition and one restart from hot condition.	
66	Bearing RTDs, Winding RTDs & TGs	Not Applicable	
67	Noise	85 DBA at 1 m distance from motor body, in any direction	
68	Vibration	As per IS 4729	
DIESEL ENGINE DETAILS FOR ENGINE DRIVEN PUMPS			
69	Drive	Diesel Engine	
70	Type	Bidder to Furnish	
71	Location	Indoor	
72	BKW at the rated point	Bidder To Indicate	
73	BKW at 110% of Relief Valve set Pressure	Bidder To Indicate	
74	Selected drive rating: i. The continuous engine brake horse power rating (after accounting for all auxiliary power consumption) at the site conditions shall be at least 20% greater than the brake horse power required to drive the pump at its duty point at rated R.P.M. and in no case less than the brake horse power required to drive the pump at 110% of Relief Valve set Pressure or at any condition of operation of pump. ii. Deaerating Factors considered by the manufacturer to arrive at the shaft power of the diesel engine at site, shall not be less than the following: a. 3% for each 305 meter elevation above MSL b. 1% for each 5.6° C rise in air temperature above 15.6° C iii. The base power rating of the diesel engine shall be referred to any accepted datum like BS/SAE Standard condition or equivalent. In any case, horsepower rating shall not be higher than the limit set by Tariff Advisory Committee.	Bidder to mention engine HP rating for the motor duly taking care of the requirements.	
75	Drive Standard	As Per TAC	
76	Name of Manufacturer	Bidder to furnish.	
77	Model No	Bidder to furnish.	
78	Duty	Intermittent. However, same shall be capable of operating continuously on full load at the site elevation for a period of 1 hours.	
79	Speed	Less than 2300 rpm	
80	Type of cooling	Bidder to Furnish	
81	Noise	105 DBA at 1 m distance, in any direction	
82	Vibration	As per IS standard	
Note: Individual datasheets for Pump, Motor & Diesel shall be furnished during detailed engg stage. It is mandatory for the equipment supplier to furnish in format [to be submitted during detailed engg stage] in case of placement of order.			

Revisions: Refer to record of revisions				

Annexure-3A							
		BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032					
PRICE FORMAT (R00) FOR FOAM PUMP WITH DRIVES (MOTOR & DIESEL ENGINE) PROJECT : 1X600 MW BHUSAWAL TPS UNIT-6, CUSTOMER:MAHARASHTRA STATE POWER GENERATION CO. LTD.,BHUSAWAL, CONSULTANT:DEVELOPMENT CONSULTANTS PVT. LTD.,CONSULTING ENGINEERS,VASHI,MUMBAI							
SL NO	ITEM DESCRIPTION	QTY	UNIT	Weightage w.r.t Overall Price (In %)	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. : <Bidder to indicate> BHEL Enq. No. & date : <Bidder to indicate>						
I	MAIN OFFER						
A	MATERIAL SUPPLY: FOAM PUMP WITH MOTOR [Material code:PY9751639018]						
A.1	Foam Pump with Drive Motor along with all accessories including commissioning spares, special tools & tackles as per specification.	1	Sets	32.5			
B	MATERIAL SUPPLY: FOAM PUMP WITH ENGINE [Material code:PY9751639026]						
B.1	Foam Pump with Diesel engine, Control Panel, Fuel tank, Battery, Charger etc along with all accessories including commissioning spares, special tools & tackles as per specification.	1	Sets	52.1			
C	MATERIAL SUPPLY: Mandatory spares [Material code: PY9751639034] Refer Note-14						
C.1	For Motor			10			
i)	Bearings(DE+NDE)	2 Sets for each type/Size/Rating of Motor					
ii)	Coupling Between Pump And Motor & Coupling Guards	1 Set for each type/Size/Rating					
C.2	For Engine						
i)	Packings And Gaskets	Two (2)	Sets				
ii)	Fuel Oil Filter Elements With Seals	Eight (8)	Sets				
iii)	Fuel Oil Filter Assembly	One (1)	Set				
iv)	Lubrication Oil Filter Elements With Seal	Eight (8)	Sets				
v)	Solenoid Coil For Fuel Valve	One (1)	Set				
vi)	Corrosion Inhibitor (If Provided)	One (1)	Set				
vii)	Big End & Small End Bearing of Connecting Rod	One (1)	Set				
viii)	Speedometer Wire	One (1)	Set				
ix)	Rubber Hoses Of Water Line With Mounting Clamps	Two (2)	Sets				
x)	Cranking Starter Assembly Complete	One (1)	Set				
xi)	Lubrication Oil And Fuel Oil Hoses With End Connectors	Two (2)	Sets				
xii)	Water Pump Belts	Two (2)	Sets				
C.3	For Gear Box(If Applicable)						
i)	Bearings	One (1) Set for each type/Size/Rating					
ii)	Gears (Drive & Driven)	One (1) Set for each type/Size/Rating					
iii)	Lubrication Oil Heat Exchanger	One (1) Set for each type/Size/Rating					
C.4	For Panel						
i)	Control supply transformer	One (1) of each type					
ii)	Relay and timer	One (1) of each type					
iii)	Contactors	One (1) of each type					
iv)	Ammeter/Voltmeter	One (1) of each type					
v)	Electronic Cards	Two (2) of each type					
vi)	LED's	Four (4) of each type					
vii)	Control Switches	One (1) of each type					
viii)	Push Button complete with contact elements	One (1) of each type					
ix)	Control fuse base with carrier complete set for panel	Two (2) of each type					
x)	Bi-metallic overload relays	One (1) of each type					
xi)	Alarm buzzer	Two (2) of each type					
C.5	Instrumentation -Mandatory spares						
i)	Pressure gauges	Five (5)	Nos				
ii)	Temperature gauges	Two (2)	Nos				
iii)	Level Indicator	Two (2)	Nos				
iv)	Pressure switches	Five (5)	Nos				
D	Supervision charges for erection & commissioning at site [Material code:PY9851639044]						
	Supervision charges for erection & commissioning shall include the following: 1. Per diem charge of for supervision of erection & commissioning of Pump/Motor & Controller/Diesel Engine & Controller etc. 2. Charges for 1 visit Note: The above shall also include all other expenses like boarding, lodging, local travel, insurance, travel expenses (inclusive of all other charges like visa fee (if applicable), insurance etc) from / to vendor works to site for Engineer. [Refer Note 11]	5 Day and 1 Visit		5.4			
	Grand total price for sl no A, B, C and D (Inclusive of Packing & Forwarding, Freight and Insurance)			100			
Packing & Forwarding, Freight, Insurance and GST :							
(A) For Supply:							
(i) Packing & Forw	In bidder scope			Included in basic price			
(ii) Freight:	In bidder scope			Included in basic price			
(iii) Insurance:	In BHEL scope						
(iv) GST	Extra at actuals			Extra at actuals			
(v) Any other:	shall be included in baisc price of pumps			Included in basic price			
(B) For supervision of E&C:							
(i) GST:	Extra at actuals			Extra at actuals			
(ii) Any other:	Included in basic price			Included in basic price			

SL NO	ITEM DESCRIPTION	QTY	UNIT	Weightage w.r.t Overall Price (In %)	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. : <Bidder to indicate> BHEL Enq. No. & date <Bidder to indicate>						
Notes:							
1) Bidders should quote the Total Bid Value in both in figures & words in the specified place.							
2) Bidders should mention the applicable HSN/SAC code along with GST% against respective line items.							
3) Bidders shall not fill/edit/modify anything else in the Price Bid Format.							
4) The rates of line items mentioned in the Price Format shall be derived by BHEL by multiplying the Total Bid Value quoted by the Bidder with the Weightage Factor assigned against respective line items. The rate of each item shall be rounded off to the next 1 (one) paisa.							
5) The Total Bid Value quoted by the Bidder shall represent the total landed cost for this enquiry and shall include Packing & Forwarding Charges, Freight & Insurance Charges, and all applicable taxes and duties, other than GST. GST shall be paid extra by BHEL at applicable rates.							
6) Evaluation shall be done on the basis of total bid value i.e. the total landed cost to BHEL for this enquiry. Loading (if applicable) shall be added to the Total Bid Value for evaluation purpose.							
7) The bidders will also provide un-priced price format strictly in the BHEL price format given above, in the techno commercial part of their offers. Bid will be rejected if any other price format is used. Both priced and un-priced price formats to be provided by the bidders shall be signed and stamped copies.							
8) Bidder to quote strictly as per BHEL's NIT requirements.							
9) Bidder to note that this is a LUMP SUM Turn-Key Order. However							
(a) Changes to the tender specification during execution of the project for successful operation of the system need to be carried out by bidder and commercial implications if any will be settled suitably.							
(b) Unit rates quoted by bidder shall be applicable for any changes in BOQ during detailed engineering stage.							
10) Main offer (Annexure-3A) consists of those items which will be part of main order after successful bidder is identified. Optional Items (Annexure-3A-I) consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format.							
11) Prices quoted by bidders for items under main offer : Sl. No.I(A+B+C+D) will be considered for evaluation of lowest bidder. For the purpose of tender (L1 bidder evaluation) following shall be noted:							
Referring to Sl no D- Supervision charges for Pump/Motor & Controller/Diesel Engine & Controller , For the purpose of Quotation, total no of 5 man days for Pump/Motor & Controller/Diesel Engine & Controller will be covered in 1 visit have been considered and payment against Sl.No D above shall be made as per the actual number of visits and man days required for the supervision of the complete E&C activities as per these diem rates. Purchase Order for supply of main items, (A to C) shall be placed by BHEL- PE&SD Hyderabad. For Supervision of E&C, LOI shall be placed by PE&SD and PO By BHEL-Power sector region.							
However, BHEL reserves the right							
(a) To include any of the optional items in scope of supply (as per customer contract requirements) and accordingly consider the same in evaluation. Any such scope increase and change in evaluation will be intimated to vendor during technical evaluation(before price bid opening).							
(b) To place PO for any of the Optional items with in the contract period.							
Hence bidders need to mandatorily quote reasonable prices for all optional items considering such requirement and keep the validity of the prices till the end of contract period.							
12 a) For all items including Optional items, prices to be furnished in this prescribed price bid format only for each individual item. The price to be quoted against sl no A, B & C shall be Weightage w.r.t Overall Prices mentioned above. No combined prices, common prices or any other format will be accepted and such bids may be liable for rejection.							
12 b) Bidder must not change the indicated item description, quantity & units in the price bid format. Bidder should only fill the unit rates & total price.							
12 c) Bidder to quote for all the items as per price bid format. Incomplete/partial offer may be liable for rejection.							
13 a.) Commissioning spares are those spares which are required at the time of commissioning and shall be recommended (as per bidders experience) and quoted by bidder. However commissioning spares indicated in the price bid format shall be quoted as minimum.							
13.b) Commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.							
14)With respect to Mandatory Spares;							
A) If any of above items indicated by the specified name are not applicable, bidder to offer alternative item serving the same function as per equipment's design and indicate below the item being replaced.							
B) If bidder is not able to meet the above note, then bidder may mention "Not Applicable". However, if found applicable during detailed engg. stage or alternative item as per equipment design can serve the same function, bidder to supply the specified quantity with out any delivery and commercial implications to BHEL.							
15) Reference document: PY51639_R00 & annexures.							
16) Unpriced price bid format indicating as quoted against each applicable item shall be submitted duly signed & stamped along with technical offer by bidder as a token of concurrence that prices are submitted in this format only. The offer shall be liable for rejection in case if un-priced price bid format is not submitted or any modification is carried out in price bid format.							
17) In case the systems are being supplied from outside India , reputed Third Party Inspection as mentioned in BHEL Tender Specification has to be considered and the charges should be included in the Main offer. For those bidders who are supplying from India, such third party inspection charges need not be considered and same will be arranged by BHEL/BHEL nominated inspection agency.							

Annexure-3A-I						
		BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032				
		PRICE FORMAT (R00) FOR FOAM PUMP WITH DRIVES (MOTOR & DIESEL ENGINE) PROJECT : 1X600 MW BHUSAWAL TPS UNIT-6, CUSTOMER:MAHARASHTRA STATE POWER GENERATION CO. LTD.,BHUSAWAL, CONSULTANT:DEVELOPMENT CONSULTANTS PVT. LTD.,CONSULTING ENGINEERS,VASHI,MUMBAI				
SL NO	ITEM DESCRIPTION	QTY	UNIT	Bidder confirmation (Quoted/ Not Quoted)	HSN/SAC Code	GST (%)
	Bidder's Name : <Bidder to indicate> Bidder's Offer No. & Dt. : <Bidder to indicate> Bidder's Ref No. & Dt. :<Bidder to indicate> BHEL Enq. No. & date :<Bidder to indicate>					
II	Optional Items	--	--			
A	Engine Revalidation Spares	1	Set			
B	2 Years Recommended Spares					
	Recommended spares list for two years normal operation along with unit price breakup for Pump, Drives & other accessories. (List with price break up to be enclosed) (1 set stands for quantity required for the replacement of one pump, drive (or) accessories)	1	Set			

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-4 (CHECKLIST)
--	---------------------------------------

Revisions: Refer to record of revisions				

ANNEXURE- 4 to BHEL TENDER SPECIFICATION

CHECKLIST FOR OFFER FOR FOAM PUMP WITH DRIVES (MOTOR/DIESEL ENGINE)

S.No.	Description	Bidder's Reply
1.	Bidder to confirm that the following documents are submitted along with their offer to enable BHEL to evaluate the offer. a) Duly filled in Pump-Motor-Diesel Engine datasheet (Annexure-2) b) Tentative GAD for Pump with Motor & Engine c) Performance curves for pump d) Un-priced copy of price in attached BHEL price bid formats (Annexure-3) indicating quoted/ not quoted against each row & column. e) Equipment qualification criteria / PTR / Reference Lists (Annexure-6) f) Checklist as per Annexure-4 g) No Deviation Certificate as per (Annexure-10) Datasheets in formats other than Annexure-2 shall not be reviewed.	
2.	All-important documents such as duly signed in unpriced price bid, reference list, pump performance curve, Pump & drive assembly GA drawings, CS drawings must necessarily to be furnished by bidder along with their offer for evaluation. Bidder to once again check their offer before submission and confirm.	
3.	Scope of supply as per Tender Specification. Bidder to Confirm. <u>Further any document indicating scope of supply submitted by bidders shall not be reviewed.</u>	
4.	Bidder to confirm that Performance requirement, Design and construction of the offered Pump model shall be as per Manufacturing Standard duly taking care of TAC requirement and Customer Specification.	
5.	Bidder to confirm that Performance requirement, Design and construction of the offered Diesel Engine shall be as per As Per TAC and Customer Specification (Annexure-5).	
6.	Bidder to confirm that Performance requirement, Design and construction of the offered Motor shall be Relevant Indian Standards and as Per TAC and Customer Specification (Annexure-5).	
7.	Bidder to confirm that Motors, Engine, Panel make shall be as per approved vendor list.	
8.	Bidder to submit Soft copy and hard copy of logics executed in the control panel. The same is required by customer during operations for uploading the programme.	
9.	Bidder to confirm that the Motor Rating Selected is as per requirement mentioned in BHEL Tender Specification.	
10.	Bidder to confirm that the Engine Rating Selected is as per requirement mentioned in BHEL Tender Specification.	

11.	Refer Annexure-2 of Tender Specification: Datasheet of Foam Pump-Motor & Engine Datasheet. Duly filled Annexure-2 is enclosed with bidder's offer as indicated Tender Specification, Bidder to Confirm.	
12.	Bidder to confirm that suitable supporting structure for Fuel tank along with necessary fixing arrangement included in their scope.	
13.	Bidder to confirm that suitable supporting structure for Battery along with necessary fixing arrangement included in their scope.	
14.	Suitable power, control and signal cable with glands & lugs for cable between Control panel, Battery, Battery charger and Diesel Engine shall be included in bidder scope of supply. Deviation in this is not acceptable. Bidder to Confirm.	
15.	Bidder to provide suitable Power cable gland and lugs for motor. Cable details shall be furnished during detail engineering stage. Bidder to confirm.	
16.	Bidder to provide suitable canopy for motor. Bidder to confirm.	
17.	Minimum instrumentations indicated in Tender Specification, bidder to include it in their scope of supply. Deviation in this is not acceptable. Bidder to Confirm.	
18.	Bidder to consider Exhaust Piping, Silencer, Insulation, Bends, Fittings etc. as per BHEL tender specification. However as a minimum Bidder to consider 15 m of exhaust piping with silencer & insulation with 6 Nos. of bends in bidder's scope of supply. The exhaust piping shall consist of bends, hood, bird screen etc. Deviation in this is not acceptable. Bidder to Confirm.	
19.	Each engine shall be provided with Two (2) sets (1 working & 1 standby, 100% capacity) battery units as per IS. Battery shall be sized as per BHEL tender specification. Bidder to Confirm.	
20.	Each engine shall be provided with 2 sets of battery charger units as per specification. □ Bidder to Confirm.	
21.	Suitable reducers/expanders & counter flanges along with gaskets & stud nuts at all the terminal points are considered by bidder. Deviation in this is not acceptable. Bidder to Confirm.	
22.	Bidder to furnish list of commissioning spares as per OEM recommendation. Any commissioning spare required over and above the recommended commissioning spares during commissioning shall be supplied free of cost by the equipment vendor. Deviation in this is not acceptable. Bidder to Confirm.	
23.	Bidder to furnish list of special tools & tackles. All the special tools and tackles indicated in tender specification are included in bidder's scope of supply. Deviation in this is not acceptable. Bidder to Confirm.	
24.	Bidder to furnish list of 2 year recommended spares as per OEM recommendation. Bidder to quote for the same in the price bid as optional price. Bidder to Confirm.	
25.	Painting schedule shall be as per Annexure-5 of Tender Specification, Bidder to Confirm.	
26.	Inspection, Testing requirements for Pump & Drive assembly: Inspection, Testing requirements shall be as per BHEL QAP & specification requirement only. Bidder to note that QAP shall be as per Annexure-7 & the same shall be discussed during detail engg. However in case of practical difficulties in meeting the quality requirement, same shall be mutually discussed & agreed during detail engg. Stage. Bidder to note & confirm.	
27.	Make of all the items shall be as per Annexure-8 (Sub-Vendor List). Bidder to confirm.	

28.	Bidder to confirm compliance with Annexure-9, Master Document List enclosed with Tender Specification, wrt list of documents, schedule of submission.	
29.	Bidders to comment on the instrumentation requirement as per P&ID (Annexure -1) based on their experience. If any other instruments are required as per good engg practice, bidder to highlight & Consider the same.	
30.	Any specific deviations, which are impractical, shall be raised in form of pre-bid queries as per Annexure-11 before submission of Techno Commercial offer. Any deviation/ queries raised during technical bid submission shall not be entertained. Bidder to Confirm.	
31.	Bidder to quote as per Annexure-3, Price Bid Format only. Price quoted as per the price bid format, clearly indicating all the applicable items are quoted, and not applicable items are clearly highlighted. Un priced copy of the same is enclosed with bidder's offer. Bidder to check and confirm.	
32.	Bidder to quote individual price for each item mentioned in the seal priced bid. Bidder to check and confirm.	
33.	Bidder to confirm that the bidder has quoted prices for respective items as percentage of total price mentioned in price bid format.	

SIGNATURE:

NAME:

DESIGNATION:

COMPANY:

DATE:

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-5 (Customer/Consultant specification)
--	--

Revisions: Refer to record of revisions				

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 43 of 123
7.2 <u>DIESEL ENGINE</u> 7.2.1 Performance requirement of the diesel engine shall be guided by TAC recommendations. 7.2.2 The engine shall be capable of operating continuously on full load at the site conditions for a period of at least six (6) hours.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 44 of 123

7.2.3

The engine shall be naturally aspirated, super charged or turbo-charged as recommended by the manufacturer (Ref. Fire Protection Manual by TAC).

7.2.4

The continuous engine brake horse power rating (after accounting for all auxiliary power consumption) at the site conditions shall be at least 20% greater than the brake horse power required to drive the pump at its duty point at rated R.P.M. and in no case less than the brake horse power required to drive the pump at 150% of rated discharge or at any condition of operation of pump. Deaerating Factors considered by the manufacturer to arrive at the shaft power of the diesel engine at site, shall not be less than the following for normally aspirated engines only :

(a)

3% for each 305 metre elevation above MSL (Ref. NFPA, Volume-2, 1978).

(b)

1% for each 5.6°C rise in air temperature above 15.6°C (Ref. NFPA, Volume-2, 1978).

The base power rating of the diesel engine shall be referred to any accepted datum like BS/SAE Standard condition or equivalent. In any case, horsepower rating shall not be higher than the limit set by Tariff Advisory Committee.

7.2.5

Design and construction of the diesel engine shall be guided by the specification for diesel engine attached herewith and TAC recommendations.

7.2.6

Starting

(a)

The engine shall be capable of both automatic and manual start.

(b)

Automatic cranking shall be effected by a battery driven D.C. motor having high starting torque to overcome full engine compression. Starting power shall be supplied from two (2) sets of storage batteries. One (1) set of battery is for automatic starting of the engine and the other provided for manual starting. A selector switch shall be provided at the automatic starting control panel to select any of the two (2) sets of battery for manual/auto starting of the engine.

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
REV: R0	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
	FIRE PROTECTION AND DETECTION SYSTEMS	Page 45 of 123
The automatic starting arrangement shall include, as a safeguard, a "Repeat Start" feature so that if the pinion of the starting motor does not engage the flywheel at the first attempt, it is automatically retracted and after a short pause again will advance towards the flywheel. This repeat start cycle will continue until five (5) kicks after which there will be suitable annunciation. The battery capacity shall be adequate for ten (10) consecutive starts without recharging with a cold engine under full compression. (c) Arrangement for both trickle and booster charge of the batteries shall be provided. When the engine starts running, provision should be kept to ensure that the charger is automatically disconnected and the battery is charged by engine dynamo. Each diesel engine shall be provided with two (2) battery charger units of air-cooled design. Each charger unit shall be capable of charging one (1) set of battery at a time. Provision shall, however, be kept so that any of the charger units of a particular engine can be utilised for charging any one of the two (2) batteries of that engine. 7.2.7 Governing System (a) The engine shall be fitted with a speed control device that will control the speed under all conditions of load. (b) The governor shall offer following features: (i) Engine should be provided with an adjustable governor capable of regulating engine speed within 10% of its rated speed under any condition of load up to the full load rating. The governor shall be set to maintain rated pump speed at maximum pump load. (Refer Fire Protection Manual by TAC). (ii) Engine shall be provided with an over speed shut-down device. It shall be arranged to shut-down the engine at a speed approximately 20% above rated speed and for manual reset, such that the automatic engine controller will continue to show an over speed signal until the device is manually reset to normal operating position (Refer NFPA).		

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 46 of 123
(c) The governor shall be suitable for operation without external power supply. 7.2.8 Fuel System (a) The diesel engine shall run on High Speed Diesel oil. (b) Each engine shall be provided with fuel oil tank having storage capacity sufficient to run the engine at full load for at least six (6) hours. (c) For each compression ignition engine driven pump set, there shall be individual fuel tank and fuel feed pipes. (d) A suitable Single phase, 230 Volt fuel pump (portable) shall be provided to fill up diesel oil from Diesel Drum received from supplier of Diesel. This pump should also have facility to be operated by hand, in case electricity fails. 7.2.9 Lubricating Oil System Automatic pressure lubrication shall be provided by a crankshaft driven oil pump. 7.2.10 Cooling Water System The cooling water system shall conform to any one of the systems specified in Fire Protection Manual of the Regional committee of the Tariff Advisory Committee/NFPA. 7.2.11 Instrumentation & Control The diesel engine shall be provided with adequate instrumentation. These shall include but not limited to the following: (a) Temperature indicator (contact type) in cooling water inlet and outlet.		

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 47 of 123
(b) Temperature indicator in lubricating oil outlet from the oil cooler. (c) Pressure gauges (contact type) for lubricating oil system. (d) Differential pressure gauges (contact type) across strainers/ filters. (e) Speed indicator. (f) Running hour meter. (g) Dip stick type lubricating oil sump level indicator. (h) Gauge glass type Fuel Oil Tank level indicator.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 87 of 123
<u>DATA SHEET - A</u> <u>DIESEL ENGINE</u>		
<u>SR. NO.</u>	<u>ITEM</u>	
1.0	<u>GENERAL INFORMATION</u>	
1.1	Service	Fire Water Pumps/Booster Pump
1.2	Designation	Internal Combustion Diesel Engine
1.3	Type	Compression ignition, mechanical (air less) direct injection multicylinder and four stroke cycle and cold starting type.
1.4	No. of engine required	By bidder
1.5	No. of engine working	By bidder
1.6	Duty	Intermittent
1.7	Location	Indoor/Indoor
2.0	<u>ENGINE PARAMETERS</u>	
2.1	Nominal output of engine at site operating under ambient conditions	Bidder to indicate during detailed engineering
2.2	Speed of the Engine	Not more than 2300 rpm.

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 119 of 123

6.0 COMPRESSION IGNITION DIESEL ENGINE

6.1 SHOP TESTS

- | | |
|-------|--|
| 6.1.1 | All pressure parts shall be subjected to hydraulic pressure tests at 1.5 times the design pressure. |
| 6.1.2 | All Diesel engine shall be performance tests as per relevant IS / equivalent code. |
| 6.1.3 | All gear boxes shall be tested at No-load for back lash, gear ratio, noise vibration and temperature rise. |

6.2 PERFORMANCE TEST

Performance test of diesel engine shall be carried out as per BS-5514 to determine the rated power and specific fuel consumption and governor's function. Performance test of engine in shop shall be done with actual job

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 120 of 123
accessories for minimum four hours (three hours for full load and one hour for over load at 110% of full load). All the engine parameters like RPM, inlet air temperature and pressure, water inlet and outlet temperature and pressure, lub. Oil pressure, fuel consumption, ambient condition shall be measured and recorded for every half an hour. No positive tolerance shall be allowed on the specific fuel consumption (bidder to specify in the offer).		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: III-H
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	
REV: R0	FIRE PROTECTION AND DETECTION SYSTEMS	Page 122 of 123

12.0 GEAR BOXES

- 12.1 In addition to physical and chemical properties checks, the shafts and gear forging shall be subjected to Ultrasonic Testing and Hardness Test.
- 12.2 MPI/DPT to be carried out on Gears after heat treatment to ensure freedom from defects.
- 12.3 No load shop trial run to be conducted on gearboxes, which should include check for temperature rise, noise and vibration level.

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 365 of 440
1.0 <u>SCOPE</u> 1.1 This section covers the general requirements of the drive motors for power station auxiliary equipment. 1.2 Motors shall be furnished in accordance with both this general specification and the accompanying driven equipment specification. 1.3 In case of any discrepancy, the driven equipment specification shall govern etc. 2.0 <u>STANDARDS</u> 2.1 All motors shall conform to the latest applicable IS, IEC and CBIP Standards/ Publications except when otherwise stated herein or in the driven equipment specification. 2.2 Major standards, which shall be followed, are listed below other applicable Indian Standards for any component part even if not covered in the listed standards shall also be followed (a) IS-325 (b) IS-12615 (c) IEC-34 3.0 <u>SERVICE CONDITIONS</u> 3.1 The motors will be installed in hot, humid and tropical atmosphere, highly polluted at places with coal dust and/or fly ash canopy to be provided to all outdoor install motors. 3.2 Unless otherwise noted, electrical equipment/system design shall be based on the service conditions and auxiliary power supply given in the annexure to this specification.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 366 of 440
3.3	For motor installed outdoor and exposed to direct sunrays, the effect of solar heat shall be considered in the determination of the design ambient temperature	
4.0	<u>TYPE AND RATING</u>	
4.1	<u>A.C. MOTORS</u>	
4.1.1	Motors shall be general purpose, constant speed, squirrel cage, three phase, induction type.	
4.1.2	All motors shall be rated for continuous duty. They shall also be suitable for long period of inactivity.	
4.1.3	The motor name-plate rating at 50°C shall have at least 10% margin over the input power requirement of the driven HT equipment at rated duty point unless stated otherwise in driven equipment specification or in general electrical specification.	
4.1.4	The motor characteristics shall match the requirements of the driven equipment so that adequate starting, accelerating, pull up, break down and full load torques are available for the intended service.	
4.1.5	All LT motors used in this project are proposed to be energy efficient type suitable for EFF1 efficiency rating.	
4.1.6	The motor name plate rating shall have at least 10% margin over the input power requirement of the HT driven equipment and 15% for LT driven equipments at rated duty point.	
4.1.7	Motors located in hazardous area shall be flame proof type.	
4.2	<u>D.C. MOTORS</u>	
4.2.1	D.C. Motor provided for emergency service shall be shunt/compound wound type.	
4.2.2	Motor shall be sized for operation with fixed resistance starter for maximum reliability.	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 367 of 440
4.2.3	Starter panel complete with all accessories shall be included in the scope of supply.	
4.3	For equipment installed outdoor and exposed to direct sun rays, the effect of solar heat shall be considered in determining the design ambient temperature.	
5.0	<u>PERFORMANCE</u>	
5.1	<u>RUNNING REQUIREMENTS</u>	
5.1.1	Motor shall run continuously at rated output over the entire range of voltage and frequency variations as given in the annexure.	
5.1.2	The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.	
5.1.3	The motor shall be designed to withstand momentary overload of 60% of full load torque for 15 second without any damage.	
5.1.4	Motor shall not be stalled if the supply voltage drops to 70% of the rated voltage for 2 seconds duration.	
5.2	<u>STARTING REQUIREMENTS</u>	
	Motor shall be designed for direct online starting at full voltage. Starting current shall not exceed 6 times full load current for all auxiliaries except boiler feed pump where the starting current shall be limited to 4.5 times. No further tolerances are applicable on starting current specified above for HT motors	
5.2.1	The motor shall be capable of withstanding the stresses imposed if started at 110% rated voltage	
5.2.2	Motor shall start with rated load and accelerate to full speed with 80% rated voltage at motor terminal except BFP motor. In case of BFP motor, it shall	

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 368 of 440
be 75% rated voltage. Minimum starting requirement for mill motor (double cage) shall be 85% rated voltage at motor terminals.		
5.2.3	Motor shall be capable of three equally spread starts per hour, two starts in quick succession from cold condition and one restart from hot condition. Cranking motor shall be capable of six equally spread starts per hour, three starts in quick succession from cold condition and one restart from hot condition. The coal conveyor and crusher motors shall be suitable for 3 consecutive hot starts with maximum 20 starts per day. Pump motor subject to reverse rotation shall be designed to withstand the stresses encountered when starting with shaft rotating at 125% rated speed in reverse direction.	
5.2.4	HT pump motors shall be suitable to start with forward rotation.	
5.2.5	The motors shall be designed to withstand 120% of rated speed for 2 minutes without any mechanical damage	
5.3	<u>STRESS DURING BUS TRANSFER.</u>	
5.3.1	The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage.	
5.3.2	The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.	
5.4	<u>LOCKED ROTOR WITHSTAND TIME</u>	
5.4.1	The locked rotor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 2.5 seconds for motors up to 20 seconds starting time and by 5 seconds for motor with more than 20 seconds starting time.	

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 369 of 440
5.4.2	Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.	
5.4.3	Hot thermal withstand curve shall have a margin of at least 10% over the full load current of the motor to permit relay setting utilizing motor rated capacity	
6.0	<u>SPECIFIC REQUIREMENTS</u>	
6.1	<u>ENCLOSURE</u>	
6.1.1	All indoor motor enclosures shall conform to the degree of protection IP-55 unless otherwise specified and outdoor motor enclosure shall conform to degree of IPW-55. Motor for outdoor or semi-outdoor service shall be of weather-proof construction.	
6.1.2	For hazardous area approved type of increased safety enclosure shall be furnished.	
6.2	<u>COOLING</u>	
6.2.1	The motor shall be self ventilated type, either totally enclosed fan cooled (TEFC) or closed air circuit air- cooled (CACA).	
6.2.2	In case water cooling is required for very large motors, prior approval of the customer is to be obtained before proceeding ahead with design & manufacture.	
6.3	<u>WINDING AND INSULATION</u>	
6.3.1	All insulated winding shall be of copper.	
6.3.2	All motors shall have class F insulation but limited to class B temperature rise.	
6.3.3	Windings shall be impregnated to make them non-hygroscopic and oil resistant.	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 370 of 440
6.4 <u>TROPICAL PROTECTION</u> 6.4.1 All motors shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion. 6.4.2 All fittings and hardwares shall be corrosion resistant. 6.5 <u>BEARINGS</u> 6.5.1 Motor shall be provided with antifriction bearings, unless sleeve bearings are required by the motor application. 6.5.2 Vertical shaft motors shall be provided with thrust and guide bearings. Thrust bearing of tilting pad type is preferred. 6.5.3 Bearings shall be provided with seals to prevent leakage of lubricant or entrance of foreign matters like dirt, water etc. into the bearing area. 6.5.4 Sleeve bearings shall be split type, ring oiled, with permanently aligned, close running shaft sleeves. 6.5.5 Grease lubricated bearings shall be prelubricated and shall have provisions for in-service positive lubrication with drains to guard against over lubrication. 6.5.6 Oiled bearing shall have an integral self cooled oil reservoir with oil ring inspection ports, oil sight glass with oil level marked for standstill and running conditions and oil fill and drain plugs. 6.5.7 Forced lubricated or water cooled bearing shall not be used without prior approval of Owner. 6.5.8 Lubricant shall not deteriorate under all service conditions. The lubricant shall be limited to normally available types with IOC equivalent. 6.5.9 Bearings shall be insulated as required to prevent shaft current and resultant bearing damage.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 371 of 440
6.6	<u>NOISE & VIBRATION</u>	
6.6.1	The noise level shall be as per statutory acceptance (IS/IEC).	
6.6.2	The peak amplitude of the vibration shall be within IS/IEC specified limits.	
6.7	<u>MOTOR TERMINAL BOX</u>	
6.7.1	Motor terminal box shall be phase segregated (PSTB) type and located in accordance with Indian Standards clearing the motor base- plate/ foundation.	
6.7.2	Terminal box shall be capable of being turned 360 Deg. in steps of 180 Deg. For HT motors and 90 Deg. for LT motors unless otherwise approved.	
6.7.3	The terminal box shall be split type with removable cover with access to connections and shall have the same degree of protection as motor.	
6.7.4	The terminal box shall have sufficient space inside for termination/connection of XLPE insulated armoured aluminium cables.	
6.7.5	Terminals shall be stud or lead wire type, substantially constructed and thoroughly insulated from the frame.	
6.7.6	The terminals shall be clearly identified by phase markings, with corresponding direction of rotation marked on the non-driving end of the motor.	
6.7.7	The terminal box shall be capable of withstanding maximum system fault current for duration of 0.25 sec.	
6.7.8	For 11kV and 3.3kV motor, the terminal box shall be phase-segregated type. The neutral leads shall be brought out in a separate terminal box (not necessarily phase segregated type) with shorting links for star connection.	
6.7.9	Motor terminal box shall be furnished with suitable cable lugs and double compression brass glands to match with cable used.	
6.7.10	The gland plate for single core cable shall be non-magnetic type.	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A												
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10												
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 372 of 440												
6.7.11 Due to any reason, if the terminal box is found to be not suitable for the approved cable size for either HT/LT motors, then the bidder shall arrange necessary adopter box to facilitate the termination of cables. The adopter box shall be of the same short circuit rating and specifications as the main terminal box. The adopter box shall be located as near as possible to the main terminal box. The interconnecting cabling between adopter box and main terminal box along with providing suitable cable glands and termination kits as applicable shall also be done by the bidder. 6.8 <u>GROUNDING</u> 6.8.1 The frame of each motor shall be provided with two separate and distinct grounding pads complete with tapped hole, GS bolts and washer 6.8.2 The grounding connection shall be suitable for accommodation of ground conductors as follows : <table border="0"> <tr> <td>Motor above 90 kW</td> <td>:</td> <td>75 x 10 mm GS Flat</td> </tr> <tr> <td>Motor above 30 kW up to 90 kW</td> <td>:</td> <td>50 x 6 mm GS Flat</td> </tr> <tr> <td>Motor above 5 kW up to 30 kW</td> <td>:</td> <td>25 x 6 mm GS Flat</td> </tr> <tr> <td>Motor up to 5 kW</td> <td>:</td> <td>8 SWG GS Wire</td> </tr> </table> 6.8.3 The cable terminal box shall have a separate grounding pad 6.9 <u>RATING PLATE</u> In addition to the minimum information required by IS, the following information shall be shown on motor rating plate: (a) Temperature rise in Deg.C under rated condition and method of measurement. (b) Degree of protection.			Motor above 90 kW	:	75 x 10 mm GS Flat	Motor above 30 kW up to 90 kW	:	50 x 6 mm GS Flat	Motor above 5 kW up to 30 kW	:	25 x 6 mm GS Flat	Motor up to 5 kW	:	8 SWG GS Wire
Motor above 90 kW	:	75 x 10 mm GS Flat												
Motor above 30 kW up to 90 kW	:	50 x 6 mm GS Flat												
Motor above 5 kW up to 30 kW	:	25 x 6 mm GS Flat												
Motor up to 5 kW	:	8 SWG GS Wire												

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 373 of 440
(c) Bearing identification no. and recommended lubricant. (d) Location of insulated bearings. 6.10 <u>CONSTRUCTION</u> 6.10.1 Stator Core The Stator Core Lamination shall be made of high-grade silicon/magnetic steel sheet varnished on both sides and pressed to form rigid core. 6.10.2 Rotor The rotor construction shall be such that in case of dislodging of the rotor bar from the end ring, it should not come out and hit the stator core/stator winding and damage. 7.0 <u>ACCESSORIES</u> 7.1 <u>GENERAL</u> Accessories shall be furnished, as listed below, or if otherwise required by driven equipment specification or application 7.2 <u>SPACE HEATER</u> 7.2.1 Motor of rating 30 kW and above shall be provided with space heaters, suitably located for easy removal or replacement. 7.2.2 The space heater shall be rated 240 V, 1 phase 50 Hz and sized to maintain the motor internal temperature above dew point when the motor is idle. 7.3 <u>TEMPERATURE DETECTORS</u> 7.3.1 All 11kV and 3.3kV motors shall be provided with twelve (12) nos. Simplex type winding temperature detectors, four (4) nos. per phase.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 374 of 440
7.3.2	11kV and 3.3kV motor bearing shall be provided with duplex type temperature detectors.	
7.3.3	The temperature detector mentioned above shall be resistance type, 3 wire, platinum wound, 100 Ohms at 0°C.	
7.3.4	Leads of all simplex type motor winding RTDS and motor bearing RTDS shall be wired up to respective switchgear metering & protection compartment. From which one set of RTDS will be connected to numerical protection relay and another set shall be kept free for DCS connectivity.	
7.3.5	Five numbers of Temperature detectors / thermistors shall be provided for L.T. Motors above 90 kW (3 nos. Winding temperatures & 2 nos. bearing temperatures).	
7.4	<u>INDICATOR/SWITCH</u>	
7.4.1	Dial type local indicator with alarm contacts shall be provided for the following :	
	(a) 11kV and 3.3kV motor bearing temperature	
	(b) Hot and cold air temperature of the closed air circuit for CACA and CACW motor	
7.4.2	Flow switches shall be provided for monitoring cooling water flow of CACW motor and oil flow of forced lubrication bearing, if used.	
7.4.3	Alarm switch contact rating shall be minimum 0.5 A at 220V D.C. and 5A at 240V A.C.	
7.5	<u>CURRENT TRANSFORMER FOR DIFFERENTIAL PROTECTION</u>	
7.5.1	Motor 1000 KW and above shall be provided with three differential current transformers mounted over the neutral leads within the enclosure. Loose 3 nos. CT for mounting on switchgear side shall be in bidder's scope.	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 375 of 440
7.5.2	The arrangement shall be such as to permit easy access for C.T. testing and replacement. Current transformer characteristics shall match Owner's requirements to be intimated later.	
7.6	<u>ACCESSORY TERMINAL BOX</u>	
7.6.1	All accessory equipment such as space heater, temperature detector, current transformers etc., shall be wired to and terminated in terminal boxes, separate from and independent of motor (power) terminal box.	
7.6.2	Accessory terminal box shall be complete with double compression brass glands and pressure type terminals to suit cable connections.	
7.7	<u>DRAIN PLUG</u>	
	Motor shall have drain plugs so located that they will drain the water, resulting from the condensation or other causes from all pockets of the motor casing.	
7.8	<u>LIFTING PROVISIONS</u>	
	Motor weighing 25 Kg. or more shall be provided with eyebolt or other adequate provision of lifting.	
7.9	<u>DOWEL PINS</u>	
	The motor shall be designed to permit easy access for drilling holes through motor feet or mounting flange for installation of dowel pins after assembling the motor and driven equipment.	
7.10	<u>PAINTING</u>	
	Motor including fan shall be painted with corrosion proof paints of colour shade (RAL-7032).	
8.0	<u>TESTS</u>	
8.1	<u>ROUTINE AND TYPE TEST:</u>	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 376 of 440

Tests are to be conducted for HT and LT motors 60kW and above in presence of Mahagenco representative and contractor as per IS: 325 and required copies of test certificates are to be furnished for approval and despatch clearance. In addition, following tests shall have to be carried out on the motors in presence of MAHAGENCO representative & contractor on LT & HT motors. For Motors below 60kW type and routine test conducted as per IS325 shall be witnessed by contractor and test certificate shall be submitted for review of Mahagenco & Dispatch clearance

8.1.1 FOR HT MOTORS:

(a) Impulse test by 1.2 / 50 micro sec. On sample coil of Stator winding insulation as type test as per IEC-671/IS 14422,1995 test voltages as under

Voltage rating of motor	Impulse Test Voltage
3.3 kV	: 18 kV peak
11 kV	: 49 kV peak

(b) Tan delta, charging current and dielectric loss measurements on each phase of motor stator winding as routine test

(c) Polarization Index Test as per IS:7816 as routine test

(d) Tan delta measurement on coils

(e) Surge withstand test for inter turn insulation.

(f) Test to diagnose rotor bar failure during manufacture.

Tests indicated at (d), (e), (f) shall be carried out during manufacture of the coils and shall be furnished for verification .

8.1.2 FOR HT & LT MOTORS:

(a) Test for suitability of IP55/ IPW– 55 as per IS 4691 as type test. Type test certificate for first numeral shall be acceptable in lieu to test,

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 377 of 440
provided the test motor is identical to motor being supplied. Second numeral test shall be carried out on one motor of each type and rating. (b) Fault Withstand Test for main terminal box as type test. Type test certificate shall be acceptable, if the test is conducted on exactly identical terminal box within last three years. (c) Test for noise level as routine test. (d) Test for vibration as routine test. (e) Overspeed test as type test. 8.2 <u>TEST WITNESS:</u> Test shall be performed in presence of Owner/Purchaser's representative so desired by the Owner/Purchaser. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.		

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES	Page 378 of 440

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.		Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1		Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES		Page 379 of 440

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.		Volume: IV-A
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1		Section – 10
REV: R0	ELECTRICAL EQUIPMENT & ACCESSORIES		Page 380 of 440
SR. NO.	ITEM	UNIT	
2.1	<u>A.C. SUPPLY:</u>		
	Voltage		± 10%
	Frequency		± 5%
	Combined Voltage & frequency		± 10% (absolute sum)
	During starting of large motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment while running shall successfully ride over such period without affecting system performance		
2.2	<u>D.C. SUPPLY</u>		
	Voltage		198 to 240 Volt

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO MAHARASHTRA STATE POWER GENERATION CO. LTD.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume : V
	BID SPECIFICATION NO.:DG/BSL U-6/2011/T-1	Section – 5
REV: R0	CONTROL & INSTRUMENTATION	Page 221 of 718
SR. NO.	ITEM	DESCRIPTION
1.0	<u>FIELD INSTRUMENTS</u>	
	This section provides general hardware guidelines for field instruments and equipment to be supplied under this specification.	
1.1	<u>PRESSURE TRANSMITTER</u>	
1.1.1	Working Principle	SMART, HART Protocol.
1.1.2	Type	2 – Wire.
1.1.3	Output Signal	4-20 mA DC.
1.1.4	Signal Processing	Silicon solid state electronic circuitry.
1.1.5	Measuring Element	Capsule/ Diaphragm.
1.1.6	Element material	AISI-316 (Stainless Steel) or better.
1.1.7	Static Pressure	150 % of maximum span continuously, without affecting the calibration.
1.1.8	Turn-down ratio	100:1
1.1.9	Span and Zero	Locally adjustable non-interacting. Facility for elevation and suppression by 100% of span.
1.1.10	Enclosure Class	IP-65.
1.1.11	Output Indicator	LCD Type.
1.1.12	Nameplate	Tag number, service engraved in SS tag plate.
1.1.13	Body	Forged Carbon Steel for air and flue gas application and SS for other

SR. NO.	ITEM	DESCRIPTION
		application.
1.1.14	Operating Voltage	16 - 48 Volts D.C.
1.1.15	Load	600 Ohms (min.) at 24 Volts D.C.
1.1.16	Ambient Temperature	0 - 50 °C.
1.1.17	Performance :	
	(a) Accuracy	± 0.1% of Span or better.
	(b) Repeatability	± 0.05% of Span or better.
	(c) Stability	a) +/- 0.1% of calibrated span for 5 year for ranges upto and including 70 Kg/cm ² b) +/- 0.25% of calibrated span for 5 years for ranges more than 70 kg/cm ² (g)
1.1.18	Sealing/Isolation	Extended diaphragm with 5 meters SS armoured capillary for viscous fluid applications.
1.1.19	Accessories	(a) Universal mounting bracket suitable for 2" pipe mounting.
		(b) High tensile carbon steel U- bolts.
		(c) Siphon for steam and hot water services.
		(d) ½" NPT 2-valve stainless steel manifold, constructed from SS316 bar stock.
		(e) Companion flange with nuts, bolts and gaskets.
		(f) Hand held configuration kit for calibration of SMART Transmitter.
		(g) ½" NPT cable gland.

1.7	<u>PRESSURE GAUGE AND DIFFERENTIAL PRESSURE GAUGE</u>	
1.7.1	Type	Bourdon / Bellows / Diaphragm.
1.7.2	Sensing & Socket	AISI-316 SS.
1.7.3	Movement Material	AISI-304 SS.
1.7.4	Case Material	Stainless steel, IP-65.
1.7.5	Dial Size	Generally 150 mm.
1.7.6	Scale	Black lettering on white in 270 ° arc.
SR. NO.	ITEM	DESCRIPTION
1.7.7	Window	Shatterproof glass.
1.7.8	Range Selection	Normal process pressure: 50~70% of range.
1.7.9	Over-range Protection	125% of maximum range by internal stop. External stop at zero.
1.7.10	Adjustment	Micrometer screw for zero. Internal micrometer screw for range.
1.7.11	Element Connection	Argon welding.
1.7.12	Process Connection	1/2" NPT(M) Bottom for local, back for panel mounting.
1.7.13	Performance	Accuracy of ± 1.0 % of span or better.
1.7.14	Operating ambient	0 - 50 °C.
1.7.15	Safety Feature	Blow out disc / diaphragm at the back.
1.7.16	Accessories	(a) Snubbers and Glycerin filled for pulsating fluid applications and at pump discharge.
		(b) Stainless steel Diaphragm seals for viscous fluids
		(c) 3-Way SS316 Gauge cock for pressure gauges.
		(d) 5-valve SS316 manifold from barstock for differential pressure gauge.
		(e) Siphons for steam and hot water services.

SR. NO.	ITEM	DESCRIPTION
1.7.17	Applicable standard	IS-3624 / 1996.
1.7.18	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.8	<u>TEMPERATURE GAUGE</u>	
1.8.1	Type	Mercury or gas filled.
1.8.2	Sensing Element Material	Bourdon - AISI-316 SS.
1.8.3	Capillary Armoring	Stainless steel flexible.
1.8.4	Movement Material	AISI 304 SS.
1.8.5	Bulb / Stem Diameter	12 mm.
1.8.6	Bulb / Stem Material	AISI 316.
1.8.7	Capillary	Stainless Steel.
1.8.8	Connection to well	½" NPT.
1.8.9	Case Material	Stainless steel.
1.8.10	Dial Size	150 mm in general.
1.8.11	Scale	Black lettering on white in 270 ° arc.
1.8.12	Mounting	Surface/ Panel.
1.8.13	Over range Protection	125 % of range or more.
1.8.14	Instrument connection	Bottom for local and back for panel mounting.
1.8.15	Range	Normal temperature – 50~70% of range.
1.8.16	Zero adjuster	Micrometer screw adjustable from front.

SR. NO.	ITEM	DESCRIPTION
1.8.17	Window	Shatterproof glass.
1.8.18	Accuracy	$\pm 1\%$ or better.
1.8.19	Enclosure Class	IP-65.
1.8.20	Capillary	5 meters (local surface)/15.0 meters (local panel) - armoured stainless steel.
1.8.21	Compensation	Capillary and Case Compensation.
1.8.22	Accessories	(a) Forged barstock thermowell screwed as per ASME PTC code. Process connection M 33X2 (M). Material of construction of Thermowell: (i) SS 316: In general. (ii) Inconel: For flue gas application. (iii) Tungsten carbide: For coal mill application.
1.8.23	Nameplate	Tag number, service engraved in stainless steel tag plate.
1.9	TESTER/CONTROLLER	
1.11	<u>PRESSURE SWITCH</u>	
1.11.1	Type	(a) Piston for high pressure application.
		(b) Bellow / Diaphragm for low pressure application.
1.11.2	Sensing element material	AISI SS-316. All other wetted part SS316.
1.11.3	Case Material	Die-cast aluminium alloy, neoprene gasket.
1.11.4	Setter Scale	Black graduation on white linear scale. Graduation 0-100% with red pointer for set points.

SR. NO.	ITEM	DESCRIPTION
1.11.5	Over range	150 % of maximum pressure.
1.11.6	Adjustments	(a) Internal Set Point.
		(b) Differential adjustment.
1.11.7	End Connection	½" NPT (M) bottom connected.
1.11.8	Switch configuration	Two SPDT.
1.11.9	Switch Rating	240V, 5A AC / 220V, 0.5A DC.
1.11.10	Switch Type	Snap acting, hermetically sealed, shock & vibration proof.
1.11.11	Terminal Block	Suitable for full ring lugs.
1.11.12	Cable connection	½" NPT conduit connection.
1.11.13	Enclosure Class	IP-65.
1.11.14	Performance	(a) Repeat accuracy $\pm 1.0\%$.
		(b) Accuracy of Setting Indication of $\pm 1.5\%$.
1.11.15	Ambient temperature	0 – 50 Deg C.
1.11.16	Nameplate	Tag number, service engraved in SS tag plate.
1.11.17	Accessories	(a) Remote diaphragm seal with SS-316 capillary for viscous & corrosive application.
		(b) Siphons for steam and hot water services.
		(c) Retention ring and screws for surface mounting.
SR. NO.	ITEM	DESCRIPTION
		(d) 1/2" NPT 2 Valve SS-316 barstock manifold.
		(e) ½" NPT cable gland.

1.13	<u>LEVEL SWITCH</u>	
1.13.1	Type	External cage float operated. Magnetically coupled.
1.13.2	Float Material	AISI-316 stainless steel or better.
1.13.3	Other wetted parts	AISI-316 stainless steel or better.
1.13.4	External Cage	Carbon steel/Stainless steel as per process requirements, welded type/ flanged construction. Cage pressure rating shall equal or exceed the rating of the main vessel.
1.13.5	External cage mounting	Side-Side.
1.13.6	External cage connection	25 NB socket welded.
1.13.7	Switch housing	Epoxy coated die-cast aluminium alloy with neoprene gasket conforming to IP-65.
1.13.8	Type of switch configuration	2 SPDT (two nos.).
1.13.9	Contact rating	5A, 240V/ AC, 0.25A, 220V DC.
1.13.10	Accessories	(a) Counter flange, nuts & bolts, suitable gasket etc.
		(b) Steel globe type drain valve.
		(c) ½"NPT cable gland.
		(d) Stainless steel nameplate with

SR. NO.	ITEM	DESCRIPTION
		alpha-numeric engraved for service and tag.
1.13.11	Preferred feature	Switch operating point marked on cage.
1.13.12	Mounting	On standpipe.
1.14	<u>CONDUCTIVITY TYPE LEVEL SWITCH</u>	
1.14.1	Type	Conductivity discrimination.
1.14.2	Application	Drain pots viz. on CRH line.
1.14.3	Mounting	Flanged – on external cage.
1.14.4	Probe MOC	Stainless steel with high purity ceramic.
1.14.5	Probe rating	> Maximum design pressure of vessel.
1.14.6	Input	Four independent channel with selectable switching threshold for water conductivity.
1.14.7	Relay Output	Four isolated output relays for Hi, Lo, Hi-Hi, Lo-Lo.
1.14.8	Contact type & rating	2 SPDT or 1 DPDT @ 5A 30V DC.
1.14.9	Local Display	Coloured LEDs for Hi, Lo, Hi-Hi, Lo-Lo, Power & fault.
1.14.10	Power supply	Dual 240V AC, 50 Hz, 1Ph.
1.14.11	Enclosure	IP-65, corrosion resistant & wall mounting type (Explosion proof for NEC Class-1, Division-1 area).

SR. NO.	ITEM	DESCRIPTION
1.14.12	Accessories	(a) PTFE cable from probe to electronics.
		(b) Mounting accessories.
		(c) External cage.
		(d) Washer & gasket.
1.14.13	Test pressure	(e) Two times rated pressure.
1.14.14	Cable connection	(f) ½" NPT with cable gland.
1.15	<u>CONDUCTIVITY TYPE</u> <u>ELECTRONIC LEVEL</u> <u>INDICATOR</u>	
1.15.1	Type	Conductivity discrimination.
1.15.2	Application	HP heater level.
1.15.3	No. of Probes	10
1.15.4	Probe Mounting	Flanged – on standpipe.
1.15.5	Probe MOC	Stainless steel with high purity ceramic.
1.15.6	Probe rating	> Maximum design pressure of vessel.
1.15.7	Input	Independent channel with selectable switching threshold for water conductivity.
1.15.8	Relay Output	Four isolated output relays for Hi, Lo, Hi-Hi, Lo-Lo.
1.15.9	Contact type & rating	2 SPDT or 1 DPDT @ 5A 30V DC.

SR. NO.	ITEM	DESCRIPTION
1.15.10	Current output	Isolated 4-20 mA DC.
1.15.11	Local Display	(a) Coloured (Red & Green) LEDs for level.
		(b) Flashing LEDs for fault.
1.15.12	Remote Display	Red, Green & flashing yellow LEDs for steam, Water & Fault indication respectively.
1.15.13	Power supply	Dual 240V AC, 50 Hz, 1Ph.
1.15.14	Enclosure	(a) IP-65, corrosion resistant & wall mounting type for local electronics.
		(b) IP-42 for remote indicator.
1.15.15	Accessories	(a) PTFE cable from probe to electronics.
		(b) Mounting accessories.
		(c) Standpipe.
		(d) Washer & gaskets.
		(e) Double isolation valves on each connection, double drain valves & double vent valves with mechanical lock.
		(f) ½" NPT cable gland.
1.15.16	Test pressure	Two times design pressure.

1.18	<u>GAUGE GLASS</u>	
1.18.1	Type	Reflex.
1.18.2	Glass	Toughened borosilicate Resistant to mechanical and thermal shocks.
1.18.3	Body material	Carbon steel / stainless steel - As per process requirements (Flanged Connection).
1.18.4	Pressure rating	Twice the maximum working pressure.
1.18.5	Temperature rating	As required.
1.18.6	Bolts and nuts	Rust proof alloy steel.
1.18.7	Accessories	Suitable ball check valves of SS-304 / 316 body, gaskets, companion flange etc.

1.26	<u>RADAR TYPE LEVEL MEASUREMENT</u>	
1.26.1	Type	Radar based on Time Domain Reflectometry.
1.26.2	Antenna	Co axial / single rod type guided wave or Horn type as required for the application.
1.26.3	Communication	Two wire 4-20mA DC, HART protocol.
1.26.4	Environmental temperature	0 – 50 °C.
1.26.5	Enclosure	Explosion proof/IP 65 as per application.
1.26.6	Cable Entry	½" NPT.
1.26.7	Calibration	Self calibration with internal reference.
		Zero & Span calibration.
1.26.8	Programming	Handheld programmer & Local keypad.
1.26.9	Process Connection	Flanged /screwed.
1.26.10	Electronic Housing	Epoxy painted Die-Cast aluminium alloy.

SR. NO.	ITEM	DESCRIPTION
1.26.11	Antenna / Flange assembly	316 SS or Hastalloy. (as required)
1.26.12	Output Indicator	Digital Integral Display.
1.26.13	Accuracy	5 mm or 0.1% of probe length.
1.26.14	Accessories	(a) Programming tool kit.
		(b) Gasket.
1.27	<u>ULTRASONIC LEVEL TRANSMITTER</u>	
1.27.1	Principle of operation	Detection of reflected ultrasonic pulse, HART Protocol
1.27.2	Measuring ranges	Up to 30 meters (typical)
1.27.3	Signal processing	Microprocessor Controlled Signal Processing
1.27.4	Operating frequency	10 KHz to 50 KHz (typical)
1.27.5	Display	Large alpha-numeric back lit LCD/ LED
1.27.6	Calibration & Configuration	Accessible from front of panel
1.27.7	Diagnosis	On-line
1.27.8	Status	For power, Hi/Lo/V. Hi/V. Lo - level indication, fault etc.
1.27.9	Construction	Plug-on board
1.27.10	Power supply	240 V AC 50 Hz / 24V DC
1.27.11	Signal Output	4-20 mA DC - 600 Ohm load.

SR. NO.	ITEM	DESCRIPTION
1.27.12	Hysteresis	Fully adjustable preferred
1.27.13	Output contacts	2 SPDT Potential free changeover contacts @ 240V, 5A AC/220V, 0.5A DC.
1.27.14	Accuracy & Repeatability	0.25% of span or better
1.27.15	Resolution	0.1% of span
1.27.16	Operating Temperature	Transmitter- 50 °C and Sensor – 80 °C
1.27.17	MOC Sensor	Body- PVC and Face – Polyurethane
1.27.18	Humidity	1% to 95% non condensing.
1.27.19	Enclosure	IP-65 Epoxy painted die cast aluminium or Polycarbonate housing.
1.27.20	Cable connection	3/4" ET
1.27.21	Mounting	2" for sensor and Transmitter on panel.
1.27.22	Accessories	Cable gland, prefab cable, mounting accessories.

SR. NO.	ITEM	DESCRIPTION
1.37	<u>SOLENOID VALVE</u>	
1.37.1	Operating Principle	Electromagnetic. (noiseless)
1.37.2	Coil voltage rating	240 V AC/220 V DC(as required. Any other voltage, if necessary, to be arranged by Bidder)
1.37.3	Ways	Generally 3-ways other depending on requirement
1.37.4	Port size	1/4" NPT all ports.
1.37.5	Body	SS bar stock.
1.37.6	Trim	SS-316.
1.37.7	Duty	Suitable for continuous energization.
1.37.8	Sealing	Airtight and leak proof.
1.37.9	Ambient Temperature	0 - 50 ° C.
1.37.10	Fluid Temperature	0-150 ° C (approx.)
1.37.11	Coil Enclosure	Stainless Steel.
1.37.12	Insulation	Class-H.
1.37.13	Coil Casing	IP-65 (Explosion proof for NEC Class-1, Division-1 area)
1.37.14	Mounting	On pipe or on panel.
1.37.15	Cable Connection	3/4" ET.
1.37.16	Accessories	Mounting brackets, nuts and bolts.
1.37.17	Preferred feature	(a) Solenoid valve directly integral to actuator body shall have NAMOOR interface for uniformity.

1.38	<u>SIGHT GLASS</u>	
1.38.1	Type	Flap-type.
1.38.2	End connection	Screwed / Flanged.
1.38.3	Material	
(a)	Body	CS/SS as per process medium.
(b)	Indicator	Stainless steel.
1.38.4	Sight Glass	Toughened Borosilicate.
1.38.5	Gasket	Neoprene.
1.38.6	Bolts & Nuts	High tensile steel.
1.38.7	Hydraulic Test Pressure	1.5 times maximum working pressure.
1.38.8	Accessories	As required.
1.39	<u>LEVEL GAUGE (FLOAT & TAPE)</u>	
1.39.1	Type	Float and Tape
1.39.2	Float & Tape MOC	AISI 316
1.39.3	Pulley material	Aluminium
1.39.4	Guide wire	SS 316 Stainless steel
1.39.5	Accuracy	± 2 mm
1.39.6	Indication	On circular or vertical dial
1.39.7	Rating	Twice the design pressure

2.0	<u>CONTROL PANELS/DESK MOUNTED INSTRUMENTS AND ELECTRICAL SYSTEM ACCESSORIES</u>	
2.1	<u>COUPLING RELAY</u>	
2.1.1	Type	Octal base plug-in type/ DIN rail Mounting.
2.1.2	Coil voltage	24 V D.C. in general / other as required.
2.1.3	Contact	2 NO & 2 NC (Minimum).
2.1.4	Contact rating	250 V /5A (A.C)/220V/2A (D.C).
2.1.5	Operating range	70 to 110% of rated voltage.
2.1.6	Insulation	2 kV for 1 minutes between terminal & earth.
2.1.7	Mechanical life	20 million operations.
2.1.8	Coil protection	Diode.
2.1.9	Indication	Coil on LED.
2.1.10	Enclosure	Transparent cover.
2.1.11	Connection	Screw terminals.
2.1.12	Mounting	Projection mounting inside panel / DIN rail mounting.
2.2	<u>DISTRIBUTION BOARDS</u>	
2.2.1	Type	Fixed, Modular.
2.2.2	Power distribution	Through MCCB.
2.2.3	Enclosure	Sheet Steel, IP54.
2.2.4	Mounting	Free standing (Can be attended from both front & back).

2.9	<u>PUSH BUTTON</u>	
2.9.1	Type	Shrouded square format.
2.9.2	Face Dimension	32 x 32 mm (maximum)
2.9.3	Contact Configuration	2 NO + 2 NC.
2.9.4	Contact Addition	Add-on block up to 4 each with 2 pairs of contacts.
2.9.5	Contact Material	Hard Silver Alloy.
2.9.6	Contact Rating	500V / 10 A.
2.9.7	Utilization Category	AC11 / DC11.
2.9.8	Insulation Voltage	2 kV for 1 minute between terminals and earth.
2.9.9	Mechanical Life	1 million operation.
2.9.10	Construction	Aluminium shrouding with plastic lens.
2.9.11	Colours	Red, Green, Yellow, Black, etc.
2.9.12	Connection	Screw terminals.
2.9.13	Enclosure Class	IP-52
2.9.14	Legend	Engraving.
2.10	<u>ILLUMINATED PUSH BUTTON</u>	
2.10.1	Type	Square format.
2.10.2	Face Dimension	32 x 32 mm. (maximum)

SR. NO.	ITEM	DESCRIPTION
2 10.3	Contact Configuration	2 NO + 2 NC. (minimum)
2 10.4	Contact Addition	Add-on-Block up to 4 each with 2 pairs of contacts.
2 10.5	Contact Material	Hard Silver Alloy.
2 10.6	Contact Rating	500 V / 10A.
2 10.7	Utilization Category	A C11 / DC11.
2 10.8	Insulation Voltage	2 kV for 1 minute between terminals and earth.
2 10.9	Mechanical Life	1 Million Operation.
2 10.10	Lamp	LED with built-in resistors as required.
2 10.11	Lamp Rating :	
(a)	Voltage	240 V AC.
(b)	Watt	2 Watt (approx.)
2 10.12	Lamp and Lens Replacement	From front.
2 10.13	Construction	Transparent Plastic Lens.
2 10.14	Colour	Red, Green, Amber, Yellow etc.
2 10.15	Connection	Screw terminals.
2 10.16	Enclosure Class	IP-52
2 10.17	Legend	Engraving.
2 11	<u>SELECTOR SWITCH</u>	
2 11.1	Type	2/3/4 position stay put type with rotary lever actuator.

SR. NO.	ITEM	DESCRIPTION
2.11.2	Face Dimension	32 x 32 mm. (maximum)
2.11.3	Contact Configuration	4 pair of contacts.
2.11.4	Contact Addition	Add-on-Block up to 4 each with 2 pairs of contact.
2.11.5	Contact Material	Hard silver Alloy.
2.11.6	Contact Rating	500 V / 10 A.
2.11.7	Utilization Category	AC11 / DC11.
2.11.8	Insulation Voltage	2 kV for 1 minute between terminals and earth.
2.11.9	Mechanical Life	1 million operation.
2.11.10	Construction	Aluminium shrouding.
2.11.11	Connection	Screw terminals.
2.11.12	Enclosure Class	IP-52
2.12	<u>INDICATING LAMP</u>	
2.12.1	Type	LED with built-in resistor.
2.12.2	Face Dimension	32 x 32 mm. (maximum)
2.12.3	Voltage	240 V AC.
2.12.4	Watt	2.5 Watt (approximate).
2.12.5	Lamp and Lens Replacement	From front.
2.12.6	Construction	Transparent Plastic lens.
2.12.7	Colour	Red, Green, Amber, Yellow etc.
2.12.8	Connection	Screw terminals.

SR. NO.	ITEM	DESCRIPTION
2 12.9	Legend	Engraving.
2 13	<u>INDICATING METERS (A.C)</u>	
2 13.1	Type	Rectifier type.
2 13.2	Face Dimension	96 x 96 mm.
2 13.3	Scale	Radial arc of 240 Deg.
2 13.4	Accuracy	1.5% of full scale. ± 0.5 Hz for frequency meter.
2 13.5	Input	0-1/0-5A for current measurement, 0-240V, 50 ± 2.5 Hz for voltage/frequency measurement.
2 13.6	Zero Adjustment	Screw on meter face.
2 13.7	Enclosure	Shielded Case.
2 13.8	Mounting	Flush Panel.
2 13.9	End Scale Suppression	6 times the measuring range only for motor ammeters.
2 14	<u>INDICATING METERS (D.C)</u>	
2 14.1	Type	Taut band moving coil.
2 14.2	Face Dimension	96 x 96 mm.
2 14.3	Scale	Radial arc of 240 Deg.
2 14.4	Accuracy	1.5% of full scale.
2 14.5	Input	0-75 mA for current measurement. Direct reading for voltage measurement.

SR. NO.	ITEM	DESCRIPTION
2.14.6	Zero Adjustment	Screw on meter face.
2.14.7	Enclosure	Shielded case.
2.14.8	Mounting	Flush Panel.
2.14.9	End Scale Suppression	2 times the measuring range only for motor ammeters.
	For electrical system's meter and for synchronization, Bidder shall refer to electrical volume of the specification.	
2.15	<u>AUXILIARY RELAY</u>	
2.15.1	Type	Electromagnetic.
2.15.2	Coil voltage	240 V A.C / 220V DC. For any other voltage bidder to make his own arrangement.
2.15.3	Contact Configuration	2 NO & 2 NC (Minimum), additional contacts as per requirement with provision for additional contact block expansion.
2.15.4	Contact rating	250V/5A. (A.C/D.C.)
2.15.5	Operating range	80 to 110% of rated voltage.
2.15.6	Insulation	2 kV for 1 minute between terminals & earth.
2.15.7	Mechanical life	20 million operations.
2.15.8	Coil protection	Diode/surge suppressor.
2.15.9	Connection	Screw terminals.
2.15.10	Mounting	Projection mounting inside panel.

4.0 CONTROL DESK / PANELS / RACKS

- (a) Convenient and logical approach to operational interfaces and aesthetics in the overall view of the panel / desk shall be considered.
- (b) For items susceptible to vibration, suitable anti-vibration padding shall be provided to prevent damage or malfunction.
- (c) All items inside the panels/cabinets shall be neatly arranged with easy access/maintenance approach.
- (d) Incoming power supply feeders shall be duplicated . Alarm shall be provided for failure of a power supply feed.
- (e) Desk/panel shall be provided with interior illumination, utility receptacles with plug and cooling fan.
- (f) Panel/Desk shall have gland plate at cable entry to panel. Thickness of gland plate shall not be less than 3 mm.
- (g) Wire shall be routed/laid through covered trough.
- (h) Crating of the panels and desks shall be suitable for protection against shock, vibration, inappropriate handling and inclement weather conditions during transportation and warehousing. Mounted equipment shall have adequate protection against damage during handling, transit and storage. Suitable desiccant shall be used inside the packing case.
- (i) Nameplate
 - (i) Nameplate shall be provided for instrument or device mounted on the panel.
 - (ii) Nameplates for panels shall be provided both in front and rear.
- (j) All local control panels shall be housed in air condition environment.

4.2 BACK UP PANEL

- 4.2.1 Construction shall be from sheet steel of thickness not less than 3 mm.
- 4.2.2 Electrical upright Panel construction & design shall be similar to back up panel. Control switches, meters, indicators, synchronizer, excitation control switch, annunciation window etc. along with associated mimic diagram, as recommended, shall be provided for manual synchronization of generator.

4.2.3 Cabinets/Enclosure/Panels

- (a) Material of construction : Cold rolled steel sheet.
- (b) Thickness of Sheet : (i) 2.0 mm for faces supporting instruments / terminals.
- (c) Construction : Welded throughout as per approved National Standards.
- (d) Panel height : 2300 mm. (approx)
- (e) (i) Corners : 7 mm inner radius.
(ii) Dimensional : a. In height & length - 3 mm.
(iii) Tolerances : b. In height between adjacent sections - 2 mm.
: c. Total for a group - 6 mm.
- (f) Doors : Double, recessed, turned back edges.
 - (i) Thickness of Sheet : 2 mm.
 - (ii) Hinges : Stainless steel.
 - (iii) Door latches : Three point type.
 - (iv) Door gaskets : Neoprene rubber on fixed frame to result dust proof/ weatherproof enclosure.
 - (v) Opening of the doors : Outward.
 - (vi) Louvers : With removable wire mesh to ensure dust and vermin proof.
- (g) Color of interior : Brilliant white.
- (h) Colour external : RAL 7032

(i)	Painting	:	Epoxy powder coated or better.
(j)	Gland plates	:	Removable 3 mm thick. (bottom)
(k)	Cable entry	:	Bottom.
(l)	Hardware	:	(i) Anti vibration pad- 15 mm.
		:	(ii) Predrilled base channel ISMC - 10 or equivalent for all sides.
		:	(iii) Stainless steel buff- finished 2 mm thick kick plate for all sides.
		:	(iv) Stainless steel scratch strips along desk edges fixed with pan-head recessed screws.
		:	(v) Rubber strips to ensure air tightness between kick plate and finished floor.
		:	(vi) Lifting hook / Eye bolt.
		:	(vii) Drawing pocket.
		:	(viii) Door switch, lamps, thermostat, heaters and fans.
(m)	Enclosure Protection	:	As per environment condition of the area of installation. Refer section-1 of this vol.

6.0 PROGRAMMABLE LOGIC CONTROLLER (PLC)

- 6.1 The following specification is applicable for for PLC related to main plant auxiliaries and off-site plants (like CHP,AHP,WTP etc.). In order to provide smooth and optimal maintenance, easy inter-changeability and optimal spare part management, the bidder should ensure that the PLC system offered for main plant auxiliaries and off-site plants are of the same make, series and family of hardware.
- 6.2 Programmable Logic Controller (PLC) based control system shall be high end version with latest configuration with 1:1 hot redundant Central Processing Units (CPUs). CPUs shall have word length of 32 bits minimum
- 6.3 Following components shall be redundant as well: communication processors, memory modules, rack power supply units, bulk IO power supply units, IO communication modules, data highway and high speed (100Mbps) data network connecting the operator stations.
- 6.4 Two CPUs shall operate on fault tolerant mode with continuous self and cross- monitoring. Failure of the active CPU shall not affect the operation of the plant. In the event of failure of active CPU, tasks shall be transferred to the standby CPU within fastest possible transfer time (< 5m sec.) without causing any relays to drop out during the transfer.
- 6.5 CPUs shall not be loaded to over 60% of their capacity even under worst data loading conditions. It shall be possible to make a manual transfer from the active to the back-up CPU from engineering station and as well as from the front panel of CPU module.
- 6.6 Modules shall have adequate status and diagnostic indication on the front panel.
- 6.7 System shall be of modular construction and expandable by adding hardware modules. Bidder shall provide at least 20% or a minimum of one off, spare channels as hot-on-rail spares in each configured cards / modules.

In addition to this, 10% or minimum of one off, extra assigned complete spare modules mounted on rails in racks for each type of I/O modules shall also to be provided. The spare channel and cards shall be fully wired and terminated.

- 6.8 Memory unit of the CPU shall be field expandable at least by 25%. Operating system/application program/sequence logic etc. shall be stored in nonvolatile memory for automatic re-booting. Dynamic memories shall be provided with battery back up at least for 360 hours.
- 6.9 Number of input/output points per card shall not exceed 16 (sixteen) for digital and 8 (eight) for analog/thermocouple/RTD signals. Individual input and Output channels shall have galvanic/optical isolation. Merely fusing of individual or a group of channels is not acceptable.
- 6.10 Data communication system of the PLC shall not be limited to the following:
 - (a) Internal bus and external data network loading shall in no case be more than 60% of its capacity.
 - (b) Disrupted message shall be automatically retransmitted when the system is restored.
 - (c) Failure or physical removal of any module connected on the system bus shall not lead to any loss of communication.
 - (d) Diagnostics message shall be issued on fault detection.
 - (e) Bus change over from active bus to stand by bus, during failure of active bus, shall be performed automatically and bumpless. Such event shall be suitably logged or alarmed.
 - (f) Noise immunized and reliable high speed dual fault tolerant optic fiber cable communication with standard communication protocol shall be provided between PLCs and remote or extended I/O modules.

- (g) Main data network shall comply with the International Standard IEEE-802.3 (Ethernet) for data exchange and communication.
- 5.11 Operator workstation shall be complete with latest user friendly operating system, 24" colour TFT monitor, membrane or positive depression KB, mouse, colour laser printer and dot matrix printer. In addition, 3 no (three) laptop unit loaded with all PLC system software shall be furnished.
- 5.12 For PLC systems without OEWS (Operator cum Engineering work station), above mentioned Laptop shall be used.
- 5.13 Only licenced copy of programming software suitable for multi-user's use shall be provided.
- 5.14 PLC systems without OEWS (Operator cum Engineering work station) shall have panel mounted pushbuttons, lamps, hardware annunciation system and MIMIC for operation and control of the system from desk/panel.
- 5.15 The functions performed from the HMIs shall not be limited to the following:
 - (a) Selection of Auto/Manual, Open/Close, Sequence Auto, Start/ Stop operation.
 - (b) Dynamic Mimic display depicting the process.
 - (c) Alarm monitoring, report & log generation, printing of trends etc.
 - (d) On line/historical trending, historical storage and retrieval of data.
- 5.16 Software
 - (a) Necessary software for implementation of the control logics, operational displays & logs, data storage, retrieval and other functional requirements, shall be provided.
 - (b) Licensed version of required software including operating system, configuration and HMI software suitable for multi-user's use shall be provided.

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: II
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 4
REV: R0	MASTER SPECIFICATIONS	Page 79 of 555
openings shall be closed with forged steel plugs. The closures shall be taped to seal the interior of the equipment. Open ends of piping, tubing and conduit shall be sealed and taped. Returnable containers and special shipping devices shall be returned by the manufacturer's field representative at the Contractor's expense. 15.0 <u>PAINTING</u> 15.1 <u>GENERAL</u> All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two (2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner. All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner. All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects. All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat. Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used outdoors in		

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: II
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 4
REV: R0	MASTER SPECIFICATIONS	Page 80 of 555
windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment. Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use. Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel. The Contractor shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished. The Contractor shall select shop primer for steel and iron surfaces, which will have a continuous operating temperature below 35°C, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35°C. The Owner/Engineer shall submit the colour scheme during execution of contract for approval. 15.2 <u>PREPARATION</u> Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying. Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed. The priming coat shall be applied without delay. 15.3 <u>DAMAGED PAINTWORK</u> Any damaged paintwork shall be made good as follows:		

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: II
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 4
REV: R0	MASTER SPECIFICATIONS	Page 81 of 555
15.3.1	The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.	
15.3.2	A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.	
15.3.3	The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming	
15.4	<u>PAINTING SYSTEMS</u> The requirements for the Dry Film Thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.	
15.4.1	Surfaces subject to Weathering All surfaces shall have a minimum of four coats of paint made up as follows: (a) Primer coat	

CONSULTANT : PROCON ENGINEERS

 MAHAGENCO Maharashtra State Power Generation Co. Ltd.	MAHARASHTRA STATE POWER GENERATION CO. LTD.	Volume: II
	BID SPECIFICATION NO.: DG/BSL U-6/2011/T-1	Section – 4
REV: R0	MASTER SPECIFICATIONS	Page 82 of 555
The Contractor shall select the type and colour of primer & finish coat after approval by the Owner. For detail painting on building & structural steel elements, please refer Volume VI / A & B of this specification. 16.0 <u>COLOUR CO-ORDINATION & FINISH</u> 16.1 Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape. 16.2 Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification. 16.3 All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned. 16.4 Final colours and finishes shall be to the Approval of the Engineer. 17.0 <u>ENVIRONMENT PROTECTION AND NOISE LEVEL REQUIREMENT</u> 17.1 <u>ENVIRONMENT PROTECTION</u> The plant shall be designed for installation and operation in harmony with the surrounding environment and all measures of pollution control shall be ensured by the Bidder to restrict pollution from the liquid effluent and Stack emission within the limits as given below with due consideration of Environment (Protection) Rules 1986 as amended till date. In case the Ministry of Environment & Forest stipulates any other conditions not specified hereunder while clearing the project, same shall be complied with by the Contractor.		

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION		Std. / Doc. Number	
				Annexure-8	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-8 Packing & Shipping specification			

Revisions:	Prepared by :	Checked by :	Approved by :	Date :
Refer to record of revisions	Girish Prasad Palo	Siva Prasad Babu	Siva Prasad Babu	11.09.2018



CORPORATE STANDARD

AA0490004

Rev. No. 01

PAGE 1 of 8

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

1 GENERAL

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

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

2 SCOPE

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

3 CROSS REFERED SPECIFICATION

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

4 WOOD SPECIFICATION FOR PACKING

The wood shall conform to specification AA51401.

5 TYPE OF PACKING

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

- 'OP' - Open Type
- 'PP' - Partially Packed
- 'CP' - Crate Packing - Components/Equipment requiring physical protection

Revisions: Committee changed from MRC-M&CD to PGC-Packing

APPROVED:
PROCEDURAL GUIDELINES COMMITTEE –
PGC (Packing)

Rev. No. 01	Amd. No.	Reaffirmed	Prepared	Issued	Dt. of 1 st Issue
Dt: 12-06-2018	Dt:	Year:	HPEP, Hyderabad	Corp. R&D	17-08-2013



- ‘CQ’ - Case Packing - Small medium Components/ Assemblies/ Equipment which require corrosion & physical protection
- ‘CR’ - Case Packing - Electrical Components/Assemblies which require special packing viz. Water Proof, Shock Proof, etc.

6 DESCRIPTION OF TYPES OF PACKING

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

6.1 ‘OP’ - Open Type

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

6.2 ‘PP’ - Partially Packed

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

6.3 ‘CP’ - Crate Packing – General

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

6.4 ‘CQ’ - Case Packing - Machined Components/Assemblies/Equipment

- a) Small & Medium sized components/assemblies/equipment due to size/weight & to avoid handling, and pilferage, problems shall be packed in Case/Containers.
- b) Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/ Tablets, packed in thin muslin cloth cotton bags shall be suitably placed.
- c) Small machines/components of less weight shall be provided with suitable cushioning. Wood Wool/Expanded Polyethylene Foam Sheet, if used, shall be sandwiched between polyethylene sheets and sealed.
- d) The components inside the case shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, where-ever required.

6.5 ‘CR’ - Case Packing - Electrical & Electronic Components/Assemblies

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

- a) Adequate quantity of Silica gel to AA55619 packed in cotton bags, of 100 grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with Multi-layered cross laminated plastic film to AA51420, before being packed in the cases.
- b) VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.
- c) Empty space in the cartons shall be filled with small chips of Expanded Polystyrene (Thermocole), Wood Wool etc. Polyethylene air bubble film shall conform to IS 12787/AA51420 Expanded polystyrene (Thermocole) shall conform to AA51416.
- d) The cartons shall be manufactured from corrugated Fibre Board, meeting requirements of AA51414.

6.6 Volatile Corrosion Inhibitor (VCI) Paper

- a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.
- b) 7 m³ VCI paper is necessary for 1 m³ of packed item approximately as per AA51406.



CORPORATE STANDARD

AA0490004

Rev. No. 01

PAGE 3 of 8

Application Limitation:

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

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

6.7 Moisture Absorber

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

7 TYPE OF CASES

For specific requirement of packing the cases are to be provided with Tongue and Groove joints.

8 PREPARATION OF PACKING CASE

- 1) The base of the case shall be made of wooden batons for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200 mm from the ground level depending upon size, ft weight of equipment. However for packing cases of smaller size equipment can be at a height of 40 mm from the ground level.
- 2) In case of 'CR1 - Packing Viz. Electrical ft Electronic components for instruments/assemblies, a rubber sheet, Self-expanded polyethene foam sheet, preferably 10 mm thick, shall be fixed on to the base to act as cushioning to the equipment.
- 3) The four sides, shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.

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

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

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



9 STEEL CONTAINERS

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

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

Following precautions are to be taken during packing:

- Put the Components/Assemblies/Equipment in the steel container properly. Cover the Components/Assemblies/Equipment with polythene.
- To arrest the movement in the steel container necessary wooden Blocks/Batons may be put.
- Put cover on steel, container and Bolt Properly.

10 SEALED PACKING

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

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

11 SLING PLATE

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

12 PACKING SLIP HOLDERS

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

13 GENERAL PRECAUTIONS

- a) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.
- b) Sling protection brackets to be provided on cases wherever required.
- c) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.
- d) The various caution signs shall be marked with stencil on both sides of the packing box.
- e) Do not pack any other Mechanical items with this case.

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

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

k) Loading and unloading precautions

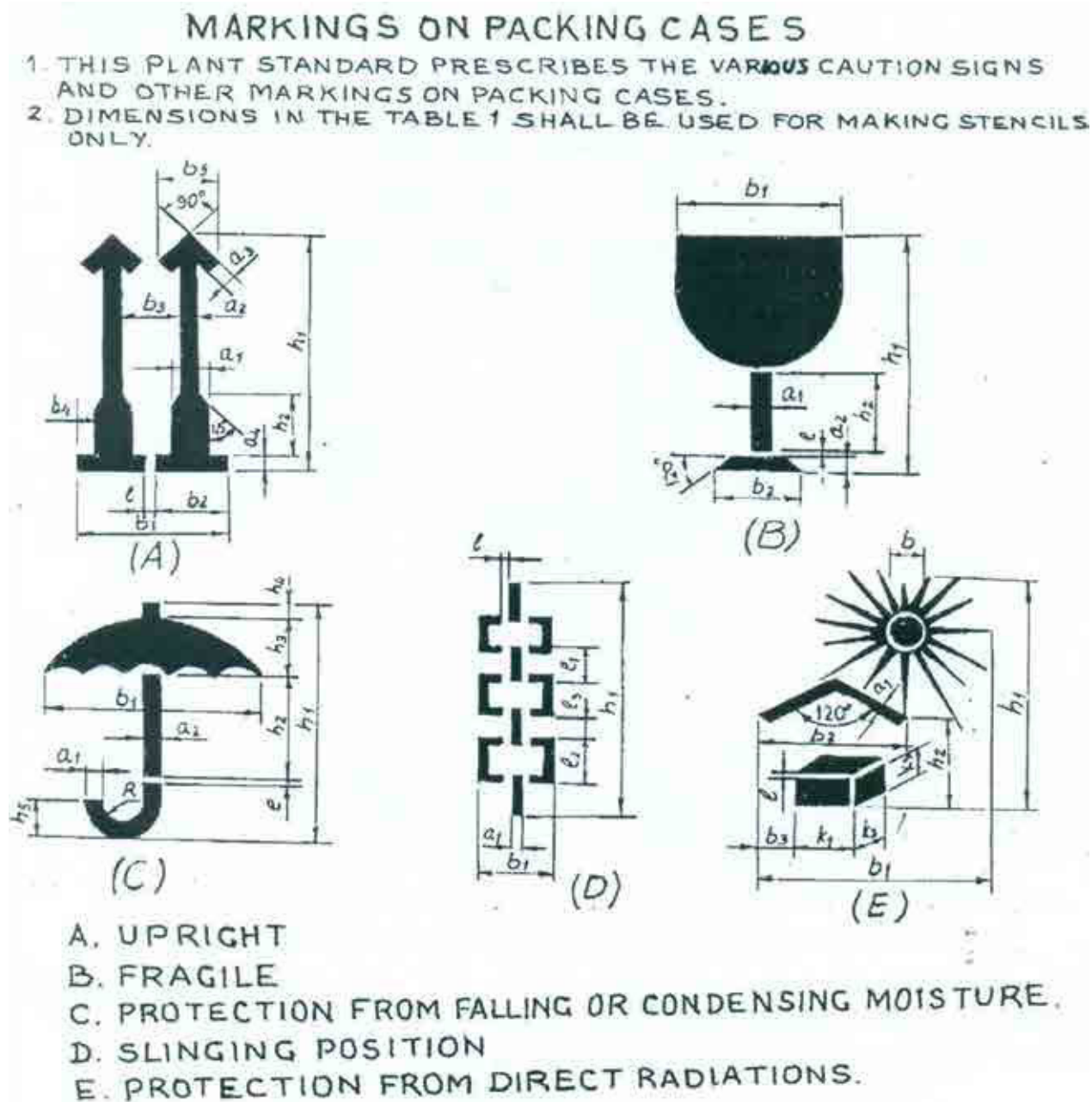


Figure 1

CENTER OF GRAVITY



Figure 2

Table 1

DESIGN- ATION		DIMENSIONS IN mm.																							
		a ₁	a ₂	a ₃	a ₄	b ₁	b ₂	b ₃	b ₄	b ₅	b	ℓ	h ₁	h ₂	h ₃	h ₄	h ₅	K ₁	K ₂	K ₃	ℓ ₁	ℓ ₂	ℓ ₃	R	
A	1	12	5	5	4	52	25	19	8	21	-	2	84	23	-	-	-	-	-	-	-	-	-	-	
	2	17	7	7	6	75	36	29	11	30	-	3	119	33	-	-	-	-	-	-	-	-	-	-	
	3	24	10	10	8	104	50	38	16	42	-	4	168	46	-	-	-	-	-	-	-	-	-	-	
	4	34	14	14	11	147	71	59	23	60	-	5	239	65	-	-	-	-	-	-	-	-	-	-	
B	1	5	5	-	-	50	33	-	-	-	-	2	84	25	-	-	-	-	-	-	-	-	-	-	
	2	7	7	-	-	71	47	-	-	-	-	3	119	36	-	-	-	-	-	-	-	-	-	-	
	3	10	10	-	-	100	66	-	-	-	-	4	168	50	-	-	-	-	-	-	-	-	-	-	
	4	14	14	-	-	142	94	-	-	-	-	5	239	71	-	-	-	-	-	-	-	-	-	-	
C	1	4	3	-	-	66	-	-	-	-	-	2	80	39	19	5	11	-	-	-	-	-	-	6	
	2	6	4	-	-	85	-	-	-	-	-	3	114	55	27	7	16	-	-	-	-	-	-	9	
	3	8	6	-	-	120	-	-	-	-	-	4	160	78	38	10	22	-	-	-	-	-	-	12	
	4	11	9	-	-	170	-	-	-	-	-	5	227	110	54	14	31	-	-	-	-	-	-	17	
D	1	6	-	-	-	30	-	-	-	-	-	4	148	-	-	-	-	-	-	-	30	30	10	-	
	2	9	-	-	-	42	-	-	-	-	-	5	209	-	-	-	-	-	-	-	42	42	14	-	
E	1	3	-	-	-	69	47	10	-	-	16	2	91	26	-	-	-	17	8	11	-	-	-	-	
	2	4	-	-	-	98	67	15	-	-	23	3	128	33	-	-	-	24	11	16	-	-	-	-	
	3	6	-	-	-	138	94	20	-	-	32	4	187	62	-	-	-	34	16	22	-	-	-	-	

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

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

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

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

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

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

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



CORPORATE STANDARD

AA0490004

Rev. No. 01

PAGE 7 of 8

14 PROCEDURE FOR HANDLING OF COMPONENTS

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

- 14.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.
- 14.2 Appropriate material handling equipment like fork lifters, cranes etc. Shall be used where needed.
- 14.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. Shall be done carefully.
- 14.4 For critical items, where specified, special handling fixtures shall be used for lifting.
- 14.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.
- 14.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.
- 14.7 Precision machined components like blades, catches, rollers etc. Shall be lifted using suitable wooden pallets.

14.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH:

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

- The markings showing the upright position.
- The markings showing the sling position
- Markings showing the fragile contents.
- Other required markings as per Clause No. 13

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

15 GI SHEET

The packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per the Figure-3.

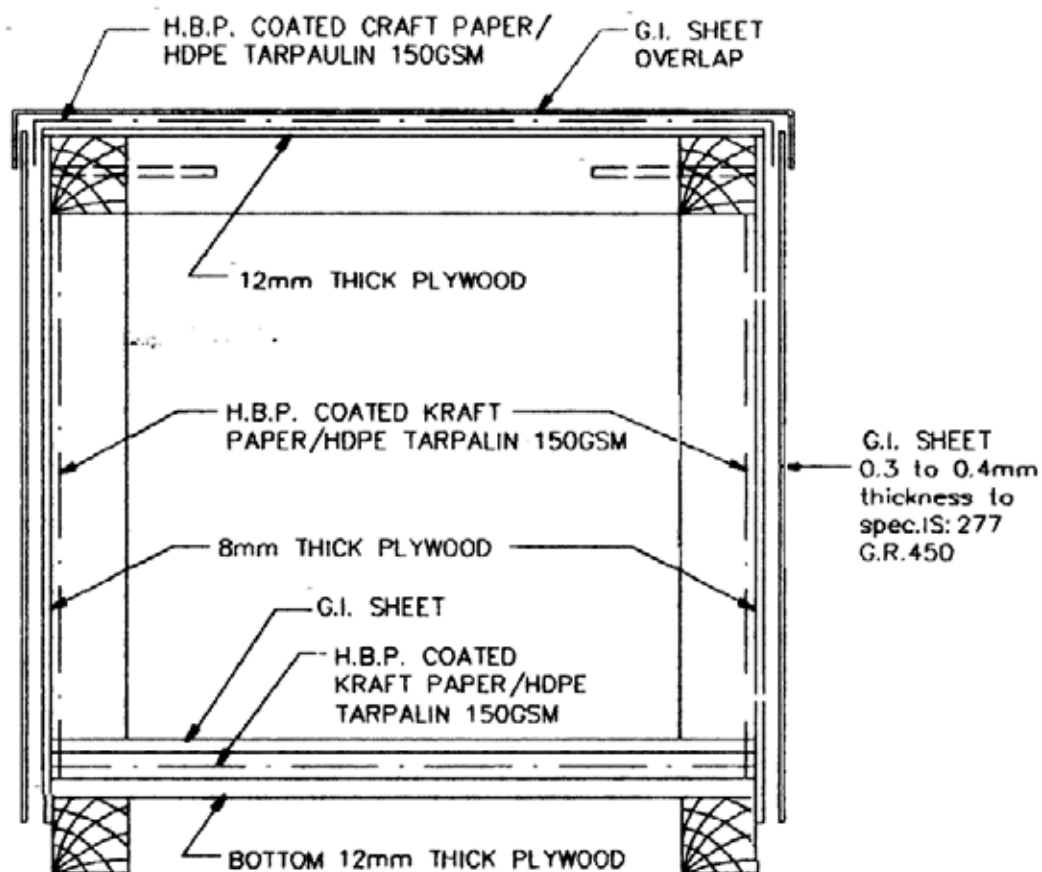
16 TREATMENT of Wood

Treatment of wood is as per ISPM 15: 2009

17 PROVISION FOR INSPECTION

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

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



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

Figure 3



CORPORATE STANDARD

AA0490005

Rev. No. 01

PAGE 1 of 5

VACUUM PACKING FOR STAMPINGS

1 GENERAL

This standard lays down the packing instructions for packing of Stamping to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing stamping in a wooden packing boxes with vacuum packing.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/ AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement which has to be checked by QC.

5 PACKING PROCEDURE

- Only QC cleared packing wooden Boxes shall be used for Packing of stampings.
- Stampings marked by QC with "OK" stickers only need to be packed. Varnished stampings are to be brought down to room temperature before labelling them "OK" for packing. Do not pack hot/warm stampings that have just received after varnishing.
- Stampings are to be stacked in proper alignment and to be kept in packing wooden boxes of specific size.

6 Vacuum Packing

- Turbo generator stamping of HEEP-Haridwar and Hydro stator and Hydro rims stamping of HEP-Bhopal will be packed in Vacuum Bag.
- The stack of stampings shall be placed over porous plastic sheets (for Cushioning) with total thickness of at least 5mm and shall be wrapped with first layer of aluminium barrier bag (vacuum bag), second layer of VCI Paper (Vacuum Corrosion Inhibitor as per BHEL Standard AA51406). The VCI paper must contact stacked stampings. (Refer Figure-1).
- Silica gel packets are to be placed inside the vacuum bag (between stamping and VCI paper) uniformly distributed around the stampings to remove/ prevent moisture. Total quantity per box should be a minimum 1.5 kg for packing box with a single stack and minimum of 2 kg for a double stack box. In order to cover the maximum space inside the box, small quantity packets 25 gm, 50 gm and 100 gm uniformly distributed all-round the box.
- After final clearance from QC by putting green stickers on stack stampings, Vacuum bag should be secured in position and properly sealed using heat sealing machine and air to be drained using vacuum pump. At the time of the evacuation the vacuum inside the pack should be less than 0.5 ata.
- The top covers of boxes shall be sealed only after final clearance from QC for confirmation of above.

Revisions:

APPROVED:PROCEDURAL GUIDELINES COMMITTEE –
PGC (Packing)

Rev. No. 01

Amd. No.

Reaffirmed

Prepared

Issued

Dt. of 1st Issue

Dt: 12-06-2018

Dt:

Year:

EDN, Bangalore

Corp. R&D

31-05-2018



- f) All boxes should be covered by water proof tarpaulin over top and on all sides.
- g) The packing boxes shall be covered with GI sheets (0.25-0.40mm thick) on all the sides for Export/ Seaworthy packing.
- h) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:
Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.

7 Aluminium Barrier Laminated Bags

Material must be a first ply of a relatively tough, bi-axially oriented film of organic polymer adhered to second ply of metallic foil/coating and a third ply of a tough polymer such as polyethylene with proper flexibility.

Bags are to be supplied with five sides' sealed and top cover in loose form. Sealing width should be 8 mm minimum.

Properties	Units	Value
Weight	g/m ²	150+ 5 GSM
Tensile Strength	N/mm ² MD	40 (min)
	N/mm ² TD	41 (min)
Water vapour Transmission	g/m ²	0.01 in 24 hrs. at 38 degree C & 90% RH (max)
Oxygen Transmission	cm ³ /m ²	0.02 in 24 hrs at 38 degree C & 90 % RH (max)
Sealing Temp.	Degree C	180 - 220 degree C

8 MARKING OF PACKING BOX

- a) Box No.
- b) P.O. No.
- c) Product Name
- d) Project / Customer Name
- e) Consignee
- f) Water proofing (Umbrella Stencilling)
- g) Upside direction

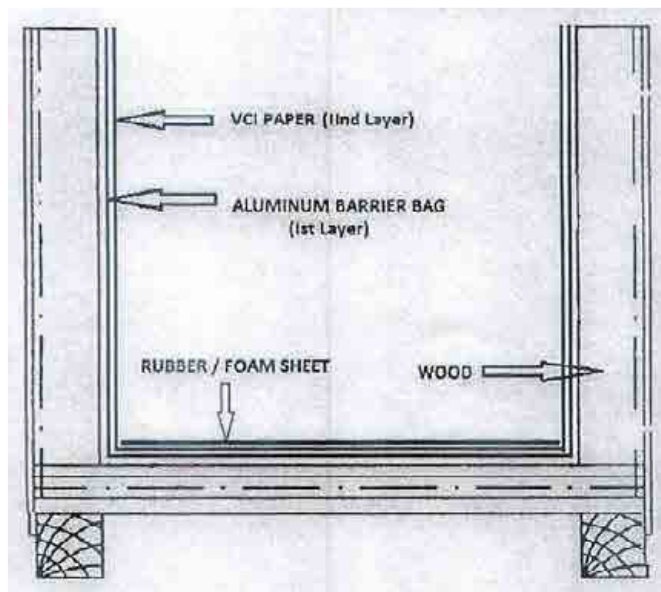


Figure 1



Figure 2



Figure 3



Figure 4



Figure 5



Figure 6



Figure 7



Figure 8



Figure 9



Figure 10



Figure 11



CORPORATE STANDARD

AA0490005

Rev. No. 01

PAGE 5 of 5



Figure 12

	CORPORATE STANDARD	AA0490006 Rev. No. 01 PAGE 1 of 3
VACUUM PACKING FOR ELECTRONIC COMPONENTS		
1 GENERAL This standard lays down the packing instructions for packing of components / Electronic module / Assemblies to be dispatched against Customer contracts.		
2 SCOPE This procedure covers method of packing electronic components using vacuum packing in a wooden packing boxes.		
3 OBJECTIVE To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.		
4 PACKING BOX Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/ AA0490009 for Export/ AA0490004 for Seaworthy packing. Size of the box as per the contract requirement which has to be checked by QC.		
5 PACKING PROCEDURE a) Cleaning parts shall be thoroughly cleaned just before VCI (Volatile Corrosion Inhibitor) Vacuum packing. Finger prints on cleaned items are to be avoided as the same are very corrosive. b) VCI Rust preventive oil (Ferrous grade oil base) shall be applied to all the components to withstand any corrosion.		
6 VCI VACUUM PACKING a) Bubble wrapping the items VCI vacuum packing. b) Appropriate vapour corrosive packets one pouch (1 gm. /pouch) of VCI Anticorrosive Powder and one pouch (10gm./ pouch) of VCI Desiccant per 1000 cub. meter packing space shall be placed inside the VCI vacuum packing. c) All the components shall be separately packed using VCI laminated Aluminium foils from which air/moisture are removed by the air vacuum device and sealed thoroughly using heat sealing machine. At the time of the evacuation the vacuum inside the pack should be less than 0.5 ata. d) One identification slip containing component information such as description of item, Material No. Customer PO, Item No. Quantity etc. shall be put inside the VCI vacuum packing. e) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above. f) All boxes should be covered by water proof tarpaulin over top and on all sides. g) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing. h) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below: Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.		
Revisions:		APPROVED: PROCEDURAL GUIDELINES COMMITTEE – PGC (Packing)
Rev. No. 01	Amd. No.	Reaffirmed
Dt: 12-06-2018	Dt:	Year:
Prepared EDN, Bangalore		Issued Corp. R&D
		Dt. of 1 st Issue 31-05-2018



7 COMPONENTS REQUIRED

7.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil and VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

7.2 Composition construction of VCI laminated Aluminium foil

- a) PET Film : 12 Microns
- b) Bonding layer : 2 Microns
- c) Aluminium Foil : 9 Microns
- d) Bonding layer : 2 Microns
- e) VCI Poly film : 100 Microns
- f) Total thickness : 125 Microns + or – 5%

7.3 Properties of VC Laminated Aluminium foil

- a) Basic Weight : 138 gsm +/- 8%
- b) Sealing condition : 180 C/ 2 sec
- c) Tensile strength
MD: 20 kgf
CD: 18 kgf
- d) Tear Strength
MD 4.8 kg
CD:3.4 kg
- e) Heat Seal Strength : 30.380 N/cm
- f) WVTR Value : 0.05gms/m /24 hrs.
- g) OTR Value : 0.1 cc/m/24 hrs

8 MARKING OF PACKING BOX

Mark the following information on the two adjacent sides of the each package

- a) Material No.
- b) Customer PO
- c) Item No.
- d) Quantity
- e) Storage Requirement : Indoor
- f) Content Description : Electronic Module
- g) Net weight (in kg)
- h) Dimension (L x W x H in centimetres)
- i) Project Name
- j) Consignee
- k) Water proofing (Umbrella Stencilling)
- l) Upside direction

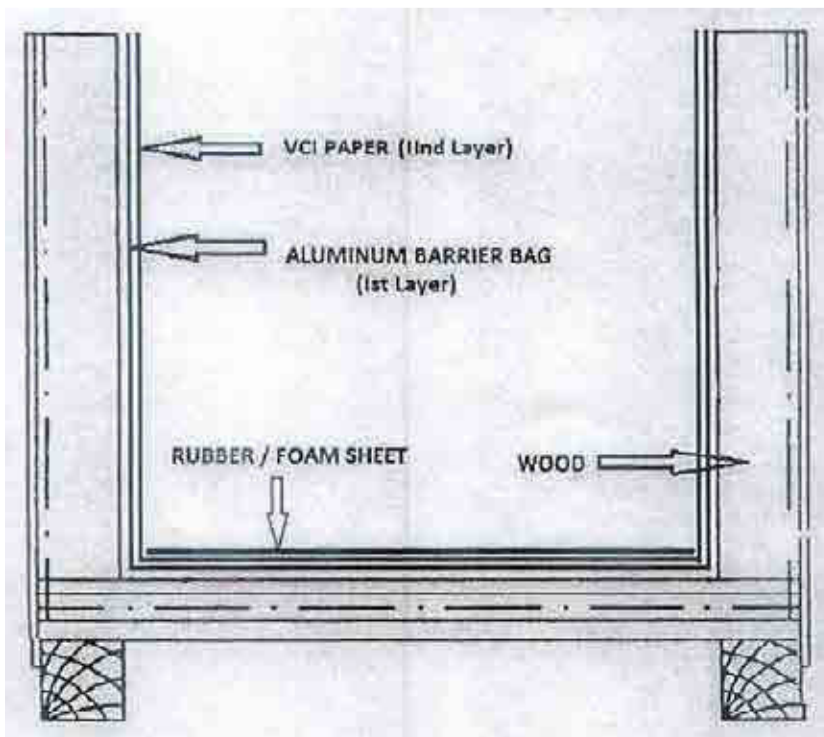


Figure 1



CORPORATE STANDARD

AA0490008

Rev. No. 01

PAGE 1 of 4

VACUUM PACKING FOR ELECTRICAL COMPONENT

1 GENERAL

This standard lays down the packing instructions for packing of components / Electrical components Stator/ Rim punching, Wound Pole/ Field Coils and Stator coils / bars to be dispatched against Customer contracts.

2 SCOPE

This procedure covers method of packing component in a wooden packing boxes.

3 OBJECTIVE

To establish a rust proof safe packing procedure and where the components required to protect against temperature and humidity. In general minimum temperature +5 deg C and maximum temperature 45 deg C, and relative humidity between 10% to 40%.

4 PACKING BOX

Wooden Box shall be made as per BHEL Standard AA0490010 for Domestic/AA0490009 for Export/AA0490004 for Seaworthy packing. Size of the box as per the contract requirement, which has to be checked by QC.

5 PACKING PROCEDURE

- All items packed are to be marked by QC with "OK" stickers. Varnished stator punchings are to be brought down to room temperature before labelling them "OK" for packing. Do not pack hot/warm stator punchings that have is just received from the varnishing.
- Packing of stator punchings, wound pole/ field coils and stator coils / bars should be done in a covered shed.
- Packed materials are to be stacked in proper alignment and to be kept in wooden packing.

6 Additional Packing Methodology for Stator / Rim Punchings (Double stacking) only

In order to eliminate the use of studs avoid double stack packaging per box. Where double stacked packing boxes are unavoidable, the stator /rim punchings are to be securely tightened using GI studs, nuts and soft material washers (rubber/plastic). GI studs, nuts and soft material only to be used in case of double stacking of rim / stator punchings (with holes). Use soft rubber washers to seal the punctured opening at the bottom from where the studs pass in each layer of VCI (Volatile Corrosion Inhibitor) paper, polythene and tarpaulin sheet in case of rim /stator punchings (with holes).

- GI studs with rubber washer to be placed initially inside the wooden packing box.
- Over the wooden base, place water proof tarpaulin sheet.
- Rubber washer shall be placed after the layer of tarpaulin sheet.
- Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to punchings).
- Place the Aluminium Barrier laminated Bags over this porous sheet, place the rubber washer over it.
- Place VCI papers on the Aluminium barrier bag and fix with rubber washer.

Revisions:

APPROVED:
PROCEDURAL GUIDELINES COMMITTEE –
PGC (Packing)

Rev. No. 01

Amd. No.

Reaffirmed

Prepared
EDN, Bangalore

Issued
Corp. R&D

Dt. of 1st Issue
31-05-2018

Dt: 12-06-2018

Dt:

Year:



- g) PVC Pipes shall be inserted over the GI studs. These pipes are to be used to cover each stud, to protect its direct contact and hence rubbing with punchings.
- h) Now place the stack of punchings over the VCI paper and securely tighten the punchings using nuts and soft material, washers.
- i) Each layer should be secured in position. Wrap the punchings with VCI paper and properly sealed separately using an adhesive tape.
- j) Silica Gel packets are to be placed over the VCI paper and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.
- k) Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of the evacuation the vacuum inside the pack should be less than 0.5ata.

Use two separate VCI papers for doubled stacked boxes independently covering each stack. Similarly two Aluminium barrier laminated bag are to be used to wrap the two stacks independently, as explained above.

7 Additional Packing Methodology for Wound Pole/ Field Coils and Stator Coils/Bars only

- a) Over the wooden base, place the waterproof tarpaulin sheet.
- b) Then place a layer of porous plastic sheet with total thickness of at least 5mm (for cushioning and reduces the chances of damage to Wound pole/field coils and stator coils/ bars.
- c) Place the Aluminium barrier laminated bag over this porous sheet.
- d) Place the VCI paper (Volatile Corrosion Inhibitor as per BHEL Standard AA51406) on the Aluminium barrier laminated bag along with rubber washer.
- e) Bare copper portion of field coils and stator coils / bars to be covered by VCI paper pouch and fasten with VCI tape.
- f) Now place the wound pole, stack of field coil and stator coil / bars over the VCI paper.
- g) Each layer should be secured in position. Wrap wound pole / field coils and stator coils / bars with VCI paper and properly sealed separately using an adhesive tape.
- h) Silica Gel packets are to be placed and uniformly distributed inside the boxes on the VCI paper to remove/prevent moisture.
- i) Then Aluminium barrier laminated bag has secured in position and properly sealed by using heat sealing machine and air to be drained out by using vacuum pump. At the time of evacuation the vacuum inside the pack should be less than 0.5ata.
- j) The VCI paper must contact the stator / rim punchings, wound pole / field coils and stator coils/bars. It has to ensure that the VCI paper, Aluminium barrier bag should not get damage / puncture during the packing process.
- k) Top cover of the wooden box shall be sealed only after final clearance from QC for confirmation of above.
- l) All boxes should be covered by water proof tarpaulin over top and on all sides.
- m) The packing boxes shall be covered with GI sheets (0.25 -0.4mm thick) on all the sides for Export / Seaworthy packing.
- n) Vacuum packing room temperature and Relative Humidity should be maintained as mentioned below:
Min. +5 deg. C and Max. 45 deg. C, Relative humidity between 10% to 40%.



CORPORATE STANDARD

AA0490008

Rev. No. 01

PAGE 3 of 4

8 COMPONENT REQUIRED

8.1 VCI laminated Aluminium foil

Volatile Corrosion Inhibitor (VCI) safe foil shall be with aluminium barrier laminated which is flexible, heat sealable, water vapour and anticorrosion resistant barrier laminate of polyester, Aluminium foil & VCI Polyethylene. It is used as a primary packaging material for packing metal components and sealed with the help of a heat sealer after vacuuming with vacuum machine maintaining the humidity level below 40 RH inside the package.

8.2 Composition construction of VCI laminated Aluminium foil

- a) PET Film : 12 Microns
- b) Bonding layer : 2 Microns
- c) Aluminium Foil : 9 Microns
- d) Bonding layer : 2 Microns
- e) VCI Poly film : 100 Microns
- f) Total thickness : 125 Microns + or – 5%

8.3 Properties of Aluminium Barrier laminated Bag

- a) Basic Weight : Unit: g/sq. m 150 +/- 5
- b) Tensile strength : Unit: N/sq. mm MD: 40 (min.)
Unit: N/sq. mm TD: 41 (min.)
- c) Water Vapour Transmission : Unit: g/m² 0.01 in 24 hrs. at 38 deg C & 90% RH(max)
- d) Oxygen Transmission : Unit: cm³/m² 0.02 in 24 hrs. at 38 deg C & 90% RH (max)
- e) Sealing Temp. : Unit : Degree C 180-220 deg C

9 MARKING ON PACKING BOX

Mark the following information on the two adjacent sides of the each package.

- a) Box No.
- b) Customer PO
- c) Product Name.
- d) Project Name
- e) Quantity
- f) Storage Requirement : Indoor
- g) Net weight (in kg)
- h) Dimension (L x W x H in centimetres)
- i) Consignee
- j) Water proofing (Umbrella Stencilling)
- k) Upside direction
- l) Sling position indicator

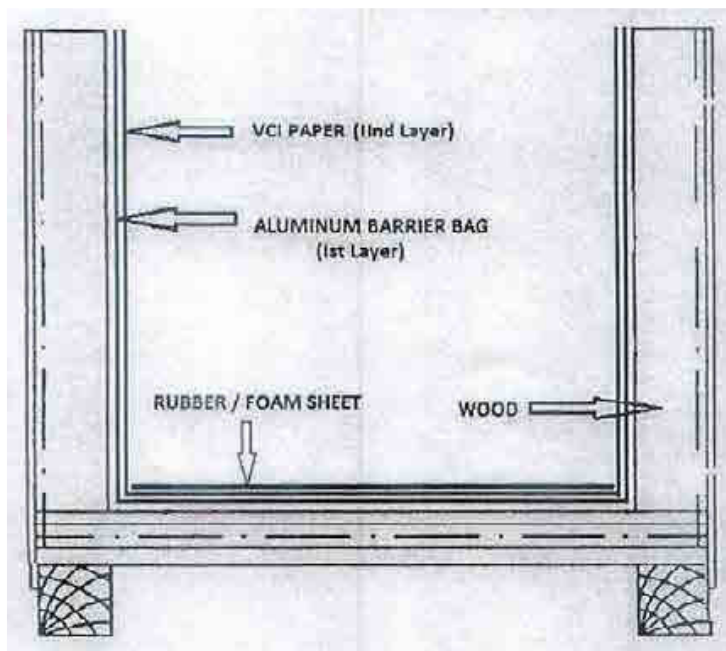


Figure 1



Figure 2



Figure 3



Figure 4



Figure 5

	CORPORATE STANDARD	AA0490009 Rev. No. 01 PAGE 1 of 7	
EXPORT PACKING (PACKING INSTRUCTIONS FOR GENERAL COMPONENTS / ASSEMBLIES / EQUIPMENT)			
1 GENERAL This standard lays down packing instructions for export packing of components/assemblies/equipment to be dispatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments. The components/assemblies need to be packed suitably to avoid physical damage & corrosion during transit for storage. For specific applications, the concerned engineering department shall issue a product standard. Reference of this standard, must appear in the Shipping list/Packing List.			
2 SCOPE This procedure gives minimum guidelines for export packing to be complied with for packing of components/assemblies/equipment. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.			
3 WOOD SPECIFICATION FOR PACKING: a) The wood shall conform to specification AA51401. b) Ply Wood planks as per specification IS:303 Gr. "MR" Type A,B are used for the sides, top & bottom of the packing cases. c) Ply Wood of marine grade as per IS:710 for packing of control equipment and for support batten pinewood to be used as per specification AA51401.			
4 TYPE OF PACKING: The following types of packings have been standardized for packing of general components/assemblies. 4.1 Open Type: Packing subjected to BHEL approval. 4.2 Closed packing cases: a) Export packing of the specific items requiring additional protection shall be covered with G.I. sheet covering as per customer/contractual/engineering requirements. G.I. shall conform to specification AA10166. b) Any other special or export seaworthy packing (improvement or equivalent to the above) shall be subjected to BHEL Engg & QC approval). 4.3 Special Packing Components requiring special packing (as per customer/contractual/ engineering requirements) not included in this specification shall be covered by product standards.			
5 TREATMENT OF WOOD AS PER ISPM-15 As per customer requirement for export packing, wood to be treated as per International Standards for Phytosanitary Measures ISPM:15.			
Revisions:		APPROVED: PROCEDURAL GUIDELINES COMMITTEE – PGC (Packing)	
Rev. No. 01	Amd. No.	Reaffirmed	Prepared HEP, Bhopal
Dt: 12-06-2018	Dt:	Year:	
		Issued Corp. R&D	Dt. of 1 st Issue 31-05-2018

**6 PREPARATION OF PACKING CASE:**

- 1) Export items are to be packed in sea worthy wooden/Ply board cases.
- 2) The base of the case shall be made of wooden battens for planks giving necessary reinforcement, such that the bottom of the equipment is at a height of 100 to 200mm from the ground level depending upon size & weight of equipment. However for packing cases of smaller size equipment can be at a height of 40mm from the ground level.
- 3) The four sides & top cover shall be lined, from inside with multi-layered cross-laminated polyethylene sheet of 90GSM as per AA51420 and tacked at suitable places.
Whenever specified the top cover will have a layer of multi-layered cross laminated polyethylene sheet of 90 GSM over the cover. This should project about 100 - 250mm on all sides.
It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
- 4) Put the job on the base and wherever necessary may be screwed / fastened.
- 5) In case of delicate component Packing Viz. Electrical & Electronic components for instruments/ assemblies, a rubber sheet, Self-expanded polyethene foam sheet as per AA51423, preferably 10mm thick, shall be fixed on to the base to act as cushioning to the equipment.
- 6) Place the Components/cartons with corrosion inhibitors duly applied wherever necessary for place suitably, thin muslin cloths bags containing 100grams (approx.) of activated Blue Silica Gel to AA55619, wherever necessary. Alternatively VCI Powder or Tablet may be used.
- 7) In case, depression is formed, at the top, after the equipment is lowered, provide ply board/wooden batons.
- 8) Whole Equipment shall be covered and sealed with Multi-layered cross-laminated Polyethylene sheet to AA51420.
- 9) For indoor panels/equipment, provide suitable packing batons with covering of Thermocole/ expanded soft polyethylene foam/polyethylene air bubble film wrapped with suitable cords, to avoid cutting of the polyethylene sheet so that finished surface is not damaged.
- 10) Empty space in the box shall be filled with adequate cushioning material e.g. Thermocole Chips, Wood Wool etc. to avoid movement for shocks. Alternatively put wooden blocks/batons wherever necessary.
- 11) The inner side of the top cover shall be lined with M.L.C. laminated polyethylene sheet of at least 90GSM, which shall project approximately 25 to 150mm depending upon the size of the case on all sides of the top cover shall be provided below the top cover. This projection, after nailing the top cover, shall be folded over, on the sides of the crates & tacked, to, prevent ingress of water from the top.
- 12) For specific applications requiring additional protection the packing cases are covered with GI sheet on outside for sides and top; inside for bottom as per specification AA10166, thickness of G.I. sheet shall be 0.25mm.
- 13) For specific applications requiring inspection, additional inspection window has to be provided for custom clearance for export jobs.

7 SEALED PACKING:

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

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

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



CORPORATE STANDARD

AA0490009

Rev. No. 01

PAGE 3 of 7

8 OTHER PACKING MATERIAL

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

- a) Un-protected surfaces of steel and cast iron components, tools bearing, shaft seals etc. are covered with VCI paper. VCI paper has been impregnated with corrosion inhibitors which by evaporation and chemical conversion protect metals in an enclosed area against corrosion.
- b) 7m³ VCI paper is necessary for 1 m³ of packed item approximately as per AA51406.

Application Limitation:

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

8.2 Moisture Absorber:

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

8.3 Sling Plate:

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

8.4 Packing Slip Holders:

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

8.5 Nails

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

8.6 Strapping Strips:

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

8.7 Brackets:

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

8.8 Fasteners:

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

8.9 Polyethylene Sheet:

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

8.10 Expanded Poly Foam Sheet and Air Bubble Film:

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

8.11 Thermocol (Expanded Polystyrene) Sheets:

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

8.12 Cotton Bags:

These are used for holding silica gel.

**8.13 Marking Ink:**

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

8.14 Polyethylene Bags:

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

8.15 Mechanical Latching Clamps:

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

9 DESIGN OF PACKING BOXES

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

10 GENERAL PRECAUTIONS:

- 1) While fixing nails during packing, necessary care shall be taken to ensure that materials used for protection inside the case e.g. paper, polyethylene sheet, coir etc. do not get damaged.
- 2) Sling protection brackets to be provided on cases wherever required.
- 3) It shall be ensured that all stencil marks external, front & rear sides of the casing shall be of water proof Material to prevent obliteration in transit.
- 4) For packing of small/delicate items - Item may be wrapped properly with M.L.C. laminated polyethylene and wrapped item may be further wrapped with air bubble film as per spec. AA51426, these curtains will be subsequently packed in wooden/ply boxes as at clause 8.0.
- 5) The various caution signs shall be marked with stencil on both sides of the packing box.
- 6) Instructions on handling, storage, preservation, represervation and transport of export order components at works and site shall be covered by product standards.

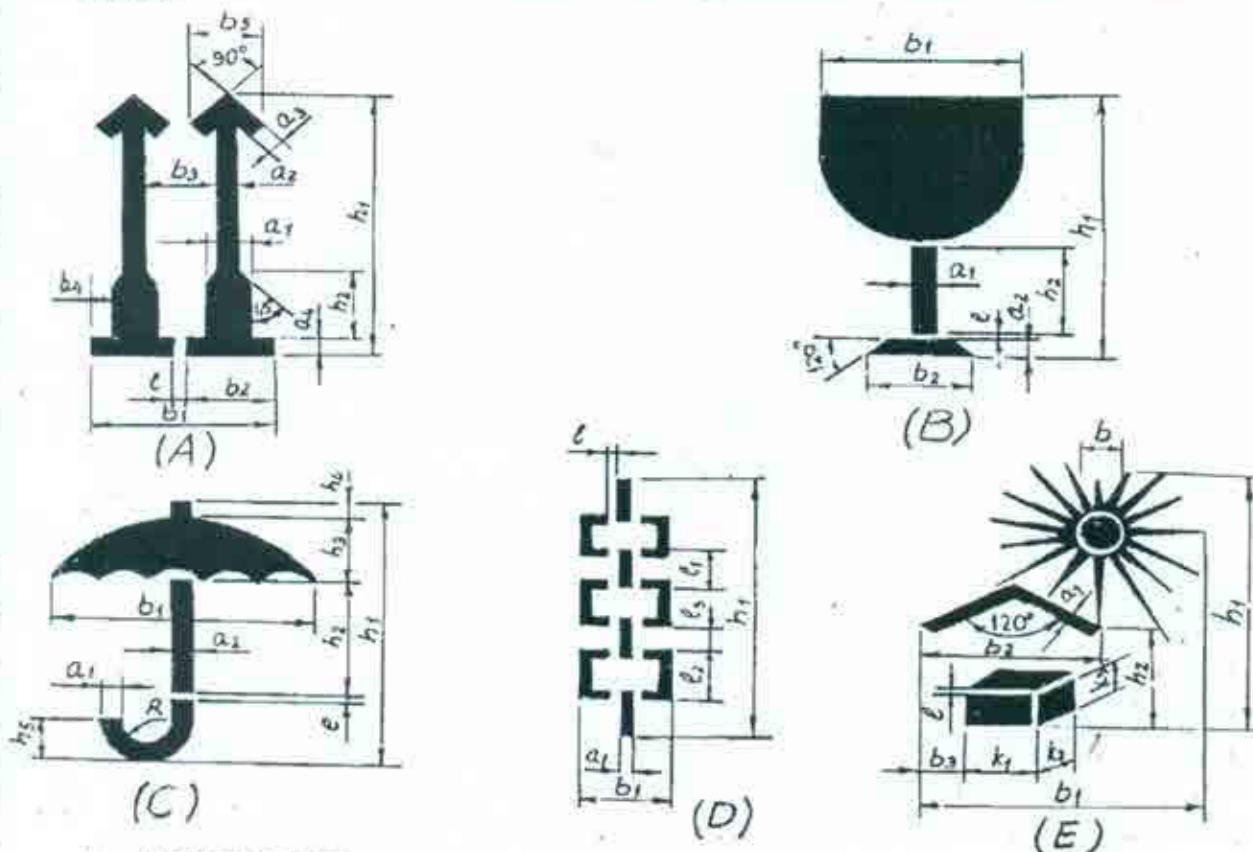
11 MARKING

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

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

MARKINGS ON PACKING CASES

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



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

CENTER OF GRAVITY

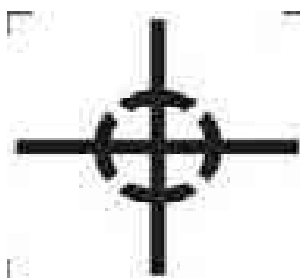


Figure 1 – Markings



DESIGN- ATION	DIMENSIONS IN mm.																						
	α_1	α_2	α_3	α_4	b_1	b_2	b_3	b_4	b_5	b	l	h_1	h_2	h_3	h_4	h_5	K_1	K_2	K_3	l_1	l_2	l_3	R
A	1	12	5	5	4	52	25	19	8	21	-	2	84	23	-	-	-	-	-	-	-	-	-
	2	17	7	7	6	75	36	29	11	30	-	3	119	33	-	-	-	-	-	-	-	-	-
	3	24	10	10	8	104	50	38	16	42	-	4	168	46	-	-	-	-	-	-	-	-	-
	4	34	14	14	11	147	71	59	23	60	-	5	239	65	-	-	-	-	-	-	-	-	-
B	1	5	5	-	-	50	33	-	-	-	-	2	84	25	-	-	-	-	-	-	-	-	-
	2	7	7	-	-	71	47	-	-	-	-	3	119	36	-	-	-	-	-	-	-	-	-
	3	10	10	-	-	100	66	-	-	-	-	4	168	50	-	-	-	-	-	-	-	-	-
	4	14	14	-	-	142	94	-	-	-	-	5	239	71	-	-	-	-	-	-	-	-	-
C	1	4	3	-	-	66	-	-	-	-	-	2	80	39	19	5	11	-	-	-	-	-	6
	2	6	4	-	-	85	-	-	-	-	-	3	114	55	27	7	16	-	-	-	-	-	9
	3	8	6	-	-	120	-	-	-	-	-	4	160	78	38	10	22	-	-	-	-	-	12
	4	11	9	-	-	170	-	-	-	-	-	5	227	110	54	14	31	-	-	-	-	-	17
D	1	6	-	-	-	30	-	-	-	-	-	4	148	-	-	-	-	-	-	30	30	10	-
	2	9	-	-	-	42	-	-	-	-	-	5	209	-	-	-	-	-	-	42	42	14	-
E	1	3	-	-	-	69	47	10	-	-	16	2	91	26	-	-	-	17	8	11	-	-	-
	2	4	-	-	-	98	67	15	-	-	23	3	128	35	-	-	-	24	11	16	-	-	-
	3	6	-	-	-	138	94	20	-	-	32	4	182	62	-	-	-	34	16	22	-	-	-

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

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

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

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

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

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

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

12 PROCEDURE FOR HANDLING OF COMPONENTS

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

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



CORPORATE STANDARD

AA0490009

Rev. No. 01

PAGE 7 of 7

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

8) HANDLING OF COMPONENTS ON RECEIPT/DESPATCH:

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

- The markings showing the upright position.
 - The markings showing the sling position
 - Markings showing the fragile contents.
 - Other required markings as per Cl.No:11
- a) Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15°.
 - b) Handling and lifting should be done without jerks or impacts.
 - c) Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.
 - d) On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.
 - e) Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.
 - f) Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

13 PROVISION FOR INSPECTION:

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

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

14 REFERRED STANDARDS (Latest publications including amendments):

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



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 1 of 26

DOMESTIC PACKING

COMMON GUIDELINES

1 GENERAL:

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

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

2 TYPES OF PACKING:

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

- 1) 'OP' - Open Type.
- 2) 'PP' - Partially Packed.
- 3) 'CP' - Crate/Box Packing - Components/Equipment requiring physical protection.
- 4) 'CQ' - Case Packing - Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
- 5) 'CR' - Case Packing - Electrical Components/Assemblies, which require special packing viz. Water Proof, Shock Proof etc...

3 DESCRIPTION OF TYPES OF PACKING:

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

3.1 'OP' - Open Type

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

3.2 'PP' - Partially Packed

Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film to Specification No.AA51420. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film

3.3 'CP' - Crate Packing

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

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

Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of

Revisions:

APPROVED:PROCEDURAL GUIDELINES COMMITTEE –
PGC (Packing)

Rev. No. 01

Amd. No.

Reaffirmed

Prepared
HPBP, TrichyIssued
Corp. R&DDt. of 1st Issue
31-05-2018

Dt: 12-06-2018

Dt:

Year:



silica gel to AA55619 or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420, wherever required.

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

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel to AA55619 packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 70GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420 before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel to AA 55619.

Empty space in the cartons shall be filled with rubberized coir to get proper cushioning effect. The cartons shall be manufactured from corrugated Fiber Board, meeting requirements of AA51414.

4 PREPARATION OF PACKING CASES

4.1 DOMESTIC:

Based on the availability, the wood shall be Rubber wood (Havea Brasiliensis)/Pine wood for packing of cubicles, loose items, spares and photovoltaic items meant for customers in India.

4.2 DIMENSIONS:

- Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25 +2/-3 mm.
- Width of all planks including the tongue shall be more than 125mm and after planing it shall be minimum 100mm.
- Minimum number of planks shall be used for a shook.
- Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel).
- External sides of front and rear planks to be planed to facilitate writing of address and other markings.
- Width of binding planks shall be minimum 100mm.
- Distance between any 2 binding planks shall be less than 750mm.
- diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
- Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
- Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

4.3 JOINTING OF PLANKS

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

4.4 TONGUE AND GROOVE JOINTS

Two Consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

4.5 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 3 of 26

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

4.6 CHEMICAL TREATMENTS FOR PRESERVATION OF WOOD

- 1) This treatment provides protection to the packing wood against deterioration due to fungi and attack by termites, borers and marine organism and any kind of infections.
- 2) The wooden planks, after making tongues / grooves shall be treated with chemicals. For pine wood, treatment with ASCU/ CCA solution need not be done.
- 3) The chemical used shall be ready mix ASCU paste. This consists of Arsenic pent oxide, copper sulphate sodium dichromate. This Paste shall be mixed at the rate of 1 kg of paste per 10 liters of water to the extent of water used. Alternate this CCA paste as mentioned at Para 4.6.5) can also be used.
- 4) The chemical treatment shall be done at the premises of the contractor. A cement concrete tank of capacity to hold a minimum of 2000liters of solution shall be constructed. The solution shall be prepared in the presence of BHEL Representative by contractor. The wooden planks shall be soaked in the solution for a minimum of 12 hours. The solution shall be replenished after treating a maximum of 12 cubic meters of wood. A log book shall be maintained by the contractor to give the details of date of preparation of solution, quantity of solution prepared, quantity of chemicals used, Quantity of wood treated and the details of replenishment. Samples of solutions before mixing will be tested at the laboratories designated by BHEL. The testing fees to be paid to the laboratories will have to be borne by the contractor. The paste shall be tested as and when required.
- 5) Specifications for water soluble type wood preservatives: Copper – Chromium – Arsenic [CCA]: Copper – Chromium – Arsenic preservative formulation shall be as per IS:10013 Part – II – 1981 shall consist of following active ingredients in nominal proportions by weight as shown below:

– Arsenic Pent oxide	AS ₂ O ₅ 2H ₂ O	12.5
– Copper Sulphate	CuSO ₄ 5H ₂ O	37.5
– Sodium Dichromate	Na ₂ Cr ₂ O ₇ 5H ₂ O	50.0
– Or Potassium Dichromate	K ₂ Cr ₂ O ₇	

4.7 OTHER MATERIALS

4.7.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

4.7.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

4.7.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6 +0.01mm. The material shall be free from rust.

4.7.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

4.7.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of "L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

**4.7.6 FASTENERS**

Bolts, double nuts, spring washers will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box. The bolts, nuts, washers will be provided by the vendor. Drilling of holes will have to be done using contractor's tools.

4.7.7 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

70GSM (Colourless) Multi Layered Cross Laminated Polythelene Film Specification No: AA51420 are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

4.7.8 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

4.7.9 FOAM RUBBER / 'U' FOAM:

This is used for covering the delicate items. This material is provided by the vendor.

4.7.10 MARKING PLATE:

This shall be of anodized aluminium sheet. Details and specifications are given in Fig-4

4.7.11 PACKING SLIP HOLDER:

This shall be of galvanized iron tinned sheet /Aluminium sheet

4.7.12 SILICA GEL:

This shall be of indicating type to conform to IS: 3401/AA55619.

4.7.13 COTTON BAGS:

These are used for holding silica gel. The bags shall have the following matter indicated on them:

BHEL-UNIT NAME	PLACE-PINCODE
SILICA GEL	INDICATING TYPE
BLUE :	ACTIVE
ROSE :	REDUCED ACTIVITY
WHITE :	NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL

4.7.14 COTTON/ PLASTIC TAPE:

This is used for tying small items. And also to prevent vibrations of moving parts within the cubicles.

4.7.15 MARKING INK:

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

4.7.16 POLYETHYLENE BAGS:

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



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 5 of 26

4.7.17 Hessian cloth, twine thread, paint will have to be used in packing certain items.

4.7.18 Mechanical Latching clamps:

For CLW Railway panels and similar Panels self-locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. For reusable boxes, these clamps provide easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.

4.7.19 STICKERS

The following stickers to be put by the vendor on cubicles/Boxes after packing.

1. Case No sticker: 2 nos. Size 25.Cm x 0.45Cm
- 6) BHEL Monogram sticker: 1 no. Size 1.75Cm x 2.3Cm
- 7) Address sticker: 2 nos. Size 3.8Cm x 3.0Cm
- 8) Direction sticker " Front " & " Back " - 4 nos. Size 2.0Cm x 0.75Cm
- 9) Chain Mark Sticker: 4 Nos. Size – 3.0Cm x 0.75Cm
- 10) "Fragile " sticker: 2 Nos Size. 2.1Cm x 1.5Cm
- 11) "DO NOT STACK " sticker - 2 Nos. Size 3.0Cm x 2.2Cm

5 PACKING OF CUBICLES WITH RUBBER WOOD:

5.1 The packing is to be done as per clause 4 in all respects.

5.2 The cubicles are already fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets normally.

5.3 The cubicles will be of different sizes both widthwise and lengthwise. The cubicles may be made up of single suite, 2 Suite, 3 Suite, 4 Suite, etc., The width of the cubicles generally varies from 400 mm to 1650mm. The length of the cubicle, generally varies from 1500 mm to 4800 mm. The height is normally 2430 mm. In some cases, the height may be less/more.

5.4 MULTI LAYER CROSS LAMINATED POLY FILM

The inner surface of 4 sides of shoo's shall be nailed with Multi-layer cross laminated poly film (as per 4.7.7) using blue nails (as per 4.7.2) wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.

The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film (as per 4.7.7). This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.

The cubicles shall be covered with Multi-layer cross laminated poly film (as per 4.7.7).

5.5 SILICA GEL:

Silica gel (as per 4.3.15) packed in cotton bags shall be kept at different places inside the cubicle as per BHEL-Unit directions. Each suit of cubicle shall be provided with 1 kg of Silica gel (for a 4 suit cubicle 4 kgs of Silica Gel to be used. The bag containing silica gel to be as per 4.7.13).

5.6 LOOSE PARTS:

Any loose parts in the cubicles shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

5.7 WOODEN BATTENS:

In case of cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/battens of proper size shall be provided to give strength to the package.

5.8 RUBBERISED COIR:

Gap between the cubicle and the case shall be filled with rubberized coir (as per 4.7.8) with distance between consecutive layers less than 500mm.

**5.9 CLAMPING:**

Packing shall be bound at edges by nailing M.S. Clamps / Brackets (as per 4.7.5). Each vertical edge shall have minimum 3 clamps. Top horizontal edges will have one clamp for every meter length of package. However, minimum 4 clamps shall be nailed at the top for any cubicle.

5.10 PACKING SLIP:

Packing slip kept in the polyethylene bag (As per 4.7.16) shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder (as per 4.7.11) shall be nailed to front / rear of case.

5.11 MARKING PLATE:

One no. (As per 4.7.10) shall be nailed to the front side of the case.

5.12 CASE MOUNTING:

After complete packing, stencil marking of various details and marking of symbols shall be done as per BHEL instructions using indelible / non washable marking ink.

5.13 Different types (Typical) of Cubicles with sizes for Packing

1. Single suite cubicle - 900 x 950 x 2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x 2500
4. Four suite cubicle - 3150 x 950 x 2500
5. Regulation cub - 1300 x 1350 x 2500
6. Thy cub - 2870 x 1350 x 2500
7. VFD Cub - 3800 x 1550 x 2500

5.14 PACKING OF CUBICLES WITH PINE WOOD

Packing of cubicles for export shall be done exactly in same manner as described at Cl.No 5 except for the following changes: -

Wood shall be Silver oak/ Pine wood instead of rubber wood.

- Double polyethylene petticoat instead of one.
- Fumigation may have to be done if required (BHEL Scope).

6 PACKING OF LOOSE ITEMS/SPARES USING RUBBER WOOD:

- 1) Shape of cases shall be square, rectangular with single gabled roof or with double gabled roof depending on the nature of the job to be packed. Construction shall be as per drawings enclosed. Only gable will be additional as required.
- 2) Wood shall be rubber wood with Tongue and Groove joint as per clause 4.4.
- 3) Chemical treatment as per Clause 4.6 to be done.
- 4) Width of planks shall be at least 100 mm. Width of binding planks (battens) shall be at least 75mm.
- 5) External surface of planks on front and rear shall be plane 100% (except bottom plank).
- 6) Inner surfaces of all 6 sides shall be lined with bitumen coated hessian polyethylene Kraft paper (as per clause 4.7.7) using blue nails.
- 7) Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
- 8) Internal packing: Items that go into the box shall be packed using 70GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No: AA51420. Any space left Between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect .
- 9) Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 7 of 26

- 10) Silica gel as per clause 4.7.12 held in cotton bags as per clause 4.7.13 shall be kept at proper places in the box.
- 11) Packing slip kept in polyethylene bag (clause 4.7.16) shall be placed in the box.
- 12) Marking plate as per clause 4.7.10 shall be nailed to side of the box.
- 13) Two numbers of hoop iron strips as per clause 4.7.3 shall be strapped tightly on the case using clips.
- 14) Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
- 15) Loose items to be kept inside the cubicle
- The components which are removed from cubicle for shipping purpose only, such as meters shall be kept inside the cubicle individually, kept in wooden box and tied firmly in bottom of Cubicle.
 - Other items which are given loose in addition to cubicle shall be packed in separate boxes.

7 BOX SIZES

7.1 BOX SIZES

Table 1 – SPARES WOODEN BOX DETAILS

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
1	A	800 X 200 X 200	15	
2	B	1500 X 200 X 200	22	
3	C	2000 X 200 X 200	27	
4	D	1100 X 200 X 200	15	
5	E	200 X 200 X 200	5	
6	F	320 X 250 X 260	13	
7	G	320 X 250 X 430	16	
8	H	430 X 370 X 430	23	
9	I	1100 X 400 X 400	45	
10	J	1500 X 500 X 400	65	
11	K	2000 X 500 X 400	93	
12	L	2500 X 500 X 400	88	
13	M	900 X 600 X 600	100	
14	N	3000 X 400 X 400	60	
15	P	600 X 500 X 400	35	
16	Q	710 X 630 X 600	90	
17	R	850 X 630 X 670	102	
18	S	1000 X 770 X 670	140	
19	T	2500 X 850 X 800	180	
20	U	1500 X 700 X 700	120	
21	W	1200X900X600	120	
22	Y	450 X 200 X 200	10	



7.2 BOX SIZES

Table 2 – VALVES WOODEN BOX DETAILS

BOX TYPE	BOX SIZE (in MM)	BOX Wt (in KG)	Carrying Capacity
1A	320X250X260	10	
1	320X250X430	15	
2	430X370X430	25	
3	670X670X470	65	
4	720X630X600	75	
6	1000X770X660	100	
7	1100X430X670	80	
8	1200X1200X900	80	
10	1300X770X1050	155	
11	2500X850X800	225	
12	2000X1500X1200	305	
14	1850X1050X1250	260	
15	2000X800X800	180	
17	2600X1500X1600	470	
21	250X250X600	20	
22	250X250X880	30	
23	300X300X700	25	
24	380X380X880	45	
25		25	
26	510X510X1400	60	
27	570X570X1400	80	
28	575X575X1875	105	
29	3600X1100X1100	390	
30	900X500X800	110	
52	2000X950X740	225	
53	1600X1120X700	220	
54	2500X2000X1200	490	
55	2900X1900X1400	525	
56	3000X1000X900	370	
57	3200X2200X950	450	
58	2150X1100X750	325	
61	2000X2000X700	130	
62	700X1200X1325	130	

TYPICAL PATTERN OF WOODEN BOX

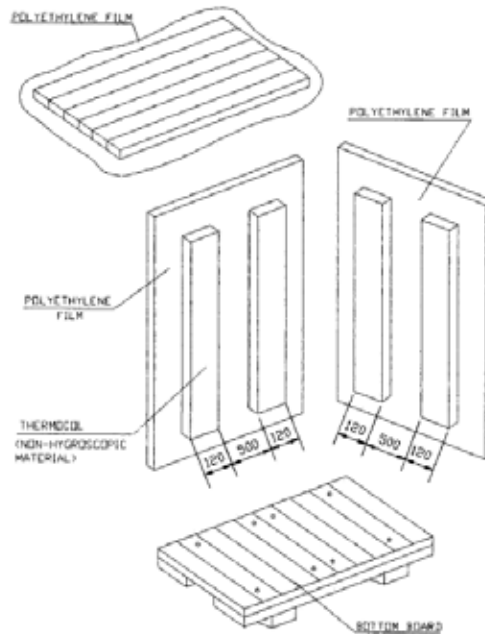


Figure 1

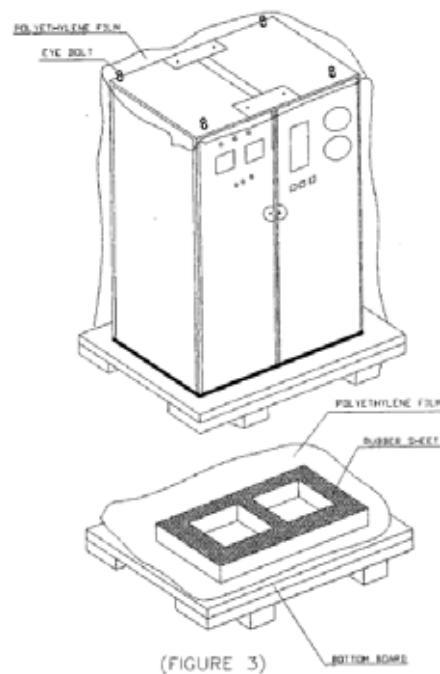


Figure 2



7.3 STANDARD BOX SIZES

WOODEN BOXES:

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
01	I	2370	1570	1650	675	4000
02	IIA	1570	720	885	200	2500
03	II	1200	900	600	150	2000
04	III	900	600	600	100	1000
05	IV	600	450	450	40	750
06	V	600	300	300	35	500

STEEL BOXES:

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
07	I	2480	1680	1500	339	4500
08	II	1200	900	600	061	2000
09	IIB	1800	850	950	115	2500
10	III	900	600	600	029	1000
11	IV	600	450	500	019	750
12	V	400	350	300	011	500

Table 3

7.4 STEEL CONTAINERS

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies. The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections.

- Following precautions are to be taken during packing: -
- Put the machine in the steel container properly,
- Cover the machine with polythene.
- To arrest the movement in the steel container necessary wooden Blocks/Battens may be put.
- Put cover on steel, container and Bolt Properly

8 MARKINGS/STENCILINGS

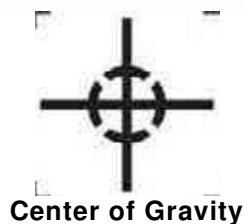
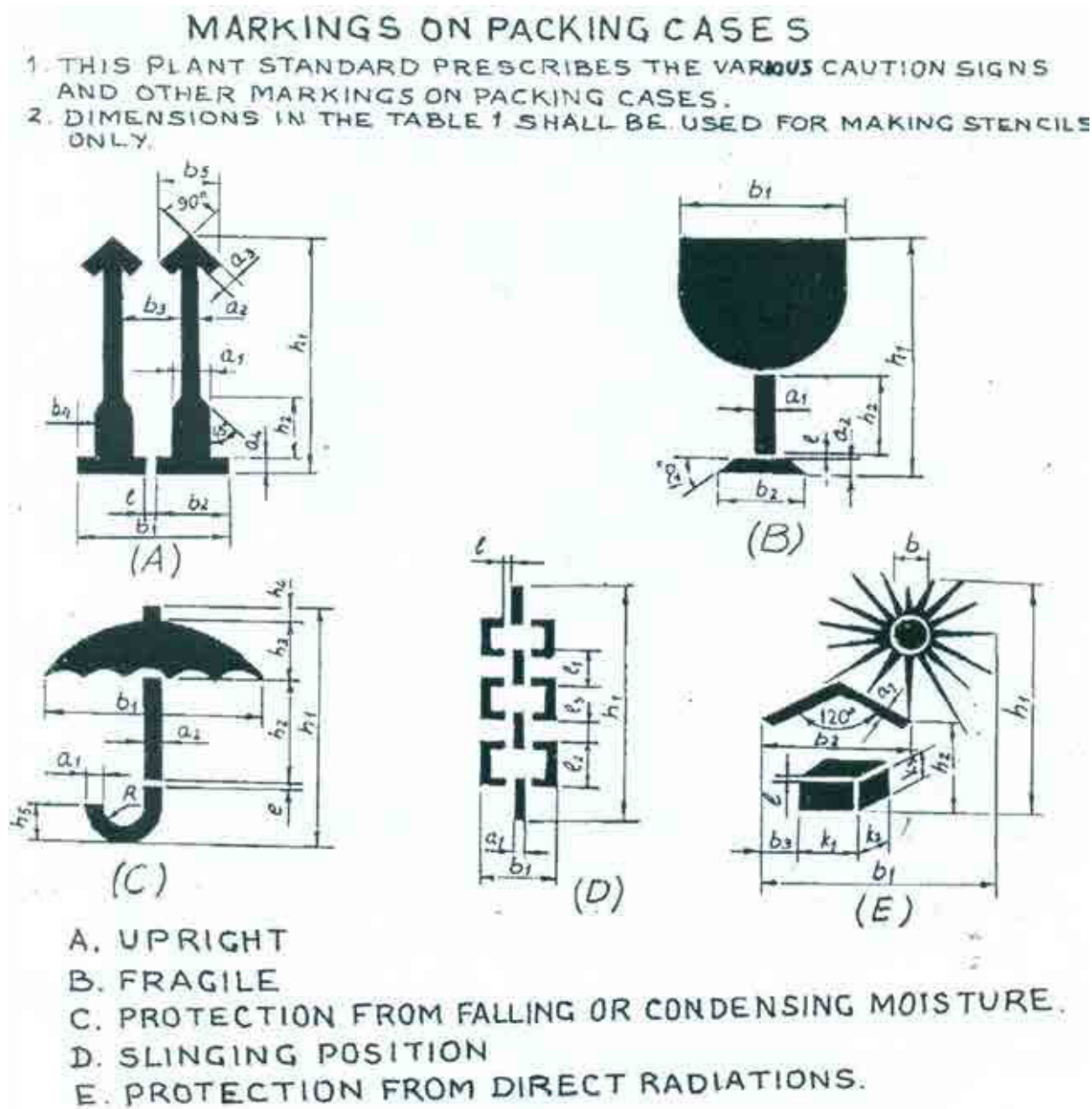


Figure 3

CORPORATE STANDARD



DESIGN- ATION		DIMENSION IN MM																							
		a1	a2	a3	a4	b1	b2	b3	b4	b5	b	l	h1	h2	h3	h4	h5	k1	k2	k3	l1	l2	l3	R	
A	1	12	5	5	4	52	25	19	8	21		2	84	23											
	2	17	7	7	6	75	36	29	11	30		3	119	33											
	3	24	10	10	8	104	50	38	16	42		4	168	46											
	4	34	14	14	11	147	71	59	23	60		5	239	65											
B	1	5	5			50	33					2	84	25											
	2	7	7			71	47					3	119	36											
	3	10	10			100	66					4	168	50											
	4	14	14			142	94					5	239	71											
C	1	4	3			66						2	80	39	19	5	11								6
	2	6	4			85						3	114	55	27	7	16								9
	3	8	6			120						4	160	78	38	10	22								12
	4	11	9			170						5	227	110	54	14	31								17
D	1	6				30						4	148								30	30	10		
	2	9				42						5	209								42	42	14		
E	1	3				69	47	10			16	2	91	26				17	8	11					
	2	4				98	67	15			23	3	128	33				24	11	16					
	3	6				138	94	20			32	4	182	62				34	16	22					

Table 4

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

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

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

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

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

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.

Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

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

225			
	BHEL-EDN-BANGALORE-26		
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		
		170	

Figure 4 – TYPICAL MARKING PLATE



Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

9 RECYCLING OF INCOMING WOODEN PACKING CASES

OBJECTIVES

- To utilize useable wood of incoming packing cases, for manufacturing of new packing boxes.
- To recycle incoming wooden packing cases, as such, wherever possible.



- 1) All incoming wooden packing cases received from suppliers /customers will be opened carefully, with the intention of reusing them, by Shop.
- 2) After carefully taking out the contents, the empty wooden packing cases will be shifted by Shop to the specified locations i.e. bin / nearly spaces, already earmarked in stores.
- 3) Material shifting contractor engaged by store, will collect all such wooden packing cases and scrap wood from specified points, on a regular basis.
- 4) After collecting / loading the empty packing cases/ scrap wood, contractor will take the carrier first to weighment bridge for weighment, thereafter, he will go to Carpentry, where Carpentry representative will identify the packing cases which can be used by Carpentry for manufacturing of New Packing Boxes. All such identified packing boxes will be unloaded and handed over to Carpentry by contractor.
- 5) These packing boxes will be made re-useable after necessary rectification and additional work.
- 6) Contractor will again take the carrier for weighment and this second reading will also be recorded on the same "Weighment Slip".
- 7) Weight of empty packing cases / scrap wood taken will be calculated on the basis of 1st and 2nd weighment readings recorded on the "Weighment Slip". A copy of "Weighment Slip" (where both the weighment readings are recorded) will be given by the contractor to the carpentry representative. Based on this "Weighment Slip", carpentry will maintain a register in which details of quantity received will be recorded.
- 8) All "Weighment Slips" will invariably be signed by carpentry representative (even when no boxes have been unloaded by carpentry). Store will accept the scrap wood only if "Weighment Slips" are signed by carpentry representative.
- 9) Balance empty packing cases / scrap wood will be handed over by contractor to Store, for storing in scrap yard.
- 10) A separate area in Scrap yard will be provided, for executing the work of de-nailing of wooden packing cases, under supervision of carpentry.
- 11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will be handed over to him by Store, at Scrap yard, for denailing and further operation.
- 12) Quality and Carpentry will jointly inspect the wood generated by de-nailing process and will prepare "INSPECTION CUM RECEIPT REPORT OF USEABLE WOOD RECEIVED FROM TPS –STORE BY CARPENTRY".
- 13) After acceptance of the wood by Quality and Carpentry, the same will be shifted to carpentry for receipt and its record will be maintained by carpentry.
- 14) This will be a Permanent Productivity Project executed by carpentry. "Productivity Savings" duly verified at the current Purchase Order rate of wood, will be sent every month to Resource Management Department, for highlighting it in their monthly progress report.

10 STANDARD METHOD OF PACKING

Table 5 –

STANDARD METHOD OF PACKING								
DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
PRESSURE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 15 of 26

STANDARD METHOD OF PACKING

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
COVERS		O						
EXCHANGERS								
HEAT EXCHANGERS					O			
TUBE BUNDLE	O							
SHELL					O			
AIR FIN COOLERS					O			
COLOUMNS, MOTOR SUSPENSIONS, PLENUM CHAMBERS, SCREEN GUARDS, ETC					O			
BEARING BLOCKS	O							
FANS	O	O						
MOTORS	O							
GASKETS	O							
FASTENERS	O							
TEST FLANGES			O					
TEST RINGS			O					
COVERS			O					

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
CRYOGENIC VESSELS								
COLD CONVERTERS					O			
HORIZONTAL STORAGE TANKS					O			
TRANSPORTATION TANK					O			
COLD BOX					O			
DRYING UNIT					O			
DRYING BOTTLES					O			
MOISTURE SEPARATORS					O			
SILENCERS					O			
ONGC SKIDS					O			
VAPORISER		O						
SPECIAL PRODUCTS								
SI/VI PIPING		O						
CRO BIO CONTAINERS	O							
AIR BOTTLES	O							
TITANIUM BOTTLE	O							
WAR HEAD CONTAINER	O							
MISSILE CONTAINER	O							
FUEL CONTAINER	O							
AIR LOCK ASSEMBLY	O							

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
BOILERS								

AA0490010		CORPORATE STANDARD							बी एच ई एल BHEL			
Rev. No. 01												
PAGE 16 of 26												
BOILER DRUMS						O						
BOILER ITEMS												
COILS				O								
PANELS						O						
HEADERS				O		O						
FEEDERS												
MACHINED ITEMS												
SHELL SEGMENTS						O						
SHELL SEGMENTS IN STACKS						O						
SPHERE PETALS												
COLOUMNS, BASE PLATES, TIERCOS, PIPES, NOZZLE E1, F1, INTERNAL PIPES, PADS ETC.						O						
ROLLERS		O										
VALVE TRAYS												
VALVE TRAY COMPONENTS		O										
LATTICE GIRDERS			O									
FASTENERS		O										
GASKETS		O										
DESCRIPTION					CA SE	CRA TE	SK ID	BUN DLE	BA RE	DR UM	METAL DRUM	FIBRE DRUM
SUB CONTRACTS												
FAB STRUCTURALS									O			
SUPPORTING STRUCTURALS									O			
STRUCTURE SUB ASSEMBLY									O			
FAB PIPES									O			
GRATINGS									O			
STAIR CASES									O			
HANDRAILS/ PLATFORMS									O			
BOUGHT OUT COMPONENTS												
IRON & STEEL (LIKE PLATES, BEAMS, ANGLES, CHANNELS ETC.)									O			
PIPE FITTINGS												
CS PIPES, TUBES									O			
SS PIPES, TUBES									O			
FIN TUBES					O							
ELBOWS						O			O			
FLANGES					O	O						
VALVES					O							
GAUGES					O							
DEMISTERS						O						
DESCRIPTION					CA SE	CRA TE	SKI D	BUND LE	BA RE	DR UM	METAL DRUM	FIBRE DRUM



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 17 of 26

ABSORBANTS (LIKE MOLECULAR SIEVES, ACTIVATED ALUMINA, MOBILE SORBID)								
PAINT TINS		O						
PAINT DRUMS						O		
IGNITORS	O							
SPRAY NOZZLES	O							
ELECTRICAL INSTRUMENTATION								
MOTORS, PUMPS, COMPRESSORS, TURBINES	O							
SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES		O						
INDICATORS, VIBRATOR SWITCHES	O							
CABLE BUNDLES, CABLE DRUMS					O			
CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL		O						
OPERATIONAL SPARES	O							

11 PROCEDURE FOR HANDLING OF COMPONENTS

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

- 11.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.
- 11.2 Appropriate material handling equipment like fork lifters, cranes etc. shall be used where needed.
- 11.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. shall be done carefully.
- 11.4 For critical items, where specified, special handling fixtures shall be used for lifting.
- 11.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.
- 11.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.
- 11.7 Precision machined components like blades, catches, rollers etc. shall be lifted using suitable wooden pallets.

11.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH

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

- a) The markings showing the upright position.
- b) The markings showing the sling position
- c) Markings showing the fragile contents.
- d) Other required markings as per CI.no:08

CORPORATE STANDARD

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

12 GENERAL GUIDELINES FOR ODC TRANSPORTATION/DESPATCH

Based on the Dimensions/Weight indicated in the Transportation Sketch, the type of Trailer is decided and indicated in the Tender Enquiry.

12.1 TRANSPORTATION:**1. LOW BED TRAILERS (LB 8):**

Well Bed Length:	10000mm
Over Gooseneck:	13000mm
Width:	3000mm
Carrying Capacity:	40MT

2. LOW BED TRAILERS (LB 16):

Well Bed Length:	12000mm
Over Gooseneck:	16000mm
Width:	3000mm
Carrying Capacity:	75MT

**3. TOW TYPE TRAILERS (WITH FRONT DOLLEY 16 TYRES): 12000MM length
(for Exceptional equipment length: 30000mm and above)**

Bigger Dia equipment are loaded in the Well with overhanging.

Smaller Dia equipment with excess length are loaded over Gooseneck with rear hanging.

The Vehicle Dimensions are defined above are only guidelines for selection based on actual Dimensions/ Weight of the Consignment

12.2 PACKING:

For all ODCs, Wooden Saddles are cut to the diameter of equipment as per the Transportation Sketch.

For Diameter up to 4000mm



CORPORATE STANDARD

AA0490010

Rev. No. 01

PAGE 19 of 26

Wooden Saddles Length: 1836/2743mm (6'0"/9'0")
Width: 300mm (1'0")
Height: Saddle + one/two wedges a top.

For Diameter up to 4000mm

Wooden Saddles Length: 3353mm (11'0")
Width: 300mm (1'0")
Height: Saddle + three/four wedges a top.

NUMBER OF SADDLES:

Minimum: 3 in case of Loading inside Well
+ 1 when loaded on Gooseneck.
Maximum: 4 in case of Loading inside Well
+2 when loaded on Gooseneck.

For Securing the equipment firmly on the Trailer, 19mm (3/4"), wire rope with 25mm (1") Heavy Duty Turn Buckles / BD Clamps are used as Lashing for the equipment.

12.3 NUMBER OF LASHINGS ARE:

	CONSIGNMENT LOADED INSIDE WELL BED	CONSIGNMENT LOADED OVER GOOSENECK
a) up to 40MT	4 (2 Single Line lashing 2 Double Line Lashing)	5 (3 Single Line Lashing 2 Double Line Lashing)
b) 40MT to 60MT	5 (3 Single Line Lashing 2 Double Line Lashing)	5 (Single Line Lashing 3 Double Line Lashing)
c) 60MT and above	5 (2 Single Line Lashing 3 Double Line Lashing)	6 (3 Single Line Lashing 3 Double Line Lashing)

13 GUIDELINES FOR HANDLING/LOADING/LASHING

13.1 HANDLING



Figure 6

Before unloading the jobs Completely painted and neatly stencilled will be checked.

Pipes with split type end cover will be checked

**Figure 7**

All Coil Tubes to be provided with End Caps.

**Figure 8**

Neatly stacked Coil Assemblies.

**Figure 9**

Columns to be lifted with Nylon belts. This protect painting, edges and attachments.

**Figure 10**

13.2 LOADING

All the components to be transported by putting inside the properly fabricated Crating

**Figure 11**

Small components may fall down while transporting without closed crating and there are chances of missing of small parts. Hence, it is always better to transport small components in closed containers/crating. Loose to be being shipped in a closed crating.

**Figure 12**

No component loaded over the crating.



Figure 13

Headers supported with wooden V blocks at 3 meters interval.



Figure 14

Spacers in between each coil assembly.

**Figure 15**

Goose pipe to be provided with rubber pad protects removal of painting and damage to the job.

**Figure 16**

13.3 LASHING

Use Nylon belts only for lashing of all components. It prevents removal off painting and cut in the materials.

**Figure 17**

Nylon Belts used for lashing the beams.

**Figure 18**

14 PRODUCT WISE SPECIAL INSTRUCTION

Additional instructions of packing not included in this standard shall be covered by individual product standard

**15 REFERRED STANDARDS (Latest publications including amendments):**

- | | | | |
|------------|------------|------------|------------|
| 1) AA51420 | 2) AA55619 | 3) AA51414 | 4) IS:3401 |
| 5) AA10108 | 6) AA56126 | | |

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-6 (VOID)
--	---

Revisions: Refer to record of revisions				

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-7 (Foam Pump assembly QAP Guide Line & Formats)
--	--

Revisions: Refer to record of revisions				

TD-201 Rev No. 00 Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE -
			Rev No. 00
			Page 1 of 3
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	QAP GUIDELINES & FORMAT (ANNEXURE -) The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement. Note : 1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval. 2. No deviation to reference document is acceptable.		

Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE
			Rev No. 00
			Page 2 of 3
<u>GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN</u> - QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10. - Each page of QAP shall contain the following information. - Vendor's name & address. - Customer: BHEL, Hyderabad. - Project. - BHEL Product Standard Number/revision number as referred in P.O. - BHEL Purchase Order Number & Date. - Product as per P.O. description. - QAP Number (unique and shall not repeat)/revision number/date. - Page number and number of pages - QAP shall contain four parts / stages as follows. - Raw materials and bought out items. - In process Control / Inspection. - Final assembly, Inspection & Testing. - Painting, preservation & packing. - Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc). - Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.) - Under 'Class', indicate minor, major or critical depending on the importance of characteristic. - Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.) - Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.) - Under 'Reference document' and 'Acceptance norms', appropriate National & International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review & approval by our Engineering dept. - Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc. - Please refer 'Agency' in QAP format. Under P: Perform, W: Witness, V: Verify Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR 2: (Vendor / Sub vendor)			
Ref. Doc			

COPYRIGHT AND CONFIDENTIAL

The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.

	Form No.	 HYDERABAD	PRODUCT STANDARD PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE
		Rev No. 00		
		Page 3 of 3		
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, Under Witness (W) column use 1. Under 'Verify' column, use code 1. 12. Under 'D' please put (☐ Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification. 13. Vendor's signature & stamp should be available on each page of QAP. 14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification & Approved Drawings. 15. The following operations/characteristics/check points may be included (AS APPROPRIATE) a) Visual check b) Dimensional check c) Mechanical and Chemical properties. d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.) e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc. f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc. g) Verification of test certificate for protection class for the enclosures. h) Mechanical functioning of switches. i) Continuity of earthing and provision of earth points. j) Colour coding of wiring, size, tightness & dressing of wiring. k) Review of test certificates of assembled items, raw materials, internal test reports etc. l) Witness of functional checks, which may include mechanical run & electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc. m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc. n) Material identification (for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.) o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests. p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating) q) All tests as per BHEL Product Standard & approved drawings including Type tests and Routine tests on individual items and on System as a whole. r) Packing and Preservation. 16. QAP Format enclosed. 17. Typical Manufacturing QAP(s) is /are attached.		
				Ref. Doc

VENDOR'S NAME & ADDRESS:			MANUFACTURING QUALITY PLAN						QP. NO.:					
			CUSTOMER: BHEL, HYDERABAD – 32. PROJECT: PRODUCT:			BHEL P.O.NO.: P.O.DATE: BHEL SPEC:			REV:		REV NO:		DATE:	
											PAGE 1 OF 1			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS	
1.0	RAW MATERIALS & BOUGHT OUT ITEMS													
2.0	INPROCESS INSPECTION													
3.0	FINAL INSPECTION & TESTING													
4.0	PRESERVATION & PACKING													

VENDOR TO NOTE: THIS FORMAT IS IN MICROSOFT WORD. HEADER & FOOTER SHALL BE AVAILABLE IN EACH PAGE OF QP. QP SHALL BE IN LANDSCAPE & A4 SIZE ONLY. FONT SIZE SHALL BE MIN 10. VENDOR SHALL SIGN & STAMP IN EACH PAGE OF QP. LOI REF. & DATE ARE NOT ACCEPTABLE. P.O.NO. & DATE SHALL BE INDICATED. QP NO. SHOULD BE UNIQUE AND SHALL NOT REPEAT. ALL THE TESTS / CHECKS INDICATED IN THE BHEL SPEC. SHALL BE INDICATED IN THE QP.

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.	PREPARED BY	APPROVED BY	APPROVED BY
	VENDOR'S SIGNATURE & STAMP	BHEL QA SIGNATURE & STAMP	CUSTOMER'S SIGNATURE & STAMP

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: FOAM PUMP BHEL TECH SPEC:			REV NO:		DATE:			
								PAGE 1 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS
1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	Casing	Visual check	Major	Visual	100%	Tech Spec/ Approved Datasheet/ Approved Drawing		--	--	2	2	--	
1.2		Dimensional check	Major	Measurements	100%			--	--	2	2	--	
1.3		Chemical & Mech. Properties	Major	Chemical & Mech. analysis	1 per heat/lot			MTC	√	2	2	1	
1.4		Heat treatment for all castings	Major	HT	100%			HT chart	√	2	2	1	
1.5	Gear and Shaft	Chemical & Mech. Properties	Major	Chemical & Mech. analysis	1 per heat/lot			MTC	√	2	2	1	
1.6	Mechanical seal	Material and leakage check (Air test)	Major	OEM's certificate review	100%			OEM's certificate	√	2	2	1	
1.7	Bearing and bearing housing	Make and Model	Major	OEM's certificate review	100%			OEM's certificate	√	2	2	1	
1.8	Coupling	Chemical & Mech. Properties	Major	Chemical & Mech. analysis	1 per heat/lot			MTC	√	2	2	1	
1.9	Strainer (as applicable)	Chemical & Mech. Properties and hydro test	Major	OEM's certificate review	100%			OEM's certificate	√	2	2	1	
1.10	Instruments and JB (as applicable)	MOC, hydro test reports, Calibration reports and Type test certificates	100%	OEM's certificate review	100%			OEM's certificate	√	2	2	1	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED √ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

बी एच ई एल BHEL		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: FOAM PUMP BHEL TECH SPEC:			REV NO:		DATE:			
								PAGE 2 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS
1.11	Interconnecting pipes and fittings (as applicable)	Chemical & Mech. Properties	Major	Chemical & Mech. Analysis	1 per heat/lot			MTC	√	2	2	1	
1.12	Wear rings, Gaskets, Flanges, and Fasteners	Chemical & Mech. Properties	Minor	Chemical & Mech. Analysis	1 per heat/lot			MTC	√	2	2	1	
2.0	INPROCESS INSPECTION												
2.1	Fabrication of casing and other components	WPS, PQR and WQR	Major	Document verification	100%	Tech Spec/ Approved Datasheet/ Approved Drawing		WPS, PQR and WQR	--	2	2	1	
2.2	Casing	NDE	Major	DPT/MPI	100%			NDE reports	√	2	1	--	
2.3		Leakage	Critical	Hydrostatic test	100%			Test reports	√	2	1	--	
2.4	Butt welds on casing (if any)	NDE	Major	RT	100%			IR	√	2	2	1	
2.5	Fillet welds on casing (if any)	NDE	Major	MPI	100%			IR	√	2	2	1	
2.6	Gear	NDE	Major	DPT / MPI	100%			NDE reports	√	2	2	1	
2.7	Shaft	NDE	Major	DPT / MPI and UT (if shaft diameter > 50 mm)	100%			NDE reports	√	2	2	1	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032				PROJECT: PACKAGE: FOAM PUMP BHEL TECH SPEC:		REV NO:		DATE:			
								PAGE 3 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V			REMARKS
2.8	Wear rings	NDE and hardness test	Major	DPT and hardness test	100%			DP and hardness test reports	√	2	2	1	
2.9	Interconnecting Piping (as applicable)	NDE and leakage	Major	DPT and hydro test	100%			DPT and hydro test report	√	2	2	1	
2.10	Coupling	Dynamic balancing	Critical	Balancing	100%			IR	√	2	2	1	
2.11	Gear	Dynamic balancing	Critical	Balancing	100%			IR	√	2	2	1	
2.12	Gear assembly	Dynamic balancing	Critical	Balancing	100%			IR	√	2	2	1	
3.0	FINAL INSPECTION & TESTING												
3.1	Motor driven pump with job motor and engine driven pump with calibrated shop motor	Overall Dimensions	Major	Measurement	100%	Tech Spec/ Approved Datasheet/ Approved Drawing		TC	√	2	--	1	Only 10% witness by BHEL / BHEL's TPIA, subjective to minimum 1 pump of each size & type.
3.2		Performance test	Critical	Testing	100%			IR	√	2	1	--	
3.5		Mechanical run test	Critical	Testing	100%			TC	√	2	1	--	
3.6		Strip Examination	Major	Dismantling	100%								
3.7		Complete unit test with job drives and job accessories.	Major	Testing	100%			TC	√	2	1	--	
3.8		Accessories and Spares (if any)	Major	BOM check	100%			IR	√	2	1	--	
4.0	PRESERVATION & PACKING												
4.1	Pump and its components	Direction of rotation, Stamping and Painting	Major	Visual, Shade & DFT	Random	Tech Spec/ Approved Datasheet/ Approved Drawing		IR	√	2	2	--	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED √ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
								REV NO:		DATE:			
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032						PROJECT: PACKAGE: FOAM PUMP BHEL TECH SPEC:				PAGE 4 OF 4	
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
4.2		Inspection reports/ certificate traceability index	Major	Visual	100%			Index	√	2	2	--	
4.3		Packing #	Major	Visual	100%			Packing List	√	2	2	--	# Seaworthy packing for export orders

Notes:-

1. This MQP should be read along with specification, approved drawings & approved datasheet. (Latest revisions to be considered as per PO).
2. Specification/Drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.
4. PMI to be witness by inspection agency for all accessible SS or AS parts.

Abbreviations:-

MTC	-	Material Test certificate	WPS	-	Welding Procedure Specification
IBR	-	Indian Boiler Regulations	PQR	-	Procedure Qualification Record
DFT	-	Dry Film Thickness	WPQ	-	Welder Performance Qualification
TC	-	Test Certificate	NDE	-	Non Destructive Examination
UTS	-	Ultimate Tensile Strength	Appd. Dwg.	-	Approved Drawing
PMI	-	Positive Material Identification	OD	-	Outer Diameter
G.I	-	Galvanized Iron	ID	-	Internal Diameter
MOC	-	Material of construction			

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032		PROJECT: PACKAGE: LT MOTOR BHEL TECH SPEC:				REV NO:		DATE:					
PAGE 1 OF 4													
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY P W V	REMARKS		
1.0 RAW MATERIALS & BOUGHT OUT ITEMS													
1.1	<u>COPPER WIRE</u> Enameled Copper Wire	Overall diameter, elongation, Mandrel winding test, Peel test, springiness, Abrasion test, Cut through test, Heat shock test, Continuity test	Major	Measurement and mechanical & electrical testing	One sample per heat/lot	National & international standard (IS or IEC) / technical specification/ approved drawing/ datasheet		IR / supplier test certificate	√	2	2	1	
1.2	<u>STEEL SHAFT</u> Straightened Steel bar in black Finish	Dimensions, surface finish, chemical composition	Major	Visual, measurement and chemical testing	One sample per heat/lot			supplier test certificate	√	2	2	1	
1.3		NDT	Major	UT	100%			supplier test certificate	√	2	2	1	
1.4	<u>ALUMINIUM INGOTS</u>	Chemical properties	Major	Chemical testing	One sample per heat/lot			supplier test certificate	√	2	2	1	
2.0 INPROCESS INSPECTION													
2.1	ASSEMBLY	Completeness and correctness of assembly	Major	Visual verification	100%	MO and manufacturer's internal processes		Log book	--	2	2	2	
LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED √ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.													

बी एच ई एल BHEL		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: LT MOTOR BHEL TECH SPEC:			REV NO:		DATE:			
								PAGE 2 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
3.0	FINAL INSPECTION & TESTING												
3.1	ROUTINE TESTING	Measurement of winding resistance in cold condition	Major	Testing	100%	National & international standard (IS or IEC) / technical specification		TC	√	2	1	--	
3.2		SH heater resistance (if applicable)	Major	Testing	100%			TC	√	2	1	--	
3.3		Insulation resistance (before and after HV test)	Major	Testing	100%			TC	√	2	1	--	
3.4		High voltage test at 1.8 KV for 1 minute and space heater HV test	Major	Testing	100%			TC	√	2	1	--	
3.5		Direction of rotation	Major	Testing	100%			TC	√	2	1	--	
3.6		No load test (measurement of NL A, voltage, NL power and NL RPM)	Major	Testing	100%			TC	√	2	1	--	
3.7		Reduced run up voltage test at (rated volt√3)	Major	Testing	100%100%			TC	√	2	1	--	
3.8		Locked rotor test at full load current	Major	Testing	100%			TC	√	2	1	--	
3.9		Vibration measurement	Major	Testing	100%			TC	√	2	1	--	
3.10		Measurement of noise level	Major	Testing	100%			TC	√	2	1	--	
3.11		120% over speed test	Major	Testing	100%			TC	√	2	1	--	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

बी एच ई एल 		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: LT MOTOR BHEL TECH SPEC:			REV NO:		DATE:			
								PAGE 3 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
3.12	TYPE TESTS	Measurement of winding resistance in cold condition	Major	Testing	One /rating	National & international standard (IS or IEC) / technical specification		TC	√	2	--	1	Verification of Identical Type test Report of same Rating
3.13		Temp. rise test at full load (load point for 100%, 75% & 50% load (full load, ¾ and ½ load)	Major	Testing	One /rating			TC	√	2	--	1	
3.14		160% momentary overload test	Major	Testing	One /rating			TC	√	2	--	1	
3.15		Locked rotor amp and torque test	Major	Testing	One /rating			TC	√	2	--	1	
3.16		No load test	Major	Testing	One /rating			TC	√	2	--	1	Identical type test reports for motor ratings (not more than 5 years old) will be provided.
3.17		Reduced voltage running up test	Major	Testing	One /rating			TC	√	2	--	1	
3.18		Insulation resistance test (before and after HV test)	Major	Testing	One /rating			TC	√	2	--	1	
3.19		HV test – 1.8 KV for winding and 1.5 KV for space heater	Major	Testing	One /rating			TC	√	2	--	1	
3.20		Vibration test	Major	Testing	One /rating			TC	√	2	--	1	
3.21		120% over speed test	Major	Testing	One /rating			TC	√	2	--	1	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED √ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
								REV NO:		DATE:			
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: LT MOTOR BHEL TECH SPEC:			PAGE 4 OF 4					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
4.0	PRESERVATION & PACKING												
		Painting*, (Shade, DFT,) Marking	Major	Visual, Measurement	Random	Technical specification/ approved drawing/datasheet	TC	√	2	--	1		
		Packing*	Major	Visual	Random		Packing List	√	2	--	--		

Notes:-

1. This MQP should be read along with specification ((Latest revisions to be considered as per PO), approved drawings & approved datasheet.
2. Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

Abbreviations:-

MTC	–	Material Test certificate	COC	–	Certificate of Compliance	DFT	–	Dry Film Thickness
TC	–	Test Certificate	NDE	–	Non Destructive Examination	IR	–	Inspection Report
DFT	–	Dry Film Thickness	IBR	–	Indian Boiler Regulations	IS	–	Indian Standards

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
								REV NO:		DATE:			
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: DIESEL ENGINE BHEL TECH SPEC:			PAGE 1 OF 3					
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	

1.0	RAW MATERIALS & BOUGHT OUT ITEMS												
1.1	Piston crown, Connecting rod, Crankshaft, Camshaft	Chem. & mech. properties	Major	Chem. & mech. Testing	1 per lot/heat	Tech Spec/ Approved Datasheet/ Approved Drawing	MTC	√	2	2	1		
1.2		Crack test	Major	NDE	100%		MTC	√	2	2	1		
1.3		Dimensions	Major	Measure ment	100%		MTC	√	2	2	1		
1.4	Cylinder block, Cylinder head, Cylinder liner	Chem. & mech. properties	Major	Chem. & mech. Testing	1 per lot/heat		MTC	√	2	2	1		
1.5		Pressure test	Major	Hydro test	100%		MTC	√	2	2	1		
1.6		Dimensions	Major	Measure ment	100%		MTC	√	2	2	1		
2.0	INPROCESS INSPECTION												
2.1	Crankshaft	Dynamic balancing	Critical	balancing	100%	Tech Spec/ Approved Datasheet/ Approved Drawing	IR	√	2	2	1		
2.2	Fuel, Lube oil pump and control panel	Functional test	Major	Testing	100%		TC	√	2	2	1		

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
								REV NO:		DATE:			
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032				PROJECT: PACKAGE: DIESEL ENGINE BHEL TECH SPEC:				PAGE 2 OF 3			
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
3.0 FINAL INSPECTION & TESTING													
3.1	Diesel engine	Performance test	Critical	Testing	100%	Tech Spec/ Approved Datasheet/ Approved Drawing		TC	√	2	1	--	Only 10% witness by BHEL / BHEL's TPIA, subjective to minimum 1 engine of each size & type.
3.2		Overall Dimensions	Major	Measurement	100%			IR	√	2	1	--	
3.3		Spares (if any)	Major	BOM check	100%			IR	√	2	1	--	
4.0 PRESERVATION & PACKING													
4.1	Diesel engine and its components	Stamping and Painting	Major	Visual, Shade & DFT	Random	Tech Spec/ Approved Datasheet/ Approved Drawing		IR	√	2	2	--	# Seaworthy packing for export orders
4.2		Packing #	Major	Visual	100%			Packing List	√	2	2	1	

Notes:-

- This MQP should be read along with specification ((Latest revisions to be considered as per PO), approved drawings & approved datasheet.
- Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
- Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

Abbreviations:-

MTC	–	Material Test certificate	COC	–	Certificate of Compliance	DFT	–	Dry Film Thickness
TC	–	Test Certificate	NDE	–	Non Destructive Examination	IR	–	Inspection Report
DFT	–	Dry Film Thickness	IBR	–	Indian Boiler Regulations	IS	–	Indian Standards

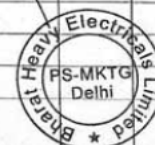
LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. * FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

ESP-001 - 2A Rev.00		BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-8 (Sub Vendor List)
--	--

Revisions: Refer to record of revisions				

14	RTD AND THERMOCOUPLE ALONG WITH THERMOWELL	II		THERMAL INSTRUMENT INDIA PVT. LTD.	MUMBAI/ SAVANTWADI	A	
		II		TEMPSENS INSTRUMENT (I) PVT. LTD.	UDAIPUR	A	
		II		DETRIV INST & ELEC LTD	MUMBAI	A	
		II		PYRO ELECTRIC INSTRUMENT (GOA) PVT. LTD.	GOA	A	
		II		TECHNO INSTRUMENT	AHMEDABAD	A	
		@		GOA INSTRUMENT PVT. LTD.	GOA	DR	
		@		TOSHNIWAL INDUSTRIAL PVT. LTD.	AJMER	DR	
		@		BAUMER TECHNOLOGIES INDIA PVT. LTD.	VAPI	DR	



1)	L T (415 V) Motors	Refer Note 1		ABB	FARIDABAD	A	UPTO 55KW
				ABB	BANGALORE	A	55KW - 200KW
				BIHARAT BULEE	MUMBAI	A	RQP, FOR FLAME PROOF ALSO
				CGL	AHMEDNAGAR	A	FOR FLAME PROOF ALSO
				JYOTI	BARODA	A	
				KEC	BANGALORE	A	FOR FLAMEVPROOF ALSO
				KEC	HUBLI	A	UPTO 90KW; FOR FLAME PROOF ALSO
				LHP	SOLAPUR	A	UPTO 200KW
				MARATHON	KOLKATA	A	FOR FLAME PROOF ALSO
				NGEF	BANGALORE	A	UPTO 15KW
				SIEMENS	MUMBAI	A	

NOTE 1 : FOR LT MOTORS

a) Less than 30 KW

Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:
It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets.

b) 30 KW -50KW

Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test inspection report as per IS 325 witnessed by main contractor along with COC of the manufacturer & the contractor confirming as follows:
It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets.

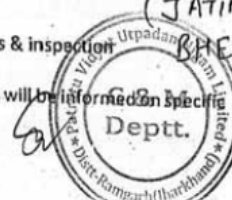
c) Above 50 KW as per NTPC approved quality plan

Approval Conditions attached to above vendors-as applicable shall prevail.

General Notes:

- 1) Vendor list & category of the mandatory spares shall be as mentioned above.
- 2) For item not appearing in the above list, main contractor to approach NTPC for acceptable vendors & inspection categorization of the same.
- 3) NTPC Approval conditions to above identified vendors shall be adhered to. Vendor's approval conditions will be request of Main Contractor.

dhf f ntpc



2.	Diesel engine	1	2	M/s Cummins	Pune	A	
				M/s Cater Pillar	USA	A	
				M/s Mitsubishi	Japan	A	Diesel engine for up to 1500 KVA DG SET
				M/s MTU	Germany	A	Diesel engine for up to 1500 KVA DG SET
				M/s Perkins	UK	A	Diesel Engine for upto 2000KVA DG SET

Sl. No.	Pressure, DP Gauge	Model	Manufacturer	Origin	Remarks
28		Dynamic Fluid Vales Pvt. Ltd.	Belgaun	DR	
		BUENBERG	UK	A	
		ASHCROFT	USA/Germany/India	A	
		Wika	GERMANY	A	
		WISE Control	Korea	A	
		Nagano KEIKI	Japan	A	
		H.Guru South India	Bangalore	A	
		A.N. Instruments	Kolkata	A	Not for MS & FW application
		Gauge Bourdon	Panel	A	Not for MS & FW application
		Gea Thermostatic	GOA	A	
		Wika	Pune	A	Not for MS & FW application
		Baumer	Vapi	A	DR for MS & FW application
		Precision mass products Pvt. Ltd.	Gandhinagar	A	DR for MS & FW application
		H Guru	Rishra/Muzaffarpur	A	Not for MS & FW application
		US Gauge	USA	DR	Not for MS & FW application
		Winters	USA	DR	
		Forbes Marshall	Hyderabad	A	
		Manometer	Mumbai	DR*	
		Walchandnagar Industries Ltd.	Chavvad	A	
		Nesstech	Vapi	A	
		Gauges Bourdon	UK	DR	DP Gauge for MS Nesstech, Japan
		Fisher Mess	Germany	DR	

4.	PAINT AND PAINTING SYSTEM	III	-	BERGER	-	N	
				SHALIMAR PAINTS	-	N	
				JENSON AND NICHOLSON	-	N	
				KANSAI NEROLAC	-	N	
				AKZO NOBEL	-	N	
				ASIAN PAINTS	-	N	

16.	Cable glands	III		Main contractor approved sources	Noted	
17.	Cable lugs	III		M/s Dowell M/s Billets Elektro Werke Ltd.	Mumbai Umbergaon	A A

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032		Std. / Doc. Number	
				Annexure-1	
				Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-9 (MASTER DOCUMENT LIST)
--	---

Revisions: Refer to record of revisions				

Annexure-9: MASTER DOCUMENT LIST - Foam Pump: Motor & Diesel Engine driven

	Vendor Name:				PROJECT:							
	Vendor Contact Person:				BHEL PO No.		PO date:			PO Dly. Date:		
	Vendor contact No.				Supplier's Job No.							
	SYSTEM/PACKAGE:	Foam Pump				TODAY-DATE	13/Jun/20			Submission status to BHEL		
Sl.No	DRG/DOC. NAME	DRG/DOC NO.	NO. OF SHTS.	CAT	CRITICAL FOR MFG?	REQD.FOR CUSTOMER SUBMISSION?	Plan date of submission	Count of DUE as on Dt.	STATUS	Rev-0		
			NO.	(A / I)	(Y/N)	(Y/N)	dd-mmm-yyyy		" *P/P/PB /PC/AA	SD	AD	APP.CAT
1.0 Mechanical												
A	MECHANICAL											
1	Pump Data Sheet -Engine & Motor Driven	Later		A	Y	Y	Within 2 weeks after PO placement					
2	Pump Performance curve-Motor Driven	Later		I	Y	Y	Within 2 weeks after PO placement					
3	Pump Performance curve-Engine Driven	Later		I	Y	Y	Within 2 weeks after PO placement					
4	Pump & Motor assembly GA drawing	Later		A	Y	Y	Within 2 weeks after PO placement					
5	Pump & Engine assembly GA drawing	Later		A	Y	Y	Within 2 weeks after PO placement					
6	Pump Cross Sectional Drawing-Motor Driven	Later		I	Y	N	Within 2 weeks after PO placement					
7	Pump Cross Sectional Drawing-Engine Driven	Later		I	Y	N	Within 2 weeks after PO placement					
8	Motor Data Sheet	Later		A	Y	Y	Within 2 weeks after PO placement					
9	Motor GA drawing	Later		A	Y	Y	Within 2 weeks after PO placement					
10	Motor TB drawing	Later		I	Y	N	Within 2 weeks after PO placement					
11	Motor Curves	Later		I	Y	Y	Within 2 weeks after PO placement					
12	T-S Curve	Later		I	N	N	Within 2 weeks after PO placement					
13	Diesel engine GA Drawing	Later		A	Y	N	Within 2 weeks after PO placement					
14	Diesel engine Data Sheet	Later		A	Y	Y	Within 2 weeks after PO placement					
15	Control Panel GA Drawing & Wiring Diagram	Later		A	Y	Y	Within 2 weeks after PO placement					
16	Diesel Engine Wiring Diagram	Later		I	Y	N	Within 2 weeks after PO placement					
17	Battery Charger Data Sheet	Later		A	Y	Y	Within 2 weeks after PO placement					
18	Battery Data Sheet	Later		A	Y	Y	Within 2 weeks after PO placement					
19	Battery capacity calculation sheet	Later		I	Y	N	Within 2 weeks after PO placement					
20	Fuel tank Drawing	Later		A	Y	N	Within 2 weeks after PO placement					
21	Fuel tank calculation sheet	Later		I	Y	N	Within 2 weeks after PO placement					

Annexure-9: MASTER DOCUMENT LIST - Foam Pump: Motor & Diesel Engine driven

	Vendor Name:				PROJECT:							
	Vendor Contact Person:				BHEL PO No.		PO date:			PO Dly. Date:		
	Vendor contact No.				Supplier's Job No.							
	SYSTEM/PACKAGE:	Foam Pump				TODAY-DATE	13/Jun/20			Submission status to BHEL		
Sl.No	DRG/DOC. NAME	DRG/DOC NO.	NO. OF SHTS.	CAT	CRITICAL FOR MFG?	REQD.FOR CUSTOMER SUBMISSION?	Plan date of submission	Count of DUE as on Dt.	STATUS	Rev-0		
			NO.	(A / I)	(Y/N)	(Y/N)	dd-mm-yyyy		" *P/P/PB /PC/AA	SD	AD	APP.CAT
23	Coupling GA Drawing for Motor Driven Pump	Later		I	Y	N	Within 2 weeks after PO placement					
24	Coupling GA Drawing for Engine Driven Pump	Later		I	Y	N	Within 2 weeks after PO placement					
25	Mechanical Seal GA Drawing and details: Motor driven Pump	Later		I	Y	N	Within 2 weeks after PO placement					
26	Mechanical Seal GA Drawing and details: Engine driven Pump	Later		I	Y	N	Within 2 weeks after PO placement					
B	INSTRUMENTATION											
1	Data Sheet of Level Gauge	Later		I	N	N	Within 4 weeks after PO placement					
2	Data Sheet of Level Transmitter	Later		I	N	N	Within 4 weeks after PO placement					
C	MISCELLANEOUS											
1	Performance Test Procedure: Motor driven & Engine Driven	Later		A	Y	N	Within 8 weeks after PO placement					
2	Vibration test procedure & Temperature rise test procedure	Later		I	N	N	Within 8 weeks after PO placement					
3	Hydro Test Procedure	Later		I	N	N	Within 8 weeks after PO placement					
4	NDE Test Procedure	Later		I	N	N	Within 8 weeks after PO placement					
5	Painting procedure	Later		A	N	N	Within 10 weeks after PO placement					
6	Packing List	Later		I	N	N	Before Despatch					
7	BILL OF MATERIAL	Later		A	N	N	Within 10 weeks after PO placement					
8	BILLING BREAKUP	Later		A	N	N	Before Despatch					
9	QUALITY ASSURANCE PLAN	Later		A	N	Y	Within 4 weeks after PO placement					
10	SUB VENDOR LIST	Later		I	N	N	Within 4 weeks after PO placement					
11	COMMISSIONING SPARES LIST	Later		A	N	N	Within 4 weeks after PO placement					
12	Mandatory Spares List	Later		A	N	N	Within 4 weeks after PO placement					
13	LUBE OIL SCHEDULE	Later		I	N	N	Within 8 weeks after PO placement					
14	O& M Manuals(Soft Copies)	Later		A	N	N	After Approval of all engineering drawings/documents					

Annexure-9: MASTER DOCUMENT LIST - Foam Pump: Motor & Diesel Engine driven												
	Vendor Name:				PROJECT:							
	Vendor Contact Person:				BHEL PO No.		PO date:			PO Dly. Date:		
	Vendor contact No.				Supplier's Job No.							
	SYSTEM/PACKAGE:	Foam Pump				TODAY-DATE	13/Jun/20			Submission status to BHEL		
Sl.No	DRG/DOC. NAME	DRG/DOC NO.	NO. OF SHTS.	CAT	CRITICAL FOR MFG?	REQD.FOR CUSTOMER SUBMISSION?	Plan date of submission	Count of DUE as on Dt.	STATUS	Rev-0		
			NO.	(A / I)	(Y/N)	(Y/N)	dd-mmm-yyyy		" *P/P/PB /PC/AA	SD	AD	APP.CAT
15	O& M Manuals(Hard Copies)** ** hard copy shall be furnished after getting concurrence on soft copy.	Later		I	N	N	After Approval of all engineering drawings/documents					
							TOTAL	0		*APP.CAT		
	A-Approval Category	PV-Commented and pending with vendor					TOTAL "PV"		0	A1-Approved		
	I-Information Category	PB- Pending with BHEL					TOTAL "PB"		0	A2-Mfg. Clearance given subject Incorporation of comments		
		PC- Pending with Customer					TOTAL "PC"		0	A3-Commented.Revision & resubmission required.		
		AA- Approved					TOTAL "AA"		0	A4- Retained for Info.		
		OD-Overdue					TOTAL "OD"		0			
		** - Not yet Due.							5			

Vendor documentation status									
Total No of Docs	Due as on Date	Submitted by vendor as on Dt.	Approved by BHEL as on Dt.	Commented by BHEL as on Dt.	Pending with BHEL/CUSTOMER as on date	%age of Dos Approved	%age of critical Dos Approved	Is Mfg. Clearance given?	Status/Remarks
(Nos)	(Nos)	(Nos)	(Nos)	(Nos)	(Nos)	% age	% age	(Y/N). / (if Y) put Dt.	
0	0	0	0	0	0	#DIV/0!	0.00%	Y	

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032	Std. / Doc. Number	
			Annexure-1	
			Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-10 (DEVIATION FORMAT)
--	--

Revisions: Refer to record of revisions				

ANNEXURE-10: DEVIATION FORMAT

Sl. No.	Section / Part/Subsection	Page No.	Clause No.	Bid Specification Requirement	Bidder's Deviation

Notes:

1. Bidder to furnish duly filled format along with SEAL & SIGN along with their offer.
2. All the pre-bid queries (if any) shall be raised before submission of the offer as per pre-bid query format (Annexure- 11).
3. Deviations, which are impractical, and the same were raised during pre-bid stage as per pre-bid query format (Annexure- 12), but still purchaser's reply/clarifications could not be met shall only be raised in this format.
4. If there are no deviations, bidders shall indicate as "No deviation" and submit the same along with their offer.
5. Deviations indicated elsewhere in bidders offer except raised through this format shall not be considered and reviewed during technical evaluation of their offer.

SIGNATURE : _____
NAME : _____
DESIGNATION : _____
COMPANY : _____
DATE : _____

COMPANY SEAL

ESP-001 - 2A Rev.00	 	BHARAT HEAVY ELECTRICALS LIMITED PROJECT ENGINEERING & SYSTEMS DIVISION RAMACHANDRAPURAM: HYDERABAD - 502 032	Std. / Doc. Number	
			Annexure-1	
			Rev. No.	00

COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	Annexure-11 (PREBID CLARIFICATION FORMAT)
--	---

Revisions: Refer to record of revisions				

ANNEXURE-11:PRE-BID QUERIES FORMAT

Sl. No.	Section / Part/Subsection	Page No.	Clause No.	Bid Specification	Bidder's Query	Purchaser's Reply

Note: During Preparation of Pre-Bid Queries, Complete Tender Specification (along with all Annexures) shall also be referred.