BHARAT HEAVY ELECTRICALS LIMITED

INDUSTRIAL SYSTEMS GROUP BANGALORE

ENQUIRY SPECIFICATION FOR

AIR-CONDITIONING SYSTEM FOR CONTROL ROOM BUILDINGS

FOR

AUGMENTATION/UPGRADATION OF BF HIGHLINE CONVEYING SYSTEM-BSL/BOKARO

Note: - In case any clarification is required, with regard to technical specification, please contact us over Email sbj@bhelisg.com, kms@bhelisg.com, jv@bhelisg.com

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List of drawings/documents enclosed

1. Control Room Layout for PSD-1 **(IS-1-LE-671-101-E195)**, Rev.02
2. Control Room Layout for PSD-5 **(IS-1-LE-671-101-E198)**, Rev.03
3. Architectural details of PSD-1 Control Room, Rev.01
4. General Specification for air Conditioning & Ventilation System (GS – 08).
5. List of Preferred Makes (Chapter 13 of GTS).
6. Standard Bidding Document of BSL.
7. Annexure-I (**Questionnaire/ data to be filled by the bidder**), Annexure-II (**Typical format for QAP**), Annexure-III (**Price bid format**), Annexure-IV (**General technical specification**) & Annexure-V (**Checklist**).

Note:-Bidder to study general technical specification (GTS No: MEC/S/E24F/11/38/0/00/00/F1874/R0) and SBD (standard bidding document) and these shall form base document for this tender specifications Bidder can download these documents from website: **www.sailtenders.co.in**.

SECTION-I: INTRODUCTION

General

The SAIL Corporate Plan envisages expansion of Bokaro Steel Plant, Bokaro, Jharkhand, from 4.0Mt/yr to 5.77 Mt /yr of hot metal. It has five blast furnaces having identical useful volume of 2000m3 and rated capacity of each furnace is 2640 TPD of hot metal production. All the five furnaces are provided with BLT charging system and conveyorised stock house with sinter & coke screening facilities. For enhancement of hot metal capacity will lead to stabilise the existing Blast Furnace stock house conveying system to its original design capacity for making it adequate for phase-I expansion to 5.77 Mt/yr.

To handle Blast Furnace charging materials required for 5.77MT expansion of BSL, Bokaro from its present production capacity, existing conveyor system within each stock house along with motors & mounted electrics including each shuttle conveyor shall be completely replaced. Also optimum automation shall be provided in Highline operation.

Package type air-conditioning system shall be provided in the control rooms at PSD-1 & PSD-5 where in various electrical & automation panels/ equipments shall be installed for smooth operation of the BF Highline conveying system.

SECTION-II: SITE DATA

1.0 GENERAL PROJECT INFORMATION:

Design Basis

The Mechanical equipment for the BF high line conveying system shall be designed taking into account following design data:

1.1 Ambient condition

Average elevation Mean Sea Level	-	229 m
Barometric Pressure	-	980 mbar
Absolute maximum	-	50^0C
Absolute minimum	-	1.8^0 C
Highest of mean monthly	-	43.8^0 C
Lowest of mean monthly	-	8.1^0 C
Relative Humidity (Maximum)	-	100%
Climate	-	Tropical humid
Mean Wind Speed	-	7.8 km/h
Maximum wind speed	-	108 km/h
Rain fall :		
Annual Average	-	1197.3 mm
Heaviest in 24 hr.	-	272.0 mm

Note- Maximum Humidity and temperature are not likely to occur simultaneously.

Power supply available

- Voltage : 415 V, (+) 10 % and (-)15%
- Phase : 3 phase, 4 wire solidly grounded system
- Frequency : 50 Hz (+/-) 6 %

- Neutral : Solidly grounded.

- System Fault Level : 50 kA (RMS) for 1 second.

Ambient Air Quality:

Laden with coal and steel dust particles, fumes, chemical gases from coke ovens and quenching towers.

2.0 SITE CONDITIONS AND INFRASTRUCTURE FACILITIES

Location

Bokaro Steel Plant (BSL), SAIL is located at Bokaro Steel City in the state of Jharkhand in the eastern region of India. The site lies between 23.29^0 North latitude and 86.09^0 East longitude.

The location of Bokaro Steel City is as follows:

From New Delhi, the national capital	-	1209	kms
From Kolkata	-	220	kms
From Chennai	-	1900	kms
From Mumbai	-	1782	kms

The distance from State Capital Ranchi to Bokaro Steel City is 140 kms. The Steel Plant is well connected by rail and road network. The nearest railway station is Bokaro Steel City Station of the SE Railway.

Infrastructure Facilities Outside the Plant

A.Railway

Bokaro Steel Plant is connected to Indian Railways network via. Bokaro Steel City Station of S.E. Railways. The track gauge of South Eastern Railways as well as of the plant tracks are standard broad gauge i.e. 1676 mm.

B.Road

The plant is well connected with National Highway No. 32 and National Highway No. 23.

C.Sea Port

The site can be served from both Calcutta and Haldia Ports which are approximately 360 Km away from the site by rail.

D. Air Traffic

The nearest air port connected to the national network is Ranchi, which is approximately 120 Km from the plant and the nearest international air port is Kolkata at approximately 320 Km by road from the plant.

A small private air strip exists at Bokaro Steel City where facilities for landing of light air craft are available.

3.0 GENERAL RULES AND REGULATIONS AND STANDARD

General Rules and Regulations

All plant units with respect to their location, layout, general arrangement and design of equipment, structural design, etc. shall be safe to the personnel and conform to the relevant statutory requirements issued by Jharkhand Government and the Government of India but not limited to the following.

- Jharkhand State Factory Rules/Acts.
- Indian Electricity Rules/Acts
- Electricity Regulatory Commission Act
- Indian Petroleum Regulations/Acts
- Indian Boiler Regulations/Acts
- Indian Explosives Acts
- Gas Cylinders Rules/Acts
- Carbide of Calcium Rules/Acts
- Static and mobile Pressure Vessels Codes (unifired) Rules/Acts
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts

Pollution control measures shall be provided considering the latest norms and international standards. These should satisfy the stipulations of Central Pollution Control Board and Department of Environment and Forest, Government of India.

SECTION-III: INTENT OF SPECIFICATION

03.01 The intent of this technical specification covers design, engineering, manufacture, supply, handling, fabrication/ assembly, shop inspection & testing, painting at manufacturer's shop as well as at site after erection, supply at M/s Bokaro Steel Plant, Bokaro, Jharkhand transportation from shop to site, drawing out items from BHEL stores at the time of erection, transportation within the site, temporary storage (if required) at erection site, safety & security during erection, erection, testing & commissioning and handing over to the end user of the air-conditioning system for the smooth operation of the BF Highline conveying system.

03.02 The intent of the specification is to make the bidder appreciate his total involvement/ commitment for this package to enable him to execute the project completely as per requirement of the augmentation proposal as specified in this specification.

03.03 This contract specification is for guidance only and the design & engineering will be complete in all respect and any equipment or facility not covered in this specification but considered essential for proper installation and smooth operation, ease of maintenance of plant/ equipment and demonstration of PG parameters of the BF highline of conveyor system will be deemed to be included in the scope of the bidder.

03.04 The successful bidder will be responsible for coordinating the supplies covered in the different parts of this Specification from different sources and execute the contract within agreed time schedule.

03.05 The project is scheduled to be implemented matching with the shutdown schedule of different BF prepared in consultation with Blast Furnace Operation Department. The erection & commissioning of the air-conditioning system shall depend on front availability at site (1 to 1.5 years delay). So the bidder shall consider this point while preparing the offer. No extra payment shall be made for the delay in E & C work due to unavailability of front at site.

03.06 MECON LIMITED, have been appointed by BSL for rendering the detailed engineering and consultancy services for setting up the project.

03.07 The contract shall be on lump sum basis for the package. Within the scope of the contract no variation shall be admissible to the contractor. It is recommended that the bidders shall submit their LUMPSUM offers in the prescribed price format only.

SECTION-IV: SCOPE OF WORK AND BATTERY LIMITS

04.01 SCOPE OF WORK

04.01.01 The scope of this package will cover **Design, manufacture, inspection, shop & primary coat of paint & supply of complete plant & equipment to Bokaro Steel Plant Site, transportation to site (BHEL stores), drawing items from the BHEL stores at the time of erection, transportation within the site, temporary storage (if required) at erection site, safety & security during erection, erection, testing & commissioning and handing over to the end user for complete & trouble free operation of the package type air-conditioning system for control rooms at PSD-1 and PSD-5** of the BF Highline conveying system to be executed on turnkey basis. The details of locations to be air conditioned, drawings etc are mentioned in the table below:

SL NO	LOCATION WHERE PAC IS TO BE PROVIDED	REFERENCE DRAWING NUMBER	ELEVATION OF THE FLOOR TO BE AIR CONDITIONED	MINIMUM TR (OF EACH PACKAGE AC)
1	PSD-1 (room size:11.77 (L) x 6.77(W) x 2.7 (H)	IS-1-LE-671-101-E195	3.0M LEVEL	8.5
2	PSD-5 (room size: 10.13 (L) x 8.85 (W) x 2.95 (H)	IS-1-LE-671-101-E198	GROUND FLOOR LEVEL	8.5

04.01.01 The air conditioning system (package type) shall be provided for smooth & trouble free operation of the Blast Furnace Highline conveying system by limiting the temperature rise w.r.t ambient air temperature & preventing the ingress of atmospheric dust.

04.01.02 Package type air-conditioning system (1W + 1S) of minimum 8.5 TR capacities shall be provided at PSD-1 and PSD-5 control rooms (*hence the total number of package air conditioning system to be supplied by the successful bidder is 4*) where PLC panels and other electrical accessories will be kept. Water cooled DX chiller/ water cooled type package air-conditioning system with condenser cooling tower shall be provided. The bidder is advised to calculate the TR value as per the basic scheme drawings & design data furnished in this TS before submitting the offer. The successful bidder shall submit the design calculation for the package air-conditioning system for both the control rooms for approval and the final TR shall be selected as per the design calculation approved by MECON/ BSL/ BHEL. **If the TR value is coming higher than 8.5 TR during detailed engineering based on design calculation, the successful bidder has to go for the higher TR. The bidder shall consider this during preparation of the offer and clearly mention the TR arrived from the heat load calculation. The pricing shall be done by the bidder based on the TR arrived at by bidder's calculation or 8.5 TR per AC whichever is higher.**

04.01.03 Along with package A/C unit 1W+1S combination, condenser cooling pump 1W+1S combination shall be provided. The packaged unit shall comprise of compressor, cooling coil, refrigerant circuit, fan, air filters, condenser, pump for condenser water re-circulation, ducting, diffusers, supply air-grills, return air ducts, cooling tower, electric drives and controls, instruments and other necessary standard accessories.

04.01.04 Condenser water piping complete with valves, fittings, installation accessories, etc.

04.01.05 25 mm NB GI pipe of length 75 m for make up water connection to the cooling tower.

04.01.06 Mechanical type cleanable, duplex pot strainer with by-pass and isolating globe valves.

04.01.07 G.I. ducting (as per IS: 655-1972) complete with volume control damper, adjustable grills/ diffuser for supply air, fixed type grills/ diffuser for return air, brackets, hangers, flanges, etc. Foundation bolts, plates, base plates, supporting brackets and inserts in concrete for erection of equipment etc. Supply of civil load data/ drawings for all civil works. Marking openings in walls/ floors/ ceiling for taking out ducts/ cables/ piping etc. shall be in the scope of the bidder.

04.01.08 Resin bonded glass wool / fiberglass, 50mm thick, with aluminium foil pasted on outer face.

04.01.09 Volume control dampers in all branch ducts. Strip heaters of adequate capacity shall be provided for winter heating and dehumidification to maintain the relative humidity & temperature inside the control rooms and shall be suitable for 415 V, 3 ph, 50 Hz AC power

supply. The successful bidder shall submit the design calculation for the capacity of strip heaters for heating in winter for approval. The strip heaters shall be of continuous duty industrial type.

04.01.10 The proposed package unit shall be supplied with first change of refrigerant and lubrication oil.

04.01.11 Condenser cooling make up line shall be laid to suit site from the battery limit of approximately 50m. The laying of pipe, pump etc. necessary for the cooling tower from this point shall be in the scope of the bidder.

04.01.12 All the works envisaged in this package shall generally be carried out by the successful bidder based on basic scheme drawings furnished in this TS. The successful bidder shall prepare all necessary general arrangement drawings, ducting layout drawings, QAPs including fabrication/ erection drawings of the proposed system and facilities. The drawing/ data sheets/ QAPs shall be submitted to BHEL for BSL/ MECON approval.

04.01.13 The bidder shall survey the site, study drawings/ documents and discuss with BHEL/ purchaser/ consultant, if required, regarding any further technical clarification and satisfy himself with respect to the nature and extent of work involved. The successful bidder of this package will have to work in co-ordination with the BF operation/ BHEL.

04.01.14 Deputation of representatives of equipment suppliers and technology suppliers at site for supervision of erection, testing and commissioning. The successful bidder shall provide all types of training to BSL/ BHEL personnel required for the operation & maintenance of the packaged type air-conditioning system.

04.01.15 Applying final finish coat of paint as per approved procedure & shades before handing over, first fill of lubricant & oil, supply of special tools & tackles, handling equipments.

04.01.16 The bidder shall consider the maintenance of the complete air-conditioning system during the guarantee/ warrantee period of the equipments. The bidder shall consider the price for maintenance during guarantee/ warrantee period in the price quoted. This price quoted shall be in the prescribed format only (Annexure-III). The successful bidder shall visit the site once in every 3 (three) months during the guarantee/ warrantee period to ensure smooth & satisfactory performance of the package type air-conditioning system. Any emergency maintenance required due to breakdown of the system, during guarantee/ warrantee period, shall also be done by the bidder without any extra cost.

04.01.17 The Contractor will bring all the required handling equipments and safety appliances for transportation, handling, erection & commissioning of plant & equipment.

04.01.18 Testing and trial run of the system shall be carried out by the contractor on continuous basis followed by commissioning. On successful commissioning of the air-conditioning system PG test will be carried out as elaborated in the relevant chapter.

04.01.19 Construction of temporary storage facility (if required) at erection site & site office for the bidder, receiving/ delivery of items at site, their proper storage at BHEL stores and handling at site, watch and ward services during erection shall be in the scope of the bidder.

04.01.20 Getting Purchaser's/ consultant's approval for the drawings prepared by the successful Bidder, obtaining required approval from statutory authorities, providing adequate personnel, equipment, tools & tackles for timely completion of the project.

04.02 GENERAL SPECIFICATIONS:

1. BHEL will have privities of contract only with successful bidder and it has nothing to do with the sub vendors/ personnel engaged by him & their conditions of employment etc.
2. Bidder to note that material handling fronts during erection will be given in a staggered manner. So, Bidder has to consider and envisage mobilization of all resources required, including manpower, in a shortest possible time during execution. For this bidder has to consider advance resource planning so that erection by the successful bidder is not delayed. No extra money shall be paid for mobilizing / demobilizing of manpower, materials/ Tools & tackles.
3. Bidder shall visit the Site to familiarize with the site constraints before submitting the offer to BHEL complete in all respects. No issues arising out of site condition or layout constraints shall be entertained later on during detail engineering and any modification required due to site condition or layout constraints shall be done by successful bidder without any cost implication to BHEL.
4. Bidder shall submit the weekly engineering progress reports in BHEL's format and depute full project team for attending all project review meetings either at purchaser/ consultants/ BHEL premises as called by BHEL without fail.
5. Bidder to note that time is the essence of this contract, thus they shall submit the submission schedule for the list of drgs within 10days from zero date i.e. LOI date. No delay shall be entertained later on.
6. Bidder shall make their own arrangements well in advance for heavy erection equipments like bigger cranes that are required for erection of equipments which are at higher height.
7. Bidder shall depute continuously and maintain sufficient nos. of engineers and supervisors, at site for supervision of E&C, coordination and commercial activity for the package.

In case Bidder fails to maintain the proper staff at site till project completion, BHEL shall arrange staff at bidders cost and suitable pro-rata deductions shall be made from payables, for the duration of such absences, at the prevailing rate of BHEL manpower cost as penalty at the sole discretion of BHEL whose decision shall be final and binding.

Note:

1. Bidder to note that list above is not exhaustive and any work required for completing the system and ensuring its satisfactory running shall also be in the scope of this package bidder.
2. Bidder shall submit the signed and stamped copy of all the pages which constitutes this technical enquiry specification signed by authorized signatory and clearly mentioning each clause under following two categories to avoid any ambiguity in scope understanding & the scope division as a technical offer during bidding.
   a. **"accepted without deviation and considered in scope of work"**
   b. **"Not considered in scope of work".**
3. Bidder shall all the items within the scope of work from the preferred make list (GS-13 enclosed) only.
4. Bidder to kindly note that Technical bids shall be accepted only if the Consultant/ End user approves the vendor. Further if vendor delays in submitting clarifications/ inputs BHEL shall have option to reject the tender with three days notice. The communication in this regard shall be done by post/ email/ phone. BHEL reserves the right in approving the vendor & accepting/ rejecting the technical bids. **The bidder shall submit the Format-A enclosed duly filled in enclosing relevant documents required for getting vendor approval from BSL/ MECON.**

04.03 Miscellaneous Scope of Supplies & Services

In addition to requirements indicated above, bidder's scope of supply and services for miscellaneous items shall also include but not limited to the following: -

- Supply of all erection accessories and materials, all steel members (angle, channel, plate, steel sheet, etc.) for installation of equipment, supporting structures, flexible metallic hoses, sealing materials for openings/ conduits etc.
- Special tools & tackles.
- First fill of all consumables.
- Unpacking, visual checking against physical damages to the cases/ equipment, cleaning of equipment before start of erection. Damage/ shortage, if any, shall be reported to Purchaser.
- Touch-up painting of damaged portion of the erected equipment/ structures as per the instructions of Purchaser. The painting of structures fabricated at site by the bidder shall also be in the scope of work of bidder. Supply of the paints shall be in the scope of bidder. Painting schedule shall be submitted by

the successful bidder during detail engineering. Painting shall be as per approved painting schedule.

- Clearing of all unused materials from the premises and depositing the same at a place indicated by the Purchaser.
- Providing communication facilities for his purposes.

Bidder shall co-ordinate and obtain clearances and instructions from the Purchaser during modifications, erection, testing & commissioning of plant equipment and shall interface & integrate their equipment with the Purchaser's equipment. Bidder shall be solely responsible for the safety and security of the equipment till plant is handed over to Purchaser. If any pilferage / theft happen, contractor has to report to police and BHEL. Lodging FIR on behalf of BHEL and arranging inspection by concerned officials shall be done by the contractor. The installation & modification work shall be carried-out only by competent contractor holding a valid license issued by the State Government for carrying out installation work of the voltage classes involved under the direct supervision of and by persons holding valid certificates of competency for the same voltage classes recognized by the State Government.

04.04 DELIVERY

The project is scheduled to be implemented matching with the shutdown schedule of different BF prepared in consultation with Blast Furnace Operation Department. The erection & commissioning of the air-conditioning system shall depend on front availability at site (1 to 1.5 years delay). So the bidder shall consider this point while preparing the offer. No extra payment shall be made for the delay in E & C work due to unavailability of front at site.

04.05 OBLIGATIONS OF PURCHASER

Construction & Drinking water shall be supplied free of cost by the Employer to the Contractor at a single point within a distance of 300 m from the battery limit. The Contractor shall make its own arrangements to lay and maintain necessary distribution lines, valves, etc., from this point at its own cost.

The Contractor shall be responsible to store water in sufficient quantities to meet its requirements and ensure that there is no wastage of water. Quantum of supply will depend on availability and no claim for shortfall shall be allowed by the Employer. This is as per the standard bidding document (SBD) clause 20.4.2.

The Employer will supply 415V, 3-Phase four wire AC power in bulk at one point within 300 meters of battery limit, for construction & erection free of charge. The Contractor shall make its own arrangements to lay and maintain necessary distribution lines and wiring at its own cost. Electrical power for fabrication work, if any, envisaged at site shall be supplied, metered and charged at the rate prevailing from time to time.

The Contractor shall ensure that the electrical equipment employed by the Contractor will be such that the aggregate power factor does not fall below 0.8 at the Employer's terminal point. This is as per the standard bidding document (SBD) clause 20.4.3.

SECTION-V: TECHNICAL SPECIFICATION/DESIGN DATA

05.01 General

This specification covering broad parameters and technical requirement shall be applicable for design, manufacture, supply, erection, painting, testing and commissioning of the package type air-conditioning system and standard accessories. The equipment shall, also, comply with Statutory Regulation and Safety Codes in force in the locality of installation.

The air-conditioning system shall be done by bidder conforming to Technical Specifications indicated in General Technical Specification (GTS) No: MEC/S/E24F/11/38/0/00/00/F1874/R0. Bidder shall supply all equipment, components from Purchaser's List of Approved Makes as per Chapter-13 of GTS. This Technical Specification (TS), General technical Specification (GTS), SBD and other attached documents considered, as a whole shall comprise the complete Tender Specification.

05.02 SITE OFFICE FOR THE BIDDER & TEMPORARY STORAGE FACILITY

Bidder shall construct his own site office, temporary storage (if required) at erection site for carrying out site activities and storing of material.

05.03 GENERAL INSTRUCTION TO BIDDER

Contractor shall inspect the site, examine and obtain all information required and satisfy himself regarding matters and things such as access to site, communications, transport, right of way, the type and number of equipments and facilities required for the work, availability of local labor, materials and their rates, local working conditions, weather, tidal/ flood levels, subsoil conditions, natural drainage etc. Ignorance of the site conditions shall not be accepted by the Owner as basis for any claim for compensation or extension of time. The submission of a bid by the contractor will be construed as evidence that such an examination was made and any later claims/ disputes in regard to price quoted shall not be entertained or considered by the owner on account of ignorance of prevailing site conditions.

Bidder has to coordinate with electrical contractor/ Automation agency for successful erection, commissioning, performance guarantee trials.

The price schedule/ Bill of Quantities mentioned are only indicative & to facilitate progressive payment to the vendor during execution of the contract. Bidder to note that the quantities mentioned are not exhaustive/ complete and any work/ equipment required for completing the system and ensuring its satisfactory running shall also be in the scope of this package bidder.

All scraps (if any) generated during dismantling the existing facilities and unnecessary structures/ spares shall be disposed by the bidder within a range of 7.0 kms in premises of BSL at the place designated by the employer.

05.04 Heat Load Details for each control room:

Sl. No.	Item/ Equipment	Heat Load (W)	Quantity	Total Heat Load (W)
01	PLC Panels	400	4	1600
02	PCs & Monitor	200	5	1000
03	Marshalling/ Relay Panel	650	2	1300
04	UPS & DBs	500	2	1000
05	Printer	100	1	100
06	Lighting Load	1000	1 Lot	1000
07	Person	75	4	300
08	Miscellaneous	500	1	500

05.05 Design Parameters:

Sl. No.	Description	Value	Unit
01	Inside Temperature to be maintained in control rooms	24 (+/-)2	deg C
02	**Ambient Conditions**		
02.01	Summer	50.0 deg C	26%
02.02	Monsoon	32.2 deg C	85%
02.03	Winter (absolute minimum)	1.8 deg C	25%
03	Relative Humidity to be maintained inside the control rooms	50% (+/-) 5%	
04	**PSD-1 control room (approximate dimensions for air-conditioning)**		
04.01	Length	11.77	m
04.02	Width	6.77	m
04.03	Height	2.7	m
05	**PSD-5 control room (approximate dimensions for air-conditioning)**		
05.01	Length	10.13	m
05.02	Width	8.85	m
05.03	Height	2.95	m

Note: Wall and window area shall be as per the architectural drawing enclosed.

MANPOWER ASSISTANCE:

During testing and commissioning of the system, placement of equipments, contractor to provide required manpower assistance. Manpower assistance like skilled/ unskilled should have the required trade tools along with them. Commissioning assistance used on Sunday is also to be considered as normal working day, no over time on Sunday will be considered.

Note: For any additional work which has not been envisaged in the scope of contract may be carried out at the discretion of BHEL on daily basis with skilled/ unskilled

manpower supply from the contractor. The quoted rate for manpower assistance shall remain valid for this purpose.

GENERAL POINTS

1. **Bidder may note that BSL reserves the right to allow setting of fabrication facility to the successful bidder in the steel plant premise. Hence it shall be in bidder's scope to make necessary arrangement for fabrication facility out side the SAIL premises and offer items for inspection & obtain prior approval from BSL/ BHEL.**

2. **The air-conditioning system shall be done by bidder conforming to Technical Specifications indicated in General Technical Specification (GTS) No: MEC/S/E24F/11/38/0/00/00/F1874/R0. Bidder shall supply all equipment, components from Purchaser's List of Approved Makes as per Chapter-13 of GTS. This Technical Specification (TS), General technical Specification (GTS), SBD and other attached documents considered, as a whole shall comprise the complete Tender Specification.**

3. **Customer approval shall be taken only for those bidders who are responding to this enquiry. In case customer does not approve the vendor BHEL reserves the right to reject his offer technically. Further communication on technical queries/ finalization of BOQ and resubmission of price bid shall be carried only with the approved vendors. The bidder shall submit the Format-A enclosed duly filled in enclosing relevant documents required for getting vendor approval from BSL/ MECON.**

4. Bidder shall attend project review meeting/ document approval meetings from time to time at Consultants, End User / BHEL proposed meeting place as desired at no extra cost. It shall be vendors primary responsibility to take approval for drawings/ documents from consultant / end user.

5. All necessary tools and tackles, Material handling equipments required for erection activities shall be arranged by bidder.

6. Bidder shall attend the pre-bid meeting/ discussions (technical & commercial) as informed by BHEL without fail. Technical clarification may be sought by the bidder before submitting the bid.

SECTION-VI: CODES AND STANDARDS

The design, manufacture, inspection and testing of the air-conditioning system shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The air-conditioning system shall conform to the latest edition of the following standards and codes. Other internationally acceptable standards/ codes, which ensure equal or higher performance than those specified, shall also be accepted.

Code	Description
IS: 655-1972	G.I. ducting
IS 5: 1994	Painting
IS: 8148-1976	Packaged Air Conditioners
IS: 1239-1992	Refrigerant Piping
IS: 3588-1986	Tube Axial Fan
IS-277 (Grade III) 1992	Galvanized mild sheet steel
IS: 5120-1970 and IS: 9137-1978	Pump set for condenser water circulation

SECTION-VII: SYSTEM DESCRIPTION & DESIGN REQUIREMENT

1. The air-conditioning system will be designed to operate continuously round the clock twenty four (24) hours a day for all seasons of the year. The inside temperature & relative humidity of PSD-1 & PSD-5 control rooms shall be shall be maintained at 24(+/-)2 deg C & 50%(+/-)5% respectively.
2. The package air-conditioning system shall be floor mounted type.
3. Each package air-conditioner will essentially comprise of compressor, cooling coil, refrigerant circuit, condenser, blowers, air filter, electric drives, instruments and controls and other standard accessories. The equipment shall be designed, manufactured and tested as per IS: 8148 1976.
4. All electrical connections shall be built in, the power supply load shall be provided by BSL.
5. The compressor will be semi-hermetically/ hermetically sealed, mounted on anti-vibration pads & dynamically balanced.
6. The condenser will be water cooled DX Chiller/ water cooled, shell and tube type with effective surface area for heat transfer taking into consideration the scale factor for water side and optimum number of passes to achieve desired duty conditions of water cooled package AC unit.
7. Cooling coil will be direct expansion type with integrally finned copper tubes and fitted with equalising distributors to ensure equal amount of refrigerant in each circuit. Condensate drip pan will be provided below the cooling coil for collecting the condensate.
8. The refrigerant circuit will comprise of thermostatic expansion valve, distributor, liquid strainer, liquid line shut off valve, dehydrator etc.

9. All refrigerant piping shall be of seamless heavy duty, high quality copper (99.9%), whereas, condenser water piping shall be medium duty / class B, ERW G.I. conforming to IS: 1239-1992.
10. The refrigerant shall be R22/ any other ozone friendly refrigerant.
11. **Controls & Instruments:**
    The air-conditioning system shall be fitted with the following control equipments and instruments.

    - Thermostatic expansion valves. High pressure and low pressure cut out together with high pressure and low-pressure indicators in the refrigerant circuit.
    - Water temperature indicator at the inlet and outlet of condenser.
    - Ammeter and voltmeter at the incoming feeder of MCC and Ammeter with indication lamps in each out going feeder for package A/C (compressor & fan unit), strip heater, humidifier etc.
    - Flow switch for condenser water line.
    - Rotameter.
    - Thermometers
    - Vibration Isolator: Suitable vibration isolating pad shall be provided below the package A/C, and drive motor base to prevent transfer of undue vibration to the concrete floor/building. Vibration isolating pad shall be of best quality and make so that the damping effects of the pad remains unaltered even after years of operation.
12. The centrifugal blower will be designed for distribution of the conditioned air through the network of duct and supply air diffusers. The fan will be coupled with motor by V-belt and mounted on anti vibration mounting for low noise and vibration free operation. Suitable vibration isolating pad shall be provided below the package A/C, and drive motor base to prevent transfer of undue vibration to the concrete floor/ building.
13. The dial type (150mm dia) pressure gauge will be provided with isolating cocks/ valves. Flow switch will be installed in condenser water inlet line to stop the compressor while water supply stops.
14. The necessary control and instruments include thermostatic expansion valve, sight glass, strainer, cooling thermostat, heating thermostat, humidistat, strip heater, shut off purge valve and drain valve, dial type pressure and temperature gauges etc.
15. The unit shall be constructed with sufficient strength and rigidity to withstand normal manual and mechanical handling, transportation and usage without damage or failure.
16. All parts that require periodic cleaning or maintenance shall be easily accessible when the unit is installed in accordance with manufacturer's instructions.
17. Units shall be free from undue noise and vibration. The noise due to vibration shall not exceed 85 dB (A) at a distance of one meter from the source.
18. Pipes and connections to moving or resiliently mounted parts shall be so arranged as not to foul, or to transmit undue vibrations to other parts, and shall be so designed as to prevent failure due to fatigue. Pipes shall be suitably insulated wherever necessary.
19. All valves and refrigeration piping shall be properly clamped so as to avoid excessive vibrations.
20. The following velocities shall be maintained in duct line for different air conditioning systems.
    i. Main header ducting 6 to 8m/ sec.
    ii. Branch ducting 5 to 7m/ sec.
    iii. Supply air grill 2 to 3m/ sec.
    iv. Return header ducting 5 to 6m/ sec.
21. Pump sets for condenser water circulation:
    Horizontal split casing, centrifugal pump sets, complete with drive motor, valves etc. (RPM of pump not to exceed 3000) shall be provided for condenser water circulation. The pump sets shall have cast steel body and internals. The pump sets shall conform to the norms stipulated

in IS: 5120-1970 and IS: 9137-1978. The capacity and head of condenser water pump sets shall depend upon pressure drop across condenser, valves, strainers, and pipe fittings and in the pipeline.

22. Cooling Tower:
    For cooling the condenser water, cooling tower of forced draft type of adequate capacity is to be installed. The cooling tower shall be rugged and structurally strong to withstand the storm and high wind velocity. The cooling tower shall be fitted with makeup water and quick fill connection with float valve, drain out pipes with valves, over flow pipes and all other essential fittings/accessories. In General FRP type cooling tower shall be provided for the cooling of condenser re-circulating water.
23. **Grills and Diffusers:**
    The grills and diffusers shall be fabricated from M.S. sheet of thickness not less than 2.0 mm. All supply air grills shall be rectangular/ circular type with adjustable louvers, whereas return air grill shall be fixed type, fresh grills shall be adjustable type with wire mesh filter.
24. **The air-conditioning system shall comprise of the following main components:**
    i. 2 nos. (1W + 1S) water cooled package type air-conditioners, complete with compressor, water cooled condenser, evaporator, centrifugal blower, steel wire reinforced washable HDPE air filter, sheet metal cabinet, flexible connecting piece, vibration isolator pad, etc for each control room (PSD-1 & PSD-5). Along with package A/C unit 1W+1S combination, condenser cooling pump 1W+1S combination for both the control rooms shall be provided.
    ii. Condenser water piping complete with valves, fittings, installation accessories, etc.
    iii. 25 mm NB GI pipe of length 150 m for make up water connection to the cooling tower.
    iv. Mechanical type cleanable, duplex pot strainer with by-pass and isolating globe valves.
    v. G.I. ducting (as per IS: 655-1972) complete with volume control damper, adjustable grills/diffuser for supply air, fixed type grills/diffuser for return air, brackets, hangers, flanges, etc.
    vi. Resin bonded glass wool / fibreglass, 50mm thick, with aluminium foil pasted on outer face.
    vii. Volume control dampers in all branch ducts.
    viii. Fusible link spring loaded type fire damper.
25. All equipment and accessories shall be suitable for conductive dusty laden corrosive atmosphere normally experienced in steel plants and all equipments and accessories shall be designed to resist vermin fungus dew etc. for uniform distribution of cooled air in the rooms, insulated supply air-duct equipped with volume control dampers and adjustable louvers is to be installed. For taking back return air into air-handling unit, the plenum between roof and false ceiling shall act as return air-duct and as such no separate return air duct has been envisaged. Duct shall be fabricated at site and as per site condition.

SECTION-VIII: PERFORMANCE GUARANTEE

08.01 General

On completion of erection of the air-conditioning system by the successful bidder as per approved drawings/ documents as well as detailed drawings, the successful bidder shall undertake preliminary Acceptance Test (PAT) i.e. cold test, to prove that the unit has been supplied as per agreement and after erection the unit is fit to be started up and commissioned. The PAT shall be followed by commissioning (hot trials) to demonstrate that the unit is fit for commercial production.

08.01.01 Preliminary Acceptance Test (PAT) (Conforming to IS 8148: 2003)

001 Cold tests shall comprise idle, no-load tests. Cold tests shall be conducted by the successful bidder under his sole responsibility. The purchaser will provide skilled operating personnel during the cold test.

002 A detailed program of cold tests shall be drawn up by the successful bidder and shall be subject to the approval of the purchaser/ consultant. Such program may be revised and adjusted as may be required by the purchaser during the test run.

003 Results of cold tests shall be recorded jointly by the successful bidder and the purchaser.

004 On successful completion of preliminary acceptance tests, and liquidation of the defects list, preliminary acceptance certificates shall be issued by the purchaser.

08.01.02 Successful Commissioning (Hot Trials)

001 Within 60 (sixty) days from the date of issue of preliminary acceptance certificates, the successful bidder shall start-up and commission the unit in an integrated manner under his sole responsibility.

002 Commissioning of the unit shall be deemed to be successfully completed, when the total commercial production of about 10,000 tonnes of material – or- ten(10) days of rated material is successfully transported, for the particular circuit.

003 Results of start-up tests and commissioning shall be recorded jointly by the successful bidder and the purchaser

Performance Guarantee Tests (PG)

After successful commissioning of the plant & equipment, the bidder shall offer the plant for conducting performance guarantee tests as mutually agreed upon between the purchaser and bidder. The PG test shall be carried out in two seasons, one in winter (December/ January) & the other in summer (May/ June) for 72 hours.

SECTION – IX: SPARES CONSUMABLES, TOOLS & TACKLES

09.01 Commissioning Spares:

Supply of commissioning spares (such as fan pulley, motor pulley, expansion valve, liquid shut off valve, pressure cut out, flare nut, fan motor, rubber pads, pressure gauges etc.) as required shall be in the scope of supply of the Bidder along with the equipment. It shall cover requirements of erection, cold tests, startup and initial operation of the plant till integrated testing & successful commissioning and commencement of commercial production up to a period of six months. Any leftover commissioning spares shall be the property of the Purchaser. A complete list of such spares shall be submitted alongwith the offer.

09.02 Consumables:

The Bidder shall supply all consumables such as initial fill of lubricants, oils, grease, chemicals, refractories, resins, refrigerants etc. as required for the air-conditioning system till commissioning and shall have a shelf life of minimum one year.

The Bidder shall also furnish Indian equivalent of oils, lubricants, refractories, refrigerants and other consumables along with necessary specifications, drawings, catalogues etc. to enable the Purchaser to procure them from indigenous sources.

The Bidder shall indicate the annual requirement of all such consumables.

09.03 Bidder shall ensure the interchangeability of the parts wherever possible. The Bidder shall furnish an itemized list of interchangeable spares.

09.04 The list of spares as necessary and recommended by the respective manufacturer for two years' of reliable and trouble free operation and maintenance of all equipment under this package shall be in the scope of the Bidder. The same shall be quoted separately. In the event of order the successful Bidder shall furnish complete specification of the same. The price quoted for the same shall be optional & BHEL may order the same at a later stage.

09.05 Special Erection/ Maintenance Tools and Tackles

09.05.01 The Bidder shall supply a complete and unused set of all the special tools

and tackles including required number of toolboxes as required for erection, maintenance, overhaul or complete replacement of the equipment and components required for the plant. A complete list of such tools & tackles shall be submitted along with the offer.

09.05.02 All the tools shall be supplied in separate containers clearly marked with the name of the equipment for which they are intended.

SECTION-X: PROJECT SCHEDULE & PROGRESS MONITORING

10.01 The project is scheduled to be implemented matching with the shutdown schedule of different BF prepared in consultation with Blast Furnace Operation Department. The erection & commissioning of the air-conditioning system shall depend on front availability at site. Hence the bidder shall consider this point while preparing the offer. No extra payment shall be made for the delay in E & C work due to unavailability of front at site.

10.02 Project Schedule

10.02.01 The Bidder shall submit the following along with the offer:

i) Overall bar-chart schedule
The heads to be covered in the schedules shall broadly be as follows:

- Basic engineering and approval
- Preparation and issue of ordering/ technical specifications for sub-vendors.
- Placement of orders on sub-vendors
- Detailed design, engineering and approval
- Manufacture and supply of equipment/ ducts/ cables etc
- Floor/ wall cut-out required for erection of equipments
- Fabrication and erection of all equipments.
- Submission and approval of erection drawings and manuals.
- Erection of equipment, ducts, cables, etc.
- Testing, trial runs and commissioning.

The major milestones for the project are to be highlighted in the schedule.

ii) The bidder shall submit an overall erection plan for the plant and equipment under his scope of supply along with the tender. The plan shall include the following :

- Requirement of construction power
- Requirement of equipment storage area
- The Off-site & On-site organization chart for execution of the project

10.02.02 The Bidder shall submit the following before finalization of contract:

i) Deployment of man power for construction / erection
ii) Special erection techniques to be employed, if any
iii) The list of construction / erection equipment and machinery, tools & tackles, etc, and details of deployment of the same.

10.03 Progress Monitoring

10.03.01 An effective system of progress monitoring is to be evolved to ensure timely completion of all project activities. In general, progress of the following major activities is to be reported.

- Issue of ordering/ technical specifications and placement of orders on sub-vendors for bought out items / components.
- Detailed design and engineering including submission of drawings and their approval.
- Manufacturing activities at the works of the Contractors/ associates/ sub-vendors.
- The progress report on inspection status.
- Dispatch of equipment to site.
- Site activities including receipt of material/ equipment at site, civil work, structural fabrication and erection including technological structures, equipment erection, testing and commissioning.

SECTION-XI: DRAWINGS AND DOCUMENTATION:

The schedule for the submission of drawings and documents are as follows

SL.NO	DESCRIPTION	FORM	QTY	TIME SCHEDULE	REMARKS
1	GA drawing of air-conditioning system indicating weight, kW rating, material of construction of major parts, specification of auxiliary equipments.	Photocopies	12 Sets	Within 1 weeks of placement of LOI	For Approval
2	Data sheet of air-conditioning system and capacity calculations	Photocopies	12 Sets	Within 1 weeks of placement of LOI	For Approval
3	GA of equipments of air-conditioning system	Photocopies	12 Sets	Within 1 weeks of placement of LOI	For Approval
4	Civil load data/ drawings for civil works	Photocopies	12 Sets	Within 1 weeks of placement of LOI	For Information
5	Revised drawings/ documents and data sheets	Photocopies	12 Sets	1 week from receipt of comments from consultant forwarded by BHEL	For Approval/ Final Submission
6	Type and routine test certificates	Photocopies	12 Sets	2 weeks before inspection at works	For Approval
7	Final type and routine test certificates	Photocopies	12 Sets	1 week after inspection at works	Final Submission
8	Erection drawings and manuals	Photocopies	12 Sets	2 weeks before dispatch of equipment	For Work

9	Pre-commissioning/ commissioning check list and procedures	Photocopies	12 Sets	2 weeks before dispatch of equipment	For WOrk
10	Quality Assurance Plan (QAP)	Photocopies	12 Sets	2 weeks from LOI	For Approval
11	As built drawings	Photocopies	12 Sets	After installation	Final Submission
12	Final operation and maintenance manuals and spare parts catalogue	Photocopies	12 Sets	2 weeks before dispatch of equipment	Final Submission

One set extra of above shall be submitted for BHEL use. It may be noted that sufficient no of drawings & documents shall be made available during erection & commissioning for site staff use.

Bidder shall attend project review meeting/ document approval meetings from tome to time at Consultants , End User / BHEL proposed meeting place as desired at no extra cost. It shall be vendors primary responsibility to take approval for drawings/ documents from consultant / end user.

Notes on Drawings and Documentation

The drawings shall be furnished, after placement of LOI, by the supplier for our approval, as per the title block format of BHEL (TITLE BLOCK FORMAT will be furnished along-with purchase order).
All documents to be furnished by the suppler shall be duly certified and signed by the competent authority and all revisions shall be duly recorded.
All drawings shall be mentioned in metric system & shall generally be of A1/A2/A3/A4 size only.
Title and written notation shall be in English.
Test certificates and documents of operation and maintenance manual shall be strictly in A4 size 297 x 210 mm only. All copies of test certificates as stipulated shall be on good quality of paper having good and legible printing. The drawings shall be prepared in Auto CAD only (schematic diagram, wiring diagram, Bill of Material, OGA GA etc).
All documents shall be duly signed by competent authority of the manufacturer.

01 List of drawings to be submitted for approval by Contractor

Following design data, calculations and drawings will be submitted by the Successful Contractor to the Purchaser / MECON in stages for approval.

- All the drawings/ data listed in clause above, giving all the details, loads/ power requirement etc.
- In addition to the above, the Purchaser/ Consultant reserve the right to insist on submission of calculations/ drawings/ data for any mechanical, structural or electrical equipment/ component as required.

02 Detailed Engineering Drawing shall be submitted for approval after placement of order and prior commencement of fabrication and manufacturing by the Contractor.

SECTION –XII: INSPECTION AND TESTING

GENERAL

12.1 Inspection & testing of plant & equipment shall be carried out by Consultant/ Purchaser at the works of successful bidder during manufacturing and/ or on final product to ensure conformity of the same with the acceptable criteria of technical specifications, approved drawings, manufacturing drawings and applicable national/ international standards.

QUALITY ASSURANCE PLAN (QAP)

12.2 The successful bidder shall furnish Quality Assurance Plan (QAP) for respective equipment after completion of detailed engineering and finalisation of billing schedule/ equipment identification number for Consultant's approval at least one month prior to start of manufacturing.

12.3 QAP shall be prepared & furnished by Vendor in Form Nos. 11.20(DQM) F-09,10,11 (specimen copy enclosed as annexure-II) / detailed manufacturing QAP for structural & mechanical equipment, electrical equipment and refractory materials respectively ,QAPs must be submitted in required number of sets duly signed and stamped by bidder for MECON approval .

12.4 The successful bidder shall indicate procurement source and furnish to Consultant, during the submission of QAP, copies of P.O., Sub-P.O., T.S., approved GA drawings/ data sheets & detailed manufacturing drawings, as backup reference materials for scrutiny & final approval by Consultant. The submission & subsequent approval of QAPs shall be ensured to be restricted to one round only.

12.5 CALIBRATION OF MEASURING EQUIPMENT

12.5.1 All the measuring equipment used for inspection & testing shall be calibrated and appropriate accuracy class of measuring equipment shall be used. Calibration standards used for calibration of measuring equipment shall be traceable to national standards of National Physical Laboratory (NPL), New Delhi with unbroken chains of comparison.

12.6 Valid calibration certificate for all measuring equipment used during inspection and testing at manufacturer's works, with traceability to national standards of NPL/ NABL accredited laboratories shall be furnished prior to undertaking inspection by Consultant/ Purchaser. Calibration certificate shall also indicate reference no. of calibration standards calibrated by NPL/NABL accredited laboratories and copies of such calibration certificates of calibration standards shall be included in the compiled dossiers of inspection/test results.

12.7 TEST CERTIFICATES AND DOCUMENTS

12.7.1 For each of the items being manufactured as per approved QAP, following test certificates and documents, as applicable for each of the equipment, in requisite copies including original, duly endorsed by the Manufacturer/successful bidder with appropriate linkage to project, purchase order and acceptance criteria etc shall be submitted to Consultant/ Purchaser.

i. Raw materials identification & physical and chemical test certificates for all materials used in manufacture of the equipment (except IS: 2062-1999 Gr.A & IS: 210-1993,FG-150).
ii. WPS, PQR & WPQ documents as per applicable code.
iii. Details of stagewise inspection & rectification records for fabricated items, castings,forgings and machined articles.
iv. Control dimension chart with records of alignment, squareness etc.
v. Manufacturer's material and performance/ relevant test certificates for all bought-out items.
vi. Details of heat-treatment and stress relieving charts as per specification.
vii. Non-Destructive Test reports as per respective code.
viii. Static/ dynamic balancing certificate for rotating components/machines.
ix. Hardness test certificate.
x. Pressure/ Leakage Test Certificates.
xi. Performance Test Certificates for all characteristics.
xii. Routine/ type/ calibration/ acceptance/ special test (Type Tests etc.) certificates for electrical items.
xiii. Surface preparation and painting certificates.
xiv. Certificates from competent authority for the items coming under statutory regulations.

12.8 Where physical and chemical test certificates of material are not available, the successful bidder/Sub-contractor shall arrange to have specimens and test samples of the materials, tested in his own laboratory at his cost and submit the copies of test results in requisite numbers to Consultant/Purchaser for review. Number of test

samples against each heat/cast/lot or batch of materials, as applicable shall be as per relevant Indian or International Standards.

12.9 Where facilities for testing do not exist in the successful bidder/ Sub-contractor's laboratories or in case of any dispute, samples and test pieces shall be drawn by the successful bidder/ Sub-contractor in presence of Consultant/ Purchaser and sealed sample shall be sent to any Govt. approved/ NABL accredited laboratory for necessary tests at former's own cost.

12.10 The Consultant/ Purchaser shall have the right to be present and witness all tests being carried out by the successful bidder/ Sub- contractor at their own laboratory or approved laboratories. Also, the Inspection Agency shall reserve the right to call for confirmatory test on samples, at his discretion.

The over & above the inspection and testing shall be as per the GTS 5.0.

SECTION-XIII: LIST OF DRAWINGS AND DOCUMENTS

The successful bidder shall submit the following drawing/ documents after placement of LOI:

1. All General Arrangement drawings and data sheets for the package A/C system like fans, pumps, A/C unit, Schematic Diagrams etc.
2. Ducting layout drawings for both the control rooms.
3. Design Basis Report for the package A/C system.
4. Design calculation for the package A/C system.
5. Quality Assurance Plans.
6. Design calculation for suitability of strip heater for heating during winter.

The list above is indicative only. Any drawing/ document required over and above this list shall be submitted by the successful bidder.

SECTION –XIV: INFORMATION TO BE FURNISHED BY BIDDER

1. List of makes for various components with catalogue.
2. L2 Schedule
3. Signed Un-priced format (Annexure-III).
4. Questionnaire as per annexure-I
5. Signed and stamped checklist as per annexure - V
6. List of commissioning spares.

7. List of spares recommended for 2-years normal operation.
8. List of special erection & maintenance tools & tackles.
9. List of drawings for the package type air-conditioning system.
10. Price Bid Format: Annexure-III (un-priced bid duly signed & stamped to be submitted with technical bid & price bid to be submitted in separate sealed envelope)
11. Painting Schedule: Annexure-IV (to submitted duly signed & stamped as acceptance along with the technical bid)
12. HSE & GCC (to be submitted duly signed & stamped as acceptance with the technical bid).
13. Signed and stamped copy of QAP as per Annexure-II
14. The signed and stamped copy of all the pages which constitutes this technical enquiry specification signed by authorized signatory and clearly mentioning each clause under following two categories

a. **"accepted without deviation and considered in scope of work"**
b. **"Not considered in scope of work".**

NOTE: - BIDDER SHOULD ENCLOSE THE ABOVE DOCUMENTS IN THEIR TECHNICAL BIDS WITHOUT WHICH THE OFFER IS LIABLE TO BE REJECTED.