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SCOPE OF WORK AND EQUIPMENT SPECIFICATIONS

1.0 SYSTEM DESIGN DATA

1.1 **General**

The basis of design, system selection, estimated requirements & other relevant data are outlined in this section.

1.2 **Scope of Work:** The scope of work for both HVDC Rihand and Dadri S/s includes:

1.2.1 Dismantling of existing HVAC system viz. 2x32TR and 1x50TR Compressor system, 2 nos. condenser water pump system, 3 nos. AHU, Cooling Tower, Condenser water/compressor, piping network, existing MCC/Electrical Panels, wiring/cabling, auxiliaries & Accessories of AC system etc.

1.2.2 Dismantling of existing equipment foundations and construction of new foundations for chiller/condenser water pump/AHU etc wherever required for installation & commissioning of new AC system.

1.2.3 Scope of work also includes buyback of dismantled old AC system and its accessories at Rihand & Dadri HVDC, which shall be handed over only after supply, erection testing & commissioning of new HVAC system. Therefore, prices shall be quoted by contactor accordingly.

1.2.4 **The contractor shall provide and ensure alternate arrangement for cooling of control room and other Areas in order to protect the failure of equipment prior to dismantling of the existing central AC system at both Rihand & Dadri stations and same shall be in operational condition till the commissioning of new HVAC system.**

1.2.5 Shifting of all the dismantled equipments/Accessories to the suitable location decided by Engineer-in-charge or his/her authorized representative within the substation premises.

1.2.6 The contractor shall visit the site to assess the nature of work as per site condition and shall design the new Air conditioning system to meet the requirements and technical specifications of the existing AC system.

1.2.7 Supply, installation, testing and commissioning of new centralized air-conditioning system as per CPWD specification, relevant standards, Indian/international codes to provide designed conditions in the following areas of HVDC building:

Sr. no.	Floor to be Air Conditioned	Supply Capacity
1.	Control Room Area	Minimum 2x32TR (Main & Standby)
2.	Other/Administrative Area	Minimum 1x50TR (Main only)

The central air conditioning and ventilation system shall comprise of the following which shall meet the performance in line with existing AC system:

a) Supply and installation of the water-cooled chilling Machines.
b) Pumping Systems (including chiller & condenser water pumps).
c) Cooling Towers
d) Air Handling Units (AHUs).
e) Electrical panels related to HVAC & Motor Control Centers.
f) Expansion tank along with the accessories.
g) Make up tank for pressurizing unit/expansion tank and cooling tower along with accessories etc.
h) Chilled water, condenser water, condensate drain piping inclusive of all valves, fittings and pipes insulations.
i) Insulation of pipes, pumps and tanks.
j) Water treatment plant.
k) Vibration isolation for all equipment.
l) Automatic Controls and instruments.
m) Power and control cable wiring & earthing from MCC panels to various refrigeration, air-conditioning and mechanical ventilation equipment control wiring and interlocking.

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n) Cutting holes, chases and the likes through all types of walls and finishing for all type of wall crossings, including sealing, framework, fire proofing, providing sleeves, cover plates, making good structure and finishing to an approved standard.

o) Balancing, testing and commissioning of the entire HVAC installations.

p) Test report, list of recommended spares, as installed drawings, operation and maintenance manuals for the entire HVAC installations. Standard product catalog of each equipment used shall also be provided.

q) Training of owner's staff.

r) For the purpose of Integrated Building Management system related allied works like providing openings in pipes. Integration of motorized valves etc. as required.

1.2.6 Scope of work also includes civil works associated with new HVAC installations viz. foundation for water chilling machines, cooling towers with angle iron framework, foundation for pumps, motors, expansion tank, AHUs, water proofing of floors, drain channels and sumps in AC pant including provision for sump pump and disposal.

1.2.7 Further, scope of work also includes supply and installation, testing and commissioning of all the Electrical works associated with installation of new HVAC system such as electrical panels, power cable, control cable, earthing, cable laying/termination and associated materials required for cabling, earth mat etc.

1.2.8 Scope also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the drawings/documents as being furnished or installed but which are necessary and customary to be performed under this contract for successful commissioning of HVAC system.

1.3 **Basis of Design**

1.3.1 **Site Location**

a) **HVDC Rihand Substation**
POWERGRID CORPORATION OF INDIA LTD.
±500KV HVDC Rihand Substation
Inside NTPC Rihand Thermal Power Plant
Bijpur, Sonebhadra, Uttar Pradesh-231223

b) **HVDC Dadri Substation**
POWERGRID CORPORATION OF INDIA LTD.
HVDC terminal vidyut nagar
G B Nagar, Uttar Pradesh, India-201008

1.3.2 **Ambient Temperature:**

Maximum ambient temp. considered for design = 50 °C
Minimum ambient temp. considered for design = 5 °C
Inside temperature required = 24 °C ± 1°C
Inside RH required = 50%

1.3.3 **Inside design Conditions:** Minimum as per Previous installed Equipment

1.3.4 **Fresh Air** = As per Previous installed Equipment

1.4 **Cooling Loads:** As per Previous installed Equipment.

1.5 **Equipment Selection**

1.5.1 **Central A.C. System**

Water Cooled Reciprocating/scroll/skew/centrifugal Chilling Machines:

Minimum 50 TR x 1 Nos. (1 working for Service Area)
Minimum 32 TR x 2 Nos. (1 working + 1 standby for Control Room Area)

Above are minimum technical requirements and bidders are free to offer AC System having better technical features. Further, all the materials to be supplied under this contract should be of reputed make having good quality, conforming to relevant national/ international standards.

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The actual system design shall be done after detailed heat load calculations considering the outside and inside design conditions, ventilation requirements & internal loads.

The type, capacity and quantities of the various components of the system shall have to be worked out and specified. The various components of the system shall be so selected as to match each other under operating conditions of full load as well as anticipated partial loads.

The overall dimensions of various equipments in the system shall be suitable for installation in the available space. The permissible loading of the building structure, acceptable noise level and aesthetics should also be considered.

1.6 System Design

It is proposed to provide chilled water type central plant for air-conditioning the various areas of the building. The system shall be designed as described below

Sr. no.	Description	Control Room Area	Other Area	Installation Location
		Qty.	Qty.	
1.	Water cooled chiller Machine	Minimum 2x32TR (Main & standby)	Minimum 1x50TR	AC plant room (Ground Floor)
2.	Condenser Water Pump set	2 nos. (Main & standby)	2nos. (Main & standby)	AC plant room (Ground Floor)
3.	Chiller water Pump set	2 nos. (Main & standby)	2nos. (Main & standby)	AC plant room (Ground Floor)
4.	Air Handling Unit	2 nos. (Main & standby) CMM-467	1 no. , CMM 300	2nd floor (height approx. 15mtrs. From Ground floor)
5.	MCC/LT Electrical Panel	2 nos. for 2x32TR AC system	1 no. for 50TR AC system	AC plant room (Ground Floor)
6.	All accessories/ auxiliaries	2 sets	1 sets	As per system design
7.	Cooling Tower	Minimum capacity 100TR 2 nos. (Main & standby)		Terrace (height of approx. 30 mtrs. From ground floor

The HVAC system shall have condenser water and chilled water pumps with main and standby arrangement along with AHU system and the LT supply panels for control room and other Area.

The conditioned air shall be uniformly distributed through existing insulated ductwork and grilles/diffusers.

All the work shall be carried out as per CPWD specification and direction of Engineer-in-charge. Further, the pump and motor ratings proposed for new AC system shall meet the required existing technical parameters.

1.7 Drawings

The drawing forming a part of these specifications shall indicate broadly the proposed scheme for equipment layout and location. The contractor shall take approval for the proposed scheme and thereafter have to execute the scheme as approved. However, any changes in plant room may be permitted to suit the equipment offered and actual conditions, subject to the approval of Engineer-in-charge. The fabrication and working drawings shall be prepared by the Contractor and got approved by the POWERGRID before execution.

1.8 Technical Data

The Contractor shall furnish complete technical data of the equipment offered by them for evaluating the required actual capacity and rating of each items.

1.9 Performance Data

The contractor shall guarantee that the air-conditioning plant shall maintain the design inside temperature and the relative humidity as specified. The Contractor shall also guarantee that the capacity of various components as well as the whole system shall not be less than specified.

2.0 WATER COOLED CHILLING MACHINES

2.1 General

The water chilling units shall be complete in all respects along with accessories and shall generally comply with the specifications as mentioned in CPWD specification or as per relevant standards and Indian/ International codes.

The condenser, evaporator shall be complete in all respects and include supports for mounting, refrigerant and water valves (isolating valve at inlet and balancing valve at outlet) at in and out connection, discaling connection, stem thermometer and pressure gauges at water inlet and outlet, combined dirt & air separator, expansion tank, make up tank, fittings etc., as required.

The above-mentioned components shall all be interconnected by suitably sized and properly designed heavy class pipe and fittings complete with accessories and controls such as valves, liquid line sight glass, strainer, expansion valve etc.

The units shall be complete with a Microprocessor Based Control Console mounted directly on the unit and pre-wired with all operating and safety controls and Communication card.

2.2 Installation and Testing

The complete water-chilling unit shall be mounted on a suitable foundation using grouting bolts, nuts, channels, etc. Suitable vibration isolation pads of high efficiency in preventing transmission of vibrations.

On installation, the refrigerant circuits and the connected equipment and parts shall be thoroughly tested against leaks as per CPWD specification. Further, the water chilling unit shall be tested for performance. The capacity in tons shall be calculated from measurements of temperature difference and flow rates of water in the condenser and cooler at site conditions.

All instruments and personnel for tests shall be provided by the Contractor and no extra charges shall be paid by POWERGRID.

All safety controls, settings for low and high refrigerant pressure controls, starter overload trips etc. shall be suitably set and a record of all the setting shall be furnished to POWERGRID.

3.0 AIR HANDLING UNITS

The work under this part shall consist of dismantling of existing AHU system along with accessories and furnishing all labor, material equipment and appliances for new AHU system such as housing/casing, cooling coils, Fans , thermometer, pressure gauge, Filters, 3 way automatic valves etc required to install Air Handling Units and other allied work to make air conditioning system ready for operation.

4.0 COOLING TOWERS

4.1 General

All the items as required for cooling towers (natural/induced) viz. cooling tower body, fan/motor and starter assembly, fill media, distribution pipes, concrete-steel foundations, etc shall be included for successful commissioning of Cooling Towers.

Further in case of Induced draft cooling, Main and standby arrangement shall be provided along with all accessories in order to run the AC system without any shutdown. Due care shall be taken with regard to corrosive effects and maintainability in the design of the water distribution system of cooling towers.

In case of induced draft cooling the fan motor shall be totally enclosed type conforming to I.P.65 for outdoor operation.

All towers shall be provided with a ladder with safety cage and hand rail, overflow switches, drain pipeline upto nearest drain, makeup tank, makeup waterline from nearest point. All the accessories viz. valves, strainer, flanges, fittings etc. shall be within the scope of contractor without any additional cost.

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4.2 **Testing**

Tower performance curves shall be furnished by the contractor. The entire acceptance test to demonstrate the performance of the installed cooling tower shall be conducted in accordance with the CPWD specification, relevant standard and Indian/International codes.

5.0 PIPE WORK

The scope shall comprise of dismantling the existing pipe lines along with all the accessories including demolition of any civil work. The scope also includes the supply, installation, testing and commissioning of pipe, fittings, and valves, etc. and testing/balancing of complete system. All piping work, accessories shall conform to best quality standards and conforming to relevant Indian Standards and Codes:

All the accessories viz. flange, branches, bends, reducers, strainers, valves (Gate, Globe Check and Butterfly Valves, pressure switch, pressure gauges, hangers/supports, wielding etc. shall be included in the rates of the bidder.

All the piping supply, installation, testing, painting etc shall be carried out as per CPWD specification and relevant standards and Indian/International codes.

6.0 INSULATION

The insulation of water piping, air handling units, ducting, chillers, hot water generator etc. and acoustic treatment of AHU enclosures, plant room, etc. as applicable, shall be carried out as per CPWD specifications and relevant standards and Indian/International codes.

7.0 LT SWITCHGEAR PANEL

The scope of work includes the dismantling existing of LT AC and MCC Panels installed in AC plant along with all the equipments and accessories. Further, the existing cabling laid for supply and control to various equipments of HVAC system shall be dismantled.

The specification covers the design, material, construction features, manufacture, supply, inspection and testing at the Contractor's or their principal supplier's work, delivery and performance testing of L.T. Switchgear panels.

The switchgears would comprise of LT switchboards, power panels, control panels and Distribution Boards (DBs) required for the supply of power to various equipment of air-conditioning and Ventilation system. The LT supply boards shall have spare feeders after utilizing required feeders for all the components of new AC system.

The bidder shall follow the Model technical specification for POWERGRID for LT switchgear.

8.0 LIST OF DRAWINGS

The CONTRACTOR shall furnish the following drawings for panel and switchgear after placing the order.

8.1 Overall outline dimensions and general arrangement including plan, front elevation, rear & side elevations, clearances required in front and back.

8.2 Switchgear layout plan including floor openings, fixing arrangements and loading details.

8.3 Schematic control diagrams to cover controls, protection interlocks, instruments, space heaters, etc. for each type of module.

8.4 a) Detailed internal wiring diagram of each type of module, including terminal block numbers, ferrule numbers and the external cable connection designations.

b) Item wise bill of material for each module, listing all devices mounted and also otherwise furnished like cable glands, indicating the Manufacturer's type, rating, quantity & special notes, if any.

8.5 Inter-panel interconnection wiring diagram including terminal numbers and ferrule numbers

8.6 Switch development diagrams

8.7 Each type of protective relay and circuit breaker release characteristics.

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9.0 TEST CERTIFICATES

9.1 Type test certificates of all standard component parts, e.g. contactors, breakers, switches, fuses, relays, CTs, PTs and for the standards factory-built assembly shall be submitted by the CONTRACTOR as per category of materials mentioned in the list of approved makes.

9.2 Routine test certificates of all components shall be submitted by the CONTRACTOR before dispatch.

9.3 Equipment shall not be despatched unless the test certificates are duly approved by the POWERGRID before dispatch.

9.4 The specified number of copies of the compiled and approved test certificates shall be submitted to the POWERRGRID before dispatch of the equipment.

9.5 Wherever required, the factory acceptance tests shall be carried out and submitted as per BIS, BS or IEC as applicable to the owner for approval, before dispatch to the site.

10.0 INSTRUCTION MANUALS:

The CONTRACTOR shall furnish specified number of copies of the instruction manual which would contain detailed instructions for all operational & maintenance requirement. The manual shall be furnished at the time of despatch of the equipment and shall include the following aspects.

a) Outline dimension drawings showing relevant cross-sectional views, earthing details & constructional features.

b) Rated voltages, current, duty-cycle & all other technical information, which may be necessary for correct operation of the switchgear.

c) Catalogue numbers of all components liable to be replaced during the life of the switchgear, storage, handling at site, erection, pre-commissioning tests, operating & maintenance procedure, Precautions to be taken during operation & maintenance work

11.0 MODE OF MEASUREMENT:

Measurement of all the items shall be carried out as per CPWD specifications.

12.0 TESTS AT SITE

All the tests at site on Air conditioning system shall be carried out as per CPWD specification and relevant standards and India/International codes.

13.0 BUILDING MANAGEMENT SYSTEM FOR AIR CONDITIONING WORKS

The bidder shall provide Building management system (BMS) with minimum features as per CPWD specifications. The number of Analog and Digital Input/ Output of Direct Digital controllers (DDC) shall be decided after detailed Engineering of all the parameters, control logics etc.

14.0 WORK COMPLETION PERIOD

It is clearly understood that time is essence of the contract and same shall be strictly adhered to. The entire scope of work viz. supply, installation, testing, and commissioning shall be completed within ^ (9) months from the date of issuance of purchase order.

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15.0 GENERAL TERMS AND CONDITIONS

15.1 The contractor shall take approval from the owner prior to supply and installation of any material required for SITC of AC system in order to confirm that the materials are as per specification, relevant standards and to the satisfaction of Engineer-in-Charge.

15.2 The contractor has to make all necessary safety arrangement and competent person has to supervise the work.

15.3 The contractor should deploy adequate manpower and T&Ps, resources etc. required for execution of work.

15.4 The contractor shall only use the required materials of approved brand and quality as per satisfaction & direction of Engineer in-charge.

15.5 The contractor shall ensure observance and performance of superior quality work as per direction and full satisfaction of Engineer In-charge.

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15.6 The contractor would only deploy manpower of good character and should not be indulged in any unlawful activities while working at site.

15.6 Safety is the most important aspect, which is to be adhered to strictly by the contractor. The contractor has to supply all PPEs viz. helmet, safety shoes, gloves etc. to their working personnel and has to take all sorts of safety precautions related to works failing which POWERGRID shall take necessary action.

15.7 POWERGRID shall, not entertain any sort of legal obligation compensation etc., arising out of acts of mishaps or carelessness on the part of the contract or his staff during the execution of the work.

15.8 Site will have to be neatly cleared before packing up work after completion.