



भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LIMITED

पारेषण व्यापार अभियांत्रिकी प्रबंधन

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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				समूह/GROUP	TBEM	W.O. No	80012	
ग्राहक/ CUSTOMER	APGENCO							
ठेकेदार / CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED							
सलाहकार / CONSULTANT	DESEIN PRIVATE LIMITED							
परियोजना/ PROJECT	400/220KV SWITCHYARD, RAYALSEEMA, 1 X 600MW, STAGE-IV, UNIT-6							
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SECTION -1

INTENT, DESIGN CRITERIA AND SCOPE

1.0.0 INTENT OF SPECIFICATION

- 1.1.0 This specification covers the design, manufacture, inspection and testing at bidder's and/ or his sub-vendor's work(s), proper packing for transportation, delivery at site of **FANS AND FILTERS for Air Conditioning & Ventilation System** as detailed in this section and in various other sections of this specification for **Switchyard Control Building** of **1 X 600MW, Stage-IV, Unit-6 TPS at Rayalseema** of APGENCO.
- 1.2.0 The requirement(s) specified under 'SECTION 2, SECTION 3, SECTION 4' and 'SECTION 5' of this specification shall be considered as part of this section. In case of variance between various sections, requirements of Section-1 shall prevail.
- 1.3.0 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.
- 1.4.0 The bidder shall be deemed to have understood completely all the tender drawings and documents and quoted accordingly.
- 1.5.0 The bidder has to note carefully the parameters, estimated capacities of equipment indicated and the tender drawing in the specification are only for guidance of the bidder. The system shall be designed as per relevant standards / codes and exact capacities and quantities are to be estimated by the bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.
- 1.6.0 In case of any deviation, the bidder shall indicate separately the deviations clause-wise with respect to the specification in the 'Schedule of Deviation'. Deviations in any other form including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.

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1.7.0 The **contract** shall be on **UNIT RATE basis** for the package. Within the scope of the contract no variation shall be admissible to the contractor.

1.8.0 The Purchaser, Consultant and Owner in this specification stand for **BHEL**, **DESEIN** and **APGENCO** respectively. The successful bidder shall be referred to as Contractor.

2.0.0 VENTILATION SYSTEM

A) Ventilation System Switchyard Control Room shall comprise of :

1. Battery Room

Three (3) number axial flow exhaust fan of 4000 CMH @12mm WG complete with rain protection cowl, bird screen and mounting arrangement. The fan shall have bifurcated construction with flameproof motors and epoxy painting.

2. AC/DC Board Room

Five (5) number axial flow exhaust fan of 4000 CMH @12mm WG shall be provided and shall be complete with rain protection cowl, bird screen and mounting arrangement.

3. Pantry Room

One (1) number axial exhaust fan of 1000 CMH @ 5mm WG shall be provided. The fan shall be complete with rain protection cowl, bird screen and mounting arrangement.

4. Store

One (1) number axial exhaust fan of 1000 CMH @ 5mm WG shall be provided. The fan shall be complete with rain protection cowl, bird screen and mounting arrangement.

5. Toilet

One (1) number axial exhaust fan of 500 CMH @ 5mm WG shall be provided for each toilet (Gents toilet, PH toilet & Ladies toilet). The fan shall be complete with rain protection cowl, bird screen and mounting arrangement.

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6. AC Plant Room

One (1) number Axial Flow Fresh Air fan of 850 CMH @ 30mm WG shall be provided for AC Plant Room. The Fresh air unit shall be complete with Fan, rain protection cowl, bird screen, pre and fine filters, Volume Control Damper and mounting arrangement.

3.0.0 SCOPE

3.1.0 SCOPE OF SUPPLY

3.1.0.1 Complete supplies for FANs and Filters for Ventilation System (As per clause no 2.0.0 above.)

Sl. No.	Item Description	Unit	Qty.
1	Axial flow exhaust fan of 4000 CMH @12mm WG for Battery Room complete with rain protection cowl, bird screen and mounting arrangement having bifurcated construction with flameproof motors and epoxy painting.	Nos.	03
2	Axial flow exhaust fan of 4000 CMH @12mm WG for AC/DC Board Room complete with rain protection cowl, bird screen and mounting arrangement.	Nos.	05
3	Axial exhaust fan of 1000 CMH @ 5mm WG one each for Pantry and Store complete with rain protection cowl, bird screen and mounting arrangement.	Nos.	02
4	Axial exhaust fan of 500 CMH @ 5mm WG one for each toilet (Gents toilet, PH toilet & Ladies toilet) complete with rain protection cowl, bird screen and mounting arrangement.	Nos.	03
5	Axial flow Fresh air fan of 850 CMH @ 30mm WG for AC Plant Room complete with Fan, rain protection cowl, bird screen, pre and fine filters, Volume Control Damper and mounting arrangement.	Nos.	01
6	Pre Filter of Size 610 mm x 610 mm x 50 mm for fresh air unit in AC Plant Room.	Nos.	01
7	Fine Filter (size in mm) 610 mm x 610 mm x 300 mm for fresh air unit in AC Plant Room.	Nos.	01

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3.1.2 SCOPE OF SERVICES :

NIL

3.2.0 Exclusions :

- i. **Any Erection, Testing & Commissioning (ETC) requirements**
- ii. **Any Civil Works**
- iii. Supply of Cable trays for laying cables. Installation wherever required is in contractor scope.
- iv. Supply of power and control cables.
- v. Laying & termination of power and control cables.

3.3.0 Utilities Available :

Construction water and 415 V power shall be available at one point each at the site.

3.4.0 ENGINEERING DRAWING / DOCUMENT SUBMISSION :

The successful bidder will start detail engineering immediately after placement of purchase order. The engineering drawing/ document submission schedule is as follows:

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS	CUMULATIVE TIME IN WEEKS FROM LOI/PO DATE	REMARKS IF ANY
1.	Submission of Drawings/ Documents as per list furnished in section-4.	6	6	
2.	Approval of documents from BHEL/Customer	4	10	

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3.5.0 OPERATION & MAINTENANCE (O&M) MANUAL :

Operation and Maintenance manuals shall be specifically complied for the project by the bidders. The draft O&M manual shall be submitted within 20 weeks after award of contract. The O&M manual shall contain the following information:

- a. Description of the system and equipment with design particulars.
- b. Instruction for erection.
- c. Instruction for operation, maintenance and repair.
- d. Recommended inspection practices and inspection schedule.
- e. Ordering information for all replaceable parts.
- f. Recommendation for type of lubricants and frequency of lubrication.

4.0 Inspection & Testing

All the equipments shall be inspected prior to dispatch in line with relevant IS, approved GTP/ drawing and technical specification, BHEL/ customer approved QAP.

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SECTION-2

EQUIPMENT SPECIFICATION

1.0.0 General Design and Constructional Requirements :

- i. All the equipment shall be capable of withstanding the stresses, which may be experienced during normal operation and test.
- ii. All the equipment shall be designed to permit inter-changeability of parts and ease of access during inspection, maintenance, installation and repair of various parts.
- iii. All parts subject to substantial temperature changes shall be designed and supported such as permit free expansion or contraction without resulting in leakage, harmful distortion, misalignment or play.

2.0.0 Equipment Specification :

2.1.0 AXIAL FLOW FAN (PROPELLER TYPE)

These are used for general ventilation of premises emitting heat. These shall be of heavy duty and wall mounted type. Fan impeller blade shall be of aerofoil section and mounted directly on the motor shaft. Fan to be installed in fire hazardous area shall be of spark proof construction and motor of flameproof construction.

Air entry shall be from motor side. Louver shutter shall be provided at the outlet side of fan to prevent back draft. Consequent loss in capacity shall be taken into account while selecting the fan.

The propeller fan to be provided with roof monitors shall have motor mounted on the outside face. The bird screen shall be provided at the suction side of the fan.

2.2.0 AXIAL FLOW (TUBE AXIAL) FAN

Tube axial flow fans shall be used for the exhaust of fume/hot air/supply of air as well as for Induction of Fresh Air in AC Plant Room. Fan impeller shall be of

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aerofoil section. The impeller shall be directly mounted on the motor shaft and the assembly shall be mounted inside rigid tubular casing. Terminal box shall be provided outside tubular casing. The connecting flanges shall be provided at both ends of tube.

Fan to be installed in fire hazardous/acid area shall be spark proof construction and painted with acid resistant paint / anti corrosive lining and motor of flameproof construction.

Bifurcated fans shall be considered in Battery rooms.

Volume Control Damper is to be provided with Fresh Air Fan to allow only required quantity of Fresh Air inside AHU Room.

2.3.0 FILTERS FOR FRESH AIR FAN

The Fresh Air Unit for Induction of Fresh Air in AC Plant Room shall have pre and fine filters for filtering of intake air in line with the requirement below :

2.3.1 Pre Filters

Panel type dry fabric filter having an efficiency of 90% down to 10-micron size particles shall be provided.

The filters shall be of clean-able type construction of reinforced glass fiber or cotton fabric or fabric like material sandwiched in between two galvanized wire netting arrangement in a uniformly corrugated form to increase the surface area. The filter shall have aluminum frames of adequate thickness suitable for long use in an industrial plant. The filters may be in panels of size about 600 x 600 for easy handling them.

The frames shall be designed strong enough to take the load of double the pressure drop in dirty condition of the filters. Face velocity of air across the filters shall not exceed 2.5 m/sec.

2.3.2 Fine Filters - High Efficiency Filters (Micro-vee fine filters)

High efficiency filter having an efficiency of 99% down to 5 microns shall be provided in the fresh air unit and supply air duct of air conditioning system.

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The filters shall be of cleanable type construction of reinforced glass fiber or cotton fabric or fabric like material sandwiched in between two galvanized wire netting arrangement in an uniformly corrugated form to increase the surface area. The filter shall have Aluminum frames of adequate thickness suitable for long use in an industrial plant. The filters may be in panels of size about 600 x 600 for easy handling them.

The filter panels shall be mounted on frame duly tightened with four nut/ bolts. The frames shall be designed strong enough to take the load of double the pressure drop in dirty condition of the filters. Face velocity of air across the filters shall not exceed 2.5 m/sec.

SECTION – 3
PROJECT DETAILS AND GENERAL SPECIFICATIONS

SL.NO.	DESCRIPTION	
1.	PROJECT INFORMATION	
	a) Customer	APGENCO
	b) Consultant	Desein Consulting Engineers, New Delhi
	b) Projects	1x600MW RayalseemaTPP, Stage-IV, Unit#6-400/220kV Switchyard
	c) Project locations	The project site is located in VV Reddy nagar, Karamala, about 30KM west-south of Proddatur & 20KM from Yerraguntla. Nearest Rail head is Muddanur, which is approx. 10 kM from Site. Site is approximately 480KM from Hyderabad and 350KM from Chennai.

Equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

2.	SITE CONDITIONS	
i.	Maximum Ambient air temp. (max.)	40.3 °C
ii.	Minimum Ambient air temp. (max.) °C	19.1 °C
iii.	Design ambient temperature	50 °C
iv.	Altitude above MSL	Less Than 1000m
v.	Basic wind speed	39m/s
vi.	Seismic acceleration	Zone-III As per IS-1893
vii.	Average Rainfall	742.8 mm
viii.	Humidity	Max: 49-74%, Min: 35-60%

3. Auxiliary Supply

Normal Voltage	Variation in Voltage	Frequency in Hz	Phase/Wire	Neutral Connection
415 Volts	± 10%	50 ± 5%	3 phsae/4 wire	Solidly earthed
240 Volts	± 10%	50 ± 5%	1 phase/2 wire	Solidly earthed
220 Volts	190V to 240V	DC	---	Isolated 2 wire system (ungrounded)

Combined variation of voltage and frequency shall be limited to ± 10%.

5. DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings.
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

6. DOCUMENTATION SCHEDULE AT CONTRACT STAGE

A : For & After Approval	Soft copies as per clause no. 5 in 1 set
B : For Approval	Hard copies as per clause no. 5 in 12 sets
B : After Approval	Bound sets of Approved Hard copies and Installation, Operation & Maintenance manual and all as built drawings in 20 sets
	3 Set of Computer CD-ROMs (with unbreakable CD Covers) containing all as-built drawings in Auto-Cad version 2006 or later with 2D and 3D drawings, Instruction Manual and GTP.

7. Title block: Title block shall be forwarded to successful bidder after placement of order.

8. All outdoor enclosures shall provide a degree of protection of not less than IP 55 as per IS-13947 & colour shade of RAL 7032 and one enclosures of each type shall be tested for the same or evidence of testing shall be furnished in lieu of type testing.

9. Quality plan:

BHEL or APGENCO approved QP shall be followed.

10. Type Test reports:

Bidder shall submit valid type test reports (as per relevant IEC/IS Standard) of the tests carried out within last five years from the date of bid opening.. The report should have been conducted on identical or similar equipment/ components to those offered. In case type test reports are more than 5 years old OR the reports of type tests are found to be technically unacceptable, the type test shall be conducted without cost and delivery implication to BHEL/APGENCO.

11. INSPECTION, TESTING AND INSPECTION CERTIFICATE

Inspection testing shall be done as per customer specification and inspection plan.

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SECTION 4

LIST OF DOCUMENTS & DATASHEETS

GUARANTEED TECHNICAL PARTICULARS

The Sample GTP for FANs required is Annexed herewith.

The list furnished here is tentative and additional documents may be required during detailed engineering.

List of Data Sheets		
S.No.	Item Description	BHEL's doc. no.
01.	TDS for Fine Filter	TB-DS-344-553-033
02.	TDS for Pre Filter	TB-DS-344-553-034
03.	TDS for Fresh Air Unit for AC Plant Room, exhaust fan for ACDB room & exhaust fan for battery room	TB-DS-344-553-035
04.	TDS for exhaust fan for Toilet, Store & Pantry	TB-DS-344-553-043
List of Other documents		
01.	O & M Manual	

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GUARANTEED TECHNICAL PARTICULARS		
SI No	Description /Details	Vendor Confirmation
	Fine Filters	
1	Make	
2	Size (in mm)	610 x 610 x 300
3	Material of Construction	
a	Frame	
b	Filter media	
4	Support Mesh	
5	Spacer	
6	No. of pleats	
7	Efficiency	
8	Initial Pressure drop (in clean condition)	
9	Max. allowable pressure drop (when due for cleaning)	
10	Test Standard	

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GUARANTEED TECHNICAL PARTICULARS		
SI No	Description /Details	Vendor Confirmation
	Pre Filters	
1	Make	
2	Size (in mm)	610 x 610 x 50
3	Material of Construction	
a	Frame	
b	Filter media	
4	Support Mesh	
5	Spacer	
6	No. of pleats	
7	Efficiency	
8	Initial Pressure drop (in clean condition)	
9	Max. allowable pressure drop (when due for cleaning)	
10	Test Standard	

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GUARANTEED TECHNICAL PARTICULARS					
SI No	Description /Details	Units	Vendor Confirmation		
	Tube axial flow fans				
1	Make and Model.	Nos.			
2	Quantity		1 No.	5 Nos.	3 Nos.
3	Capacity in m3/h.	Nos.	850 CMH	4000 CMH	4000 CMH
4	Total static pressure		30 mm WC	12 mm WC	12 mm WC
5	Outlet Velocity	m/s			
6	Type of fan As per application		Axial flow fan for fresh air supply in AC plant room	Exhaust axial flow fan for AC/ DC Room	Exhaust axial flow fan in bifurcated construction with flameproof motor, epoxy painted, for Battery Room.
7	Material of contruction and thickness				
a	Aerofoil section Impeller				
b	Tube	MS			
8	Electrical Characterstics				
8	Speed and fan impeller dia relationship				
9	Rated HP of Motor	HP			
10	Drive details				
11	Wheel diameter	mm			
12	Statically and Dynamically Balanced				
13	Critical speed of Fan				
14	Noise level at 1.0 m distance	db			
15	Performance curves (Performance Chart)				
16	Air Flow Direction				
17	Fixing details				

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GUARANTEED TECHNICAL PARTICULARS					
SI No	Description /Details	Units	Vendor Confirmation		
	Propeller type Fan				
1	Make and Model.	Nos.			
2	Area fed	CMH.	Toilet	Pantry	Store
3	Capacity in m3/h. (Free Air Delivery)	Nos.	500 CMH	1000 CMH	1000 CMH
4	Quantity		3 Nos.	1 No.	1 No.
5	Type of fan (as per application)		Propeller type		
6	Material of contruction and thickness				
a	Propeller Blades				
b	Frame				
7	Electrical Characteristic				
8	Speed in rpm	rpm			
9	Drive details				
10	Wheel diameter	mm			
12	Critical speed of Fan				
13	Noise level at 1.0 m distance	db			
14	Performance curve (Performance Chart)				
15	Air Flow Direction				
16	Fixing details				

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SECTION- 5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

Schedule 1 **Schedule of Deviations**

Schedule 2 **Details of contact persons (technical & commercial)**

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SCHEDULE-1

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations / exceptions from the specification:

Section	Clause No./ Page No.	Statement of deviation/ Variations/Exceptions
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- 1) In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the specification.
- 2) If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**
- 3) Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----

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SCHEDULE-2

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Signature of the authorized representative of Bidder

Date

Name-----

Designation-----

Company seal -----

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.