

**STEEL AUTHORITY OF INDIA LTD  
BOKARO STEEL PLANT  
BOKARO STEEL CITY**



**TECHNICAL SPECIFICATION NO- DB/BSL/19/TS/007/R3**

**FOR**

**SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF DC DRIVES OF RE-HEATING  
FURNACES AREA**

**AT**

**HOT STRIP MILL, SAIL/BSL**

**AUGUST'2023**

## **1. INTRODUCTION:**

### **1.1. GENERAL:**

- 1.1.1. In Hot Strip Mill (HSM) at Bokaro Steel Plant (BSL), following equipments are installed:
- 1.1.1.1. The Depilers (03nos) are used for receiving slab pile from transfer car and depile it on roller tables for charging in Reheating Furnaces.
- 1.1.1.2. The Pushers (04nos) are used for pushing the slabs inside the reheating furnaces.
- 1.1.1.3. The Extractors (04nos) are used for receiving hot slabs from reheating furnaces at the discharging side and putting them on roll table for rolling.
- 1.1.1.4. Roll Tables 92, 93 are used for carrying hot slabs from furnace area and feeding them in RR2.
- 1.1.2. The BHEL Make thyristor convertors of Depiler, Pusher drives & Roller table 92, 93 are in continuous operation for the past 35 years (Since 1987). NELCO make Thyristor convertors are in operation for Reheating Furnaces 2&3 Extractor mechanism since 1998.
- 1.1.3. These thyristor convertors have become old and obsolete and giving frequent problems leading to delays in the rolling process. Therefore, it is proposed to replace these thyristor convertor drives with new thyristor convertors with digital regulation.

### **1.2. INTENT OF SPECIFICATION:**

- 1.2.1. The intent of this specification is to furnish the required details, as far as possible, to enable the bidder to submit their best offer (technical & techno-commercial) for “SUPPLY, INSTALLATION, TESTING AND COMMISSIONING OF DC DRIVES OF RE-HEATING FURNACE 2&3 OF HOT STRIP MILL, SAIL/BSL” on turnkey basis, within the stipulated time frame, as per the scope of work described in clause 2.0, for achieving design and technological parameters as indicated in clause 3.0, with the special instructions to bidders as per clause 4.0 & realization of performance guarantee parameters as mentioned in clause 5.0.

### **1.3. BRIEF DESCRIPTION OF THE EXISTING SYSTEM(TABLE):**

<b>S. N</b>	<b>DRIVE NO.</b>	<b>DESCRIPTION</b>	<b>CONVERTOR RATING</b>	<b>MOTOR RATING</b>	<b>TRANSFORMER RATING (Line to neutral)</b>
1	2KTIIY,6KTIIY,8KTIIY	COLD & HOT SLAB CHARGING SYSTEM (3Nos)	ARMATURE :3000A EXC: 20A	500KW 440V DC, 1230A 1050 rpm	11KV/460V, 863KVA

S. N	DRIVE NO.	DESCRIPTION	CONVERTOR RATING	MOTOR RATING	TRANSFORMER RATING (Line to neutral)
2	92,93KTITY	RECEIVING ROLL TABLE (2Nos)	11X60 KW (2 CONV.) ARMATURE:3000 A FIELD: 5X20=100A	11X60KW (for each) 220V DC (Armature & Field) 560rpm, 300A	THP 1600/10T 11KV/230V,863KVA Impedance=4.75 %
3	FURNACE2,3 EXTRACTOR DRIVE PANEL	SLAB EXTRACTOR DRIVE, NELCO MAKE (4nos.)	INPUT: 230V AC, 500A, 50HZ OUTPUT:220V DC, 600A	145 KW, 220VDC 760A FLC 480/920 rpm	11KV(3PH)/240 V (Ph to ph), 1600 KVA
4	FURNACE2,3 PUSHER DRIVE PANEL	SLAB PUSHER DRIVE(4 NOS.)	INPUT:440V AC OUTPUT:230V DC, CURRENT:3000 A	320KW, 220V DC 1600A 73/146 rpm	11KV/230V, 901KVA Impedance-5.46 % Sec.:440V(Ph to Ph)6 phase

#### 1.4. SCOPE OF WORK:

1.4.1. The Scope of Work shall include but not limited to the following:-

1.4.1.1. Design/engineering, development, manufacturing/procurement, inspection, supply, handling & storage at site, erection, simulation, testing & commissioning, dismantling and disposal of old systems, completion of all related facilities, performance guarantee testing, painting at site and handing over to SAIL/BSL, of suitable electrics of DEPILER, RT92,93 & PUSHER, EXTRACTOR DERIVES of FURNACES 2&3 at Hot Strip Mill as per specifications and scope defined in tender documents complete with all accessories including any item, which are not mentioned specifically but are required for the efficient and trouble free operation of the equipment/system.

1.4.2. SCOPE OF WORK COVERS THE FOLLOWING(TABLE):

<b>SCOPE OF WORK</b>						
<b>DRIVE NO.</b>	<b>Transformer + HT Isolator</b>	<b>AC breaker Converter</b>	<b>DCC B</b>	<b>DC isolation contactor/ MCCB</b>	<b>Interface with PLC/HMI</b>	<b>DCCB Operating Switch/Run Switch/ Indication</b>
2KTIIY,6KTII Y,8KTIIY	Y	Y	Y	N	Y	Post 6 and Post 1
92,93KTIIY	N	Y	Y	N	N	Post 7
FURNACE2,3 EXTRACTOR DRIVE PANEL	N	Y	Y	Y	Y	Post 4 & 7
FURNACE2,3 PUSHER DRIVE PANEL	N	Y	Y	Y	Y	Post 2& 3

1.4.3. FOLLOWING SCOPE OF WORK IS ENVISAGED (TABLE):

1	<b>ELECTRICAL</b>	<p>1 Suitable <u>Reversible</u> Digital Thyristor Converter units, Air circuit breaker, DC Breaker (HSDCB in a separate cubicle) for Armature circuit with necessary interfacing control &amp; protection circuits, Cooling system for Thyristor Converter, 11kv transformer and its interface systems, assembled in an adequately protected panel for the Drives listed above (Table-1) at Hot Strip Mill of Bokaro Steel Plant, as well as modification and alteration in existing equipment &amp; facilities and interfacing with existing control systems on <b>turnkey basis</b>.</p> <p>2 Panels shall be designed in such a way that the same should be accommodated in the vacant space in Suitable AC glass enclosure. The thyristor panel should have a modular design having single Module without paralleling so as to accommodate the control cards in same cabinet. However the panel should have ease of maintenance.</p> <p>3 11kv Transformer replacement along with HT Isolator is envisaged for 3 Nos. of drives at sl. no. 1 (Table-1) only. Rest drives will undergo Drive panel replacement only. However Protection and control to be completely retrofitted in Russian panel at 11KV MSDS-2 substation for such feeders whose transformers are not to be replaced. Retrofit shall include numerical, auxiliary relays, metering, indication, annunciation etc. Total nos-04</p> <p>4 Redundant 24V DC power pack of suitable rating shall be supplied for interposing relays. All interposing relays should be 24V DC and plug in type.</p> <p>5 All switchgear items and Bus bars inside the drive panels should be designed as per the ratings of the converters. Contactors and relays shall be of 24 volt DC or 230 volt AC. Contactors for interfacing with DC breakers/contactors shall be of at least 6 Amp at 220 volt DC contact rating. Contactors, Relays, MCBs and Terminal blocks used in the Panels should have 20% spares.</p> <p>6 230V AC utility supply for lighting and sockets shall be provided with isolating transformer.</p> <p>7 Meters and Indications to be provided as detailed later (mentioned in sec 3).</p> <p>8 Protection of Drives against over speed, over &amp; under voltage, over current, current over shoot and Motor Stall.</p> <p>9 Zero speed and zero current sensing.</p> <p>10 All electrical accessories e.g. circuit breakers, control switches, push buttons, panel, lighting fixtures, light switches receptacles, horns etc. required for the panel shall be provided.</p> <p>11 The scope of work covers displaying of speed, current &amp; Armature voltage at Posts with proper signal isolators.</p> <p>12 Interfacing/ Interlocking with other systems wherever required.</p> <p>13 Laying of all Control &amp; power cables as per requirement (LT as well as HT). Control cable from each transformer to respective HT panel to be considered for incorporating existing transformer protection viz</p>
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		<p>Oil/winding temp rise alarm and trip etc) and individual isolator over current protection.</p> <p>14 Double pole Double throw Knife switch of rating 1500A, 2500A and 4000A in armature circuit &amp; 32A, 100A for field circuit will be supplied by the bidder for changeover purpose.</p> <p>15 Three nos of new panel rooms , one each in Motor Room 2,3 &amp; 5 (25x20 sq. ft. approx) will have two DC drive panels, ACB, PC based engineering workstation, ergonomic table (2nos), chairs (4no.s) and Almirah (1No.) in each room. Augmentation of AC &amp; carpet area of one existing drive room in MR-1 will also be under scope of work of the bidder.</p> <p>16 Items not mentioned in this TS but required to fulfill the existing functions and features of the Drive shall be included in the 'scope of supply'.</p>
2	<b>CIVIL &amp; STRUCTURAL</b>	<p>1 The scope shall include any civil work such as chipping/cutting of floors for making grooves or laying of cables/cable conduits, making holes/opening through walls, ceiling or floors, drilling of holes through steel structures and frames, grouting of frames, hooks on walls, ceiling for execution of work. After erection, surface shall be made good by plastering/ painting/pasting PVC sheets to their original finish. All the Civil/Mechanical modifications needed for mounting of all the electrical equipments/cables shall be in scope of work.</p> <p>2 Construction of 03nos of dust-free, positive pressure glass enclosure or panel rooms, one each in Motor Room 2 (size of 30x30 sq ft. approx), 3 &amp; 5 (size of 25x20 sq. ft. approx) (exact requirement shall be finalized during detail engineering) with Anodized aluminum frames / double doors with suitable air conditioning system (one working &amp; one standby) in glass enclosure (suitable for the environmental condition of electrical control room).</p> <p>3 Augmentation of AC (one package AC to be installed) &amp; carpet area of Old Kick Off Drive room in MR1 to be extended to accommodate one more panel. It is a glass enclosure panel room with false ceiling. Its area to be increased by 05x20 sq ft. approx. It will be under the scope of the bidder.</p> <p>4 The temperature to be maintained inside the panel rooms is 22 degree Celsius by installation of package ACs.</p> <p>5 The rooms will have false ceiling with raised flooring for cable laying from the panel to the external equipment. Roof will be of structural sheet at approximately +5 meter level and false ceiling at +4 meters level above the existing floor level. Enclosure will be of glass panel in anodised aluminium frame upto false ceiling. The major civil &amp; structural works involved are as under:-</p> <p>a Supply and Fixing of structural base frame on existing floor for proposed panels of Depiler, Pushers &amp; Roller Tables in respective control rooms of HSM, SAIL/BSL.</p> <p>b The enclosures for panels should have sufficient space around the panel for maintenance purposes to accommodate panels of Depilers, Pushers &amp; Roller Tables in respective Control Rooms as per approved drawings.</p> <p>c Enclosure consisting of :</p> <p>i Anodised aluminium frame door of suitable size (meter) with float glass panes and laminated board.</p>

		ii False ceiling for enclosure.
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		<p>iii Heavy Duty Fully Flexible Marbled Pattern PVC Floor Covering of minimum thickness 3mm on the existing floor.</p> <p>Adequate illumination &amp; cooling provision for the enclosures to be considered in the scope supply / work.</p>
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		<p>6 The scope shall include any civil work such as chipping/cutting of floors for making grooves or laying of cables/cable conduits, making holes/opening through walls, ceiling or floors, drilling of holes through steel structures and frames, grouting of frames, hooks on walls, ceiling for execution of work. After erection, surface shall be made good by plastering/ painting/pasting PVC sheets to their original finish. All the Civil/Mechanical modifications needed for mounting of all the electrical equipments/cables shall be in scope of work.</p> <p>7 Construction of 03nos of dust-free, positive pressure glass enclosure or panel rooms, one each in Motor Room 2 (size of 30x30 sq ft. approx), 3 &amp; 5 (size of 25x20 sq. ft. approx) (exact requirement shall be finalized during detail engineering) with Anodized aluminum frames / double doors with suitable air conditioning system (one working &amp; one standby) in glass enclosure (suitable for the environmental condition of electrical control room).</p> <p>8 Augmentation of AC (one package AC to be installed) &amp; carpet area of Old Kick Off Drive room in MR1 to be extended to accommodate one more panel. It is a glass enclosure panel room with false ceiling. Its area to be increased by 05x20 sq ft. approx. It will be under the scope of the bidder.</p> <p>9 The temperature to be maintained inside the panel rooms is 22 degree Celsius by installation of package ACs.</p> <p>10 The rooms will have false ceiling with raised flooring for cable laying from the panel to the external equipment. Roof will be of structural sheet at approximately +5 meter level and false ceiling at +4 meters level above the existing floor level. Enclosure will be of glass panel in anodised aluminium frame upto false ceiling. The major civil &amp; structural works involved are as under:-</p> <ul style="list-style-type: none"> <li>a Supply and Fixing of structural base frame on existing floor for proposed panels of Depiler, Pushers &amp; Roller Tables in respective control rooms of HSM, SAIL/BSL.</li> <li>b The enclosures for panels should have sufficient space around the panel for maintenance purposes to accommodate panels of Depilers, Pushers &amp; Roller Tables in respective Control Rooms as per approved drawings.</li> <li>c Enclosure consisting of : <ul style="list-style-type: none"> <li>i Anodised aluminium frame door of suitable size (meter) with float glass panes and laminated board.</li> <li>ii False ceiling for enclosure.</li> <li>iii Heavy Duty Fully Flexible Marbled Pattern PVC Floor Covering of minimum thickness 3mm on the existing floor.</li> <li>iv Adequate illumination &amp; cooling provision for the enclosures to be considered in the scope supply</li> </ul> </li> </ul>
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3	<b>EARTHING AND GROUNDING</b>	The scope of work shall cover grounding of the panel, electrical & electronic equipments etc. and they shall clearly indicate if any additional grounding is required in existing system. Earthing & Grounding shall conform to IS: 3043. Transformer Body and Neutral Earthing shall be provided in all transformers. Separate earth pits one each at Charging Side and Discharging side shall be under the scope of work.
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<b>AIR CONDITIONER (AC)</b>	The scope of work also includes supply and installation of Air cooled Package AC units (with one standby unit) of suitable capacity for each panel room (total 06nos of AC units for 03nos of panel rooms) and 01no of Air Cooled Package AC unit for old Kick Off AC Room, to achieve the temperature of 22 degree Celsius. Total 07nos of Air Cooled Package AC units to be supplied and installed.
<b>HARDWARE &amp; SOFTWARE</b>	Five nos of PC based maintenance tool shall be supplied for programming, troubleshooting, backup, trending and diagnosis of the system. Necessary hardware and software at Drive & PC end including Anti Virus software, and MS Office for communication of Drive with PC based maintenance tool shall be provided. Firmware of each of the drives Control card shall be provided in CD. Back up of all software for Regulation system and Maintenance tool in external Hard disk of minimum 2 TB memory. Necessary hardware/software for communicating with commissioning/maintenance tool. Licensed software of Operating System of PC, antivirus, Drives Programming, and other related softwares used in the Project shall be under scope of supply.

- 1.4.4. Erection, testing & commissioning and performance guarantee of the complete system including supply of erection materials. Tenderer is advised to study the actual layout of site of Thyristor Converter Room of HSM at SAIL/BSL to assess the system requirement as well as requirement of erection materials including pipes, cables etc. The Tenderer's quotation shall include entire requirement of erection materials as per actual site location. Any shortfall in erection material shall be included in the tenderer's scope of work only and no further increase in prices on this account shall be considered on later date.
- 1.4.5. The list of equipments/items envisaged for the above Project is provided in Table-1 above and elaborated in detail under Clause No. 3. The tenderer shall include these & all other items considered necessary for complete system offered for the safe, efficient & reliable operation of the plant under the normal and worst service & environmental condition.
- 1.4.6. Packing, forwarding, transportation, storage & handling of materials/equipments at site.
- 1.4.7. Any improvement over the above specified system requirement shall be accepted as long as it does not deviate from the scope of this specification & the system offered by the tenderer shall be subject to approval of the purchaser.
- 1.4.8. Successful bidder shall restore, reconstruct and make good the existing equipment/facilities (except items redundant) and foundations etc. dismantled or removed for carrying out the total job. The successful bidder shall rectify all the consequential damages occurring due to activities related to their scope of work at their cost.
- 1.4.9. All the technical services fully coordinated and in an integrated manner, including demonstration of the performance guarantee as specified in clause 5.0 and handing over the system complete in all respect to the purchaser after successful commissioning and stabilization.

- 1.4.10. The successful bidder shall depute a team of experts for erection, testing, commissioning & completion of PGT.
- 1.4.11. Design/engineering, preparation of detail general arrangement and detailed working drawings, obtaining the approval/clearance/acceptance of the same from SAIL/BSL.
- 1.4.12. Supply of all labour, materials, consumables, tools, tackles loading, unloading, site clearance, site handling, erection and fabrication, shop painting, testing and inspection, unloading, storage at site, transportation to site, and construction of entire civil & structural steel works as per specifications as mentioned in this TS.

**1.5. SPARES, CONSUMABLES, TOOLS & TACKLES:**

- 1.5.1. The scope of work shall include supply of consumables and commissioning spares for the supplied system for execution.

**2. SPARE PARTS:**

**2.1. COMMISSIONING SPARES:**

- 2.1.1. The successful bidder shall supply commissioning spares as may be required for tests and initial operation of the installed system till successful completion of commissioning and also as required during performance guarantee test (PGT). The list of commissioning spares (minimum), along with their technical specifications and make, shall be submitted along with the offer as per Schedules Format-1.4. It should include 1) Controller card 1 No, 2) Fuses: at least 30% of installed quantity.

**2.2. OPERATING & MAINTENANCE SPARES:**

- 2.2.1. A list of operating & maintenance (O&M) spares, along with their technical specifications, make and itemised prices recommended for two years normal running of the installed system shall be furnished by the Bidder as per Schedules Format-1.3 and Section 7.4.3 of SBD. The itemised prices of such spares shall be kept valid for a period of up to twelve months. However, these spares are not in the scope of supply of the bidder.

**2.3. IMPORTED SPARES:**

- 2.3.1. A list of imported spares, along with their technical specifications and make, shall be furnished by the bidder.

**2.4. CONSUMABLES:**

- 2.4.1. All consumables required to install the system shall be in the scope of work of the bidder. Such consumables are defined as but not limited to bolt, nuts, rivets, welding electrodes, seals, packing components etc. for erection of the proposed equipment shall be in the scope of work of the bidder. The bidder shall furnish the list, along with their technical

specifications and make as per Schedules Format-1.6.

**2.5. SPECIAL TOOLS,TACKLES AND INSTRUMENTS:**

- 2.5.1. The scope of work of the bidder shall include supply of tools & tackles, test & calibration equipments, test kit etc. required for the system. Tools and tackle include torque wrench & thyristor removal tool. Measuring Instruments including digital oscilloscope, Two Digital Multimeter with Current measurement, and Two Tongue tester with DC measurement capability, during commissioning should be handed over to SAIL/BSL.
- 2.5.2. The bidder shall furnish a complete list, along with their technical specifications and make, of all special tools, tackles and instruments required for operation and maintenance of the installed system as per Schedules Format-1.5. The supply of these items shall be under the scope of the successful bidder.

**2.6. BATTERY LIMIT(TABLE):**

	INCOMING
ELECTRICAL	1 11KV source for 3 Nos of Transformers for Depiler converters will be provided from existing source. 3 Ph, 415V +10% & -15%, 50Hz +4% & -6% power supply for different Thyristor converters shall be provided by BSL from the nearest available/existing source. Other voltage levels, if required shall be arranged by the bidder itself. Installation, testing & commissioning of complete panel shall be in Bidder's scope.
	2 Construction water and Power from the nearest available/existing source.

**2.7. SAIL/BSL'S OBLIGATION:**

- 2.7.1. SAIL/BSL shall provide site for storage of the equipment/material within a reasonable distance from the shop. However, construction of temporary sheds/barricades for the temporary store premises as well as safety and security of equipments shall be in the tenderer's scope.
- 2.7.2. Free water & electricity shall be provided by SAIL/BSL. Power feeder rated for 3 phase, 415V, and 50 Hz A.C. for construction purposes, shall be provided from existing source. However, all the tools, tackles, handling equipment, testing equipment, and consumables like gas cutting machine, welding machine, gas cylinders, electrodes, measuring instruments, etc. shall be arranged by the successful tenderer only.
- 2.7.3. SAIL/BSL, on request of the successful tenderer, shall provide required drawings/data of the existing equipment, to the extent available with it.
- 2.7.4. Operator assistance in the control room during cold run test, hot run test and performance guarantee test shall be provided by SAIL/BSL. However, necessary skilled/unskilled labour shall be supplied by the tenderer.

**2.8. SHUT DOWN ACTIVITIES:**

- 2.8.1. The work may be executed in phased manner as per the agreed shutdown schedule. The project shall be carried out in such a way that the entire work shall be executed within the planned shutdown period. Keeping this in view, the Bidder shall indicate the total implementation strategy and best implementation schedule including shut downs mutually agreed as per production plan of HSM. This strategy shall clearly indicate the off-line as well as on-line activities with respect to shutdown. The complete change over from existing system to proposed system shall be done in shortest possible time and without disturbing the production schedule.

**2.9. TRAINING:**

- 2.9.1. Training to 04 BSL Engineers on the supplied system to be provided by the Tenderer at manufacturer's premises/training Centre amounting to 12 man days minimum. The cost of traveling, boarding and lodging will be borne by SAIL/BSL.
- 2.9.2. Training to 06 BSL personnel on the supplied system amounting to 12 Man Days to be provided by the Tenderer at the site.

**2.10. EXCLUSION & DEVIATION:**

- 2.10.1. The tenderer shall clearly specify the exclusion and deviation, if any in the offer from the scope of work specified in the TS as per Schedules Format-1.1 and Format-1.2.

**2.11. SPARE SUPPORT AND REPARABILITY:**

- 2.11.1. The supplier shall give the details of the reparability option of the offered system. The extent of reparability at the supplier end shall be indicated. The supplier shall also indicate whether and up to what extent the system will be repairable at user end and what are the supports the supplier will provide to user for repairing. The supplier shall ensure / stand guarantee that the spares of the offered system will be available for a minimum next 10 years from the date of commissioning.

**2.12. SITE VISIT AND OTHER REQUIREMENTS:**

- 2.12.1. The bidder shall visit the site, study drawings/ documents and discuss with the employer, if required, regarding any technical clarification and satisfy himself with respect to the nature and extent of work involved. The bidder shall also obtain first-hand information regarding location, work terrain, climate condition, railways, roads, airports and communication etc. before offering the bid for the job. Site visit declaration is to be submitted along with offer.

**2.13. WARRANTY AND GUARANTEE:**

- 2.13.1. There will be a warranty/defect liability period of 01 year from the date of commissioning of the system, for all the equipments including DC drives, associated electrics/electronics, maintenance of the system and consumables. Any defect during the warranty period in DC drives, associated electrics/electronics and anything else is to be resolved by the supplier, if required the defective item is to be replaced with new item at no extra cost to SAIL/BSL.
- 2.13.2. Supplier will give a guarantee of availability of necessary spares for at least 10 years from the date of commissioning to run the system. The tenderer shall stand guarantee against obsolescence of equipment under their scope of supply for minimum period of 10 years. The

tenderer shall also guarantee that discontinuity of production of any item offered as a part of the system shall not affect the maintainability of the system.

**2.14. QUALITY ASSURANCE:**

- 2.14.1. The successful bidder shall furnish a plan of quality assurance in respect of site works as well as supplies proposed to be followed for the purpose of assuring the quality of equipment and workmanship at various stages. The Quality Assurance Plan shall be mutually discussed and approved by SAIL/BSL.

**2.15. HAZARD/RISKS:**

- 2.15.1. The bidder shall identify any hazard / risks which may result in fatal accidents/ severe damage to human health and safety, damage to equipment, and material resulting in loss of time, and having cost implication. The bidder will carry out the above assessment and formulate appropriate action plan to prevent such incidents. This action plan shall be submitted to SAIL/BSL before start of the work.

**2.16. STORAGE & MATERIAL HANDLING:**

- 2.16.1. The storage and material handling will be the Tenderer's responsibility.
- 2.16.2. All equipments shall be packed properly for prevention of damage during transit & storage. The successful tenderer shall have to arrange for safe & secured storing of the materials in a space provided by the purchaser inside the plant premises.
- 2.16.3. The successful tenderer shall arrange to transport, unload and store at site all the equipment and materials. The equipment shall be suitably packed and protected before transporting. Supplier shall bear the sole responsibility for any damage/theft before installations of items.
- 2.16.4. To transport and/or remove the materials/equipment from their respective storage areas/ space to the respective erection/work site/location shall be successful bidder's responsibility.
- 2.16.5. All arrangements for smooth erection like crane etc., if required, shall be arranged by the contractor.

**2.17. DRAWINGS / DOCUMENTS / DATA TO BE FURNISHED:**

- 2.17.1. The complete Design, detailed engineering & documentation of the offered Digital Thyristor Converter shall be in tenderer's scope of work. The tenderer shall submit all the relevant drawings & documents for SAIL/BSL's approval prior to commencement of any manufacturing/ project implementation/ ordering activities.
- 2.17.2. Successful tenderer will prepare and submit for SAIL/BSL's approval, GA & schematic diagrams (03 sets) for Main Distribution Board, sub distribution board and single line diagram indicating the power distribution system. After completion of work as built drawings incorporating all changes at site shall also be submitted by the successful tenderer in three (03) sets of hard copy and one soft copy as well.
- 2.17.3. The Bidder shall furnish the tender in six copies. This shall cover the technical part of the

tender and the following drawings/documents shall essentially be furnished in the technical part.

- 2.17.4. Schedule of offered instruments including quantities as per Bill of Materials.
- 2.17.5. Technical specification, literature, catalogues etc. of offered equipments.
- 2.17.6. GA Drawings for each item.
- 2.17.7. List of deviations and exclusions, if any.
- 2.17.8. List of bought out items /components with their makes.
- 2.17.9. List of consumables and commissioning spares of the system.
- 2.17.10. To confirm towards the compliance of each clause & sub-clause of the T.S.
- 2.17.11. Implementation schedule in form of Bar chart.
- 2.17.12. The bidder shall submit the following drawings for approval and reference in 03 sets
- 2.17.13. Data Sheet for each equipments/items.
- 2.17.14. GA and schematic drawings for complete system.
- 2.17.15. Disposition of equipment in control room.
- 2.17.16. Power wiring diagram.
- 2.17.17. External connection diagram.
- 2.17.18. Cable and pipe schedule.
- 2.17.19. Cable and pipe routing diagram.
- 2.17.20. Installation drawing for equipment/item.

## **2.18. OPERATION AND MAINTENANCE MANUAL:**

- 2.18.1. These manuals shall include the complete specification of the offered system, sub assemblies, ordering information, programming steps, optimization steps, configuration details, explanation of each and every parameter, complete terminal details of control cards with signal level, inter connection detail of the cards/sub assemblies, details of control and power interface, fault details with possible reasons, troubleshooting steps, diagnostic procedures and detailed commissioning procedures.

## **2.19. COMPLETION TIME AND PROJECT IMPLEMENTATION SCHEDULE:**

- 2.19.1. The Tenderer shall be responsible for completion and integration of the system in all respect within eighteen months (18) from effective date of contract. The job would be done in phased manner in Annual Capital Repair/Fortnightly Shutdown of HSM. Details of the same shall be furnished. Bar chart shall be furnished along with the offer indicating time period required for design/engineering,

manufacturing, supply, erection, testing & commissioning of the system. The work shall be completed as per bar chart of implementation schedule.

**2.20. COMPLETENESS OF PROJECT:**

- 2.20.1. All the ratings of equipments /items mentioned in this Technical Specification shall be considered minimum. However, actual ratings shall be decided mutually during detail engineering, for which no extra claim on price by the bidder shall be entertained.

**3. TECHNICAL SPECIFICATION:**

**3.1. DESIGN BASIS:**

- 3.1.1. Climatic conditions:
- 3.1.2. Altitude above sea level: 229m
- 3.1.3. Ambient temperature: 50 degree Celsius (max)
- 3.1.4. Relative humidity: 100% (max)
- 3.1.5. Environment: Dusty
- 3.1.6. Note: Maximum temperature & maximum humidity not likely to occur simultaneously.
- 3.1.7. For the purpose of equipment design, maximum ambient conditions are to be taken into consideration for de-rating and shall be for 50 degree Celsius temperature and 99% relative humidity.
- 3.1.8. All equipment and components shall be suitable for operation in hot, humid and dusty atmosphere prevailing in steel plant.
- 3.1.9. All equipment and accessories shall be designed for continuous operation understated site area.
- 3.1.10. Design shall include all reasonable precaution and provision for the safety of operating and maintenance personnel/equipments.

**3.2. INPUT POWER SUPPLY SYSTEM :**

- 3.2.1. Input voltage: 3 phase 11kv to each transformers
- 3.2.2. Input voltage: 3 phase, 415V (+10%, -20%) (for drives at sl. No. 2 &4) Input voltage: 3 phase, 220V (+10%, -20%) (for drives at sl. No. 3)
- 3.2.3. Input frequency: 50 Hz ( $\pm 6\%$ ) System power factor: 0.8 lag to 1.0
- 3.2.4. A Source of 3 phase 415V& 220V raw power shall be made available from the purchaser. The supplier shall derive all required power and control supplies from this feed.

**3.3. OFFERED SYSTEM FOR THYRISTOR CONVERTER PANEL SHALL COMPRISE OF FOLLOWING:**



- 3.3.1. AC Circuit Breaker for Digital Thyristor Converter, DC Breaker (HSDCB) for Armature Converter, Isolation Transformer for Control circuit for interphasing the Thyristor Converter with the existing logic.

**3.4. TECHNICAL SPECIFICATIONS OF THE ITEMS TO BE OFFERED:**

- 3.4.1. Dry type Transformer with following details & specification:

3.4.1.1. 1600 KVA, 3 phase 11000v/440v for 3 Nos. of converters at sl. No.1 of Table-1. TYPE : DRY

3.4.1.2. DESIGN SPECIFICATION : IS - 11171-1985, IS: 2026-2011, IEC-60076  
FREQUENCY : 50HZ

3.4.1.3. PHASE (HV AND LV) : 3PH(THREE PHASE)

3.4.1.4. TYPE COOLING: AN (Temperature controlled Blowers to be provided for additional cooling if required)

3.4.1.5. INSULATION : CLASS-H

3.4.1.6. VOLTAGE, INPUT : 11KV(UE)

3.4.1.7. VOLTAGE, OUTPUT : 440V

3.4.1.8. POWER, RATED : 1600KVA

3.4.1.9. DUTY : Transformer should be designed for continuous overload of 150% of rated current. The transformer should be capable of taking overload of 200% of rated current for 30 sec once in every 120sec.

3.4.1.10. K-FACTOR RATING : More than 20

3.4.1.11. GROUND SHIELDING : A shield of grounded metallic barrier between the primary and secondary windings of the transformer to be provided to reduce the capacitive coupling and thereby increases the transformers ability to reduce high frequency noise.

3.4.1.12. VECTOR GROUP : DYn11 (preferably)

3.4.1.13. TAP OFF CIRCUIT : 5(2.5% STEPS) on HT Side

3.4.1.14. WINDING MATERIAL : COPPER MAXIMUM AMBIENT TEMP. : 50 Degree C

3.4.1.15. PERMISSIBLE MAXIMUM WINDING TEMP. AT FULL LOAD : 70 Degree C above ambient temp

3.4.1.16. PERCENTAGE IMPEDANCE : AROUND 5.5 %

3.4.1.17. ENVIRONMENT : TROPICAL (Transformer shall be used in environmental condition with Maximum ambient of 50 degree centigrade and maximum humidity of 100 % (not occurring simultaneously).

- 3.4.2. Following fittings shall be provided:

3.4.2.1. Rating and diagram plate.

3.4.2.2. 02 nos. earthing terminals

3.4.2.3. 04 nos. bidirectional rollers

3.4.2.4. Off circuit tap links

3.4.2.5. Lifting lugs

3.4.2.6. Marshalling box

- 3.4.2.7. LV terminal suitable for cable termination or as per requirement
- 3.4.2.8. HV terminal suitable for cable termination or as per requirement
- 3.4.2.9. Transformer door interlock protection
- 3.4.2.10. Digital WTI scanner
- 3.4.2.11. Transformer fitted with neutral ct:- 1000/5a-1a
- 3.4.2.12. Any other accessories and fitting deemed fit for installation may be supplied.
- 3.4.2.13. Note: Guarantee certificate and test reports as per the standards must be submitted at the time of material supply. Supplier shall submit Type Test certificate for transformer conducted at factory. Routine test will be required to be done at site by the successful bidder.

### **3.5. TS OF HT ISOLATOR:**

- 3.5.1. HT isolator should be suitable for 11kv unearthed system. Isc 40ka for 3sec. Isolator has to be without HT fuse. It has to be fitted with class-3 surge arrester with suitable mcov.
- 3.5.2. HT isolator 630A, Isc 40KA 3 sec. with Numerical relays and CT for transformer protection , metering, annunciation, temperature scanner and suitable auxiliary relays for signaling and tripping upstream HT breaker on minimum following protections with indication at HT panel also(11KV Unearthed system)
- 3.5.3. Overcurrent b) Over temperature c) Earth fault (for 3 nos. of transformers to be supplied)
- 3.5.4. Isolator has to be without ht fuse. it has to be fitted with class-3 surge arrester with suitable mcov

### **3.6. NUMERIC RELAYS SPECIFICATIONS FOR TRANSFORMER PROTECTION:**

- 3.6.1. Numerical relays to be considered for transformer protection.Siemens-Siprotec4 and above,ABB- 615 series, Schneider-Micom P141 series
- 3.6.2. Minimum 8 numbers of programmable LEDs for fault indication.
- 3.6.3. Screen display size shall be such that SLD could be configured.
- 3.6.4. Display shall have dynamic mimic of CB and CT etc.
- 3.6.5. Auto diagnostic feature.
- 3.6.6. Fault event and trip log storage.
- 3.6.7. Direction phase over current protection-4 stages minimum.
- 3.6.8. Relay shall have current coil for CBCT based Sensitive Earth fault sensing.Minimum primary current sensing 0.1A
- 3.6.9. 2nd harmonic restraint against inrush feature.
- 3.6.10. Relay shall be suitable for 1A and 5A both.
- 3.6.11. Flagged type trip and auxiliary relay.

- 3.6.12. GE make Master trip relays-VAJHM23.
- 3.6.13. Trip circuit supervision relay-VAX31.
- 3.6.14. Breaker On /OFF position control relay-VAJC11.
- 3.6.15. Auxiliary relay for transformer trouble-VAA33.
- 3.6.16. Alarm and Trip relay shall be separate. Relay shall be separate for each transformer.
- 3.6.17. Door open trip to be considered for dry type transformer.
- 3.6.18. Analog ammeter with ammeter selector switch(25A rated). Digital ammeter with communication capability.
- 3.6.19. MFM with communication capability.
- 3.6.20. Static annunciator(16Window).Push buttons shall be external to annunciator.
- 3.6.21. CBCT-50/1A. Minimum primary operating sensitivity-0.1A
- 3.6.22. ICT-1/1A. For remote metering.
- 3.6.23. TNC switch(25A)& Local remote switch(25A)
- 3.6.24. Indication lamps-ON,OFF,TRIP,TEST,SERVICE,SPRING CHARGED,TC HEALTHY,TC UNHEALTHY
- 3.6.25. Separate control MCB for Closing, Tripping, annunciation, indication, auxiliary, MFM etc. Control supply-110V DC.
- 3.6.26. provision of 3/5 pin 10A plug and socket for testing & space heater
- 3.6.27. The Microprocessor based 3 phase, 4Q, 4000Amp (at 50 degree celsius), 460Volt DC drive shall be supplied for drives at sl. No. 1&2.
- 3.6.28. However drive to be supplied against sl. No.3 &4 will have current rating of 1500A (at 50 degree celsius), & 2500A (at 50 degree celsius) respectively for each. All the 13 drives should have following features:
  - 3.6.28.1. User configurable
  - 3.6.28.2. DI – 16 nos. minimum (At least 8nos 230vac isolated input) DO – 8nos. minimum (Potential free relay contact)
  - 3.6.28.3. AI - 4nos. minimum (Isolated 0 to  $\pm 20$ mA/ 0 to  $\pm 10$ volts) AO - 4nos. minimum (Isolated 0 to  $\pm 20$ mA/ 0 to  $\pm 10$ volts)
  - 3.6.28.4. Drive Software shall be user configurable. Online parameter changing facility. Adaptability to higher level automation with Profibus communication.
  - 3.6.28.5. Diagnostic features: standard features and online monitoring of signals in values and in graphic mode.

- 3.6.28.6. Data logger for min 4 signals with user configurable and user selectable condition for trigger and with min 800 data before trigger and 200 data after trigger.
- 3.6.28.7. Fault logger to log faults with real time and date tag.
- 3.6.28.8. Suitable draw out type Air Circuit Breaker.
- 3.6.28.9. AC surge suppressor for armature converter
- 3.6.28.10. Field converter shall be of fixed voltage type of rating 32A, 220 volts DC for drives at sl. no. 1,3&4 and Adjustable Field converter(for variable no of motors) through parameterisation of minimum 100A,220V DC for two nos of drives at sl. No. 2 along with isolating transformer and over voltage protection. There should be provision to adjust field current as per the number of motors in operation.

### **3.7. SPECIFICATIONS OF THE A.C. B (TO BE OFFERED):**

- 3.7.1. Voltage rating: 415 V (+10%, -20%)
- 3.7.2. Current rating: As per drive rating.
- 3.7.3. Frequency: 50Hz  $\pm$  6%
- 3.7.4. Short time rating for 1 sec: 50KA
- 3.7.5. Symmetrical breaking capacity: 50KA
- 3.7.6. Making capacity: 105KA
- 3.7.7. Control supply: 240V AC
- 3.7.8. Closing mechanism: Motor wound spring charged, stored energy type along with independent manual
- 3.7.9. Tripping mechanism: Shunt trip/direct acting release.

### **3.8. PROTECTION RELEASE:**

- 3.8.1. The ACB shall have self-powered Microprocessor based release with following protection:
  - 3.8.1.1. Short circuit protection,
  - 3.8.1.2. Overload protection,
  - 3.8.1.3. Earth fault protection
- 3.8.2. The main feature of the release shall be as follows:
  - 3.8.2.1. The release shall be settable at site.
  - 3.8.2.2. Each protection shall have separate indications of protection operation. Fault indications shall have retention features till it gets acknowledged without requirement of any external control supply/inbuilt battery.
  - 3.8.2.3. The short circuit protection shall have instantaneous & short time provision to ensure discrimination with downstream & upstream circuit breakers.
  - 3.8.2.4. Earth fault protection shall be definite time type & a minimum time setting of 100msec shall be available in the release.
  - 3.8.2.5. All protection shall have separate setting dials for pickup and time settings.

### **3.9. SHUNT TRIP RELEASE:**

- 3.9.1. Each ACB shall have Shunt trip release of rating 240V AC, directly operated through auxiliary contact (Rated current-10A) and having at least 4NO+4NC shall be provided.

### **3.10. DC BREAKER:**

- 3.10.1. DC Breaker (HSDCB) shall be used as a line contactor in the converter output circuit.
- 3.10.2. Power contact rating shall be 4000A, 2500A & 1500A as per converter rating with proper arc quenching arrangement. Coil voltage and auxiliary contact shall be finalized during detailed engineering of the system. DC Breaker Control shall be from the respective operating pulpit with Indication Lamps

### **3.11. SPECIFICATION OF DIGITAL THYRISTOR CONVERTER SYSTEM:**

- 3.11.1. (ACCEPTABLE MAKE FOR THRISTOR UNIT/DC DRIVES: ABB, GE AND SIEMENS ONLY)
- 3.11.2. This specification includes specific salient features, constructional details of the drive system & control equipment, protection, indication and annunciation components.
- 3.11.3. The system shall comprise of following main units:
  - 3.11.3.1. Air Circuit Breaker.
  - 3.11.3.2. AC Reactor for armature converter.
  - 3.11.3.3. Semiconductor fuses to be provided in the incomer circuit of each drive.
  - 3.11.3.4. Thyristor Converter with digital drive regulation and control for armature.
  - 3.11.3.5. Operator interface for visualization of parameters and local control of the drive.
  - 3.11.3.6. Surge Suppressor.
  - 3.11.3.7. DC Breaker for armature circuit.
  - 3.11.3.8. Control circuit to interface Thyristor Converter with existing relay logic/ PLC based control system.
  - 3.11.3.9. Interposing relay shall be used for the connection of all Digital inputs and digital outputs.
  - 3.11.3.10. Proper signal isolator for all Analog inputs and Analog outputs (ref., current, speed) at/from remote location.
  - 3.11.3.11. Portable Programming Unit (PC based) with associated hardware & software for configuration/programming of drive, storage of program backup & fault analysis.
  - 3.11.3.12. Provision of required power supply units for 'Control Circuits' & various transducers used in the Thyristor Converter panel.
  - 3.11.3.13. The IP (interposing) relay for on command shall have 4NO & 4NC contacts for interfacing with existing machine.
  - 3.11.3.14. Field Sensing Relay to be provided for all the existing motors
  - 3.11.3.15. Torque proving feature.
  - 3.11.3.16. Drive controller and power device should be of same OEM make and panel should be modular in design having single module without paralleling.
- 3.12. The offered thyristor converter panel shall have following controls & monitoring facilities on the panel

door:

3.12.1. Push Button :Emergency Stop

3.12.1.1. This push button will be used for switching OFF thyristor Converter in case of Emergency .  
Emergency stop PB shall be Mushroom type.

3.12.2. Analog Meters for monitoring : (Size – 90x 90)

3.12.2.1. Input AC voltage ( 0 – 500 Volt AC )

3.12.2.2. Converter Output DC voltage (500- 0 – 500 Volts DC )

3.12.2.3. Converter Output current (4000- 0 – 4000A DC )

### 3.13. LED indications:

3.13.1. Drive Ready

3.13.2. Drive ON

3.13.3. Drive OFF

3.13.4. Drive Trip

### 3.14. TECHNICAL SPECIFICATION OF DIGITAL THYRISTOR CONVERTER UNIT(TABLE):

Sl.NO.	Specific Aspect	Technical Features
1	Power Supply System	3 Phase, 415 Volt, 50 Hz, (+10%, -20%) SL. NO. 1,2 &4 3 Phase, 220 Volt, 50 Hz, (+10%, -20%) SL. NO.3
2	Ambient Temperature Humidity	50 ° C 100%
3	Incoming power supply Sourcefor thyristor converter.	From rectifier transformer secondary
4	Enclosure & degree of protection	Control panel shall be dust & vermin proof made of 2 mm thick CR sheet steel. Height of panel not to exceed 2200mm. Degree of protection of the panel –IP41.
5	Thyristor converter type	Armature converter: 3 phase,6 pulse, 4Quadrant operation ,(Reversible) Output: 4000Amp, 460Volt DC(drives at sl. No. 1&2) For Drive at. Sr.no.3 &4, Converter Rating would be 1500A& 2500A respectively. Field Converter : 220V; 100 A (drives at sl. No.2) i 220V; 32A (drives at sl no.1,3 &4)

SI.NO.	Specific Aspects	Technical Features
6	Duty	ii Shall match with the loading nature of existing machine
7	Connectivity to external field devices	a For meeting the application need, sufficient nos. digital & analog I/Os shall be provided in the drive speed reference, interlocking & sequencing. Provision to be given for 'SPEED FEEDBACK' / 'EMF FEEDBACK(User selectable)
8	Communication with Automation system	The Digital Thyristor Converter shall be able to communicate with Level 1 automation system through Standard Communication protocols/Profibus communication matching with Existing System / Future requirement. Provision of HMI with redundancy will be made to include display of status of other drives in furnace area
9	Protection features	The drive shall have following protection Features (minimum required ) : Phase failure Under voltage/ over voltage Over speed Speed feedback failure (Tacho failure) Overload Inst. Over current Motor field loss Cooling fan failure SCR heat sink temperature too high - Motor stall Communication error

### 3.15. SAFETY REQUIREMENT:

- 3.15.1. Special care shall be taken to make the enclosed equipment protected against the entry of foreign matters, vermin etc. that may create electrical short circuits inside the active equipment.

### 3.16. CABLES & CABLE LAYING:

- 3.16.1. The scope shall cover supply of power (HT and LT AC & DC) & control cables, special cables, cable laying accessories consisting of cable trays, supports, conduits, termination accessories, identification ferrules and tag marks etc. The scope shall include, unless and otherwise specifically excluded, cable laying & terminations at both ends for the cables originating from Seller's equipment & terminating at Bidder's equipment as well as originating from Bidder's equipment & terminating at Buyer's equipment at field. Scope shall include GI conduits, mounting stands, junction boxes and other cabling & piping accessories etc.

3.16.2. All control cables should be conforming to IS-1554 or relevant Indian Standards as applicable.



- 3.16.3. The wiring in cubicles should be done with minimum 2.5 Sq. mm copper conductors.
- 3.16.4. Power cable to be provided by the tenderer wherever required for power tapping as per rating of motor (Twice the motor peak current). i.e. 3.5 cores X 240 sq.mm at least 2 lengths in each tapping.

**3.17. ELECTRICAL ACCESSORIES & WIRING:**

- 3.17.1. All electrical accessories e.g. circuit breakers, control switches, push buttons, panel, lighting fixtures, light switches receptacles etc. required for the panel to be provided wherever required for power tapping.
- 3.17.2. Electrical accessories should be suitable for the environment or specific locations.
- 3.17.3. The panel wiring except power should be done with 1.1 KV grade PVC insulated, 2.5 sq. mm annealed tin copper conductor. Wiring shall be continuous between terminal points (without joint) and shall terminate on solderless type wire connection at the instrument and to terminal blocks.
- 3.17.4. All terminal blocks shall include minimum 20% spare terminals and shall not have terminals screws smaller than 2.5 mm.

**3.18. PANEL CONSTRUCTION:**

- 3.18.1. The offered drive system, its related circuit, shall be housed in a floor mounted panel.
- 3.18.2. The height of the panel shall not be more than 2300 mm.
- 3.18.3. The panel shall have panel cooling exhaust fans of suitable capacity.
- 3.18.4. Panel shall have lifting angle / eye bolts for lifting the panel.
- 3.18.5. Panel shall be accessible from front and rear both for maintenance.
- 3.18.6. Panel shall be of at least IP41 protection, acid resistant.
- 3.18.7. All boards/ subassemblies / relays / components fixed / installed in the panel shall have permanent marking for circuit designation.
- 3.18.8. All internal wiring shall be suitably routed through trunk for better noise immunity.
- 3.18.9. All cable entries shall be through bottom.
- 3.18.10. The arrangement of terminals for external connection shall be such that each an individual terminal shall be accessible for maintenance person without affecting the wiring at the any other terminal.
- 3.18.11. The Panel shall have lockable, hinge mounted door at front and rear side.
- 3.18.12. All indicating lamps shall be Group LED type.

**3.19. METERS AND INDICATIONS:**

- 3.19.1. Following meters and indications shall be provided at the front door of the panel. Accordingly the supplied system shall have provision for generating / routing the signals for these meters and indications.
- 3.19.2. Meters & indications at drive panel
- 3.19.3. Meter (center zero type) for direct armature voltage.
- 3.19.4. Meter (center zero type) for armature current
- 3.19.5. Meter for field current.
- 3.19.6. Meter (center zero type) for speed.
- 3.19.7. Drive system ready.
- 3.19.8. Interlock ready
- 3.19.9. System in Fault.
- 3.19.10. DC breaker ON.
- 3.19.11. DC breaker OFF.
- 3.19.12. Drive Running.
- 3.19.13. All input and output to / from the system shall have visual indication at the electronics level in the respective cards.
- 3.19.14. Indications & Control at Existing Control Desk
- 3.19.15. Drive Healthy LED.
- 3.19.16. Drive Fault LED.
- 3.19.17. DC breaker ON / OFF Control & Indications.
- 3.19.18. Interlock healthy.

**3.20. MAINTAINABILITY & RELIABILITY:**

- 3.20.1. In system design, special attention shall be paid for maintainability. The composition and mechanism of the instruments and other control equipment shall be simple, and the spaces for operation, inspection, repair, remedy and adjustment, shall be provided to ensure that operations are readily performed.
- 3.20.2. The Contractor shall offer computer based measurement system for diagnostic purpose.

**3.21. SPECIAL INSTRUCTIONS TO TENDERERS:**

- 3.21.1. The specifications forms a part of the overall document and shall be read in conjunction with

SAIL/BSL's General Conditions of Contract (GCC), available for download at SAIL Tender Website, for supply, erection, and commissioning of all such items and equipment. However, wherever the clauses stipulated in GCC are in contradiction with those stated herein, the clauses mentioned in this document shall prevail.

- 3.21.2. All technical specifications given in this document may be treated as minimum requirements by the Bidder. Based on this Tender document, the Bidder must submit their best Technical Offer to complete the entire job on turnkey basis. The Bidder is expected to carefully go through this Tender document, before submitting their offer. The Bidder may visit sites, at its own cost, analyse and discuss functional requirement of each section with SAIL/BSL, before submitting their offer.
- 3.21.3. The bidders scope of work shall consist of erection, testing & commissioning of the complete system including supply of erection materials. Bidder is advised to study the actual layout of site at HSM of Bokaro Steel Plant to assess the system requirement as well as that of erection materials including pipes, cables etc. The tenderer quotation shall include entire requirement of erection materials as per actual site location. Any shortfall in erection material shall be included in the tenderer scope of work only and no further increase in prices on this account shall be considered on later date.
- 3.21.4. It shall be deemed that the Tenderer has understood the content and the meaning of the requirements laid down in the specifications. Submission of Technical Bid without documents as mentioned herein shall be considered as incomplete and the Bid shall be liable to be rejected. Any representation, post submission of the offer for any revision/modification of the offer, on grounds of non-compliance of the Tender Technical Specifications shall not be accepted.
- 3.21.5. Any deviation due to site condition shall be brought to the notice of the Purchaser before starting of the job.
- 3.21.6. Normally no exclusion in the offer is allowed. However, exclusions in the offer, if any, shall be clearly stated under the heading "Exclusions" quoting the respective reference (paragraph number) of the tender documents.
- 3.21.7. All the specifications given in this document is indicative and the vendor shall be responsible for providing a complete solution. The scope shall consist of all the main components, accessories, and works as per Technical Specifications furnished in preceding sections of this document. However, as it is a turnkey project, any equipment or works not specifically mentioned but considered essential for completeness of the offered scope of work shall be deemed to be included in the Scope of Work.
- 3.21.8. The Prime Bidder shall be solely and completely responsible for the entire scope of work as per the schedule & time line on turnkey basis. All submission shall be done by the prime bidder only.
- 3.21.9. In case the Tenderer feels that he is in a position to suggest better alternative within the scope of technical specification, he may do so indicating the technical justification for such alternative offer.
- 3.21.10. All materials required for the installation and commissioning of the system shall be supplied in sufficient quantities. Adequate spares shall be included in the initial supply to meet the requirement of replacing components/parts etc. found defective or faulty during installation

and commissioning.

- 3.21.11. The Tenderer shall make their own arrangement for transportation of men and material to site. SAIL/BSL shall provide help in arranging for the gate passes as per existing CISF and company rules.
- 3.21.12. The Tenderer shall arrange necessary and sufficient infrastructure at Bokaro to provide services during complete proposal period.
- 3.21.13. The Successful Bidder/Supplier shall acquire in its name all permits, approvals, and/or licenses from all local, state, or national government authorities or public service undertakings that are necessary for the performance of the Contract.
- 3.21.14. The Successful Bidder/Supplier shall comply with all laws in force in India. The laws shall include all national, provincial, municipal, or other laws that affect the performance of the Contract and are binding upon the Successful Bidder/Supplier.
- 3.21.15. The equipment shall be manufactured with good quality material under first class workmanship. The components shall be designed, assembled & tested in accordance with the relevant standards published by the Indian Institutions or equivalent.
- 3.21.16. All the items offered shall be rugged, modular construction, designed and manufactured so as to be suitable for reliable, fail-safe operation in steel plant environment. High degree of reliability shall be built in by providing carefully selected and rigorously checked components suitable for industrial environment.
- 3.21.17. The components of all equipments shall be designed, assembled & tested in accordance with the relevant standards published by the Indian Standard Institute. Indian conditions are taken care on in cases where Indian Standards are not available. The equipment shall conform to the generally accepted codes & practices.

**3.22. SAFETY:**

- 3.22.1. All statutory safety rules and regulations prevailing in the area and as prescribed by the company shall be observed by the bidder. The bidder shall acquaint himself with the guidelines set forth by Bokaro Steel Plant in this regard in their SBD for adherence to the same during the progress of work at site.
- 3.22.2. The bidder shall acquaint himself with all the relevant statutory regulations such as Indian Electricity Rules and other statutory rules.
- 3.22.3. Prior to commencing any work at site, the bidder shall obtain clearance from the SAIL/BSL's Engineer/Safety Department and shall abide by all the safety rules and regulations of the plant.
- 3.22.4. The bidder shall enforce necessary safety measures for all personnel working at site and must have electrical supervisory license for the person supervising the electrical equipment.
- 3.22.5. The installation of all equipments, laying of cables and pipes & wiring shall conform to the application codes and practices as per the Indian standards & shall be executed to comply with latest Indian Electricity rules as regards safety, earthing of equipments & other essential provision specified there in. All installation shall be done in an approved manner &

acceptable to SAIL/BSL.

- 3.22.6. All the equipments offered shall also conform to the statutory requirement of Govt. of Jharkhand and to the latest version of Indian Electricity Rules.
- 3.22.7. All equipment shall be packaged properly for prevention of damage during transit and storage.
- 3.22.8. The contractor after completion of the erection of all equipment shall arrange for the inspection and clearance of the statutory authorities.
- 3.22.9. The tenderer shall do all the enabling works required for the said package such as temporary shed, construction of site office, equipment storage shed, adequate illumination during construction, erection and fencing etc. at his own cost.
- 3.22.10. The equipment shall be completed with safety devices for smooth operation and free from potential hazards to the working personnel. There shall be adequate provision for access to and move around equipment for operation and maintenance functions. All moving and exposed parts shall be adequately guarded.
- 3.22.11. The construction of electrical equipment shall provide adequate access to facilitate easy disconnection/connection, inspection, maintenance and repairs.
- 3.22.12. All working parts, so far as possible, shall be arranged for convenience operation, inspection and ease of replacement with minimum down time. All like parts on equipment furnished or on duplicate equipment shall be interchangeable.
- 3.22.13. All equipment supplied shall have adequate access for connecting up, inspection, and maintenance and shall operate satisfactorily under such variation of load and climatic conditions as may actually occur at site of working.
- 3.22.14. For Thyristor Converter/DC Drives the acceptable makes are ABB, GE Power Conversion and Siemens only. All other equipments/accessories etc shall be from preferred make list of GS-13 or CET-LIST OF ACCEPTABLE MAKES OF EQUIPMENT & SUPPLIES (Indigenous Supplies Only), March'2022 or latest amended versions.

**3.23. CO-ORDINATION WITH OTHER AGENCIES AT SITE:**

- 3.23.1. Co-ordination with other agencies be organized by the supplier and the work carried out smoothly without affecting schedule of work.

**3.24. LANGUAGE & UNITS:**

- 3.24.1. All name plate, drawings/documents, operating & maintenance manual shall be in English language. Calibration of all instruments, dimensions, weights and quantities shall be in Metric units.
- 3.24.2. In case the tenderer feels that equipments offered shall have to be imported, the foreign exchange component and equivalent Rupees shall be indicated in the tender. All such equipment/system shall be imported by the tenderer on his own import licenses.

- 3.24.3. In case the equipment/system offered has designed/manufactured with foreign collaborations, terms and conditions, the level of collaboration etc. shall be furnished along with the tender.
- 3.24.4. The tenderer shall submit detailed specification of all the equipments quoted. Equipments shall conform to the specifications laid down to the relevant IS/IPSS specification and in case of item for which IS/IPSS specification is not available, the relevant international standard shall be followed. The standards to which the equipments conform shall be clearly indicated in the offer for each item.
- 3.24.5. The tenderer shall provide all necessary documents to satisfy SAIL/BSL that the necessary technical know-how, facilities, etc. are available with them to execute the work.
- 3.24.6. The work shall be completed in phased manner as per the availability of front/shutdown. The tenderer shall have to dovetail his completion schedule with the scheduled shutdown/front availability. The time bar chart mutually agreed upon shall form a part of the contract and shall not be changed arbitrarily by the contractor.

#### **4. PERFORMANCE GUARANTEE**

##### **4.1. GENERAL:**

- 4.1.1. The Successful Bidder shall take the full responsibility of guaranteed performance of each of the erected equipment / items and the overall system.
- 4.1.2. Before commissioning of the system, the Contractor shall complete preliminary acceptance test of all equipments and systems by demonstrating the working of individual equipment and system in an integrated manner.
- 4.1.3. The bidder shall give guarantee for design, manufacture and performance of individual equipment as well as complete system installation for a period of 01 (one) year (defect liability period) from date of commissioning of the system. The Service Engineers shall be well equipped with all spare parts for various equipments as required and shall arrange to replace / repair the failed / defective devices, component during commissioning /warranty period without any commercial implication to the purchaser.
- 4.1.4. The bidder will have to rectify all the defects during the defect liability period of 01 year free of cost towards design, manufacture, material quality, workmanship & erection. Replacement of defective parts shall be done free of cost and to the satisfaction of the purchaser. Cost of dismantling, transport, insurance, re-erection, if any, during elimination of defects/replacements of defective items shall be on the tenderer's account.
- 4.1.5. The bidder shall take full responsibility for the satisfactory performance/operation of the equipments to be supplied by him. The equipment shall be guaranteed by the tenderer as per relevant clauses of General Conditions of Contract (GCC) of the Purchaser.
- 4.1.6. The bidder shall stand guarantee against obsolescence of equipment under their scope of supply for minimum period of ten years. The Tenders shall also guarantee that discontinuity of production of any item offered as a part of the system shall not affect the maintainability of the system.

- 4.1.7. The bidder shall guarantee the system supplied for its workmanship, materials, design and satisfactory operation in accordance with relevant specifications and provisions of the contract. The guarantee for performance shall include individual items and systems for outputs as well as for the integrated operation of the supplied system.
- 4.1.8. The details of the performance guarantee tests, test procedures, test schedules for the demonstration of performance guarantee parameters shall be submitted to the employer which shall be mutually agreed upon.
- 4.1.9. The bidder shall conduct the performance guarantee tests to demonstrate PG parameters as defined hereunder in subsequent Para and as per provisions of Clause 27 of GCC and Appendix-V of SBD.

#### **4.2. PRELIMINARY ACCEPTANCE:**

- 4.2.1. On completion of the facilities by the bidder, trial runs for equipment/units shall be conducted by the bidder to prove that the facilities have been supplied and installed as per contract and after installation, facilities are fit for start-up and commissioning. The Successful Bidder shall carry out PAT in presence of BSL according to the test procedures, to be prepared by the Bidder and approved by BSL. After liquidation of all the defects and after fulfilling all the provision of clause 24 of GCC of Standard Bidding Document (SBD), SAIL/BSL shall issue Preliminary Acceptance Certificate (PAC) for the subsequent commissioning of facilities.
- 4.2.2. Preliminary Acceptance Tests (PAT) shall be started and continued for 7 days. The system shall be monitored closely and preliminary acceptance certificate (PAC) shall be issued on the basis of trouble-free operation.
- 4.2.3. PAT shall be conducted after completion and confirmation of the following:
  - 4.2.3.1. All the equipment/system along with its components and accessories have been properly installed as per the erection procedure submitted by OEMs.
  - 4.2.3.2. All approved drawings, documents and catalogues are available.
- 4.2.4. Following tests shall be included:
  - 4.2.4.1. Visual Inspection
- 4.2.5. The equipment shall be visually inspected to ensure **the** following:
  - Completeness of supply.
  - 4.2.5.1. Equipment conforming to specifications and drawings.
  - 4.2.5.2. Correctness of installation.

#### **4.3. RUNNING TEST:**

- 4.3.1. During this test, the installed equipment / system shall be tested to demonstrate their ruggedness functions and satisfactory performance. Total system shall be tested and validated to demonstrate satisfactory performance of the complete system.
- 4.3.2. After successful completion of the above tests and correction of the defects, if observed, Preliminary Acceptance Certificate (PAC) shall be issued by BSL to the successful bidder

and the facilities shall be considered as fit for start-up and commissioning

**4.4. COMMISSIONING:**

- 4.4.1. Commissioning test shall be undertaken by the bidder as per the provisions of Clause 25 of GCC of SBD. On successful completion of commissioning test employer shall issue commissioning certificate.
- 4.4.2. In case of any interruption during the specified period/duration of commissioning on account of reasons attributable to the employer, the acceptance of commissioning with regards to duration of commissioning tests shall be as per the mutually agreed terms between the employer and the bidder.

**4.5. PG TEST:**

- 4.5.1. After minimum one-month of regular operation from the date of commissioning of the project, bidder shall offer the equipment for carrying out Performance Guarantee Test. Starting time of Performance Guarantee Test shall be mutually agreed upon between BSL and Bidder.
- 4.5.2. The bidder shall carry out regulation of newly erected equipment and shall take full responsibility of operation of equipment and carrying out PG test using their experts. BSL shall make available necessary operating & maintenance personnel and required services during PG Test.
- 4.5.3. PG test shall be carried out as per the procedure mutually agreed and prepared for the pre decided parameters. Special instruments, if any, required for carrying out PG test shall be temporarily arranged by the Bidder.
- 4.5.4. PG Parameters:-
- 4.5.5. In order to qualify for acceptance, the equipment shall operate successfully for seven (7) days at 98% uptime efficiency.
- 4.5.6. 
$$\text{AVAILABILITY / UPTIME definition (A)} = \frac{(T-D)}{T} \times 100 \% +$$
- 4.5.7. A - Availability/ Uptime in percentage
- 4.5.8. T – Total time equipment is required to be in use (i.e. excluding time for planned maintenance period only)
- 4.5.9. D - Time lost due to failure of equipment/system supplied.
- 4.5.10. In case, the uptime efficiency is not obtained as mentioned above i.e. not meeting 98%, it will be run for additional number of days till the required uptime efficiency is achieved. However, the maximum allowable time for this will be 60 days.
- 4.5.11. Any other input condition, modalities of conducting the PG test shall be indicated by the bidder. The same shall be discussed with BSL and mutually agreed upon.



**4.6. FINAL ACCEPTANCE**

4.6.1. Final acceptance shall be as per clause no. 28 of GCC of SBD.

**\*\*End of Clauses\*\***

## FORM # 1

[Sample Manufacturer Authorization Form (MAF) from the OEM]

Ref. No.: \_\_\_\_\_

Date \_\_\_\_\_

To,  
The Engineer In Charge (*Name of the Project*)  
Project Department,  
Bokaro Steel Plant  
Steel Authority of India Limited,  
Bokaro Steel City – 827001,  
BOKARO, JHARKHAND

### Subject: Authorization / Undertaking for extending Service & Spare Support

Ref.: Bid Reference No.:

Dated:

\_\_\_\_\_  
Sir, I/We, M/s \_\_\_\_\_ [name & address of the OEM] who are Original Equipment Manufacturer (OEM) of the [Servers / Storage / Backup Drives] as listed in the BOM do hereby authorize M/s \_\_\_\_\_ [name and address of the bidder] to quote for the Service Contract with you as per the above referenced tender for the equipment(s) as mentioned above and manufactured by us. I/We also take full responsibility for both replacement of original Spare Parts & Service SLA as per the content & Scope of Work of the reference Tender for the entire period of the Service Contract.

Yours truly/faithfully,

For [*type name of the firm here*]

Signature of Authorized Signatory

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Phone No.: \_\_\_\_\_

Place: \_\_\_\_\_

Date: \_\_\_\_\_

[*Affix Seal of the Organization here*]

[*Note: The Bidder shall require the Original Equipment Manufacturer (OEM) to fill in this Form in accordance with the instructions indicated. This letter of authorization should be on the letterhead of the Original Equipment Manufacturer (OEM) and should be duly signed by the person who has proper authority to sign documents that are binding on the Original Equipment Manufacturer (OEM). SAIL/BSL has all the right to verify for the same from the OEM. The Bidder must include it in its bid*]

**DECLARATION OF SITE VISIT**

**(To be filled up by the Bidder)**

I, hereby, declare that I have visited the site to understand the site conditions, and acquainted myself with atmosphere prevalent therein. I have also understood the extent of total works involved for this package.

Signature of the Bidder:

Seal of company Name:

Designation:

**DETAILS OF AUTHORISED PERSON OF BIDDER DURING TENDER EVALUATION**

1. Name of Project:
2. Tender No. :
3. Name & Address of Bidder :
4. Name of authorized person (TECHNICAL) :
5. Email address :
6. Mobile No. :
7. Aadhaar No. :
8. Name of alternate authorized person (TECH) :
9. Email address :
10. Mobile No. :
11. Aadhaar No. :
12. Name of authorized person (COMMERCIAL) :
13. Email address :
14. Mobile No. :
15. Aadhaar No. :
16. Name of alternate authorized person (COMM) :
17. Email address :
18. Mobile No. :
19. Aadhaar No. :

Authorised Signatory

**Format-1.1**

**LIST OF EXCLUSIONS**

<b>Sl. No.</b>	<b>Reference clause of TS</b>	<b>Details of Exclusions</b>	<b>Reasons</b>

Seal of company

Signature of the Bidder  
Name  
Designation

**Format-1.2**

**LIST OF DEVIATIONS**

<b>Sl. No.</b>	<b>Reference clause of TS</b>	<b>Details of Deviations</b>	<b>Reasons</b>

Seal of company

Signature of the Bidder  
Name  
Designation

**Format-1.3**

**LIST OF RECOMMENDED OPERATION & MAINTENANCE (O&M) SPARES FOR TWO YEARS NORMAL OPERATION**

(To be filled by the Bidder)

Bidder shall recommend and tabulate below the list of Operation & Maintenance (O&M) spares for two years trouble free operation. Additional sheet of like format may be used if necessary.

<b>Sl. No.</b>	<b>Name of Sub Assembly</b>	<b>Description of Items</b>	<b>Quantity recommended</b>	<b>Make</b>	<b>Price per unit</b>

Seal of Company

Signature of the  
Bidder Name:  
Designation:

**Format-1.4**

**LIST OF COMMISSIONING SPARES**

(To be filled by the Bidder)

Bidder shall tabulate below item wise the list of commissioning spares necessary for the equipment offered.

Additional sheet of like format may be used if necessary.

Sl.No.	Name of Sub Assembly	Description of items	Quantity recommended	Make

Seal of company

Signature of the Bidder

Name

Designation



**Format-1.5**

LISTS OF SPECIAL TOOLS AND TACKLES

Sl. No.	Description	Quantity	Make

Seal of company

Signature of the Bidder  
Name  
Designation

**Format-1.6**

**LIST OF CONSUMABLES**

Sl. No.	Description	Quantity	Make

Seal of company

Signature of the Bidder  
Name  
Designation















**DETAILS OF AUTHORISED PERSON OF BIDDER DURING TENDER EVALUATION**

20. Name of Project:
21. Tender No. :
22. Name & Address of Bidder :
23. Name of authorized person (TECHNICAL) :
24. Email address :
25. Mobile No. :
26. Aadhaar No :
27. Name of alternate authorized person (TECH) :
28. Email address :
29. Mobile No. :
30. Aadhaar No :
31. Name of authorized person (COMMERCIAL) :
32. Email address :
33. Mobile No. :
34. Aadhaar No :
35. Name of alternate authorized person (COMM) :
36. Email address :
37. Mobile No. :
38. Aadhaar No :

Authorised Signatory

