




भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LIMITED

पारेषण व्यापार अभियांत्रिकी प्रबंधन

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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| TITLE/ शीर्षक | PACKAGE AIR-CONDITIONERS FOR AIR-CONDITIONING & VENTILATION SYSTEM | | | नाम / NAME | HK | SKS | SS | |
| | | | | दिनांक/ DATE | 24.05.14 | 24.05.14 | 24.05.14 | |
| | | | | 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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| <p>Project: 400/220 KV Switchyard, RAYALSEEMA, 1 X 600 MW, Stage - IV, Unit - 6</p> <p>Customer: APGENCO Consultant: DESEIN PRIVATE LIMITED Contractor: Bharat Heavy Electricals Limited.</p> | <p>TB 344 553 501</p> <p>Rev 01 Technical specification for Package Air Conditioner for Air Conditioning & Ventilation System</p> |  |
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SECTION -1

INTENT, TYPE OF AIR CONDITIONING, 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 **PACKAGE AIR CONDITIONERS FOR Air-Conditioning and 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

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any other form including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.

- 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 QUALIFYING REQUIREMENT


"The bidder should have supplied similar equipment of same or higher capacity to Electricity Boards, Power Utilities, installations such as power plants, substations, refineries, fertilizer plants or other industrial or commercial installations in India in any one year during the last five years. The same should have been in satisfactory operation for a minimum period of two years as on date of technical bid opening."

3.0.0 HVAC REQUIREMENTS FOR VARIOUS AREAS

Air-conditioning shall be provided on continuous basis to maintain the specified inside conditions.

11 TR air cooled package units having scroll compressor are envisaged on 3 X 50% basis (two (02) working and one (01) standby) to cater the air conditioning load.

The packaged indoor evaporative units shall be kept in AHU room where as condensing unit shall be kept outside the AHU Room either on ground or on roof. Indoor unit and outdoor units will be connected through interconnecting copper refrigerant pipe. Outlet of all the package units shall be collected in a common plenum chamber through flexible canvass connection & volume control dampers. The conditioned air is then distributed to various AC areas through duct along with diffuser (with volume control damper) running above false ceiling. The return air from all these areas shall be collected above false ceiling & shall be taken back to the AHU room

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Following major parameters shall be taken into consideration for the design of air conditioning.

| Ambient Conditions | DB in °C | RH |
|---------------------------|---|-----------------|
| Summer | 47.2 | 24.5% |
| Monsoon | 34.4 | 60% |
| Winter | 18.3 | 60% |
| Inside Condition | 24 ⁰ C±1 ⁰ C 50%±5% RH | |
| Illumination Heat load | 2 | Watt per sq. ft |
| Occupancy | 3 | people |
| Fresh Air requirement | 1.5 | ACPH |
| Safety margins | 10% | Sensible |
| | 10% | Latent |

Control Philosophy


Air conditioning system shall run round the clock.

4.0.0 SCOPE

4.1.0 SCOPE OF SUPPLY

4.1.0.1 Complete supplies for Package Air-conditioning System (As per clause no 3.0.0 above.)

| Sl. No. | Item Description | Unit | Qty. |
|----------------|---|-------------|-------------|
| 1 | 11 TR Package Air Conditioners with scroll compressor | Nos. | 03 |

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| | | | |
|---|---|--------|----|
| | for Refrigerant R-407 C. | | |
| 2 | Copper Refrigerant piping between indoor unit and outdoor unit - Size 5/8 inch for Liquid line. | Meters | 80 |
| 3 | Copper Refrigerant piping between indoor unit and outdoor unit - Size 7/8 inch for Gas line. | Meters | 80 |
| 4 | G. I. Drain Pipe for Indoor Units | Meters | 25 |

4.1.2 SCOPE OF SERVICES :

NIL

4.2.0 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.
- vi. Various rooms and foundations for locating air conditioning equipments.
- vii. Supply & installation of false ceiling and openings in false ceiling for diffusers as required.
- viii. Underdeck insulation of the air conditioned areas.
- ix. Supply of GI flat for earthing of equipments.

4.3.0 Utilities Available :

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

4.4.0 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 :

| | | |
|---|---|---|
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| 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 | |


4.5.0 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.

5.0 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 Package Air conditioning Unit :

- i) Scroll compressor suitable for refrigerant R-407C with drive motor, air cooled condenser with integrally finned copper tubes, interconnecting copper refrigerant piping, drain pipe, insulation, vibration isolator, controls and accessories.
- ii) Vibration isolation pads.
- iii) First charge of refrigerant and oil.

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 Package ACs 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 Package air-conditioner | TB-DS-344-553-032 |
| List of Other documents | | |
| 01. | Performance Guarantee Test procedure | TB-PG-344-553-200 |
| 02. | O & M Manual | |

| | | |
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| GUARANTEED TECHNICAL PARTICULARS | | | |
|---|--|--------------|----------------------------|
| SI No | Description /Details | Units | Vendor Confirmation |
| A | Package AC Unit of capacity 11 TR | | |
| a | Type | Nos. | Air Cooled |
| b | Quantity of Package AC units | Nos. | 3 |
| 1 | COMPRESSOR | | |
| a | Manufacturer | | |
| b | Type/ Model No. | | |
| c | Refrigerant | | R-407C |
| d | No. of Compressors per package AC unit | Nos. | |
| e | Maximum speed / opearting speed | rpm | |
| f | Nominal Capacity | | |
| g | COP | | |
| h | Evaporating Temperature | °C | |
| i | Condensing Temperature | °C | |
| j | Type of controls offered | | |
| i | HP | | |
| ii | LP | | |
| iii | Reverse phase | | |
| iv | Under voltage | | |
| k | Starter | | |
| l | Make and Type | | |
| m | Lubrication | | |
| n | Total weight of PAC | kg | |
| 2.0. | AIR HANDLING SECTION | | |
| 2.1 | FAN | | |
| a | Number of Fan | Nos. | |
| b | Make & Model No. | | |
| c | Capacity of each fan | cu.m/hr | |
| d | Static pressure | mmWC | |
| e | Static pressure external to PAC | mmWC | |
| F | Discharge direction | | |
| 3.0. | CONDENSER | | |
| a | Manufacture | | |
| b | Type | | |
| c | Quantity | Nos. | |
| d | Condenser Fans type | | |
| e | Fans operating power supply | | |

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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 |
|----------------|---------------------------------|--|
|----------------|---------------------------------|--|

- 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-----

**Project: 400/220 KV Switchyard, RAYALSEEMA,
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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.