



TITLE

**CENTRIFUGAL FAN  
DATA SHEET - A**

SPECIFICATION NO. PE-TS-411-554-A001

VOLUME II-B

SECTION D

REV 00

DATE MARCH 2015

SHEET 2 OF 2

3.9	V Belt	ISI marked (Reinforced rubber section to IS: 4776)
3.10	V Pulley	Cast Iron multi groove to grade FG 20 as per IS: 210. Having taper lock type
3.11	Slide rails	M.S./C.I.
3.12	Connection pieces	G.I. according to supplier's design
3.13	Bolts & nuts	M.S. Galvanized / Epoxy painted.
3.14	Vibration isolating pads, washers and spring if any.	Hard synthetic rubber
4.0	<b><u>ACCESSORIES</u></b>	
4.1	Common base plate	Required.
4.2	Anchor bolts	-do-
4.3	Vibration Isolators	Hard synthetic rubber
4.4	V-belt pulleys	-do-
4.5	V-belts	Reinforced rubber of appropriate section
4.6	Belt guard	Required.
4.7	Outlet damper	Required(M.S. Heavy Gauge)
4.8	Inlet guard	Required.
4.9	Inlet Vane (variable)	Not required.
4.10	Drain valve	Required.
4.11	Acoustic silencers	Not required.
5.0	<b><u>Motor</u></b>	
5.1	Motor by	Bidder
5.2	Starter by	BHEL
6.0	Painting of fans including base frame	Galvanized / epoxy painting (as per Section-C & painting specifications)

**NOTE:**

- 1) Motors shall have 15 % margin on duty power point.
- 2) Fan shall be designed to operate with in 9% and 25% of system throttling line.
- 3) Opposed Multiple louvers damper shall be provided at fan outlet. Louvres shall be of 2 mm thick MS (galvanized). Casing shall be of 3.15 mm thick MS (galvanized).



TITLE  <b>VENTILATION FAN (R.E.UNIT)</b>  <b><u>DATA SHEET - A</u></b>	SPECIFICATION NO. PE-TS-411-554-A001	
	VOLUME II-B	
	SECTION D	
	REV 00	DATE : MARCH 2015
	SHEET 1 OF 2	

### General Information

- |                  |   |
|------------------|---|
| 1) Designation   | Roof extractor Units for areas as per schedule of ventilation system. |
| 2) Nos. required | As per schedule.  |
| 3) Service       | Continuous  |
| 4) Location      | Roof of respective areas.   |
| 5) Area          | As per schedule   |

### Design Data

- |                              |  |
|------------------------------|--|
| 6) Type                      | axial flow type.                                   |
| 7) Air delivery capacity     | as per schedule of ventilation system.             |
| 8) Fluid                     | Atmospheric Air.                                   |
| 9) Temperature               | 50 Deg. C  |
| 10) Static Pressure required | As per Section 'C' schedule of ventilation system. |
| 11) Outlet air velocity      | Not more than 12 m/sec.                            |

### Materials

- |                                  |   |
|----------------------------------|---|
| 12) Casing/cowl/hood             | M.S. Sheet to IS: 2062 /IS: 1079/Eq.          |
| 13) Impeller                     | Cast Aluminium alloy to A-6M IS-617 Grade LM6 |
| 14) Support frame and structure. | M.S. of adequate thickness (IS-2062).         |

### ACCESSORIES

- |                              |      |
|------------------------------|------|
| 15) Vibration isolating pads | Yes. |
| 16) Base frame for mounting  | Yes. |
| 17) Wire Guard at inlet.     | Yes. |
| 18) Disconnect switch        | Yes. |
| 19) Gravity damper at outlet | Yes  |

### Motor

- |                |        |
|----------------|--------|
| 20) Motor by   | Bidder |
| 21) Starter by | Bidder |



TITLE  <b>VENTILATION FAN (R.E.UNIT)</b>  <b><u>DATA SHEET - A</u></b>	SPECIFICATION NO. PE-TS-411-554-A001	
	VOLUME II-B	
	SECTION D	
	REV 00	DATE : MARCH 2015
	SHEET 2 OF 2	

- |   |   |
|---|---|
| 22) Type of motor<br><br>23) Free delivery test<br><br>24) Performance test at specified duty point.<br><br>25) Speed | Conforming to IS: 325 latest/as per specification.<br><br>Yes.<br><br>Yes<br><br>Not more than 1500 RPM |
|---|---|

NOTE:

1. Motors shall have 15% on duty power Point.



TITLE

Ventilation Fan (Axial Flow Type)

DATA SHEET - A

SPECIFICATION NO. PE-TS-411-554-A001

VOLUME II-B

SECTION D

REV 00

DATE MARCH 2015

SHEET 1 OF 2

**No. Particulars****Data**General Information

- |                  |   |
|------------------|---|
| 1) Designation   | Supply/Exhaust Fans.  |
| 2) Nos. required | Refer schedule of Ventilation system in section-C under specific technical requirement. |
| 3) Service       | To exhaust warm air/to supply fresh air.  |
| 4) Location      | Wall mounted.   |
| 5) Area          | Same as above in 2.   |

Design Data

- |                              |  |
|------------------------------|--|
| 6) Type supply               | Axial fans suitable for 415V/3 phase for Motor.    |
| 7) Air delivery capacity     | As per schedule of ventilation system.             |
| 8) Fluid                     | Atmospheric Air.                                   |
| 9) Temperature               | Refer Section of specific technical requirement    |
| 10) Static Pressure required | As per Section 'C' schedule of ventilation system. |
| 11) Outlet Air Velocity      | Not more than 12 m/sec.                            |

Materials

- |   |  |
|---|--|
| 12) Casing                                      | M.S. (IS-2062)   |
| 13) Impeller                                    | Cast Aluminium. (Alloy A-6M, IS-617)                       |
| 14) Hub   | Al Alloy.  |
| 15) Support frame and structure. (Galvanized/   | M.S. of adequate thickness<br>Painted) IS-2062.            |
| 16) Neoprene rubber pads                        | As required.   |
| 17) Coned inlet for wall exhausters/supply fans | MS (IS-2062)   |
| 18) Supporting frame for mounting.              | Required.  |
| 19) Protective screen at inlet.                 | Yes (Min 14 SWG Galvanized wire knitted in 1" square mesh. |
| 20) Rain Protection Cowl                        | Aluminum or hot dip Galvanized after fabrication from M.S. |



TITLE	<b>Ventilation Fan (Axial Flow Type)</b> <b><u>DATA SHEET - A</u></b>		SPECIFICATION NO. PE-TS-411-554-A001	
			VOLUME II-B	
			SECTION D	
			REV 00	DATE MARCH 2015
			SHEET 2 OF 2	

**Motor**

- |                |        |
|----------------|--------|
| 21) Motor by   | Bidder |
| 22) Starter by | BHEL   |

**NOTE:**

- 1) For Battery Room, motor for fan shall be of flame proof type & fan of spark proof construction with Epoxy painting.
- 2) Gravity type damper shall be provided at the outlet of axial fan for exhaust application.
- 3) Motor shall have 15% margin over Duty Point.



TITLE  
**Ventilation Fan (Axial Flow Type)**  
**DATA SHEET - A**

SPECIFICATION NO. PE-TS-411-554-A001	
VOLUME II-B	
SECTION D	
REV 00	DATE MARCH 2015
SHEET 3 OF 2	

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**TECHNICAL SPECIFICATION**

**AIR FILTER**

**SPECIFICATION NO.PES-554-04**

**VOLUME II B**

**SECTION D**


**REV. 02**

**DATE: NOV 2012**

**SHEET 1 OF 3**

**SECTION-D**

**AIR FILTER**

	<b>TECHNICAL SPECIFICATION</b>  <b>AIR FILTER</b>	<b>SPECIFICATION NO.PES-554-04</b>	
		<b>VOLUME II B</b>	
		<b>SECTION D</b>	
		<b>REV. 02</b>	<b>DATE: NOV 2012</b>
		<b>SHEET 2 OF 3</b>	

**1. GENERAL**

This specification covers the design, manufacture, inspection and testing at manufacturer's work or his sub-contractor's works of Air filters to be used for air-conditioning and ventilation system:

**2. CODES AND STANDARDS**

This design, manufacture and performance of AIR FILTERS shall comply with all currently applicable statutes, regulation and safety codes in the locality where the equipment will be installed. The equipment shall also conform to latest applicable Indian/British/USA standards. Nothing in this specification shall be construed to relieve the vendor of this responsibility. The following standards, in particular, shall be applicable for certified ratings of filters and for conducting performance test, if required.

a) BS EN - 779 -Methods of test for air filters used in air conditioning and general ventilation.

**3. GENERAL**

The enclosed Data sheet A gives the type and other particulars of filters required.

**3.1 POLY FIBRE AIR FILTERS**

Filtering media shall consist of a suitable fibrous material (e.g. polyethylene extruded sections coir etc.) packed into a 20 gauges GSS framework, complete with handles etc. The filter element shall be supported by galvanised steel wire mesh of 10mm. sq. on either side, Velocity across the filters shall not exceed 2.5 M/sec. Average efficiency Em (%) shall be  $\geq 80$  as per BS EN - 779..

**3.2 DRY FABRIC AIR FILTERS**

Filter element shall be pressed felt filter fabric or suitable material recommended by the manufacturer, stitched on to galvanised wire gauge support and crimped to form deep folds. Suitable aluminium spacers shall be provided to ensure uniform distribution of air flow through filters. Filter casing shall be provided with neoprene sponge rubber sealing, The filter shall have Average efficiency Em (%) of  $\geq 95$  as per BS EN - 779.


**3.3 PANEL TYPE METALLIC FILTERS (DRY/VISCOUS)**

Filter shall consist of V-fold galvanised wire mesh interspaced with flat layers of galvanised wire mesh. The density of media shall increase in the direction of air flow. Edges of wire mesh shall be suitably hemmed to prevent abrasion during handling. The media shall be supported on either side by galvanised expanded metal casing. The framework shall be at least 18 gauge GSS. Filter shall be either dry or wetted type as per data sheet=A. The oil shall be mineral oil of approved quality and make. As a the filter frame made of Aluminium alloy conforming to IS:737 can be considered unless use of aluminium is prohibited otherwise due to site conditions being saline/corrosive.

All filters shall be capable of being cleaned of their accumulated dust by tap water flushing. The dry metallic filter shall have Average arrestance Am (%) shall be  $\geq 90$ . However oil wetted air filters shall have Average Efficiency Em (%)  $\geq 90$  as per BS EN - 779..

**3.4 ABSOLUTE FILTERS (HEPA)**

Filters shall be constructed by pleating a continuous sheet of filter medium into

	<b>TECHNICAL SPECIFICATION</b>  <b>AIR FILTER</b>	<b>SPECIFICATION NO.PES-554-04</b>	
		<b>VOLUME II B</b>	
		<b>SECTION D</b>	
		<b>REV. 02</b>	<b>DATE: NOV 2012</b>
		<b>SHEET 3 OF 3</b>	

closely spaced pleats separated by heavy corrugated aluminium spacers. They shall be individually tested and certified to have an efficiency of not less than 99.97% when tested with 0.3 micron dioctylphthalate smoke as per IS:2831. The clean filter initial static pressure drop shall not be greater than 25mm WC at rated capacity. A neoprene sponge rubber sealing shall be provided on either face of filter frame.

**3.5 WATER REPELLANT NYLON FILTERS**

This shall be constructed of water repellent nylon fabric with continuous water spraying on it from a header for keeping it clean. Efficiency of this filter shall be 85% down to 10 microns. This filter shall be used for unitary air filtration system only.

**4. INSPECTION & TESTING**

The scope of inspection for air filters shall be as below:

List of TCs arranged as per Approved Quality Plan shall be furnished along with copy of TCs at the time of inspection by BHEL.

4.1.1 Dimensional inspection of frame & filter media – TC from Manufacturer- review by BHEL/Customer.

4.1.2 Witnessing by BHEL/Customer of type tests on one per type per size air filters for the following properties.

- a) Gravimetric efficiency.
- b) Pressure drop in clean & dirty (choked - %age to be specified ) condition.
- c) Efficiency as per BS EN - 779.

4.1.3 Verification of type test certificates for similar type & size of filters for sodium flame test as per BS-3928 (if applicable- refer data sheet) - by BHEL/Customer

**5. DATA TO BE FURNISHED BY VENDOR AFTER AWARD OF CONTRACT**

- 5.1.1 GA Drawing
- 5.1.2 Drawing showing material/construction detail
- 5.1.3 Installation and service manual
- 5.1.4 Rating curves/charts
- 5.1.5 Test certificates
- 5.1.6 Elect. diagrams (when automatic cleaning type)



TITLE

**AIR FILTER**  
**DATA SHEET - A**

SPECIFICATION NO. PE-TS-411-554-A001

VOLUME II-B

SECTION D

REV 00

DATE MARCH 2015

SHEET 1 OF 1

**Description****Data**1) **General**

1.1 Service	Ventilation system .
1.2 Location	Main power house bldg. & Blower room of both the unit.
1.3 Nos.	Refer Section 'C' of Specification.
1.4 Total air flow/type	Refer Section 'C' of Specification.
1.5 Temperature	As per project information.
1.6 Relative Humidity	100%
1.7 Gas Composition	Atmospheric Air (Dusty) as prevalent in power station.
1.8 Filter Media	Synthetic non woven
1.9 Efficiency	Average arrestance efficiency of 65-80 % for Dry panel filter (pre-filters) and average arrestance efficiency of 80-90 % for fine filters.
1.10 Allowable pressure drop	2.5 mm & 6.5 mm in clean and dirty condition respectively for <b>dry panel filters</b> (pre filters). 12 mm in clean condition for fine filters.
1.11 Frame Work	18 G, GSS.
1.12 Mounting	Ladder Type M.S Angles (galvanised)
1.13 Size	600 x 600 mm

Note:-

- 1) Face velocity of air across the filters shall not exceed 2.5 m/sec.



<b>TITLE</b>  <b>STANDARD TECHNICAL SPECIFICATION</b>  <b>CENTRIFUGAL PUMPS</b>	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 1 OF 7	

## 1.0 GENERAL

This specification covers the design, material, constructional features, manufacture, assembly, inspection and testing at manufacturer's or his subcontractor's works, suitable painting requirements of centrifugal pumps and drives complete with all accessories as specified hereinafter.

## 2.0 CODES AND STANDARDS

2.1 The design, manufacture, inspection, testing & performance of the pumps as specified hereinafter, shall comply with the requirements of the latest revision of the following standards as indicated below (as applicable):

- a) IS-1520 :Horizontal centrifugal pumps for clear, cold and fresh water
- b) IS-5120 :Technical requirements - Rotodynamic special purpose pump
- c) IS-1710 :Vertical turbine pumps for clear, cold and fresh water
- d) Hydraulic Institute Standards of USA
- e) BS - 599 :Method of testing Pumps
- f) PTC - '6' :Centrifugal Pumps Power test code
- g) API - 610

Wherever standards for certain aspects materials etc., not mentioned, the same shall be as per the applicable Indian or International standards.

2.2 In case of any conflict between the above codes/standards and this specification, the later shall prevail and in case of any further conflict in this matter, the decision of Purchaser's engineer shall be final and binding.

## 3.0 DESIGN REQUIREMENTS

3.1 The pumps shall be of heavy duty suitable for long periods of uninterrupted service and shall be standard product of the manufacturer thoroughly proven for satisfactory performance and reliability

3.2 The materials of construction of various components shall be as indicated under Data Sheet-A and where not specified to the applicable Indian/British/American standards.

3.3 All pressure containing components including the pump casing, nozzles and stuffing box housing shall be designed, fabricated and tested in accordance with applicable Indian standards if not specified otherwise.

3.4 The pump shall be suitable for handling the fluid as specified in Data Sheet-A

## 4.0 CONSTRUCTIONAL FEATURES

### 4.1 Pump Casing

4.1.1 Pump casing may be axially or radially split or barrel type construction as specified in the pump data specification sheet. The casing shall be designed to withstand the maximum pressure developed by the pump at the pumping temperature.

4.1.2 Pump casing shall be provided with adequate number of vent and priming connections with valves, unless the pump is made self venting & priming. Casing drain, as required, shall be provided complete with drain valves.



TITLE <b>STANDARD TECHNICAL SPECIFICATION          CENTRIFUGAL PUMPS</b>	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 2 OF 7	

4.1.3 Pump shall preferably be of such construction that it is possible to service the internals of the pump without disturbing suction and discharge piping connections.

4.1.4 Under certain conditions, the pump casing nozzles will be subjected to reactions from external piping. Pump design must ensure that the nozzles are capable of withstanding external reactions not less than those specified in API-610.

#### 4.2 **Impeller**

Unless specifically indicated under Data Sheet-A enclosed, the pump impellers shall be of closed vane type. The impellers shall be secured to the shaft and shall be retained against circumferential movement by keying, pinning or lock rings. Impellers shall be statically and dynamically balanced individually. The assembled rotor shall be dynamically balanced and checked for eccentricity.

#### 4.3 **Wearing Ring**

Renewable wearing rings for the casing and/or the impellers and renewable shaft sleeves, shall be provided for all pumps. Length of the shaft sleeves must extend beyond the outer faces of gland packing or seal and plate so as to distinguish between the leakage between shaft & shaft sleeve and that past the seals/gland.

#### 4.4 **Shaft**

Shaft size selected shall take into consideration the critical speed which shall be away from the operating speed as recommended in applicable Code/Standard. The critical speed shall also be at least 10% away from runaway speed.

#### 4.5 **Bearings**

Bearings and hydraulic devices (if provided for balancing axial thrust) of adequate design shall be furnished for taking the entire pump load arising from all probable conditions of continuous operation throughout its Range of Operation and also at the shut off condition. The bearing shall be designed on the basis of 20,000 working hrs minimum for the load corresponding to the duty point. Proper lubricating arrangement for the bearings shall be provided. The design shall be such that the bearing-lubricating element does not contaminate the liquid being pumped. Where there is a possibility of liquid entering the bearing, suitable arrangement in the form of deflectors or otherwise shall be provided ahead of bearing assembly. Bearings shall be easily accessible without disturbing the pump assembly.

#### 4.6 **Stuffing Boxes**

Packed type stuffing boxes of adequate depth with lantern rings shall be provided to minimize the leakage. In all cases where the pump suction is below atmospheric pressure, the shaft packing shall be sealed by the liquid pumped by tapping off from the pump discharge itself and all pipes, valves, fittings etc., required for this shall be furnished by the manufacturer.

#### 4.7 **Shaft Couplings**

The pumps shall be directly coupled to their drives through heavy duty flexible coupling. Suitable coupling guards shall be provided along with the coupling. The pump and its drive motor shall be mounted on a common base plate.

#### 4.8 **Base Plate and sole Plate**



TITLE  <b>STANDARD TECHNICAL SPECIFICATION CENTRIFUGAL PUMPS</b>	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 3 OF 7	

Unless otherwise stated the data specification sheet, a common base plate mounting both for the pump and drive shall be furnished. The base plate shall be of rigid construction, suitably ribbed and reinforced. Base plate and pump supports shall be so constructed and the pumping unit so mounted as to minimize misalignment caused by mechanical forces such as normal piping strain, hydraulic piping thrust, etc. Suitable drain taps and drip lip shall be provided.

If required in the data specification sheet, steel sole plates shall be provided, below the base plate.

#### 4.9 **Prime Mover**

The drive motor selected shall conform to the requirements of the enclosed motor specifications.

#### 4.10 **Lifting arrangement**

Each pump and motor shall incorporate suitable lifting attachments e.g. lifting lugs or eye bolts etc., to facilitate erection and maintenance.

#### 5.0 **Performance Requirements**

5.1 The pump shall be designed to have best efficiency at the specified duty point. The pump set shall be suitable for continuous operation at any point within the Range of Operation as stipulated in the data specification sheets.

5.2 Pump shall have a continuously rising head capacity characteristics from the specified duty point towards shut off point, the maximum being at shut off. Power capacity characteristic will be non-overloading type i.e. 110% of the design flow the power required to drive the pump will be practically the same as that at the design flow.

5.3 Wherever specified in data sheet, pumps of each category shall be suitable for parallel operation. The head vs capacity, input power vs. capacity characteristics, etc., shall match to ensure equal load sharing and trouble free operation throughout the range.

5.4 The pump motor set shall be designed in such a way that there is no damage due to the reverse flow through the pump which may occur due to any malfunction of the system.

#### 6.0 **Drive Rating**

6.1 The power rating of the drive shall be selected such that a minimum margin of 15% is available over the pump input power required at the rated duty point. However, the drive rating shall not be less than the maximum power requirement at any point within the 'Range of Operation' specified.

6.2 In cases where parallel operation of the pumps are specified the actual drive rating is to be selected by the bidder considering overloading of the pumps in the event of tripping of one of the operating pumps.

6.3 The bidder under this specification shall assume full responsibility in the operation of the pump and the drive as one unit.

#### 7.0 **SCOPE OF INSPECTION AND TESTING**



TITLE	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 4 OF 7	

**STANDARD TECHNICAL SPECIFICATION  
CENTRIFUGAL PUMPS**

**7.1 Castings**

- 7.1.1 Witnessing pouring and thereafter physical testing of castings of 'Critical' nature such as casings, impellers, diffusers.
- 7.1.2 Identification and correlation with test reports for all tests as per the relevant material specifications for castings of 'Major' nature such as suction bell, discharge elbow, stuffing box, gland, wearing rings, shaft sleeves etc.
- 7.1.3 Foundry's conformity certificate for castings of 'Minor' nature such as base plates, covers etc.
- 7.1.4 Verification of neat treatment charts (as applicable)

Note: Casting effects shall not be filled by any method until an unless approved by BHEL/their customer

**7.2 Forgings and**

- 7.2.1 Identification and correlation with mill test certificates for all tests as per the relevant specifications for important forgings like casings, stage bodies, diffusers, shaft material.
- 7.2.2 Verification of neat treatment charts (time temperature) (as applicable).

**7.3 Fabricated items**

- 7.3.1 Identification and correlation with mill test certificates for material of items such as discharge bellows, column pipes etc.
- 7.3.2 Approval of welding procedure specifications and qualifications of weld procedures and personnel.
- 7.3.3 Dye penetrant tests of weldment as per ASTM E-165 and acceptance norm as per ASME Sec.VIII, Div.1, Appendix 8
- 7.3.4 Verification of heat treatment charts (time temperature), (as applicable)
- 7.3.5 Hydro test as per para 7.5.1 below.

Note: For para 7.1.2, 7.2.1 and 7.3.1 above; in case correlating test certificates are not available, material shall be identified by BHEL and physical tests conducted by the supplier in the presence of BHEL

**7.4 In process Inspection and Testing**

- 7.4.1 Dye penetrant testing after machining for impellers including vanes, pump shaft, diffusers as per applicable code; in absence of which, as per ASTM E - 165. No defect shall be permitted on moving parts. On static parts acceptance norms are as per ASME Sec.III NB 2546.
- 7.4.2 Ultrasonic testing of dynamic duty component, i.e. pump shafts (50mm dia and above) and static duty forgings i.e. Barrel, casting (15mm and above wall thickness) as per applicable code, in absence of which as per ASTM E388 and acceptance norms as stipulated hereunder.
- 7.4.3 Acceptance norms for UT for dynamic duty components. the following defects are unacceptable :



TITLE <b>STANDARD TECHNICAL SPECIFICATION CENTRIFUGAL PUMPS</b>	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 5 OF 7	

- a) Cracks, flakes, seams and laps
- b) Defects giving indications longer than that from a 4mm equivalent flaw.
- c) Group of defects with maximum indications less than that from a 4mm equivalent flaw, which cannot be separated at testing sensitivity, if the back echo is reduced to less than 50%.
- d) Defects giving indications of 2 to 4mm dia. equivalent flaw separated by distance less than four times the size of the larger of the adjacent flaw.

7.4.4 For static duty components - as per NB 2542.2 of ASME Sec. III.

7.4.5 Hydro tests of all pressure parts such as casings, column pipes, discharge elbows etc., at two times duty point pressure or 1.5 time shut off pressure, whichever is higher for 30 min., without any leakage.

Note : In case the pump is required to boost certain pressure, the inlet pressure head shall also be taken into consideration to compute test pressures.

7.4.6 Static and dynamic balancing of individual impellers and also assembled rotors as per V.D.I. 2060 Q 6.3 or ISO 1940 G 6.3.

#### 7.5 **Performance Test**

7.5.1 Pump testing with unit supply motor as per specifications and acceptance norms cited elsewhere, in absence of which as per IS 5120 latest edition. Performance shall be checked for minimum of 7 points (including shut off head and over load) following characteristics shall be checked:

Capacity V/s Head

Capacity V/s Power absorbed by pump

Capacity V/s pump efficiency

Note : For pump of fire protection system, performance test shall be conducted up to 150% of rated capacity

7.5.2 NPSH test in case specifically mentioned elsewhere

7.5.3 Vibration and noise level measurement. Acceptance norms shall be as per manufacturers standards.

7.5.4 Overall dimensions as per GA drawings

7.5.5 Examination after selective opening up after running for pumps operating at speed over 1800 rpm and capacity exceeding 68M<sup>3</sup>/hr.

7.5.6 Painting and packing as per technical specification.

#### 7.6 **Test at site**



TITLE <b>STANDARD TECHNICAL SPECIFICATION          CENTRIFUGAL PUMPS</b>	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 6 OF 7	

The pumps will be tested at site by the purchaser to verify their performance. If the pumps fail to operate smoothly or within the required performance all such deficiencies shall be rectified by the manufacturer by making suitable alternatives in the pump set and additional tests required to show the effect of such alterations shall be performed by him.

#### 7.7 Performance Guarantee

The vendor shall guarantee the material and workmanship of all components as well as the operation of the pump as per requirement of this specification.

The vendor shall also guarantee for each pump the total dynamic head at the specified rated capacity and also corresponding efficiency, brake horse power and shut off head.

#### 8.0 CLEANING, PROTECTION & PAINTING

Before shipment of the equipment to be supplied under this specification the necessary cleaning, flushing etc., as per manufacturers standard shall be done to remove all dirt, scales etc. Shop coats of rust inhibiting paints, lacquers etc., shall be applied to various parts as necessary. Flanges, inlet and outlet pipe, etc shall be protected.

#### 9.0 DRAWINGS, TECHNICAL DOCUMENTS AND OTHER INFORMATION REQUIRED WITH THE PROPOSAL

9.1 Fully dimensioned outline GA drawings of the pump motor assembly unit for each type and size offered. This drawing should include:-

- i) Foundation base plate and sole plate details as applicable
- ii) Civil foundation and anchor bolts details and loading data
- iii) Minimum submergence required for the pump (if applicable)

9.2 Cross sectional drawing of the equipment showing the details of assembly of components and their material of construction with standard applicable codes.

9.3 Performance characteristics (Discharge capacity vs head, BHP and efficiency of the pumps).

9.4 Motor speed torque curve superimposed on pump speed torque curve. Required NPSH of pump.

9.5 Experience list about the supply and successful operation of similar pumps for similar application.

9.6 A comprehensive write up or brochure on the details of manufacturing and testing facilities in the shop of the manufacturer.

9.7 Quality plan for the equipment being offered, in BHEL format as practiced in the manufacturer's works and Field Quality Plan for receipt, storage erection, commissioning & testing at site.

9.8 Data sheet-B with all the particulars filled in.

#### 10.0 DRAWINGS AND DATA AFTER AWARD OF CONTRACT



TITLE	SPECIFICATION NO. PES-554-05	
	VOLUME II-B	
	SECTION D	
	REV 01	DATE NOV 2012
	SHEET 7 OF 7	

**STANDARD TECHNICAL SPECIFICATION  
CENTRIFUGAL PUMPS**

The vendor shall furnish the drawings and other technical documents as required in Data Sheet-C enclosed with this specification

**10.1 MANUFACTURERS NAME AND TAG. PLATES**

Each pump shall have a permanently attached brass/metal tag on the body indicating the following information both in Hindi and English.

- a) Manufacturer's name and trade mark
- b) Design Capacity and Head
- c) Design
- d) Purchaser's tag no. as furnished during the contract. The purchaser's tag no. will be indicated by the Purchaser on the drawing submitted for approval by the vendor.

**11.0 DRAWINGS/DOCUMENTS TO BE FURNISHED BY VENDOR AFTER THE AWARD OF CONTRACT.**

11.1 Certified GA drawings of pump motor assembly weights, crane

11.2 Detailed cross sectional drawings of the pump and motor assembly and all equipment & accessories supplied under the this specification along with details of material of construction with applicable standard codes

11.3 Foundation drawings with details of foundation pocket indicating static as well as dynamic load and other data with dimensions.

11.4 Certified characteristics curves (discharge capacity vs. head, BHP and efficiency) of each type of pump and motor.

11.5 Material and other test certificates as required by the application clauses of this specification.

11.6 Motor speed torque curves super imposed on pump speed torque curves.

11.7 Quality plan along with complete details of testing and inspection requirements of centrifugal pumps in BHEL format. Vendor shall also furnish Field Quality Plan.

11.8 Installation , operation and maintenance manual.

11.9 Other drawings and data, if necessary.



TITLE

**CENTRIFUGAL PUMPS  
DATA SHEET - A**

SPECIFICATION NO. PE-TS-411-554-A001

VOLUME II-B

SECTION D

REV 00

DATE MARCH 2015

SHEET 1 OF 2

<u>S.No.</u>	<u>DESCRIPTION</u>	<u>DETAILS</u>
1)	Designation	Air washer Pumps.
2)	Type	Horizontal Centrifugal Type.
3)	Quantity	As per section-C
4)	Installation	On floating type foundation inside Air Washer Room
5)	Fluid to be handled	Filtered Water.
6)	Temperature of Fluid	To suit.
7)	Capacity Cum/Hr TDH at	To suit system requirements however head shall Not be less than 35 MWC.
8)	Duty	—————Continuous (24Hr./day)—————
9)	Suction condition	—————Flooded—————
10)	Type of drive	Direct (flexible coupling)
11)	Type of prime mover	LV Ac Motor.
12)	Maximum speed	Not more than 1500 RPM
13)	Type of lubrication	Grease Lubrication

**MATERIALS OF CONSTRUCTION**

<u>S.No.</u>	<u>DESCRIPTION</u>	<u>DETAILS</u>
a)	Impeller	Bronze as per IS 318 Grade 2
b)	Pump Shaft	Carbon Steel C-45, IS-1570 or class-IV, IS-1875 / SS 316
c)	Casing	Cast Iron, grade-20, IS- 210
d)	Wearing ring	Bronze
e)	Shaft Sleeve	Bronze
f)	Base Plate/frame Grade FG-200 IS-210/ fabricated Mild steel	Carbon syeel as per IS 2062 Gr. B / Cast Iron to
g)	Counter Flanges	Mild Steel
h)	Stuffing box bush	Deep Bronze packing to be renewable with Case.
i)	Stuffing box gland	Flexible graphite or PTFE (Asbestos shall not be used)
j)	Pump Motor Coupling	Pin & Bush type (Flexible)



TITLE	<b>CENTRIFUGAL PUMPS</b> <b><u>DATA SHEET - A</u></b>		SPECIFICATION NO. PE-TS-411-554-A001	
			VOLUME II-B	
			SECTION D	
			REV 00	DATE MARCH 2015
			SHEET 2 OF 2	

k) Bolt and Nuts MS (Epoxy painted / Galvanized)

15) **ACCESSORIES REQUIRED**

The following accessories shall be provided by the bidder for each pump.

- |    |  |     |
|----|--|-----|
| a) | Priming funnel                           | Yes |
| b) | Drain piping upto<br>Common drain point. | Yes |
| c) | Vent                                     | Yes |
| d) | Suction & Discharge<br>Pressure gauges   | Yes |
| e) | Companion flanges                        | Yes |
| f) | Common base plate                        | Yes |
| g) | Suction strainer.                        | Yes |
| h) | Isolating valve.                         | Yes |
| i) | NRV at pump outlet at inlet/outlet       | Yes |
| j) | Any special requirements                 | Yes |
| k) | Inspection & Testing                     | Yes |



**TECHNICAL SPECIFICATION**  
**THERMAL INSULATION FOR COLD SURFACES**

**SPECIFICATION NO.PES-554-06**

**VOLUME II B**

**SECTION D**

**REV. 01**

**DATE: NOV 2012**

**SHEET 1 OF 4**

**SECTION-D**  
**THERMAL INSULATION FOR COLD SURFACES**



**TECHNICAL SPECIFICATION**  
**THERMAL INSULATION FOR COLD SURFACES**

**SPECIFICATION NO.PES-554-06**

**VOLUME II B**

**SECTION D**

**REV. 01**

**DATE: NOV 2012**

**SHEET 2 OF 4**

**1. SCOPE**

This specification covers design, manufacture, testing at manufacturers works, supply, application & finishing of insulation for cold piping, air conditioning ducting & equipment for low temperature service.

**2. CODES & STANDARDS**

The design, manufacture and performance of materials covered under this specification shall comply with all currently applicable statues, regulations & safety codes in the locality where the equipment/material are to be installed. The material shall also conform to the latest applicable Indian/British/American codes & standards. Nothing in this specification shall be construed to relieve the vendor of his responsibility. In particular, the material shall conform to the latest editions of the following standards :-

- 2.1.1 IS:3069: Glossary of terms & symbols & units relating to thermal insulation materials.
- 2.1.2 IS:4671: Expanded polystyrene for thermal insulation purposes.
- 2.1.3 IS:3677: Mineral wool for thermal insulation
- 2.1.4 IS:8183: Resin bonded mineral wool
- 2.1.5 IS:702

**3. DESIGN REQUIREMENTS**

- 3.1.1 The insulating material as well as protective covering shall be new & unused, non-corrosive, vermin/rodent proof and shall be guaranteed to withstand continuously & without deterioration the maximum/minimum temperatures to which they may be subjected to, under specified site conditions.
- 3.1.2 The insulation material must be light weight, strong, free from shots & coarse fibre & shall provide high insulation efficiency at low weight & coat. It should be non-hygroscopic & should not rot. It shall not settle or shake down even when subjected to prolonged vibrations.
- 3.1.3 The insulation material, density and thickness etc. Shall be as specified in DATA SHEET A.

**4. APPLICATION DETAILS**

- 4.1.1 The surface to be insulated shall be thoroughly cleaned and allowed to dry. Pressure/hydrostatic tests, if any, shall be carried out before application of insulation.
- 4.1.2 A layer of solvent free, anticorrosive paint shall be applied & allowed to dry.
- 4.1.3 Hot industrial bitumen of grade 85/40 or 85/25 conforming to latest IS:702 shall be uniformly applied @ 1.5 kg/sq.m on the surface to be insulated. A similar layer shall also be applied on the inside surface & edges of the insulation. A suitable cold adhesive compound may also be used in place of bitumen.
- 4.1.4 Insulation in the form of pipe sections/rolls slabs of specified density & thickness shall be stuck to the coated surface with joints staggered & well butted & secured. The adjoining sections shall be tightly pressed together. All the joints shall be sealed with bitumen/equivalent adhesive. Voids if any shall be packed with suitably cut pieces of insulation material.
- 4.1.5 In case of double layer application both circumferential & longitudinal joints shall be suitably staggered.



**TECHNICAL SPECIFICATION**  
**THERMAL INSULATION FOR COLD SURFACES**

**SPECIFICATION NO.PES-554-06**

**VOLUME II B**

**SECTION D**

**REV. 01**

**DATE: NOV 2012**

**SHEET 3 OF 4**

**5. VAPOR SEALING & INSULATION FINISH**

The insulation shall be treated for vapor sealing & weather proofing & finished as specified in DATA SHEET A The acceptable types of finishes are outlined below:-

**5.1 FINISHING SYSTEM I: EXTERNAL INSULATION WITH PLASTER FINISH**

5.1.1 A thick vapor seal of hot bitumen @ 2.5 kg/Sqm shall be applied on the outer surface of insulation & allowed to dry.

5.1.2 The surface shall then be wrapped with 20mm (3/4") hexagonal mesh of 24 SWG GI wire, butting all the joints & laced down with 22 SWG GI lacing wire.

5.1.3 12.5mm (1/2 inch) thick sand cement plaster in the ratio of (1:1) shall be applied in two layers, the second layer being brought to a smooth finish. A water proofing compound shall be added to the cement before its application.

**5.2 FINISH SYSTEM II: EXTERNAL INSULATION WITH PLASTER FINISH OVER POLYTHENE.**

5.2.1 The insulation shall be covered with 500 g polythene/polythene bonded Hessians (PBH) with 50mm overlap on longitudinal & circumferential joints. Overlaps shall be sealed with synthetic adhesive in case o-f polythene & liberal coat of bitumen in case of PBH:

5.2.2 The surface shall then be wrapped with 20mm (3/4") mesh of 24 SWG GI wire butting all the joints & laced down with 22 SWG GI lacing wire.

5.2.3 12.5mm thick (1/2 inch) sand cement plaster in ratio of(4:1) shall be applied in two layers, the second layer being brought to a smooth & even finish similarly as described above.

**5.3 FINISH III:EXTERNAL INSULATION WITH SHEET METAL FINISH**

5.3.1 The insulation shall be covered with 500g polythene with 50mm overlaps at joints which shall be sealed with synthetic adhesive or equivalent compound.

5.3.2 The polythene shall be covered with 24 gauge GI/aluminum sheet

5.3.3 25mm wide x 22 SWG GI/aluminum peripheral straps shall be fixed over the GI/aluminum sheet at 300mm centres to secure.

**5.4 FINISH IV: EXTERNAL INSULATION WITH PLASTER & WATER PROOFING COMPOUND**

For ducts & piping exposed to atmosphere, the finish shall be as follows:

5.4.1 A thick vapor seal of hot bitumen at 2.05 kg/sq.m shall be applied on the outer surface of insulation & allowed to dry.

5.4.2 The surface shall then be wrapped with 20mm (3/4") hexagonal mesh of 24 SWG GI Wire butting all the joints & laced down with 22 SWG GI lacing wire.

5.4.3 12.5mm thick (1/2 inch) sand cement plaster in ratio of (4:1) shall be applied in two layers, the second layer being brought to a smooth finish with water proofing compound added to the cement.

5.4.4 3mm (1/8") thick coat of water proofing compound shall be applied & wrapped with fibre glass RP tissue. A final coat of 3mm thick water proofing compound shall then be applied over the fiberglass RP tissue & allowed to dry. Alternatively, in place of water proofing as desired above, tar felt type 3 grade 1 of IS 1322 with joints overlapped by 75mm shall be fixed & sealed with bitumen & over this 24 SWG. 25mm hexagonal GI mesh shall be fixed with 22 swig. GI lacing wire & finally bitumen paint shall be applied over wire netting.



**TECHNICAL SPECIFICATION**  
**THERMAL INSULATION FOR COLD SURFACES**

**SPECIFICATION NO.PES-554-06**

**VOLUME II B**

**SECTION D**

**REV. 01**

**DATE: NOV 2012**

**SHEET 4 OF 4**

**6. INSULATION OF PUMPS & VALVES**

For all inspection covers & hatches on equipment, pump casing & valve bodies, flanges etc. the insulation shall be applied such as to facilitate removal with minimum damage to the insulation. This shall be achieved by encasing the insulation in 22 gauge aluminum sheet metal boxes, which shall be bolted together around the equipment to permit easy removal & replacement. Proper care shall be taken to maintain continuity of vapor seal between the static & removable partitions of the insulation.

The tenderer may offer thickness of insulation & finishes other than that specified in DATA SHEET A. However, calculations/reasons in support of alternative proposal shall be furnished for purchaser's approval.

**7. INSPECTION & TESTING (REFER SPEC. NO - PES-553.00)**

All necessary tests, as required to ensure that the material supplied conform to the requirements of applicable codes & standards, shall be carried out at manufacturer's works & test certificates including these for material/accessories shall be furnished for purchasers approval.

**8. PAINTING**

8.1.1 Pipe work having insulation & cladding shall be provided with color identification for the fluids handled and for indicating direction of flow.

8.1.2 Equipment surfaces having insulation and cladding shall also have identification numbers and any other relevant data provided on the insulated surface.

8.1.3 All painting for insulated surfaces shall conform to the requirement specified elsewhere.

**9. DATA TO BE FURNISHED AFTER AWARD OF CONTRACT**

9.1.1 Final version of data sheet 'B' incorporating changes if any along with design data.

9.1.2 Test certificates/reports giving result of insulation to ensure conformance to applicable codes & standards & in particular the following :-

- i) Thermal conductivity test
- ii) Sound absorption coefficient test
- iii) Corrosion test
- iv) Sulphur content, moisture content, shot content, moisture absorption etc.
- v) Compressive strength & cross breaking strength test.

9.1.3 Sketches/technical literature/sectional drgs. indicating insulation materials finish and method of application etc.

9.1.4 Manual dealing with safety aspects & instructions for combating fire arising out of insulation work

9.1.5 Instructions on maintenance of insulation work.



TITLE	<b><u>INSULATION</u></b>		SPECIFICATION NO. PE-TS-411-554-A001.
	<b><u>DATA SHEET - A</u></b>		VOLUME II-B
			SECTION D
	REV 00		DATE MARCH 2015
	SHEET 1	OF 1	

**INSULATION MATERIAL:**

Insulation	Code	Thermal Conductivity MW/cm <sup>0</sup> C	Density Kg/m <sup>3</sup>
Resin bonded mineral wool / glass wool	IS:8183	0.49 at 50 <sup>0</sup> C	At least 24 (For Thermal Insulation) 48 for Acoustic insulation
Mineral Wool Pipe Section (min. Gr.2)	IS:9842	0.43 at 50 <sup>0</sup> C	At least 81
Expanded Polystyrene	IS:4671	0.37 at 50 <sup>0</sup> C	At least 15

**TYPE OF INSULATION:**

S.No.	Surface	Insulation Material	Insulation Form	Thickness (mm)	Finish
i)	Supply ventilation Duct exposed to Sun	Resin bonded Mineral wool (IS:8183) Or Nitrile Rubber	Roll / Slab	25	F-4
		Self-extinguishing grade of Expanded Polystyrene (IS – 4671)	Roll / Slab	25	With UV Protection coating F-4



**TECHNICAL SPECIFICATION**

**4X270 MW BHADRADRI TPS**

**SPECIFICATION NO. PE-TS-411-554-A001**

**VOLUME III**

**REV. 00**

**DATE: MARCH 2015**

**VOLUME: III**



**VENTILATION SYSTEM  
4X270 MW BHADRADRI TPS  
LIST OF DOCUMENTS TO BE  
SUBMITTED WITH BID**

**SPECIFICATION NO. PE-TS-411-554-A001**

**VOLUME III**

**SECTION**

**REV 00**

**DATE: MARCH 2015**

**SHEET 1 OF 1**

DOCUMENTS TO BE SUBMITTED BY BIDDER ALONG WITH THE BID.

**BIDDER SHOULD SUBMIT THE SIGNED AND STAMPED COPY OF THE FOLLOWING DOCUMENTS:**

1. Compliance cum confirmation certificate
2. Guaranteed power consumption
3. Un priced format for main package
4. Un priced format for mandatory spare
5. Complete set of technical specification
6. No deviation deviation certificate



TITLE:  
**4X270 MW BHADRADRI TPS  
TECHNICAL SPECIFICATION  
COMPLIANCE CUM CONFIRMATION  
CERTIFICATE**

SPEC. NO.: PE-TS-411-554-A001  
VOLUME: III  
SECTION:  
REV. NO. 00  
SHEET 1 OF 2

**COMPLIANCE CUM CONFIRMATION CERTIFICATE**

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

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

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

- f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.
- g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.
- h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions
- i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification. This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account



TITLE:  
**4X270 MW BHADRADRI TPS  
TECHNICAL SPECIFICATION  
COMPLIANCE CUM CONFIRMATION  
CERTIFICATE**

SPEC. NO.: PE-TS-411-554-A001  
VOLUME: III  
SECTION:  
REV. NO. 00  
SHEET 2 OF 2

- j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.
- k) As built drawings shall be submitted as and when required during the project execution.
- l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.
- m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.
- n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.
- o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.



**TITLE**  
**4x270 MW BHADRADRI STPP**  
**VENTILATION SYSTEM**  
**PRE-BID CLARIFICATION SCHEDULE**

SPECIFICATION NO. PE-TS-411-554-A001  
VOLUME: III  
REV 00  
March 2015  
Page 1 of 1

**PRE-BID CLARIFICATION SCHEDULE**

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

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

Signature: \_\_\_\_\_  
Name: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Company: \_\_\_\_\_  
Date: \_\_\_\_\_

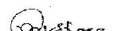
Company Seal



9. For deviations w.r.t. Payment terms, Liquidated damages, Firm prices and submission of E1/E2 forms before claiming 10% payment, if a bidder chooses not to give any cost of withdrawal of deviation loading as per Annexure-VIII of GCC, Rev-06 will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of
10. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
11. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in unpriced copy of this format.
12. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
13. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
14. In case of discrepancy in the nature of impact (positive/negative), positive will be considered for evaluation and negative for ordering.

  
Arvind

  
S.A. Khan

  
Praveen Kishore

**VENTILATION SYSTEM FOR BHADRADRI TPS (4X270 MW) - SUGGESTIVE PRICE FORMAT Rev.00**

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY						ERECTION AND COMMISSIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (IncCESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	Total Price Supply FIOR site and E&C including service tax
1.0	Total lumpsum firm prices for equipment & Services as specified, Comprising Engineering, design, manufacture, inspection & Testing at manufacturer's/subvendor's works, Painting at manufactures works, duly packed for transportation, delivery to site, unloading, storage & handling at site, fabrication, erection and commissioning, performance and guarantee testing, submission of as built drawing, carrying out acceptance tests at site, and final painting of complete Ventilation system on turnkey basis as per specification PE-TS-411-554-A001 including mandatory spares, special tool & tackels for maintenance, commissioning spares, all taxes, duties etc.													
2.0	Break up prices for items covered in clause 1.0 above. In case, price indicated above does not match with item wise break-up given at 2.0, the highest price so calculated shall be considered for evaluation but in case of order, the same shall be placed at the lowest price.													
	<b>VENTILATION SYSTEM</b>													
2.1	Sheet metal containarized type air washer unit with centrifugal fan (DIDW) with motor, pumps with motors, air washer internals, inlet air louvers, filters, piping as per IS:1239, Part-I (heavy class galvanised), valves, nozzles, level switch, temp indicators, back wash arrangement, galvanised drain piping, etc as per specification of capacity 1,30,000 CMH. Each air washer has 1 no centrifugal fan ( 1 x 100% duty) of capacity <b>1,30,000 CMH</b> at min. <b>75 mm SP.</b>	16	NO											
2.2	Unitary air filtration unit with centrifugal fan (SISW) with motor, pumps with motors, filters, UAF internals, piping as per IS: 1239 pt I (heavy class galvanised), valves for auto start of standby equipment, nozzles, level switch, pressure switches, Temp. indicators, back wash arrangement, galvanised drain piping etc. as per spec. (Fan capacity <b>50,000 CMH at 60 mmwc</b> static pressure)	4	NO											
2.3*	Supply air ducting (finished) for above area complete with dampers, grills (with VCD & without VCD), supports (painted) and all accessories as specified.													

  
Arvind

  
S A Khan

  
Praveen Kishore

**VENTILATION SYSTEM FOR BHADRADRI TPS (4X270 MW) - SUGGESTIVE PRICE FORMAT Rev.00**

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY						ERECTION AND COMMISSIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (Inc CESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	Total Price Supply FIOR site and E&C including service tax
2.3.1*	Finished GSS (zinc coating <b>180 gms/sq.m</b> ) Ducting with support structure etc.													
a)*	18 G	4700	SQM											
b)*	20 G	6500	SQM											
c)*	22 G	6500	SQM											
d)*	24 G	4600	SQM											
2.3.2*	MS Duct With Epoxy paint for battery room.	300	SQM											
2.3.3*	MS Grilles with VCD	300	SQM											
2.3.4*	MS Grilles without VCD	20	SQM											
2.3.5*	Thermal insulation 25 mm expanded polystyrene finished with sand cement plaster as specified for supply air duct	3500	SQM											
2.3.6*	Wall mounted dampers (gravity operated) for different areas.	40	SQM											
2.3.7*	Inlet Louvres	20	SQM											
2.3.8*	VOLUME CONTROL DAMPERS in GI construction as per specifications	20	SQM											
2.4*	FIRE DAMPER													
a)*	Fire damper	30	SQM											
b)*	Motorized Actuator with single phase power supply for the above Fire damper with auto resetting, limit switches, indication lamps etc	45	Nos											
c)*	Fusible Link type Fire Damper	20	SQM											
2.5*	Roof extractor units (axial flow type) with hood, disconnect switch and all accessories as specified. <b>Following fan shall have 15 mmwc static pressure.</b>													
a)*	Capacity 50,000 CMH with Motor rating 5.5 KW	32	Nos.											
b)*	Capacity 40,000 CMH with Motor rating 5.5 KW	6	Nos.											
c)*	Capacity 20,000 CMH with Motor rating 2.2 KW	28	Nos.											
2.6*	Axial flow supply fans with pre and fine filter (wall mounted) complete with casing, TEFC sq cage induction motors & mounting frame, MS rain protection cowl, bird screen and all other accessories (suitable for 415V/3-phase supply). <b>Following fan shall have 30 mmwc static pressure.</b>													

  
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S A Khan


  
Praveen Kishore

**VENTILATION SYSTEM FOR BHADRADRI TPS (4X270 MW) - SUGGESTIVE PRICE FORMAT Rev.00**

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY						ERECTION AND COMMISSIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (Inc CESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	
a)*	Capacity 10,000 CMH with Motor rating 2.2 KW	8	Nos.											
b)*	Capacity 7,500 CMH with Motor rating 1.5 KW	65	Nos.											
c)*	Capacity 6,000 CMH with Motor rating 1.1 KW	20	Nos.											
d)*	Capacity 4,000 CMH with Motor rating 0.75 KW	15	Nos.											
2.7*	Axial flow supply fans with pre filter (wall mounted) complete with casing, TEFC sq cage induction motors & mounting frame, MS rain protection cowl, bird screen and all other accessories (suitable for 415V/3-phase supply). <b>Following fan shall have 20 mmwc static pressure.</b>													
a)*	Capacity 10,000 CMH with Motor rating 1.5 KW	52	Nos.											
b)*	Capacity 7,500 CMH with Motor rating 1.1 KW	20	Nos.											
c)*	Capacity 6,000 CMH with Motor rating 1.1 KW	8	Nos.											
d)*	Capacity 4,000 CMH with Motor rating 0.75 KW	8	Nos.											
2.8*	Axial flow exhaust fans (Bifurcated type, spark proof construction, wall mounted) complete with casing, flame proof motor & mounting frame, MS rain protection cowl, bird screen and all other accessories epoxy painted (suitable for 415V/3-phase supply). <b>Following fan shall have 15 mmwc static pressure.</b>													
a)*	Capacity 15,000 CMH with Motor rating 2.2 KW	5	Nos.											
b)*	Capacity 10,000 CMH with Motor rating 1.5 KW	56	Nos.											
c)*	Capacity 7,500 CMH with Motor rating 1.1 KW	6	Nos.											
d)*	Capacity 2,000 CMH with Motor rating 0.55 KW	9	Nos.											
2.9*	Axial flow exhaust fans (Wall mounted) complete with casing, TEFC sq cage induction motor & mounting frame, MS rain protection cowl, bird screen and all other accessories epoxy painted (suitable for 415V/3-phase supply) as specified. <b>Following fan shall have 10 mmwc static pressure.</b>													
a)*	Capacity 15,000 CMH with Motor rating 1.1 KW	73	Nos.											
b)*	Capacity 10,000 CMH with Motor rating 0.75 KW	42	Nos.											
c)*	Capacity 7,500 CMH with Motor rating 0.55 KW	16	Nos.											
d)*	Capacity 6,000 CMH with Motor rating 0.55 KW	35	Nos.											
e)*	Capacity 2,000 CMH with Motor rating 0.37 KW	14	Nos.											

  
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Praveen Kishore

**VENTILATION SYSTEM FOR BHADRADRI TPS (4X270 MW) - SUGGESTIVE PRICE FORMAT Rev.00**

Clause No.	DESCRIPTION	Qty.	Unit	SUPPLY						ERECTION AND COMMISSIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (IncCESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	
2.10*	Exhaust fan (propeller type) completes with induction motor & mounting frame MS rain protection cowl, bird screen and all other accessories as specified (suitable for 240V/ 1 phase). <b>Following fan shall have 5 mmwc static pressure.</b>													
a)*	Capacity 1200 CMH with Motor rating 100 watts	156	Nos.											
2.11	Total lumpsum price for special tools & tackles for maintenance inclusive of packing forwarding, transportation up to site, etc. (Bidder shall submit item-wise price break-up).	1	LOT											
2.12	Total lumpsum price for commissioning spares inclusive of packing forwarding, transportation up to site, etc. (Bidder shall submit item-wise price break-up).	1	LOT											
2.14	<b>FIELD INSTRUMENTS</b> like pressure gauge, temperature gauge, pressure switch, differential pressure switch, flow switch and other instrument required for Ventilation System etc.	1	LOT											
2.15	Any other item not indicated above, but required to make the system complete in all respects.	1	LOT											
2.16	Total lumpsum price for Mandatory Spare inclusive of packing forwarding, transportation up to site, etc. (Bidder to submit item-wise price break-up seperately).	1	LOT											

**Note:**

- 1 The bidder shall furnish unit rates for variable item (marked \*) i.e., ducting, supply grilles (with and without VCD), fire damper, thermal insulation for ducting, gravity damper, MS Air-intake Louvers for Aux. Bldgs. only., RE Units, Axial Flow fans (Supply/Exhaust), Propellor Fans etc for necessary adjustment (plus or minus) variation during detailed engg. stage. The unit rates quoted above shall be considered and no separate unit rates shall be quoted. Unit rates shall be valid throughout the contract.
- 2 Bidder must submit prices in the Pro Forma duly filled in signed and stamped on every page without any ambiguity. The price shall be written against each item. Term such as "refer covering letter" etc. are not acceptable. Extra sheet may be attached if the space provided is not sufficient
- 3 Price format shall not be changed by the bidder
- 4 Any other item not indicated above, but required to complete Ventilation package as per system requirements.
- 5 For limitation on payment, percentages of individual items/equipments, as specified in the appendix-A shall be applicable

  
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VENTILATION SYSTEM FOR BHADRADRI TPS (4X270 MW) - SUGGESTIVE PRICE FORMAT for MANDATORY SPARE									
SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QUANTITY	UNIT	SUPPLY					
				Unit Price (Rs)	Total ex-works price (Rs)	ED including CESS (Rs)	CST / VAT (Rs)	FREIGHT including Service Tax, If applicable (Rs)	TOTAL F.O.R. Site Price Supply (Rs)
<b>1.0</b>	<b>VENTILATION SYSTEM</b>								
<b>1.1</b>	<b>Centrifugal fans</b>								
1.1.1	Set of bearings for Air washer fans	1Set for each	Type of Fan						
1.1.2	Set of bearings for U.A.F. fans	1Set for each	Type of Fan						
<b>1.2</b>	<b>Centrifugal pumps</b>								
1.2.1	Set of bearings for Air washer pumps	1Set for each	Type and rating of Pump						
1.2.2	Set of bearings for U.A.F. pumps	1Set for each	Type and rating of Pump						
1.2.3	Mechanical seal / gland packing as applicable, shaft sleeve & casing wearing rings and lantern rings for shaft and impeller	1Set for each	Type and rating of Pump						
1.2.4	Complete Impeller Assembly	1Set for each	application and ratings of Pumps						
1.2.5	Key for impeller	1No. for each	application and ratings of Pumps						
1.2.6	Pump shaft	1No. for each	application and ratings of Pumps						
1.2.7	Coupling	1No. for each	application and ratings of Pumps						
<b>1.3</b>	<b>Spray Nozzles</b>								
1.3.1	Spray nozzles for air washer unit	5%							
1.3.2	Spray nozzles for U.A.F. unit	5%							
<b>1.4</b>	<b>SS Filters</b>								
1.4.1	SS Filters for Air washer	10%							
1.4.2	SS Filter for Unitary air filtration unit	10%							
<b>1.5</b>	<b>Basket for POT Strainer</b>								
1.5.1	Strainer Basket for Air Washer	1No. for each	type and size						
1.5.2	Strainer Basket for Unitary Air Filtration unit	1No. for each	type and size						
<b>1.6</b>	<b>Valves</b>								
1.6.1	Gate valve for Air washer	10% or Minimum	1No. Whichever is higher						

SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QUANTITY	UNIT	SUPPLY					
				Unit Price (Rs)	Total ex-works price (Rs)	ED including CESS (Rs)	CST / VAT (Rs)	FREIGHT including Service Tax, If applicable (Rs)	TOTAL F.O.R. Site Price Supply (Rs)
1.6.2	NR Valve for Air Washer	10% or Minimum 1No. Whichever is higher							
1.6.3	Gate valve for Unitary Air Filtration Unit	10% or Minimum 1No. Whichever is higher							
1.6.4	NR valve for Unitary Air Filtration Unit	10% or Minimum 1No. Whichever is higher							
1.6.5	Gate Valve for Make-up Drain of Air washer	10% or Minimum 1No. Whichever is higher							
1.6.6	Gate valve for UAF	20% or Minimum 2Nos. Whichever is higher							
1.6.7	Other LP Piping valves & traps - Complete assembly	5% or min. 1 no. (whichever is more) for each size, type & rating for total population							
<b>1.7</b>	<b>Wall mounted supply/ Exhaust fan</b>								
1.7.1	Fan-motor Bearing	1 set for each rating of fan							
1.7.2	Vibration Isolators	1 set for each fan							
<b>1.8</b>	<b>Electrical Spares for Motors</b>								
1.8.1	Motor bearing set for Air washer fan motor	1 set for each type of fan motor							
1.8.2	Motor bearing set for UAF fan motor	1 set for each type of fan motor							
1.8.3	Motor bearing set for axial flow supply fan motor	1 set for each rating of fan motor							
1.8.4	Motor bearing set for axial flow exhaust fan motor	1 set for each rating of fan motor							
<b>1.9</b>	<b>Mandatory Spares for Temperature Elements and Thermowells</b>								
1.9.1	Thermocouple / RTD elements (10% of each type and length of elements , or a minimum of one number, whichever is more.)	2 Lot							
1.9.2	Thermowells for each type of temperature sensors (10% or a minimum of one for each type, whichever is more.)	2 Lot							
<b>1.10</b>	<b>Mandatory Spares for Electronic Transmitters (for pressure, DP, Flow, level, Temperature) and Electrical Transducers.</b>								

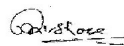
SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QUANTITY	UNIT	SUPPLY					
				Unit Price (Rs)	Total ex-works price (Rs)	ED including CESS (Rs)	CST / VAT (Rs)	FREIGHT including Service Tax, If applicable (Rs)	TOTAL F.O.R. Site Price Supply (Rs)
1.10.1	Transmitters and Electrical Transducers (10% of total number of offered for each model and type for the project or a minimum of one number, whichever is more)	2 Lot							
1.11	<b>Mandatory spares for local gauges/switch (for Pressure, DP, Temperature, Flow, level, etc.)</b>								
1.11.1	Local gauges/ Switch (for Pressure, DP, Temperature, Flow, level, etc.) (10% of total number of instruments offered for each model and type for the project or a minimum of one number, whichever is more.)	2 Lot							

**NOTE:**

- 1 Unless stated otherwise, a "set" or "Lot" means items required for complete replacement in one equipment of each type / size/ range.
- 2 Wherever quantity has been specified as percentage (%), it shall mean percentage (%) of the population of the item required for one unit of 270 MW in the station (project), unless specified otherwise.
- 3 In case of Bought Out items, itemised spares list may be vendor specific and may differ from the list of spares mentioned above. In such cases, The quoted price shall be considered for applicable items only without any change in the contract price.

  
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**APPENDIX - A**  
**Percentage breakup for Ventilation Package**  
**4x270 MW BHADRADRI TPS**

SL NO	DESCRIPTION OF EQUIPMENT/ ITEM	Percentage of total price
1	Total lumpsum firm prices for equipment & Services as specified, Comprising Engineering, design, manufacture, inspection & Testing at manufacturer's/subvendor's works, Painting at manufactures works, duly packed for transportation, delivery to site, unloading, storage & handling at site, fabrication, erection and commissioning, performance and guarantee testing, submission of as built drawing, carrying out acceptance tests at site, and final painting of complete Ventilation system on turnkey basis as per specification PE-TS-411-554-A001 including mandatory spares, special tool & tackels for maintenance, commissioning spares, all taxes, duties etc. (Without mandatory spare - Sr. No. 2.16 of suggestive price format)	<b>100%</b>
2.0	<b>BREAK-UP OF PRICES GIVEN IN 1.0 ABOVE (To be used during contract execution for payment)</b>	
2.1	Total lump sum firm price for <b>EQUIPMENT (SUPPLY)</b> for Engineering, design, manufacture, inspection & Testing at manufacturers works/subvendor's work, Painting at manufactures works, duly packed for transportation, delivery to site, unloading storage & handling at site, for the complete scope of supply of Ventilation system and as defined in the technical specification ( PE-TS-411-554-A001) for 4x270 MW BHADRADRI TPS.	<b>80%</b>
2.2	<b>Erection &amp; commissioning</b> carrying out acceptance tests at site, final painting and handing over to customer the complete ventilation system on turnkey basis as per specification PE-TS-411-554-A001 including special tool & tackels for maintenance, commissioning spares, all taxes, duties etc.	<b>20%</b>
3.0	<b>Break-up (%) of prices given at SI No-2.1 above (To be used during contract execution for payment)</b>	<b>Percentage of total price of SL No 2.1 above</b>
3.1	Air washer - (Item no 2.1 of Suggestive price format)	<b>28.00%</b>
3.2	UAF - (Item no 2.2 of Suggestive price format)	<b>11.00%</b>
3.3	GSS Duct work - (Item no 2.3.1 of Suggestive price format)	<b>22.00%</b>
3.4	MS duct and grills (Item no 2.3.2, 2.3.3 & 2.3.4 of Suggestive price format)	<b>2.00%</b>
3.5	Thermal Insulation (Item no 2.3.5 of Suggestive price format)	<b>2.00%</b>
3.6	Gravity damper, Inlet louver, Fire damper, VCD, (Item no 2.3.6 to 2.3.8 & 2.4 of Suggestive price format)	<b>3.00%</b>
3.7	RE units (Item no 2.5 of Suggestive price format)	<b>6.00%</b>
3.8	Supply air fans (Item no 2.6 and 2.7 of Suggestive price format)	<b>12.00%</b>
3.9	Exhaust fans (Item no 2.8 to 2.10 of Suggestive price format)	<b>12.00%</b>
3.10	Tools and tackles & Commissioning Spares (Item no 2.11 to 2.12 of Suggestive price format)	<b>0.50%</b>
3.11	Field Instruments and any other accessories/item (Item no 2.14 to 2.15 of Suggestive price format)	<b>1.50%</b>

  
 Arvind      S A Khan      Praveen Kishore

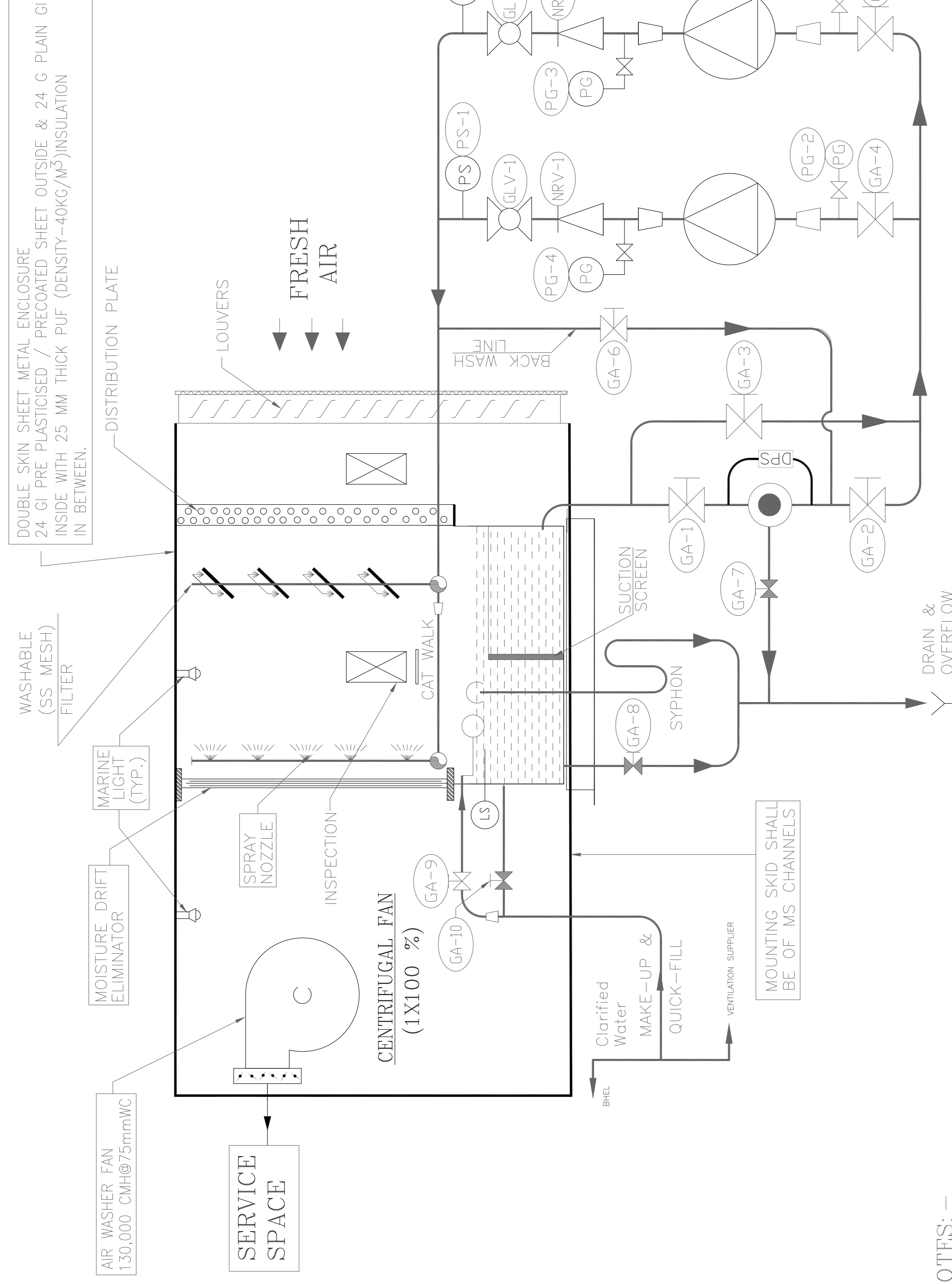
**4X270 MW BHADRADRI TPS**  
**VENTILATION SYSTEM**  
**GUARANTEED POWER CONSUMPTION FIGURES**

S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWER CONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL (IN KW)	DUTY FACTOR	TOTAL KW
		WORKIN G	STANDBY			
		3A	3B	4	5	6=3Ax4x5
<b>1</b>	<b>VENTILATION SYSTEM FOR TG BUILDING</b>					
1.1	Centrifugal Fan of cap. 1,30,000 CMH at 75 mmwc static pr for air washers.	16	0			
1.2	Pumps for circulation of water in spray chamber of above air washer	16	16			
1.3	RE Units 50,000 cmh at 15mmwc	26	0			
1.4	Centrifugal Fan of cap. 50,000 CMH at 60	4	0			
1.5	Pump for above UAF.	4	4			
<b>TOTAL (KW)</b>						<b>1090</b>

**NOTE:**

1 Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as **1090 KW**. So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation @ **Rs 2,52,000/-** per KW of additional power over EPC.

2 Bidder's guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty @ **Rs 2,52,000/-** per KW shall be levied on vendor.



**LEGEND: --**

SYMBOL	DESCRIPTION
	GATE VALVE
	GATE VALVE (NORMALLY CLOSED)
	GLOBE VALVE
	CHECK VALVE (NON-RETURN VALVE)
	POT STRAINER
	VOLUME CONTROL DAMPER(OPPOSD.BLD.)
	CENTRIFUGAL PUMP
	SS FILTER
	PRESSURE GAUGE
	PRESSURE SWITCH
	LEVEL SWITCH
	LOW LEVEL SWITCH
	TEMPERATURE INDICATOR
	FLOAT VALVE
	REDUCER
	SCOPE OF SUPPLY
	CENTRIFUGAL FAN
	DIFFERENTIAL PRESSURE SWITCH

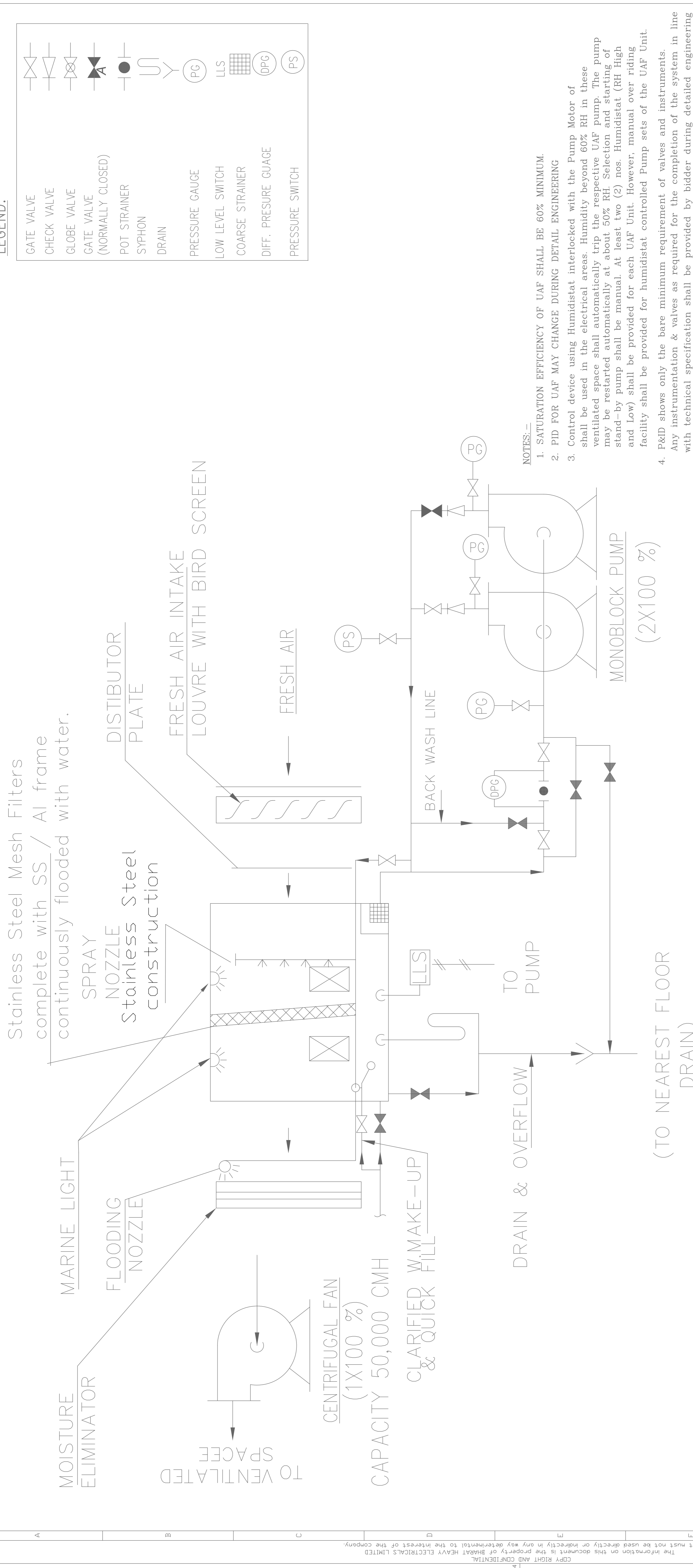
**FOR TENDER**

CUSTOMER	TSGENCO		
PROJECT:	4x270 MW MANUGURU TPS, TELANGANA		
CONTRACTOR:	<b>BHARAT HEAVY ELECTRICALS LTD</b> <b>POWER SECTOR</b> PROJECT ENGINEERING MANAGEMENT, NOIDA		
DESIGN. & DRAWN	NAME	DATE	
CHECKED			
APPROVED			
TITLE: P&I DIAGRAM FOR AIR WASHER SYSTEM			
DEPT. SCALE: 1:1	BHEL DRAWING NO:		
SIGN	PE-DG-411-554-A001		
DATE	SHEET: 1 OF 1	REV - 00	

REV. NO	DATE	DESCRIPTION	REVD. BY	CHKD. BY	APPD. BY

**NOTES: --**

- SATURATION EFFICIENCY OF AIR WASHER SHALL BE 90% MINIMUM.
- ALL AIR WASHER COMPONENTS INCLUDING FAN & DRIVE MOTOR BUT EXCLUDING PUMP SETS SHALL BE LOCATED WITHIN THE SHEET METAL CASING
- PID FOR AIR WASHER MAY CHANGE DURING DETAIL ENGINEERING
- Control device using Humidistat interlocked with the Pump-Motor of the Fill Section shall be used in the electrical areas. Humidity beyond 60% RH in these ventilated space shall automatically trip the respective AWU pump for fill section only. The pump may be restarted automatically at about 50% RH. Selection and starting of stand-by pump shall be manual.  
At least two (2) nos. Humidistat (RH High and Low) shall be provided for each Air Washer Unit. However, manual over riding facility shall be provided for humidistat controlled Pump sets of the Air Washer Unit.
- P&ID shows only the bare minimum requirement of valves and instruments. Any instrumentation & valves as required for the completion of the system in line with technical specification shall be provided by bidder during detailed engineering without any commercial implication.



**TYPICAL SCHEME FOR  
 UAF UNIT  
 FOR CAPACITY: 50,000 CMH  
 STATIC PR. 60 mmwc**

**FOR TENDER**

**LEGEND:**

	GATE VALVE
	CHECK VALVE
	GLOBE VALVE
	GATE VALVE (NORMALLY CLOSED)
	POT STRAINER
	SYPHON
	DRAIN
	PRESSURE GAUGE
	LOW LEVEL SWITCH
	COARSE STRAINER
	DIFF. PRESURE GAUGE
	PRESSURE SWITCH

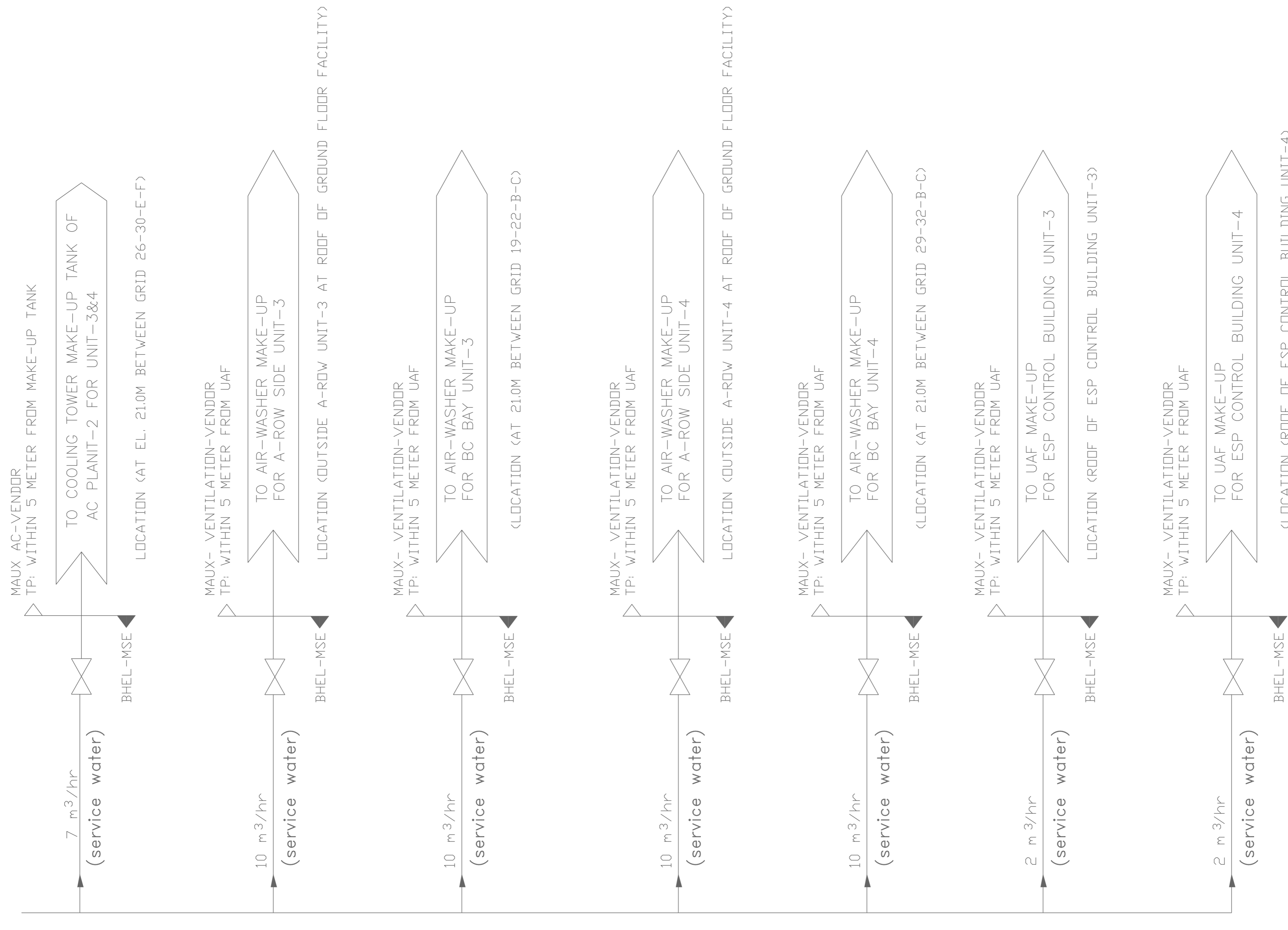
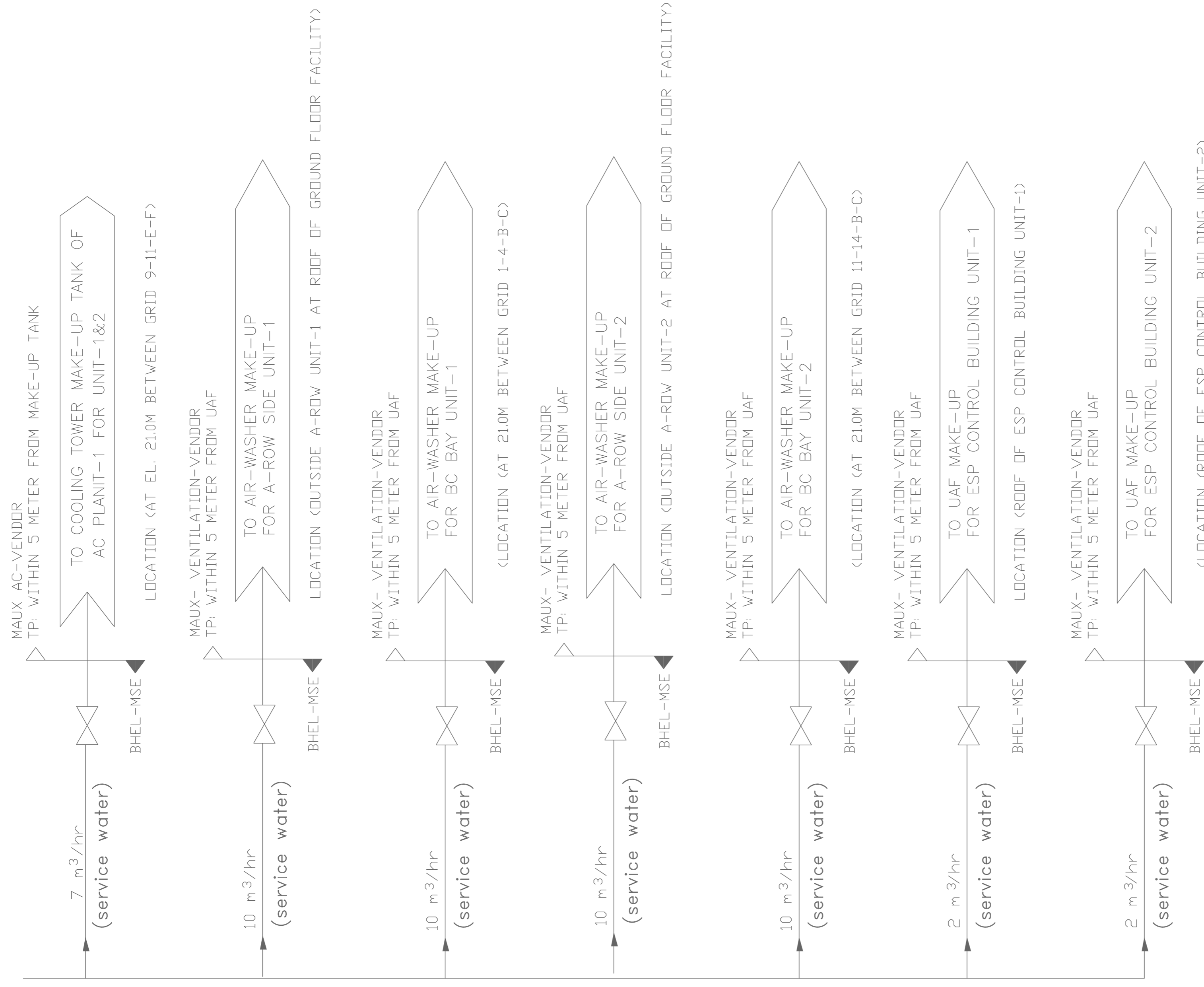
- NOTES:-**
1. SATURATION EFFICIENCY OF UAF SHALL BE 60% MINIMUM.
  2. PID FOR UAF MAY CHANGE DURING DETAIL ENGINEERING
  3. Control device using Humidistat interlocked with the Pump Motor of shall be used in the electrical areas. Humidity beyond 60% RH in these ventilated space shall automatically trip the respective UAF pump. The pump may be restarted automatically at about 50% RH. Selection and starting of stand-by pump shall be manual. At least two (2) nos. Humidistat (RH High and Low) shall be provided for each UAF Unit. However, manual over riding facility shall be provided for humidistat controlled Pump sets of the UAF Unit.
  4. P&ID shows only the bare minimum requirement of valves and instruments. Any instrumentation & valves as required for the completion of the system in line with technical specification shall be provided by bidder during detailed engineering without any commercial implication.

CUSTOMER	TSGENCO	
STATUS	CONTRACT	
JOB NO.	360	
VENTILATION SYSTEM	ALTD	CHD
REV	DATE	APPD
REV	DATE	ALTD
REV	DATE	CHD
REV	DATE	APPD
TITLE		
TYPICAL SCHEME OF UAF		
DEPT.	SCALE	BHEL DRAWING NO.
SIGN	DATE	PE-DG-411-554-A002.
SHEET 1	DF 1	REV 00

4x270 MW MANUGURU TPS, TELANGANA	
DEPT CODE	BHARAT HEAVY ELECTRICALS LTD
DRN	POWER GROUP
BSN	PROJECTS ENGINEERING MANAGEMENT
MAX.	NEW DELHI
CHD	
APPD	
NAME	
SIGN	
DATE	

### 4X270 MW BHADRADRI TPS FOR UNIT-1&2

### 4X270 MW BHADRADRI TPS FOR UNIT-3&4

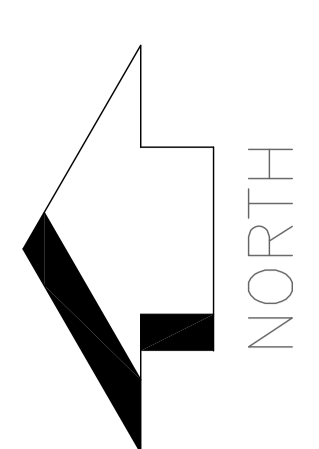


**NOTE:-**

- HVAC MAKE-UP WATER PIPING INCLUDING FITTINGS SHALL BE TERMINATED WITHIN THE RANGE OF 5 METER DISTANCE FROM MAKE-UP WATER TANK / AIR-WASHER BY BHEL. FURTHER PIPING SHALL BE DONE BY VENDOR AS MARKED IN THIS DRG.

PROJECT TITLE	4X270 MW BHADRADRI TPS		
TITLE	MAKE UP WATER SCHEME FOR HVAC SYSTEM		
DRG. NO. PE-DG-411-554-A003 REV 00			
SCALE	NTS	DRAWN	CHECKED
			APPROVED





FACILITY	DESCRIPTION OF FACILITIES
1.0	MAIN PLANT AREA
1.1	SWITCH YARD
1.2	TRANSFORMER YARD
1.3	TURBINE BUILDING
1.4	BOILER
1.5	ESP
1.6	ESP CONTROL ROOM
1.7	CHIMNEY
1.8	SPACE FOR FGD
1.9	IA & SA COMPRESSOR HOUSE
2.0	WATER SYSTEM
2.1	RAW WATER RESERVOIR
2.2	RAW WATER PUMP HOUSE
2.3	PT PLANT
2.4	DM PLANT
2.5	DOCT
2.6	CW PUMP AREA
2.7	CW CHLORINATION PLANT FOR CW SYSTEM
2.8	CW TREATMENT PLANT FOR CW SYSTEM
2.9	SIDE STREAM FILTRATION
2.10	CUMULATED WATER STORAGE TANK & PUMP HOUSE
2.11	EFFLUENT TREATMENT PLANT
2.12	CHEMICAL LAB
2.13	SEWAGE TREATMENT PLANT
2.14	DM TANKS & DM TRANSFER PUMPS
2.15	CONDENSATE STORAGE TANKS AND CONDENSER MAKE UP & BOILER FILL PUMPS
3.0	FUEL OIL SYSTEM
3.1	FUEL OIL UNLOADING TRENCH
3.2	FUEL OIL UNLOADING AND PRESSURISING PUMP HOUSE
3.3	FUEL OIL STORAGE TANK AREA
3.4	FUEL OIL FORWARDING PUMP HOUSE
4.0	COAL HANDLING PLANT
4.1	WAGON TIPPLER
4.2	CRUSHER HOUSE
4.3	CRUSHED COAL STOCKPILE
4.4	CHP CONTROL ROOM
4.5	STACKER RECLAIMER
4.6	TRANSFER POINT (TP)
4.7	PENT HOUSE (PH)
4.8	COAL BELT CONVEYOR
4.9	DUST SUPPRESSION PUMP HOUSE
5.0	ASH HANDLING PLANT
5.1	FLY ASH SILOS
5.2	ASH SLURRY PUMP HOUSE
5.3	ASH WATER PUMP HOUSE
5.4	AHP CLARIFIER
5.5	AHP VACUUM GUM COMPRESSOR HOUSE
5.6	AHP VACUUM PUMP HOUSE
5.7	SILU UTILITY BUILDING
6.0	NON - PLANT BUILDING
6.1	ADMN. BUILDING
6.2	CANTEEN
6.3	FIRE STATION
6.4	MAIN GATE
6.5	SERVICE BUILDING
6.6	RAIN WATER HARVESTING POND

LEGENDS:

- Area Boundary
- Road
- River, Stream
- DGPS Point with MS Level in Metres
- Village
- Pipe/Cable Rack

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. PIPE RACK FROM ASPH TO ASHDYKE NOT SHOWN AS LOCATION OF ASHDYKE IS TO BE FINALISED

FOLLOWING ARE THE ASSUMPTIONS AS PER INFORMATION RECEIVED FROM TEAM VISITED SITE:

1. BLOCK-I IS TO BE USED FOR 4X270MW EPC.
2. WIND ROSE IS FROM WEST TO EAST.
3. RAW WATER RESERVOIR LOCATION CONSIDERED AS RIVER WATER INTAKE IS FROM GODAVARI RIVER.
4. POWER EVACUATION DIRECTION.
5. RAILWAY TRACKS PLANNED SUCH THAT THEY PASS THROUGH BLOCK-II & III PROVIDING THEIR ACCESS.
6. MAIN GATE LOCATION.

TELANGANA STATE POWER GENERATION CO. LTD.

4X270 MW BHADRADRI TPP

CUSTOMER	TELANGANA STATE POWER GENERATION CO. LTD.			
CUSTOMER'S CONSULTANT	411			
JOB No.	CONTRACT			
STATUS	DISTRIBUTION			
TO				
REV	DATE	BY	CHK	APPD
01	05.12.14	SK	UJ	SPY/JJ
02				
03				
04				
05				

PLOT PLAN

SCALE	1:1000
DATE	12/12/2014
DRAWING No.	PE-DG-411-100-M001
SHEET	1 OF 1
REV.	POA

