# BHARAT ALUMINIUM COMPANY LIMITED

## AT KORBA, CHATTISGARH

## TENDER SPECIFICATION FOR 400KV GIS & 220KV AIS SWITCHYARD INCLUDES FOLLOWING

1) 400 KV GAS INSULATED SWITCHYARD
2) 400/220 KV, 500 MVA ICT TRANSFORMER
3) 220 KV SWITCHYARD MODIFICATION
4) 400 KV SHORT LENGTH LILO LINE SECTION

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## ATTACHMENTS

## 1.00.00 INTENT OF SPECIFICATION

This contract specification covers the engineering, design, manufacture, assembly, inspection & testing at manufacturer's works, packing, and delivery to BALCO site, Unloading at Site, Site storage & preservation, erection, testing and commissioning of 400KV/220KV switchyard and 400 KV LILO line section, including installation of 400KV GIS with outdoor equipment's, 400/220kV 500MVA ICT's, 220kV outdoor switchyard bay, interconnection with existing MRSDS switchyard & strengthening as specified in different sections of this specification, complete with all accessories for efficient and trouble-free operation including supply of spares for completeness of the total system.

It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to latest Indian & international standards of design engineering and workmanship and shall be capable of performing in continuous operation under all normal, abnormal & emergency conditions as may be desired.

The general terms and conditions, instruction to bidder and other attachment referred to elsewhere are hereby made part of the contract Technical Specification.

The bidder shall be responsible for and governed by all requirements stipulated hereinafter.

## 2.00.00 SCOPE OF WORK

## 2.01.00 400/220KV GIS & AIS SUBSTATION

**2.01.01** The broad scope under this specification covers establishment of following but not limited to as mentioned below:

1) System Engineering, Design, Manufacture, supply, transportation & insurance, storage, Civil work , Erection, testing & commissioning complete in all respect for 400KV GIS, associated outdoor equipment's, 220kV outdoor switchyard bays & equipment's to integrate with existing 220 KV MRSDS & required strengthening, two numbers of 500 MVA 400/220/33KV ICTs, related control, protection, monitoring, metering & automations system, required AC/DC/Emergency supply systems, required aux. sub-systems including Building for housing GIS, Control room & Other electrical system, office etc.

2) New s/s facility to be constructed at the existing 220/33/11/6.6 KV MRSDS Substation and requires partial dismantling of existing facilities, dismantling & relocation of some of the 220KV & 33 KV outdoor switchyard & bays as per overall requirements & feasibility considering new installation in most optimized manner.

3) While finalizing design and layout of the new s/s facility bidder needs to consider overall master plan for the MRSDS s/s location in view of proposed smelter expansion and rectifier switchyard at this location.

4) Restoration and extension of 400KV LILO Line section up to new 400/220 KV Substation at MRSDS location, this involves installation of additional 400KV Twin Curlew / Moose D/c Line section of 2+/-0.5 KM, inspection/audit, maintenance restoration & interconnection of ~15KM 400KV old LILO line already existing which is physically disconnected & discharged from existing 400 KV NTPC-Birsinghpur Line Circuit.

5) Vendor to offer equipment's and system which are of proven & latest design / model, type tested and guaranteed for long-term trouble-free operation without the risk of obsolesce at least for next 10 years. Vendor is also required to guarantee spare and services support for at least next 15 years at reasonable agreed cost

6) Obtaining all design, engineering, statutory approvals for the complete scope of works.

All the necessary miscellaneous jobs required for successful completion of total system shall be a part of the scope. The detailed tentative scope of work is brought out in subsequent clauses of this section and in the enclosed Annexure-C.

## 2.02.00 400KV GIS Switchyard & Outdoor equipment

a) Engineering, supply, civil work, installation, erection, testing & commissioning of 400kV, 63KA for 3 sec.,3150A (Min.) GIS consists of Double Bus, One and Half Breaker scheme, 4 No outgoing bays (02 line bays, 02 ICT Bays, 02 connected Tie breakers, 02 Nos. 3Ph Bus PT's) with SF6 gas ducts & air bushing for interconnecting with outdoor equipment's, SF6 evacuation, storage, filling, purifying & monitoring system, online PD & Condition Monitoring System for GIS. With provision of 02 Nos. of future bay's in GIS and building. Which includes following major outgoing equipment's
   i) 390KV, 10KA, Lightning Arrestor for 02 set for outgoing lines & 02 set for ICT bays.
   ii) 400kV SF6 to Air bushings 4 sets (2 sets for ICTs to GIS bus and 2 sets for GIS to Outgoing line gantry)
   iii) Bus post insulators 400 kV of required qty.
   iv) 04 no's of 400kV Wave trap outdoor type
   v) 02 sets 400 KV Outdoor CT & CVT for 02 nos. outgoing line metering & associated system as per grid code & requirements.
   vi) 04 set of 400 KV CVT outdoor type for outgoing going line & ICT bay (for protection & measurement)
   vii) 400 KV Line Isolator & Earth Switches as required.

b) All outdoor HV outdoor equipment should be manufacturing using polymer type of the insulator and CT & CVT should be SF6 gas type.

c) Bidder to submit 400KV GIS & Outdoor equipment yard Layout & Section Drawing, Single Line Diagram, Protection SLD, Technical Data Sheet etc. with the technical bid.

d) Power Line Carrier Communication system shall be as per grid authority requirement and the scheme of PLCC shall be approved by Power Grid Authority/WRLDC and Owner. Both end equipment's of PLCC shall be of identical make and plant end equipment's shall be provided by the contractor. Should be integrated with control monitoring system at both end and onwards communication as per monitoring requirements of Reginal / National Load Dispatch Center, should consider communication protocol as per grid requirements (IEC 101 / 104 or other as per approval requirements).

e) Control, relaying, protection, monitoring & metering panels & system for all equipment's under the scope of this contract.

f) 400kV Gantry/Tower shall be designed for factor of safety of 2.2 for normal/broken wire condition and 1.65 for short circuit condition. Gantry to design according 400kV Transmission towers.

g) Any other equipment/item as required for successful Commissioning, O&M of 400 KV GIS switchyard, 400KV out going line gantry, interconnection of 400 KV GIS bays with outgoing line gantry and 400 KV ICT transformer bushing in all respect with best engineering practices shall deemed to be part of the scope.

h) ACSR Conductor and insulators complete with required clamp/Connectors, hardware's as required.

i) Substation Automation system based on latest IEC 61850 communication protocol for 400KV GIS, 400/220/33 KV ICT, 220 KV (& 33 KV system as required) Outdoor Switchyard Bays and associated / auxiliary Systems.

j) SCADA/RTU connectivity with remote substation for substation data and protection integrations and existing BALCO system through PLCC/OPGW/FO as application considering adequate system redundancies, communication protocol should be based on the Power Grid/WRLDC/NTPC requirements for system integrations.

k) Bidder to keep required provisions in the Control, Protection, monitoring and automation system for integration with BALCO exiting GILMS system including required digital & analogue IO points, hardwired integration and through communication link.

l) Provision & installation of the addition SCADA terminal of new facility at existing 400KV GIS control

m) Related civil construction including architectural works as per relevant IS/PGCIL standards whichever is stringent in all respect for making the job functional.

n) Construction of Control Room Building which will accommodate the indoor 400kV GIS, Control, Protection, Measurement and Metering panel room for both 400kV as well as 220kV, AC, DC & emergency power & control supply systems, SCADA & Control Desk room, Engineers room, HVAC system, Fire Detection & Annunciation systems, Office, Toilets etc. The design and architecture for the same is in scope of bidder.

## 2.03.00 400kV/220KV/33kV 500 MVA ICT

a) Design, manufacturing, supply, transportation including loading and unloading of two numbers of 400kV/220kV/33kV 500 MVA ICT as per specification mentioned in Annexure # E.

b) ICT civil foundation construction (include supply of foundation bolt for rails, other civil accessories supply for completion of ICT transformer civil foundation work with cooler banks, conservator, jacking pads,)

c) ICT Fire wall – engineering & civil construction

d) Supply & fixing of Rail / Road upto maintenance platform including construction of outdoor maintenance platform for ICT

e) Oil Sump & common Oil pit – Engineering & civil construction as per relevant standard and statutory requirements with oil / water evacuation pump and interconnection with existing effluent drain line. Connection of 220KV outdoor switchyard bay with 400/220 KV ICT 220KV side gantry and transformer bushing

f) 8 Gas online DGA monitoring of international repute, transformer condition monitoring system with monitoring system/PC at control room with required software.

g) Fire Fighting system – Engineering, supply, erection & commissioning for ICTs.

h) Earthing of ICT & its auxiliaries – supply, engineering & erection

i) Supply, laying & termination of power, control, signal & communications cables from ICT to Control room and other required systems

j) Lightning protection system for ICT

k) Erection, Testing & commissioning of ICT and associated systems

## 2.04.00 220KV Outdoor Switchyard Bays & Equipment's

a) Relocation of existing & required 220 KV bays which includes 220KV BCPP plant feeder (02 nos.), associated required system & facilities; 33KV outdoor switchyard & bays, 220/33KV Transformer (if required) to other suitable location within MRSDS substation / nearby adjoining location. However, scope is not limited to same and scope include all the requirements for creation of required spaces for completion of the overall project.

b) Prior to dismantling of 220 KV Switchyard section & required bays; 33KV outdoor switchyard & feeders and 220/33KV transformer (if required) for creation of required space for installation of new facilities sections all the relocating activities must be completed to avoid any disruption of operating plant & facilities.

c) 220 kV outdoor substation bay for ICT's and interconnection with existing MRSDS Substation exiting 220 KV twin buses.

d) Strengthen existing 220 KV MRSDS Substation Bus to handle power flow (1000MVA) considering installation of new 400/220 KV ICT and routing to other 220 KV substations within BALCO. Present configuration of the MRSDS 220KV Bus Twin Zebra Conductor.

e) Scope include all required electrical equipment's and system including following but not limited to same -

i. 245 kV circuit breakers,

ii. 245 kV current transformers

iii. 245 kV CVT (Capacitive voltage Transformer)

iv. 2455 KV Isolator & Earth Switches

v. 198 kV Lightning Arrestor

vi. Bus Bar material, and accessories assemblies, clamps and connectors

vii. Bus Post Insulator

viii. Insulators and Hardware

ix. Cable rack, cables and cabling system with all required material

f) Erection, Testing & commissioning of the whole package equipment.

g) All outdoor HV outdoor equipment should be manufacturing using polymer type of the insulator and CT & CVT should be SF6 gas type.

h) Bidder to submit 220KV Switchyard modified Layout & Section Drawing, Single Line Diagram, Protection SLD, Technical Data Sheet etc. with the technical bid indicating existing and additional / new equipment's and interconnection arrangement.

i) Control, relaying, protection, monitoring & metering panels & system for all equipment's under the scope of this contract.

j) Any other equipment/item as required for successful Commissioning, O&M requirements of the facility in all respect with best engineering practices shall deemed to be part of the scope.

k) ACSR Conductor and insulators complete with required clamp/Connectors, hardware's as required.

l) Bidder to keep required provisions in the Control, Protection, monitoring and automation system for integration with BALCO exiting GILMS system including required digital & analogue IO points, hardwired integration and through communication link.

## 2.05.00 Common Items for 400kV GIS, 400/220KV ICT, 220kV Outdoor Switchyard Bays, Equipment's and other associated systems

a) All power, control, instrument & signal, special cables, networking cables, cables and connectors of automation equipment, data/communication bus cables and all required cable connectors and accessories.

b) Cable laying including cable trench, overhead cable supporting structures, cable tray etc.

c) The 220V & 48V DC Battery, Battery charger, DCDB, UPS, and ACDB is in scope of Bidder with adequate redundancy levels.

d) Earth mat of 400 kV GIS and outdoor switchyard equipment's.

e) Earthing & Lightning Protection system for 400kV outdoor switchyard & Control

f) Cable trench & removable covers, overhead cable rack, Cable trays with covering

g) Firefighting, fire protection, cable fire proofing and fire sealing systems

h) Interconnecting cables - Control/Signal/Fiber optic cables.

i) All Power & control cables used shall be of FRLS type.

j) Duplicate Energy Meters in Lines. ABT metering for four outgoing lines as per CERC /CEA guidelines & standards and as per requirements of WRLDC.

k) Redundant UPS system.

l) Redundant 415V AC Panel.

m) Civil work for
   i. Switchyard equipment foundations
   ii. Cable trench and covers
   iii. Drainage, periphery, approach and internal roads inside the switchyard

iv. Switch yard structures foundations
v. Fire wall for 400 /220 kV ICT transformers and
vi. Foundations of Lightning protection towers and area lighting system structures.
vii. Gravelling of outdoor switchyard and transformer yard
viii. Fencing of 400kV / 220kV switchyard, ICT transformer yard- supply, Civil & erection
ix. Retaining wall for the surrounding tower/ gantry. If required.
x. Rainwater drain of surrounding area & connected to plant drain.
xi. Area grading & levelling, of whole switchyard.
xii. All other civil works required for project in all respect and best engineering practices.

**2.06.00 Dismantling of 220kV Bays and other facilities in MRSDS: -**

a) Scope broadly covers part dismantling of the existing MRSDS substation & equipment's in the North-West side of MRSDS switchyard, including building, structure and facilities within MRSDS substation and relocation of required 220 / 33KV bays/feeders (if required) / loads to facilitate construction of the new 400 & 220 KV GIS/AIS Substation with ICT Transformers.

b) Scope also envisage dismantling of other adjoining facilities like Old transformer maintenance shed, Maintenance office etc. up to the existing main road on north side to free up the space for new facility.

c) Prior to dismantling of required section of switchyard & substation equipment's, various in-service 220 KV bays, other loads and feeders (as required like 33KV etc.) needs to be installed and relocated to alternative nearby location.

d) Bidder is required to carry out detailed working and finalize dismantling and relocation requirements considering all in service & required bays, feeders & loads, space required for construction & installation of new 400 / 220 KV facility and incoming 400KV D/c line bays.

e) Entire shifting and relocation of plant loads & feeders needs to be carried out in such a manner that interruptions to existing plant operation can be avoided and needs to be carried out in sequential manner with proper phasing and minimum time interruption (if it is must) and co-ordinations with owner plant O&M teams.

f) Bidder is required to carry out complete risk assessment and finalize the detailed scheme for relocation and dismantling of existing MRSDS installation in consultation and in concurrence of with the owner.

g) Scope also covered dismantling and relocation / installation of all the required auxiliary system, AC & DC supply system etc. required for the normal operation service as per prudent practices.

h) Entire scope is based on the Lump Sum Turkey basis and includes complete Engineering, Procurement, Construction & Installation, Testing and Commission activities covering all electrical, mechanical, civil, works with required infrastructure

and facilities required to installed for completion of the work including temporary and permanent facilities.

i) Bidder is also required to take adequate care during dismantling and relocation that equipment's which are in in good condition and can be re-used are not damaged during the process

**2.06.01 MRSDS substation existing installation details (Main equipment & system) are as per below –**

a) 220 KV Outdoor switchyard having two distinct islands interconnected through tie breaker arrangement (old 220 Main Receiving & Distribution Switchyard and new 220 KV Smelter Switchyard (not used)).

b) 33 KV outdoor Switchyard with downstream distribution feeders, receiving power through 02 Nos. 220/33 KV 120 MVA & 01 No. 160 MVA transformers,

c) 6.6 KV indoor Switchgear with downstream distribution feeders, receiving power through 02 Nos. 33/6.9 KV 15 MVA transformers,

d) 11 KV Indoor Switchgear, 415 Switchgear system (installed for Smelter Projects earlier) and fed through 02 Nos. 33/11 KV 50 MVA transformer and 02 nos. 11/0.433 KV transformers respectively.

e) 02 Nos. Switchgear & Control Building (03 floor & 2 floor respectively), infrastructure and facilities housing control room, Control, Protection, Monitoring & Metering systems & panels; AC & DC control and emergency supply system etc.

Drawing and SLD's listed below are enclosed with this specification provides details about MRSDS s/s and existing major installation within the MRSDS, please note that some of the auxiliary system and smaller facilities not shown in these SLD / drawings, but included in the scope of the requirements.

a) 220/33/6.6 KV MRSDS Substation Integrated Power System Single Line Diagram (Annex. – 2A)

b) 220KV Smelter (PL1B) Switchyard Single Line Diagram (new) located within MRSDS but not commissioned (Annexure – 2B)

c) Bays and feeder list of MRSDS (Annexure – 2C)

d) 220/33/6.6 KV MRSDS Substation – Installations Within (Annexure –2D)

e) Google Map Image marking proposed location details (Annexure –2E)

## 2.06.00 400 kV Double Circuit Twin Curlew / Moose Transmission Line

a) As per the scope bidder is required to restore, extend, construct and connect old & existing (now discharged & disconnected at both ends) 400KV double circuit Twin Curlew transmission line to new 400/220 GIS & AIS S/s facility to be constructed as per the scope of under this specification at BALCO MRSDS S/s locations. The transmission line shall connect from 400/220kV substation at MRSDS BALCO to 400kV NTPC, Korba – Birsinghpur Transmission Line of M/s PGCIL though LILO arrangements.

b) Bidder to submit TURNKEY OFFER for the construction of 400 kv line & its other facilities as mentioned under technical specification including all kind of supplies and services like detailed survey, soil investigation, civil works, tower erection, stringing, testing, commissioning, obtaining all govt. and non govt. statutory approvals, Approvals from appropriate & competent authorities for shutdown etc as required, ROW etc as it may be required for the overall completion of the line and its associated facilities for its successful charging .

i. Approximate length of existing line: 15 KM. (disconnected & discharged from both ends)
ii. Approx. new line length required for extension up to MRSDS: 2 +/- 0.5 KM

c) The scope or work broadly covers following activities, infrastructures and facilities to be built/set-up under the scope: -

i. Complete survey & Inspection / audit of existing transmission line in respect of tower foundation, tower structure & structural members, conductor stringing & jumpers, insulator strings, clamps & connectors, earth wire etc.; maintenance, strengthening & restoration of the existing transmission line as per line survey / audit findings and gaps observed including following
   - Complete jumper and members tightness work at all location.
   - Civil works required for strengthening & protection of tower foundation.
   - Complete tree trimming and vegetation removal up to 15 meters from center of tower
   - Submission of detail survey and action taken/compliance report

ii. Co-ordination and liaison with local authorities and govt agencies if required

iii. Construction of 400 kV D/C Twin Curlew / Moose Transmission Line additional length up to BALCO MRSDS s/s and interconnection with new facility.

iv. Installation & restoration of the LILO arrangement at the 400KV NTPC, Korba – Birsinghpur PGCIL line intersection.

v. OPGW cabling (24 core) instead of earth wire in one circuit from BALCO substation to PGCIL substation (As per PGCIL specification).

vi. Set-up of PLCC / FO communication system for LILO circuit line between BALCO to NTPC, Korba and Birsinghpur Sub-station – 4 sets (2 sets / line, one at BALCO and other at PGCIL end)

vii. Set-up of Data Acquisition System (RTU based) at BALCO end for data communication to PGCIL/NTPC Sub-station or WRLDC, Mumbai.

viii. Set-up of Phasor Measurement System (PMU) at BALCO substation and necessary communication up to PGCIL/NTPC Sub-station as per PGCIL specification- 1 set

ix. Set-up of Special protection Scheme (SPS) at BALCO substation as per PGCIL /WRLDC specification.

x. Supply of 3 Yrs O&M Spares.

d) The Scope shall consider the following services and supplies under Bidder Scope on Turn-key basis: -

i. **Engineering, Design and technical consultancy** as required for the construction of line and it associated system as considered under technical specification.

ii. **Supply of all kind of materials** as required for maintenance, construction of transmission line and its associated systems as mentioned under technical specification including Loading, unloading, storage, and watch ward for transmission line materials.

iii. **Provide all kind of Services –** Land ROW**,** ROW related lesioning with local people and administrative authorities as required , detailed survey/check survey based preliminary feasibility, Soil investigation, drawing & design procurement, Civil supplies and Civil construction, Erection & stringing, Testing, Commissioning, Obtaining of all govt and non govt statutory approvals, Approvals from appropriate & competent authorities for shutdown, consultancy services from PGCIL as it may be required for the overall construction of the line and its associated facilities included in the technical specification .

iv. **Testing and commissioning** of the line and its associated system.

v. **Demonstration of the PG parameters** after successful charging of the line and its associate's system as per FQP to be agreed between BALCO and Bidder.

## 2.07.00 Firefighting system

Portable CO2 for fire extinguisher of GIS hall, other electrical equipment rooms & areas. Installation of Fire Hydrant (Spray) & High Velocity water spray system for ICT Transformers, Fire hydrant / spray system for Outdoor Switchyard, Indoor Equipment areas, Cable Rooms. The fire sensing and alarm system in GIS hall & other electrical panel room shall be connected to SAS are included in the scope of work of contract.

## 2.08.00 Scope of Civil & Structural Work

The scope of work under this section covers, in general, collection of all site related data, surveys and investigations, design, preparation of all construction drawings, supply of all materials, construction, fabrication, erection and testing where necessary, of all structures and Civil works for the 400KV GIS, 400/220kV ICT, 220kV AIS switchyard, 33KV feeders (if required), Panel room, Control room & other civil works as defined in the specification document. The scope will cover, but not limited to the following structures/foundations/facilities: -

a). Soil investigation.
b). Switchyard towers and Gantry structures & foundations
c). Transmission line tower
d). Switchyard Equipment supporting steel structures
e). Towers and girders of the gantries located inside/outside the Switchyard fence as required for completeness of the work.
f). Lighting-masts
g). Foundations for towers, equipment support structures, gantry and Lighting masts as above.

h). Transformer foundation, oil soak pit, emergency oil pit / tank, fire wall
i). Cable trenches with pre-cast RC covers and duct banks as required.
j). Supply and Crushed stone paving as per IS after anti-weed treatment
k). Roads and culverts & boundary wall with main gate
l). Storm water drainage including drainage of trenches, drain sumps etc. and Connecting the drains to the nearest main drain existing outside the premises approx. 500 mtrs.
m). Chain link fencing and access gate.
n). Excavation of earth of all types.
o). GIS building / structure foundations for complete system including equipment, control panel room, operator room, other auxiliary rooms-Battery room, Cable vault, LT switchgear, Office space, documentation room, ladies & gents toilet, changing/rest room, security room.
p). Supply & Erection of Earthing MS Rod for Main & Auxiliary Earthing grid ,40mm dia.

heavy duty G.I. pipe for treated earth pit with alternate layers of charcoal & salt as per IS standards.

q). Earthing inside GIS substation & outside shall satisfy 400KV Step & Touch Potential as per IS/CBIP.

r). All the steel structures should be hot dip galvanized type with all arrangement prefabricated for equipment & accessories mounting & fixing, earthing etc., No wielding or cutting at site should be allowed for galvanized structure at site.

s). All the foundation bolts for 400KV equipment & structures to be hot dip galvanized. And the same shall be tack welded at diagonally two different places.

t). Welding treatment to be done for each welded joint. With lead oxide primer & Black bitumen paint for inside the ground parts. And for above ground foundation primer followed by zinc rich primer has to be carried out.

u). The design & engineering services will include preparation all necessary designs & drawings for all the above structures/foundations/facilities and

v). Any other work which is required to achieve completeness of the total system.

2.08.01 Any other items not specifically mentioned in the specification, but which are required for successful erection, testing and commissioning and satisfactory operation of the system are deemed to be included in the scope of the specification unless specifically excluded.

2.08.02 The complete design and detailed engineering shall be done by the Bidder but shall be subject to owners' approval. Design of Switchyard includes preparation of single line diagrams and electrical layouts, Equipment, support structure, Tower & gantry foundation design, erection key diagrams, electrical and physical clearance diagrams, design calculations for earth mat, Direct Stroke Lighting Protection (DSLP). Control and protection schematics, wiring and termination schedules, Cable trench/tray layout, Drawings and design of Structures, and other relevant drawings & documents required for engineering of all facilities to be provided under this contract, are covered under the scope of the Bidder. Six sets of hard copy of Drawings (Released For Construction-RFC) and reproduceable soft drawing in AutoCAD and pdf format to be submitted to purchaser for record purpose.

2.08.03 The Bidder has fully familiarized himself with the site conditions during pre-contract discussions. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation of the system covered under the scope of works in all respects.

2.08.04 Soil investigation to be done as required is in the scope of the Bidder.

2.08.05 Soil resistivity measurement in the Switchyard is in the scope of the Bidder.

2.08.06 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan (Field Quality plan, Inspection & testing Plan) and relevant IS/IEC/specifications whichever is stringent. The quality plan shall have to be approved by Balco.

2.08.07 The charges for carrying out all routine tests shall be deemed to be included in the contract price. Equipment offered shall be of type tested and proven type. The type test reports shall be for the same rated, specification and should be of carried out within 5 years from the date of LOA. In case type test reports are not found to be meeting the specification requirements, Bidder shall conduct, free of cost to the Purchaser, all such type tests according to the relevant standards.

2.08.08 Before dispatching structures from fabrication shop, prototype of each structure shall be shop assembled and checked for fabrication tolerance. Also, if desired by the Purchaser, the same shall be presented for inspection and testing at an approved Testing facility.

**2.09.00 Spares & Consumables**

The scope of supply shall also include the following.

a. First fill of consumables.
b. Spare parts required for successful commissioning.
c. Mandatory and Recommended spare parts including insurance spares for three years trouble free Operation & Maintenance, bidder to submit the detailed spare list for owner approval ~~as listed in Annexure -D.~~
d. Special tools & tackles required for erection testing. commissioning and trouble-free operation & maintenance of whole system & equipment.

The bidder to note that no O&M spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Bidder. The unutilized spares if any brought for commissioning purpose shall be handed over to the Purchaser. The bidder to submit the list of commissioning spares based on his experience.

**2.10.00 Special Tools and Tackles**

The bidder shall supply all special tools and tackles required for erection, testing, commissioning and maintenance of equipment. However, a list of all such devices should be indicated. The special tools required for periodic/special maintenance shall be handed over to the purchaser.

**2.11.00 Scope of Services**

The Bidder shall also be responsible for the overall co-ordination with internal/external agencies, project management, training of Purchaser's O&M manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the substation, construction and modification in the existing transmission route as mentioned in the drawing. The services shall include:

a). Preparation and submission of drawings & documents in soft and hard form as per the drawings / document's submission schedule.

b). Submission of monthly work Plan, Weekly work plan and weekly compliance report.

c). Participation in project review / Technical Coordination meetings.

d). All necessary co-ordination with other bidders on site for erection, testing and commissioning of equipment and accessories.

e). Carrying out necessary tests on electrical equipment as required by the Purchaser.

f). Making available of all testing and commissioning equipment, etc.

g). Arrange for all necessary approval by CEIGCEA and clearances for the entire electrical Installations & services done under this contract.

h). Preparation and submission of all as built drawings relative to the contract on drawing prints.

i). Conducting performance test at shop and site.

j). Final check-up, testing and commissioning in presence of Purchaser's representative.

k). Trial run of all equipment's and auxiliaries, rectification/ replacement, if any and adjustments as necessary.

l). Obtaining Purchaser's approval and written acceptance of satisfactory performance.

m). Handing over of installation for commercial operations.

**2.12.00 The detailed Scope of Civil design shall include, but not be limited to:**

a). Generation of all data from preparation and submission of design basis with criteria and information required for approval, for the completion of the bay structures.

b). Design and analysis of all structure including gantries and towers as applicable and their foundations, equipment supporting structures etc submission of design report with calculations for approval with all necessary documents, catalogues etc.

c). Preparation and submission of all construction drawings (Layout, Civil and Structural) required for the complete execution of Civil & structural works, material selection and material take off. Sufficient detailing shall be done in all drawings so that no difficulty is faced by site engineers during execution.

d). Furnishing of quantities of all Civil & structural items involved etc. based on approved drawings.

e). Handing over of all the documents in editable format in the compact disc along with six set of hard copies as specified.

## 3.00.00 Terminal Points

3.00.01 Detail Scope of work and Terminal Point specified and has been tabulated in **ANNEXURE -C** & same is attached**.**

All the necessary miscellaneous jobs for successful completion of project with required equipment's & system is considered in bidder scope system

The detailed indicative scope of work is brought out in subsequent clauses of this section and the enclosed drawings.

Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the all the equipment/items, complete in all respects.

## 4.00.00 SCHEDULE OF QUANTITIES

4.00.01 The Bidder has to prepare its own BOQ considering successful completeness of total system of 400/220KV GIS/AIS substation, ICT Transformer yard, 400KV Transmission Line & Associated works. The Bidder should also include all such items in the BOM developed by him which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of Switchyard shall be a part of the scope and will be provided at no extra cost to Purchaser.

## 5.00.00 BASIC REFERENCE DRAWINGS

5.00.01 Single line diagram, general arrangements/layout of Switchyards enclosed with the bid documents shall be further engineered by the bidder.

5.00.02 The Bidder shall maintain the overall dimensions of the Switchyard, phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights adequately to obtain the statutory electrical clearances required for the Switchyard.

5.00.03 All drawings, schedules and annexure appended to this specification shall also form part of the specification. These drawings are meant to give a general idea to the Vendor. No information/data shown/not shown in these drawings shall be construed to relieve the bidder of his responsibility to carryout the work as per this specification and/or construction drawings released after the award of contract.

5.00.04 In case of any discrepancy between the drawings and text of specification, the requirements of drawings/ standard engineering practices as per IS/IEC shall prevail in general. However, the Bidder is advised to get these clarified from the Purchaser.

5.00.05 For the purpose of present scope of work, technical specification shall consist of following sections and they should be read in conjunction with each other.

400 kV GIS
400/220/33 kV ICT
400 kV & 220kV Circuit Breakers
33KV Outdoor / Indoor switchgear
400 kV & 220kV Isolators & Earth Switch
400 kV & 220kV CTs – Metering & Protection.
400 kV indoor & outdoor Voltage transformers – Metering & Protection
220kV CVTs
400 kV & 220kV Lighting Arrestors
400KV & 220kV Bus PTs
400KV Line PTs- metering & protection.
GIS tube as per layout requirement.

Control, Protection, Metering & Monitoring Panel for 400 kV, 220kV, 33kV as applicable
Substation Automation System
Lightning & Earthing for extended Switchyard Area, GIS, and ICT yard
Power & Control Cables
Cabling, Earthing & Lightning protection system
Illumination System
Miscellaneous items
Civil & Structural Works associated with overall project completion

## 6.00.00 CONSTRUCTION FACILITIES

i. BALCO (within plant premises) shall make available the 415 V AC Construction power supply at one point as per already available nearby source, however all required arrangement for tapping/sourcing of power supply including required protection & metering arrangement and further distribution for construction activity shall be in bidder scope. Power supply arrangement outside BALCO plant premises is entirely in bidder scope.

ii. BALCO (within plant premises) shall make available construction water supply as per already available source point at one location, however all required arrangement for water tapping/sourcing, all further distribution of the same is in scope of Bidder. Construction water arrangement outside BALCO plant premises is entirely in bidder scope.

## 7.00.00 CODES AND STANDARDS

7.00.01 All the equipment and accessories covered under this specification shall be designed, manufactured and tested in accordance with the latest revision of the Standards mentioned under respective section. The work shall be carried out in the best workman like manner in conformity with relevant specifications / code of practices of the Bureau of Indian Standards. In addition, work shall also confirm to the requirements of latest editions / amendments of the following:-

1) Indian Electricity Act and rules framed there under.
2) Fire Insurance Regulations / TAC
3) Regulations laid by the office of the Chief Electrical Inspector to Government
4) CBIP Manual on Substations
5) IS/IEC as applicable
6) CEA/CERC/PGCIL guidelines and requirements for connectivity, metering, safety and substation installations
6) Any other regulations laid down by the local authorities.

In case of any discrepancy among various codes/guidelines the stricter shall be followed.

## 8.00.00 GENERAL REQUIREMENTS and TECHNICAL PERTICULARS

8.00.01 Details of technical particulars/ Electrical system are indicated in enclosed in Section-1,2 & Annexure-B.

8.00.02 The Bidder shall obtain all permits, licenses, and statutory approvals from various regulatory bodies including local authorities for completion of work up to Erection, testing & commissioning and making it functional. Original copies of these approvals shall be delivered to the Purchaser or his authorized representative and will become property of the Purchaser.

8.00.03 All materials and equipment furnished for permanent installation shall be new, unused, and undamaged. Asbestos or any other environment non friendly materials are not allowed to be used for construction.

8.00.04 The Bidder shall establish an identification numbering system to provide consistent numbering. All electrical devices, control and instrumentation equipment, and other items of similar nature shall be permanently identified with the Bidder's identification number. The Bidder's identification numbers shall be coordinated with the existing system.

8.00.05 All equipment's shall be boxed, crated, or otherwise protected during shipment, handling, and storage. Coated surfaces shall be protected against impact, abrasion, discoloration, and other damages. Surfaces which are damaged shall be repaired. Electrical equipment, controls, and insulations shall be protected against moisture and water damage.

8.00.06 similar equipment's and components shall be of same make. Equipment's or part thereof for same type and rating shall be interchangeable.

8.0.07 Bidder shall be responsible for safety of human and equipment during the working. It will be the responsibility of the Bidder to co-ordinate and obtain Electrical Inspector's clearance before commissioning. Any additional items, modification due to observation of such statutory authorities shall be provided by the Bidder at no extra cost to the Purchaser.

8.00.08 Bidder will develop adequate storage for sensitive equipments, which are required to be stored indoors. All equipments during storage shall be protected against damage due to acts of nature or accidents. The storage instructions of the equipment manufacturer/Purchaser shall be strictly adhered to.

## 9.00.00 DESIGN REQUIREMENTS

9.00.01 The switchyard/substation equipments shall be suitable for outdoor application. Electrical Equipment selection and derating shall be based on ambient temperature of 50 deg. C and relative humidity of 60% maximum.

9.00.02 Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements under worst operating & environmental conditions.

9.00.03 Voltage Levels shall be maintained as follows:

| | |
|---|---|
| Power Evacuation earthed. | 400kV,220kV,33KV(+10%), 3 phase, 3 wire 50 Hz |
| LT Auxiliary Supply | 415V (±10%), 3 phase. 4 wire, solidly earthed. |
| LT Emergency Supply | 415V (+10%). 3 phase. 3 wire ungrounded. |
| DC Supply | 220V (+10% to -10%). DC 2 wire unearthed. |
| Control supply for 415 V PDB | 220 V DC |
| Metering | 110V AC PT Voltage |
| Control & protection | 220V, DC 2 wire unearthed |
| Panel lighting and space heaters | 240V, 1-phase, 2wires 50 Hz. A.C |
| Permissible Frequency variation | +3% to - 5% |
| Combined voltage & frequency variation | 10% |

9.00.04 Short circuit Levels shall be as follows:

| | |
|---|---|
| Three phase symmetrical short circuit ratings of 400kV and 220kV System | >=63 kA for 3 sec |
| Three phase symmetrical short circuit ratings of 400kV and 220kV System | >=50 kA for 3 sec |
| Three phase symmetrical short circuit ratings of 415V System | 50kA for 1 sec |

9.00.05 The switchyard shall be designed considering the following design parameters.

**For 400KV system:-**

| | |
|---|---|
| Three phase symmetrical short circuit ratings of 400kV System | 63 kA for 3 sec |
| Nominal system voltage | 400 kV (rms), 50 Hz |
| Highest system voltage | 420 kV (rms), 50 Hz |
| Rated Current of GIS Bus | 3150A |
| Basic impulse levels | 1550 kV peak |
| Power frequency withstand voltage | 650 kV |
| Short time current and duration | 63 kA for 3sec |
| Dynamic rating | 170 KAp |
| Phase to phase clearances | 4200mm (min.) |
| Phase to earth clearances | 3500mm (min.) |
| Live part to Ground | 8200mm (min.) |
| Section clearance | 6500mm (min.) |
| Minimum height of earthed part of live equipment: | 3500mm (min.) |
| Creepage distance | 31 mm/kV(min.) |

**For 220KV system:-**

| **1** | **Design criteria** | |
|---|---|---|
| A | Three phase symmetrical short circuit ratings of 220kV System | 50kA for 3 Sec |
| B | Normal system voltage | 220 kV (rms), 50Hz |
| C | Highest system voltage | 245 kV(rms), 50 Hz |
| D | Rated current of Bus | 2500 A |
| E | Rated frequency | 50 Hz |
| F | Rated short-time withstand current(3s) | 50 KA for 3 sec. |
| G | Rated peak withstand current | 125 kA |
| H | Rated lightning impulse withstand voltage (peak) | 1050 kA |
| I | Rated power frequency withstand voltage (r.m.s) 1mt | 460 kV |
| J | Rated power frequency withstand voltage (r.m.s) 5mt(kV) | 1.1~1.3 of rated working phase-voltage |
| K | Min Ground Clearance | 5500 mm |
| L | Min Elevation for Main Bus –I &II from Ground level | 6000 mm |
| M | Creepage distance | 31 mm/kV |
| N | Minimum Phase to Phase clearance | 2100 mm |
| O | Minimum Phase to Earth clearance | 2100 mm |
| P | Min Sectional clearance | 5000 mm |

9.00.07 400 kV Switchyard/substation shall be provided with Double Bus, One & A Half Breaker scheme, GIS system of 400 kV, 63 kA for 3 sec, single phase enclosed bus bars rated for 3150A, 4 outgoing bays including 2 line bays, 2 ICT bays, 2 Tie Breaker bay, isolators, CT, surge arrestors, earth switches with BUS PTs etc and also supplied with GIS ducts for connectivity to outdoor equipment The various clearances of the GIS is to be maintained as per the IS/IEC/CBIP whichever is stringent.

9.00.08 Switchyard insulators shall be suitable for hot line washing.

9.00.09 The switchyard panels shall have an outer paint shade of 631 of IS: 5. however the same shall be firmed up during detail engineering.

9.00.10 The sequence of bays shall be so arranged that the maximum horizontal angle of deviation of the incoming power and shielding conductors does not exceed 30°. Similarly, the point of anchoring on incoming towers shall be such that the vertical angle of deviation is limited to 30° from horizontal plane.

9.00.11 The Lightning Protection of switchyard shall be done by lightning mast and/or on gantry tower structure peaks. Use of shield wires provided on switchyard structures should be avoided and the adequacy of protection shall be ensured.

9.00.12 **Control aspects**

a). All equipment's of the bays including earth switch (should also have provision for local electrical/manual operation with electro-mechanical interlock) shall be controlled from RCP as well as SCADA. The bidder has to supply all necessary hardware & software for 400/220 KV GIS/AIS SCADA is to be envisaged for the equipment's, which are in the scope of supplies and in the battery limits as per the tender. The necessary software to be incorporated in the existing SCADA software for communication interface.

b). For Circuit breakers, Local operation shall be carried out from CB operating box, for which Local/remote selector switch located in the CB operating box shall be selected in local. This operation is envisaged only for maintenance and testing of circuit breaker.

c). For Isolators, Local operation shall be carried out from Isolator operating box, for which Local/remote selector switch located in the Isolator operating box shall be selected in local this operation is envisaged only for maintenance and testing of Isolator.

d). For earth switches local manual operation from field and remote operation with electro-mechanical interlock is envisaged.

e). Signals from field (Breakers/Isolators/ earth switches etc) shall be hardwired separately to both Switchyard control & protection panel and SCADA. Signals from Numerical protection relays and control devices shall be interfaced through communication port on IEC 61850 protocol. Signals from transformers, breakers C&R panels shall be multiplied at Switchyard control panel through relays and wired further to SCADA for interfacing.

f). Switchyard control panel (SCP) shall have selector switch to select location of control (SCP/SCADA). Switchyard HMI shall have selector switch to select control between Switchyard HMI and remote HMI at Main control room HMI. If one location is selected, commands from other location shall be inhibited. The trip command from the protection system shall be active in all selection.

g). Control commands from SCP shall be directly sent to respective breakers/isolators after satisfying the hardware interlocks.

h). Control commands from HMI shall be sent through interposing relays to respective breakers/isolators after satisfying the software interlocks.

i). Control commands control panel shall be sent through interposing relays to respective breakers/isolators after satisfying the hardware interlocks.

## 10.00.00 MAKE

For various items, bidder shall furnish a list of makes proposed by him. All the makes shall be subject to Purchaser's approval. The manufacturer whose equipment are offered should have designed, manufactured, tested and supplied the same *for the specified system* voltage and which are in satisfactory operation for at least Five (5) years. The list of bought out/sub contracted item along with the makes are attached in '**Annexure-E'**

## 11.00.00 PROJECT TIME SCHEDULE

11.00.01 The Schedule for completion of work under this package estimated as 12-15 Months. However, bidder is required have own assessment and submit activity wise detailed project schedule from PO to final commissioning & handover.

Time Schedule of Contract End date: Please refer commercial document.
Design, Engineering, Manufacture, testing, assembly, transport and delivery at site, successful erection, testing & commissioning, handover & performance testing of the total scope.

## 12.00.00 QUALITY ASSURANCE, TESTING & INSPECTION

12.00.01 All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan.

12.00.02 All tests shall be conducted as per relevant IS/IEC/IEEE standards and shall be performed in the presence of Purchasers/ its representative, if so desired by the Purchaser. The Bidder shall give at least 21 days advance notice of the date when the tests are to be carried out.

12.00.03 Equipment offered shall be of type tested and proven type. Type test certificates for test conducted earlier on similar rating & specification shall be furnished. For the various bought out items test certificates from equipment manufacturer shall be furnished. Routine tests shall be carried out for all the equipment as per applicable standards.

12.00.04 Copies of certified reports of all tests carried out at the works shall be furnished. The equipment shall be dispatched from works, only after receipt of Purchaser's written approval of the test reports.

12.00.05 For all equipment / components / materials, for which Type tests have not been specified in the specification, only type test reports shall be furnished by the Bidder. Such Type tests should have been carried out within last three years, as on the date of opening of the bid, on identical components / materials. In absence case such reports are not found to be meeting the specification/standards requirements. Bidder shall conduct, free of cost to the Purchaser, all such type tests according to the relevant standards and reports shall be submitted to the Purchaser for approval.

12.00.06 Bidder will provide the type test report of similar system if there is no change in design /material. If there is change in design material, then valid type test report will be provided. The same shall be informed within 30 days of contract.

12.00.07 Routine tests & Acceptance tests shall be conducted for all the equipment in accordance with the agreed quality plan and as per the latest version of applicable IS for all the equipment. The charges for carrying out all the routine tests shall be deemed to be included in the bid price.

## 13.00.00 PERFORMANCE GUARANTEE

Bidder shall guarantee that system engineered, and equipment offered shall meet the requirements as stipulated in this specification and as confirmed by them in technical data sheets. **In case, the performance at site is not meeting the requirement, the bidder will have to rectify / replace the system/equipment at site free of cost for 5 year after commissioning**. The performance for the System shall be as under:

- ✓ Metering, Controls and protection as per contract document
- ✓ Zero mal operation during faults. On site simulation results to be provided.
- ✓ Any minor and major Component failure of 400KV GIS & Associated System, 400/220KV ICT, 400&220KV Outdoor equipment's, Control Protection Monitoring Metering Automation & SCADA system, Switchgears.

**Vendor to offer equipment's and system which are based on proven design, latest model, type tested, conforming to prudent engineering practices & standards and guaranteed for long-term trouble-free operation without the risk of obsolesce at least for next 10 years.**

**Vendor is also required to guarantee spare and services support (from India) for at least next 15 years at reasonable agreed cost.**

## 14.00.00 DOCUMENTATION

14.00.01 Drawings / Documents to be submitted after Award of Contract:

1) 'Data sheet' incorporating all the comments agreed during tender stage.
2) Genera! arrangement, layout drawing and Section
3) Electrical Design Basis report
4) Civil Design Basis report
5) Single line diagrams
6) Equipment layout for Control Building
7) Complete technical particulars
8) Foundation plan, loading & fixing details
9) Protection & Synchronizing scheme diagram
10) CTA/T sizing calculation
11) Civil & Structural design calculations
12) Civil & Structural drawings
13) Sizing calculation for various equipment
14) Equipment control schematics
15) Bill of material
16) Wiring diagrams & terminal list for all equipment
17) Cable Schedule
18) Interconnection Schedule
19) Cable routing layout
20) Earthing drawings
21) Lightning protection drawings
22) Illumination drawings

23) Erection key diagram
24) Detailed erection & commissioning procedures
25) Test procedure
26) Type test certificates of all equipment
27) Routine test, type test. Acceptance test certificate
28) Quality plan QP.
29) Catalogues/drawings for all other bought out items
30) Painting & surface preparation procedure.
31) Field Quality Plan
32) Bar Chart
33) Billing Schedule
34) Operation & Maintenance Manual
35) As Built Drawings
36) Earthing calculation, detail layout of earthing connection to equipment &
37) Structure as per Is standards.
38) Any other drawings / documents listed in respective sections.

The documents listed above are indicative only. However, the Bidder shall furnish all relevant documents as required by the Purchaser for successful completion of the project. Schedule for submission of various documents will be finalized during award of contract:

The modality of approval of technical documentation and priority of supply shall be mutually discussed and agreed upon with the successful Bidder in the kick-off meeting after the placement of LOA.

14.00.03 O&M manual for installation, operation and maintenance shall be furnished. Manual shall contain minimum following details:

1) Description of the equipment
2) Salient construction features
3) Packing details
4) Storage at Site
5) Unpacking
6) Handling at Site
7) Erection procedure & checks
8) Tests to be conducted at site
9) Commissioning procedure
10) Maintenance instructions
11) List of spares
12) Approved GA drawing
13) Approved Data Sheets
14) Technical leaflets of all the items/ important components
15) Copies of Test certificates
16) List of Maintenance tools
17) List of Testing Equipment required at site.

14.00.05 For all technical tables and diagrams, calculation results, drawings, test data and scales adopted in the design the standard international unit system (SI) as per International Standardization Organization (ISO) shall be uniformly employed.

14.00.06 All engineering documents and drawings shall be of international "A" series sizes that is of AO, A1, A2, A3 & A4.

## ANNEXURE: A

## PROJECT INFORMATION

| | | | | |
|---|---|---|---|---|
| 1.1) | Owner | : | - | BALCO<br>KORBA, Chattisgarh - 495689<br>Fax: 07759-243068<br>Tel: 07759 -243515 |
| 1.2) | Project | : | - | 400KV GIS & 220kV AIS Switchyard |
| 1.3) | Site Location | : | - | KORBA |
| 1.4) | Nearest Airport | : | - | RAIPUR |
| 1.5) | Approach Road | : | - | YES |
| 1.6) | Nearest Railway Station | : | - | CHAMPA |
| 1.7) | Nearest Sea Port | : | - | Kolkata |
| 1.8) | Elevation above chart datum/mean Sea level | : | - | 295-300 |
| 1.10) | Seismic Zone | : | - | III |
| **2)** | **Metrological Information** | | | |
| 2.1) | Ambient conditions | | | |
| | Design temperature for electrical Equipment / device | : | - | 50°C |
| 2.2) | Relative Humidity | : | - | |
| | a. Maximum | : | - | 80% |
| | b. Minimum | : | - | 20% |
| | a. Average | : | - | 60% |
| 2.3) | Wind Data | : | - | |
| | a. Basic wind speed | : | - | 39 m/Sec |
| 2.4) | Soil bearing capacity | : | - | Soil investigation is in scope of Bidder. |
| 2.5) | Tropicalization | : | - | Required |
| **3)** | **Electrical Details** | : | | |
| 3.1) | EHV System | : | - | 400,000V, 220,000 (±) 10% volts, phase (+) 3% to (-) 5% Hz, solidly grounded system |
| 3.2) | MV System | : | - | 33,000V, 11,000 (±) 10% volts, phase (+) 3% to (-) 5% Hz, solidly grounded system |
| 3.3) | LV System | : | - | 415V(±) 10%,3 Phase, 50(+) 3%, (-5)% Hz, solidly grounded system |
| 3.4) | Auxiliary supply for lighting etc. | : | - | 240V (±) 10% volts, 1 phase, 50Hz, (Ph/N of 415Volts) |
| 3.5) | Combined voltage & frequency variation For MV & LV system | : | - | 10% (Absolute sum) |
| 3.6) | DC control voltage | : | - | 220V (+) 10% volts (-) 15% volts (DC), ungrounded system<br>48 (+) 10% volts (-) 15% volts (DC), ungrounded system (for communication & fire system) |
| 3.7) | Fault Level | | | |
| | a) 400KV system | : | | >= 63 kA for three second |
| | b) 220kV system | : | | >= 50 kA for three second |

# CONTRACT DOCUMENT
# FOR
# REPLACEMENT OF EXISTING BALCO 400 kV GAS INSULATED SUBSTATION WITH NEW GENERATION GIS
# AND
# ASSOCIATED WORKS
# (BALCO/1200MW/GIS/2020)

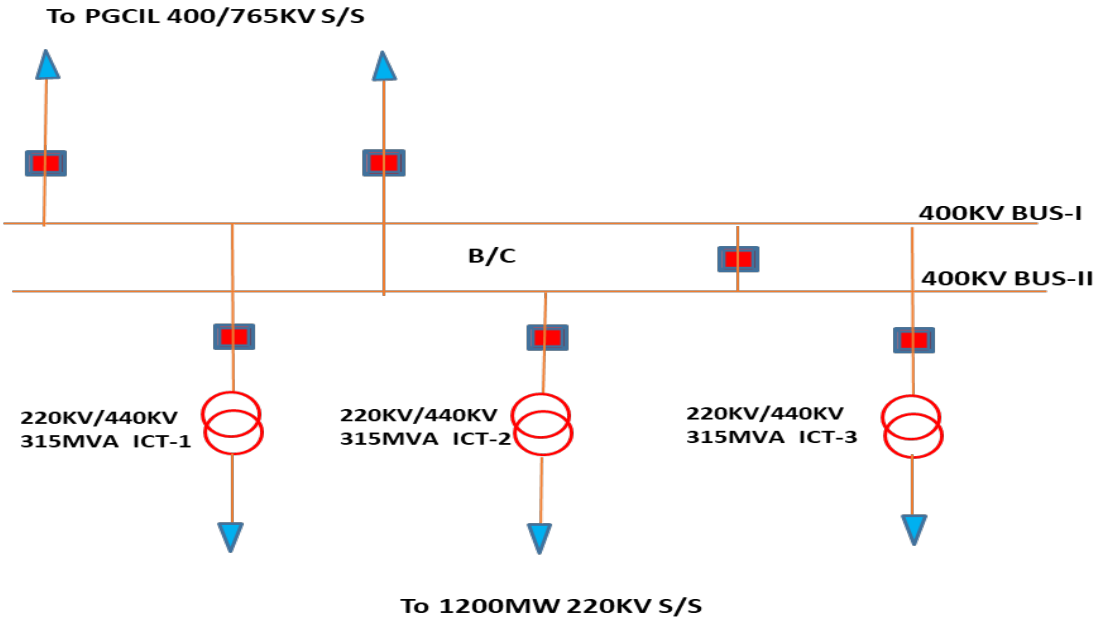
BALCO having an installed capacity of 5.7LTPA Aluminium Smelter (Potline-1 and Potline-2 & 2010MW Thermal Power Plant (4x67.5MW CPP, 4x135MW CPP, 4x300MW.The entire BALCO internal power network is operating at 220KV EHV network and at present 1200MW 220KV Switchyard is main interconnecting substation for CPP1,CPP2 Potline-1,Potline-2 and MRSDS plant for power distribution having 220KV interconnection transmission line of below

- 1200MW -270MW Double Circuit 220KV -9.2KM
- 1200MW-540MW and Potline-1 Double Circuit 220KV -2.1KM
- 1200MW-Potline-2 Double Circuit 220KV -2.2KM
- 1200MW-220/400KV ICT -0.04KM

BALCO entire 200KV Network is connected to grid through step-up transformer of 3X315MVA 220/400KV ICT with 400KV dedicated transmission line (23.5KM) from BALCO to Dharamjaygarh Substation via 400KV GIS substation system only. At present the 1200MW 400KV GIS Substation is main single grid connecting substation for all power plant and smelter plant. The Existing 400KV GIS is supplied by M/s SIEMENS of model 8DQ1(First Generation) having the following bay :-

- 400KV BALCO-PGCIL-CKT-1
- 400KV BALCO-PGCIL-CKT-2
- 400KV ICT-1
- 400KV ICT-2
- 400KV ICT-3
- 400KV BUS-1 and BUS-2 associate with individual BUS-PT.

SLD of Existing 400KV GIS: 2000A, 50KA, 3Sec ,50Hz



## 1.INTENT OF SPECIFICATION

This contract specification covers the System Engineering, design, manufacture, assembly, inspection & testing at manufacturer's works, packing, and delivery to BALCO site. Unloading at Site, Site storage & precise, erection, testing and commissioning of 400KV switchyard, including GIS, complete with all accessories for efficient and trouble-free operation including supply of spares for dismantling and replacement of existing 400KV GIS and associated equipment.

It is not the intent to specify completely herein all details of the design and manufacture. However, the equipment shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing in continuous operation under all normal, abnormal & emergency conditions as may be desired.

The general terms and conditions, instruction to Vendor and other attachment referred to elsewhere are hereby made part of the contract Technical Specification.

The vendor shall be responsible for and governed by all requirements stipulated hereinafter.

## 2.SCOPE OF WORK

a. The broad scope of works for the works shall include following but not limited to as mentioned below

   i. System engineering, design, Manufacture, supply, erection, testing & commissioning complete in all respect for upgradation of existing 400KV GIS Switchyard with new latest generation GIS including, control, protection and interlock, SCADA System and its associated systems.
   ii. Obtaining CEIG Approval/other required for the complete scope of works as mentioned in the works.
   iii. System engineering, design, manufacturing, supply, erection, testing and commissioning to bypass the existing GIS substation to achieve reliable grid connectivity of BALCO substation prior to commencement of replacement activity.
   iv. Obtaining CEIG/WRLDC/CEA clearance for bypass system.
   v. Gas Evacuation of existing GIS and store to cylinder /gas container supplied by vendor.
   vi. Safe dismantling of existing GIS equipment and packing with required box.
   vii. All the necessary miscellaneous jobs required for successful completion of total system shall be a part of the scope. The detailed tentative scope of work is brought out in subsequent clauses of this section.

b. Design, engineering, manufacture, testing, supply, including transportation & insurance, storage, erection, testing and commissioning of the equipment/items, complete in all respects.
c. Control & relay panels for the above ICT, Tie, Line feeders and spare bay with latest version SCADA system.
d. Lightning, earthing, Power & control cables, illumination – indoor & outdoor, Junction boxes, marshalling boxes, for 415V supply, battery, battery chargers, DCDB, UPS, Illumination …etc.
e. Any other equipment/item as required for successful Commissioning, O&M of 400 KV GIS switchyard, 400KV out going line gantry, OH conductors from air bushing to AIS equipment , terminal connector to 400KV GIS gantry system in all respect with best engineering practices shall deemed to be part of the scope.
f. 400 kV SF6 to air bushings.
g. Latest Generation and version of SCADA system with integration of all local device parameter display and alarm for proposed 400KV GIS System and existing 220kv System for 19 bays.
h. Power and control cables from CRP TO LCP and GIS equipment.
i. Related civil construction in all respect for making the job functional.

j. The terminal point starts from 400KV Bushing of ICT transformer up to 400KV line air bushing of GIS switchyard including the termination at ICT (supplied by Owner) bushings.
k. The 220 V DC – battery, battery charger, DCDB, UPS is in scope of Bidder.
l. Earth mat of 400 kV GIS Switchyard & ICT yard shall be interconnected with existing switchyard earth mat if found adequate through required numbers of test link pits which shall be included in Bidder's scope.
m. Cable trench / trays from GIS substation to CRP and GIS equipment is in bidder scope.
n. Interface cables as required to interface all device/equipment is in bidder scope.
o. All Power & control cables used shall be of FRLS type.
p. Fire resistance coating on control and power cable.
q. Bidder to access existing installation and auxiliary system and consider utilizing equipment and system which are in good health without affecting overall system GIS system performance and reliability from cost optimization perspective.

**3.Firefighting system**

Fire detection, quenching and alarm system design and implementation in GIS hall & other electrical panel room as per the existing norms and shall be connected to SAS are included in the scope of work of contract

**4.Scope of Civil & Structural Work**

4.1 The scope of work under this section covers, in general, collection of all site related data, surveys and investigations, design, preparation of all construction drawings, supply of all materials, construction, fabrication, erection and testing where necessary, of all structures and Civil works for the new 400KV GIS substation and outdoor structure The scope, in particular, will cover, but not limited to the following structures/foundations/facilities:-

a. Substation foundation, cable trench and outdoor equipment support.
b. Cable trenches with precast RC covers and duct banks as required.
c. Crushed stone paving as per IS.
d. If required storm water drainage including drainage of trenches, drain sumps etc and connecting the drains to the nearest drain existing inside the existing Switchyard fence.
e. Strengthening/modification in existing foundation of GIS building and equipment
f. Supply & Erection of Earthing MS Rod for Main & Auxiliary Earthing grid ,40mm die heavy duty G.I. pipe for treated earth pit with alternate layers of charcoal & salt as per IS standards.
g. Earthing inside GIS substation & outside shall satisfy 400KV Step & Touch Potential as per IS/CBIP.
h. All the foundation bolts for 400KV equipment & structures to be Hot dip galvanized. And the same shall be tack welded at diagonally two different places.
i. Welding treatment to be done for each welded joint. With lead oxide primer & Black bitumen paint for inside the ground parts. And for above ground foundation primer followed by zinc rich primer must be carried out.
j. The design & engineering services will include preparation all necessary designs & drawings for all the above structures/foundations/facilities and
k. Any other work which is required to achieve completeness of the total system.

4.2 The detailed Scope of Civil design shall include, but not be limited to:

a) Generation of all data from preparation and submission of design basis with criteria and information required for approval, for the completion of the bay structures.

b) Design and analysis of all structure including gantries and towers as applicable and their foundations, equipment supporting structures etc submission of design report with calculations for approval with all necessary documents, catalogues

etc.

c) Preparation and submission of all construction drawings (Layout, Civil and Structural) required for the complete execution of Civil & structural works, material selection and material take off. Enough detailing shall be done in all drawings so that no difficulty is faced by site engineers during execution.

d) Furnishing of quantities of all Civil & structural items involved etc. based on approved drawings

e) Handing over of all the documents in editable format in the compact disc along with six set of hard copies as specified.

f) Any other items not specifically mentioned in the specification, but which are required for successful erection, testing and commissioning and satisfactory operation of the Bay are deemed to be included in the scope of the specification unless specifically excluded.

g) The complete design and detailed engineering shall be done by the Vendor but shall be subject to owners' approval. Design of Switchyard includes preparation of single line diagrams and electrical layouts, Equipment, support structure, Tower & gantry foundation design, Erection key diagrams, electrical and physical clearance diagrams, design calculations for Earth mat, Direct Stroke Lighting Protection (DSLP). Control and protection schematics, wiring and termination schedules, Cable trench/tray layout, Drawings and design of Structures, and other relevant drawings & documents required for engineering of all facilities to be provided under this contract, are covered under the scope of the Vendor. Six sets of hard copy of Drawings (Released for Construction-RFC) to be submitted for purchaser for record purpose

h) The Vendor has fully familiarized himself with the site conditions during pre-contract discussions. The Vendor shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation of the system covered under the scope of works in all respects.

i) Soil investigation to be done as required is in the scope of the Vendor. Soil resistivity measurement in the Switchyard is in the scope of the Vendor. All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan (Field Quality plan, Inspection & testing Plan) and relevant IS/IEC/specifications whichever is stringent.

j) The quality plan shall have to be approved by Balco

k) The charges for carrying out all routine tests shall deem to be included in the contract price. Equipment offered shall be of type tested and proven type. The type test reports shall be for the same rated, specification and should be of carried out within 5 years from the date of LOI. In case type test reports are not found to be meeting the specification requirements, Bidder shall conduct, free of cost to the Purchaser, all such type tests according to the relevant standard. Before dispatching structures from fabrication shop, prototype of each structure shall be shop assembled and checked for fabrication tolerance. Also, if desired by the Purchaser, the same shall be presented for inspection and testing at an approved Testing facility.

## 5.SPARE AND CONSUMABLE

The scope of supply shall also include the following.

a. First fill of consumables.
b. Spare parts required for successful commissioning.
c. Spare parts for three years trouble free Operation & Maintenance (List to be provide by Vendor during offer)
d. Special tools & tackles required for erection testing. commissioning and maintenance of equipment.

The vendor to note that no O&M spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Bidder. The unutilized spares if any brought for commissioning purpose shall be handed over to the Purchaser. The Vendor to submit the list of commissioning spares based on his experience.

## 6.SPECAIL TOOLS AND TACKE

The Vendor shall supply all special tools and tackles required for erection, testing, commissioning and maintenance of equipment. However, a list of all such devices should be indicated. The special tools required for periodic/special maintenance shall be handed over to the purchaser.

## 6. SCOPE OF SERVICE

The Vendor shall also be responsible for the overall co-ordination with internal/external agencies, project management, training of Purchaser's manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the Switchyard and modification in the existing transmission route as mentioned in the drawing. The services shall include:

i. Complete site assessment, system design engineering for replacement of existing GIS with new generation GIS.
ii. System design, engineering to bypass the existing GIS for providing BALCO power network grid connectivity till completion of installation of New GIS System.
iii. Submission of detailed project plan for successful commissioning of GIS and bypass bay.
iv. Erection commissioning, testing, required approval, charging of bypass bay.
v. Submission of dismantling plan of existing GIS system.
vi. Evacuation of SF6 gas from existing GIS and proper disposal as per Govt. norms.
vii. Dismantling and packing of existing GIS equipment and transport to designated place as per BALCO EIC.
viii. Required Civil works for New GIS system, foundation, earthing requirement and other work.
ix. Erection, testing, commissioning of new GIS equipment.
x. Design and engineering of protection system and interlock for new GIS system.
xi. Installation of protection panels, cable laying termination, testing commissioning of protection panel and SCADA System.
xii. All Design drawings, Engineering drawings, execution plan to be taken approval from BALCO EIC.
xiii. Preparation and submission of drawings & Documents in soft and hard form as per the drawings / document's submission schedule.
xiv. Submission of monthly work Plan, Weekly work plan and weekly compliance report.
xv. Participation in project review / Technical Coordination meetings.
xvi. All necessary co-ordination with other Vendors on site for erection, testing and commissioning of equipment and accessories.
xvii. Carrying out necessary tests on electrical equipment.
xviii. Making available of all testing and commissioning equipment, etc.
xix. Arrange for all necessary approval by CEIG /WRLDC/WRPC/CEA and clearances for the entire electrical Installations & services done under this contract.
xx. Preparation and submission of all as built drawings relative to the contract on drawing prints and autocade form.
xxi. Conducting performance test at shop and site.
xxii. Final check-up, testing and commissioning in presence of Purchaser's representative.
xxiii. Trial run of all drives/motors, rectification/ replacement, if any and adjustments as necessary.
xxiv. Obtaining Purchaser's approval and written acceptance of satisfactory performance.
xxv. Handing over of installation for commercial operations.

## 7.TERMINAL POINT

Detail Scope of work and Terminal Point specified and has been included: -

i. All the necessary miscellaneous jobs for successful completion of system
ii. The detailed indicative scope of work is brought out in subsequent clauses of this section and the enclosed drawings.
iii. Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipment/items, complete in all respects

## 8.SCHEDULE OF QUANTITIES

The Vendor must prepare his own BOQ considering successful completeness of total system of 400KV GIS substation & Associated works. The Vendor should also include all such items in the BOM developed by him which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of Switchyard shall be a part of the scope and will be provided at no extra cost to Purchaser.

## 9.BASIC REFERENCE DRAWINGS

i. Single line diagram, general arrangements of Switchyards enclosed with the bid documents shall be further engineered by the Vendor.
ii. The layout drawings will be mutually finalized as per required bay configuration.
iii. The Bidder shall maintain the overall dimensions of the Switchyard, phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights adequately to obtain the statutory electrical clearances required for the Switchyard.
iv. All drawings, schedules and annexure appended to this specification shall also form part of the specification. These drawings are meant to give a general idea to the Vendor. No information/data shown/not shown in these drawings shall be construed to relieve the Vendor of his responsibility to carry out the work as per this specification and/or construction drawings released after the award of contract.
v. In case of any discrepancy between the drawings and text of specification, the requirements of drawings/ standard engineering practices as per IS/IEC shall prevail in general. However, the Bidder is advised to get these clarified from the Purchaser.
vi. For the purpose of present scope of work, technical specification shall consist of following existing equipment and they should be read/workout design and engineering with below equipment drawing provided by BALCO.
    i. Existing 400 kV GIS SLD
    ii. Existing GIS Hall layout
    iii. Existing CIVIL drawing of GIS installation
    iv. Outdoor equipment details of BALCO 400kV System.
    v. Civil & Structural Works associated with bay extension, 400KV GIS, gantries and ICT yard including ICT foundations

## 10.FACILITIES TO BE PROVIDED BY THE PURCHASER DURING CONSTRUCTION

i. Purchaser shall make available the 415 V AC Construction power supply at one-point approx. 100 Mtr away from the existing GIS substation. All further distribution from the same for construction and permanent auxiliary supply shall be made by the Vendor.

ii. Purchaser shall make available construction water supply at a single point near (200 metres) the substation. All further distribution for the same shall be made by the Vendor. However, the Vendor shall make emergency measures also as required.

## 11.CODES AND STANDARDS

All the equipment and accessories covered under this specification shall be designed, manufactured and tested in accordance with the latest revision of the Standards mentioned under respective section. The work shall be carried out in the best workman like manner in conformity with relevant specifications / code of practices of the Bureau of Indian Standards. In addition, work shall also confirm to the requirements of latest editions / amendments of the following: -

i. Indian Electricity Act and rules framed there under.
ii. Fire Insurance Regulations
iii. Regulations laid by the office of the Chief Electrical Inspector to Government
iv. CBIP Manual on Substations
v. IS/IEC as applicable
vi. CEA latest regulation and guideline for construction of new GIS substation.
vii. Any other regulations laid down by the local authorities.

In case of any discrepancy among various codes/guidelines the stricter shall be followed.

## 12.GENERAL REQUIREMENTS and TECHNICAL PERTICULARS

i. Details of technical particulars/ Electrical system are indicated in enclosed Annexure –A.
ii. Project site data is indicated in enclosed Annexure-B.
iii. The Vendor shall obtain all permits, licenses, and statutory approvals from various regulatory bodies including local authorities for completion of work up to Erection, testing& commissioning and making it functional. Original copies of these approvals shall be delivered to the Purchaser or his authorized representative and will become property of the Purchaser.
iv. All materials and equipment furnished for permanent installation shall be new, unused, and undamaged. Asbestos or any other environment non friendly materials are not allowed to be used for construction.
v. The Vendor shall establish an identification numbering system to provide consistent numbering. All electrical devices, control and instrumentation equipment, and other items of similar nature shall be permanently identified with the Vendor's identification number. The Vendor's identification numbers shall be coordinated with the existing system.
vi. All equipment shall be boxed, crated, or otherwise protected during shipment, handling, and storage. Coated surfaces shall be protected against impact, abrasion, discoloration, and other damages. Surfaces which are damaged shall be repaired. Electrical equipment, controls, and insulations shall be protected against moisture and water damage.
vii. Similar equipment and components shall be of same make. Equipment’s or part thereof for same type and rating shall be interchangeable.

viii. The Vendor shall be responsible for safety of human and equipment during the working. It will be the responsibility of the Vendor to co-ordinate and obtain Electrical Inspector's clearance before commissioning. Any additional items, modification due to observation of such statutory authorities shall be provided by the Vendor at no extra cost to the Purchaser.

ix. The Vendor will develop adequate storage for sensitive equipment's, which are required to be stored indoors. All equipment's during storage shall be protected against damage due to acts of nature or accidents. The storage instructions of the equipment manufacturer/Purchaser shall be strictly adhered to.

## 13.DESIGN REQUIREMENTS

i. The switchyard/substation equipment's shall be suitable for outdoor application. Electrical Equipment selection and derating shall be based on ambient temperature of 55 deg. C and relative humidity of 60% maximum.

ii. Unless otherwise specified, at least 10 % margin shall be considered in equipment sizing over and above the calculated load current/fault current/power requirements under worst operating & environmental conditions.

iii. Upgradation of existing Double bus GIS system of 400 kV, 50 kA for 3 sec, single phase enclosed busbars, having breakers of model - 8DQ1, 6bays including bus coupler bay, Circuit breakers, Isolators, CT, PT, surge arrestors, earth switches etc. and also supplied with GIS ducts for connectivity to outdoor equipment with New latest Generation GIS of one and half breaker scheme of GIS with below technical specification :

iv. Voltage Levels shall be maintained as follows:

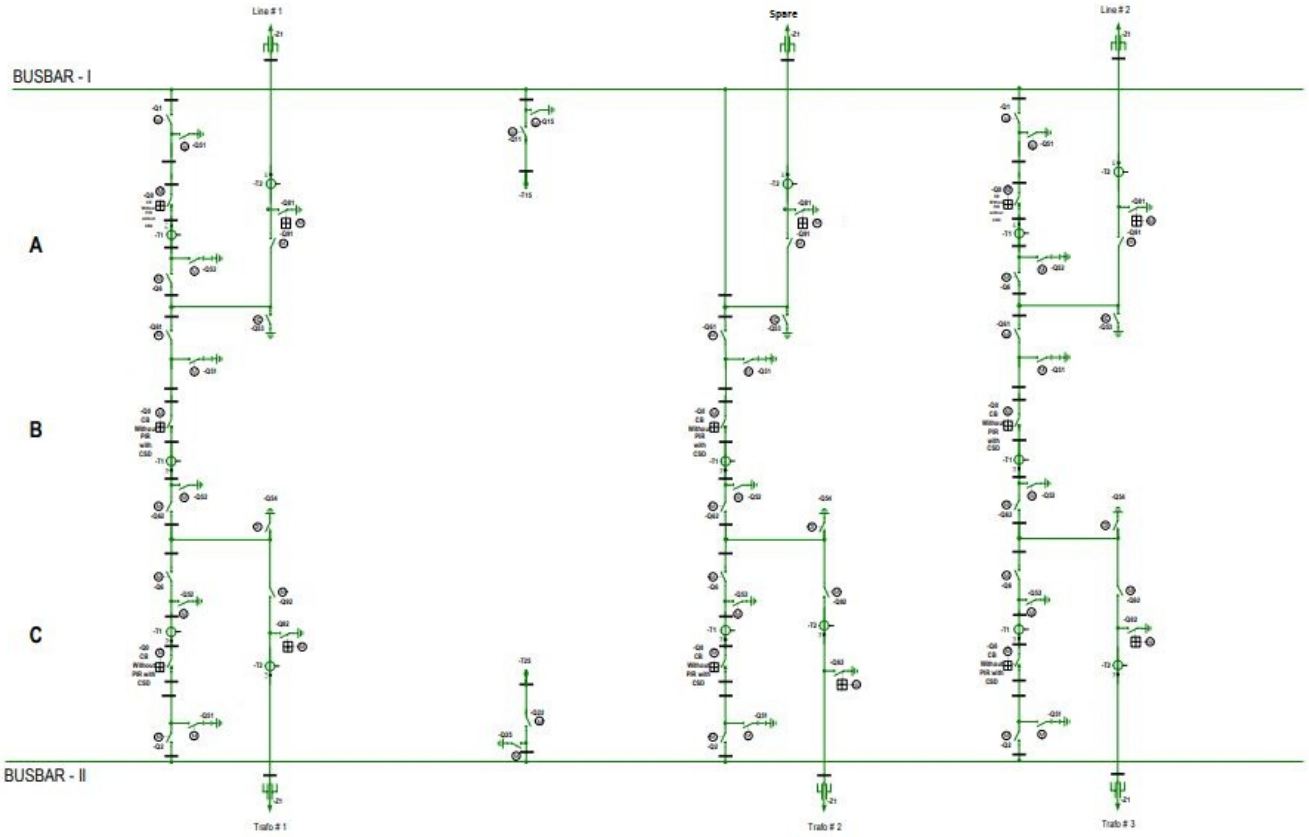
| | |
|---|---|
| Power Evacuation earthed. | 400 kV, 220kV (+10%), 3 phase, 3 wire 50 Hz, |
| LT Auxiliary Supply | 415V (±10%), 3 phase. 4 wire, solidly earthed. |
| LT Emergency Supply | 415V (+10%). 3 phase. 3 wire ungrounded. |
| DC Supply | 220V (+10% to -10%). DC 2 wire unearthed. |
| Control supply for 415 V PDB | 220 V DC |
| Metering | 110V AC PT Voltage |
| Control & protection | 220V, DC 2 wire unearthed |
| Panel lighting and space heaters | 240V, 1-phase, 2wires 50 Hz. A.C |
| Permissible Frequency variation | +3% to - 5% |
| Combined voltage & frequency variation | 10% |

Short circuit Levels shall be as follows:

| | |
|---|---|
| Three phase symmetrical short circuit ratings of 400kV | >=63 kA for 3 sec |

400 kV Switchyard/substation shall be provided with one and half breaker configuration of GIS system of 400 kV, 63 kA for 3sec as per proposed attached first cut design: -

**Proposed Scheme: -**




## 14.CONTROL ASPECT

i. All equipment's of the bays shall be controlled from CRP as well as with the existing network control system. The bidder must supply all necessary hardware for 19 bays of 220KV AIS, 400 KV GIS and ICT etc which will be interfaced through the communication on IEC 102 with existing 220KV SCADA. The provision for separate SCADA control is also to be envisaged for the equipment's, which are in the scope of supplies and in the battery limits as per the tender. The necessary software to be incorporated in the existing SCADA software for communication interface.

ii. For Circuit breakers, Local operation shall be carried out from CB operating box, for which Local/remote selector switch located in the CB operating box shall be selected in local. This operation is envisaged only for maintenance and testing of circuit breaker.

iii. For Isolators, Local operation shall be carried out from Isolator operating box, for which Local/remote selector switch located in the Isolator operating box shall be selected in local this operation is envisaged only for maintenance and testing of Isolator.

iv. Signals from field (Breakers/Isolators/ earth switches etc) shall be hardwired separately to both existing SCADA and Switchyard control panel & SCADA. Signals from Numerical protection relays shall be interfaced through communication port on IEC protocol Signals from transformers, breakers C&R panels shall be multiplied at Switchyard control panel through relays and wired further to existing SCADA for interfacing.

v. Switchyard control panel (SCP) shall have selector switch to select location of control (SCP/SCADA). Switchyard

HMI shall have selector switch to select control between Switchyard HMI and remote HMI at Main control room HMI. If one location is selected, commands from other location shall be inhibited. The trip command from the protection system shall be active in all selection.

vi. Cable supply & laying from bay equipment to LCP and CRP is an part of the scope.

vii. Control commands from SCP shall be directly sent to respective breakers/isolators after satisfying the hardware interlocks.

viii. Control commands from HMI shall be sent through interposing relays to respective breakers/isolators after satisfying the software interlocks.

ix. Control commands Generator control panel shall be sent through interposing relays to respective breakers/isolators after satisfying the hardware interlocks

## 15.MAKE

For various items, Vendor shall furnish a list of makes proposed by him. All the makes shall be subject to Purchaser's approval. The manufacturer whose equipment are offered should have designed, manufactured, tested and supplied the same for the specified system voltage and which are in satisfactory operation for at least Five (5) years.

## 16.TIME SCHEDULE

The Schedule for completion of work under this package estimated as 9-10 Months. However, bidder is required have own assessment and submit activity wise detailed project schedule from PO to final commissioning & handover Please refer commercial contract, Design, Engineering, Manufacture, testing, assembly, transport and delivery at site, successful Erection, testing & commissioning of the total scope.

## 17.QUALITY ASSURANCE, TESTING & INSPECTION

i. All materials, components and equipment covered under this specification shall be procured, manufactured, erected, tested, and commissioned at all the stages, as per approved Quality Plan.

ii. All tests shall be conducted as per relevant IS/IEC/IEEE standards and shall be performed in the presence of Purchasers/ its representative, if so desired by the Purchaser. The Bidder shall give at least 21 days advance notice of the date when the tests are to be carried out.

iii. Equipment offered shall be of type tested and proven type. Type test certificates for test conducted earlier on similar rating & specification shall be furnished. For the various bought out items test certificates from equipment manufacturer shall be furnished. Routine tests shall be carried out for all the equipment as per applicable standards.

iv. Copies of certified reports of all tests carried out at the works shall be furnished. The equipment shall be dispatched from works, only after receipt of Purchaser's written approval of the test reports.

v. For all equipment / components / materials, for which Type tests have not been specified in the specification, only type test reports shall be furnished by the Bidder. Such Type tests should have been carried out within last three years, as on the date of opening of the bid, on identical components / materials. In absence case such reports are not found to be meeting the specification/standards requirements. Bidder shall conduct, free of cost to the Purchaser, all such type tests according to the relevant standards and reports shall be submitted to the Purchaser for approval.

vi. Vendor must provide the type test report of similar system if there is no change in design /material. If there is change in design material, then valid type test report will be provided. The same shall be informed within 30 days of contract.

vii. Routine tests & Acceptance tests shall be conducted for all the equipment in accordance with the agreed quality plan and as per the latest version of applicable IS for all the equipment. The charges for carrying out all the routine tests shall be deemed to be included in the bid price.

## 18.PERFORMANCE GUARANTEE

Bidder shall guarantee that system engineered, and equipment offered shall meet the requirements as stipulated in this specification and as confirmed by them in technical data sheets. In case, the performance at site is not meeting the requirement, the bidder will have to rectify / replace the system/equipment at site free of cost for 5 year after commissioning. The performance for the System shall be as under:

- ✓ Metering, Controls and protection as per contract document
- ✓ Zero mal operation during faults. On site simulation results to be provided.
- ✓ Any minor and major Component failure of 400KV GIS & Associated System, 400/220KV ICT, 400&220KV Outdoor equipment's, Control Protection Monitoring Metering Automation & SCADA system, Switchgears.

Vendor to offer equipment's and system which are based on proven design, latest model, type tested, conforming to prudent engineering practices & standards and guaranteed for long-term trouble-free operation without the risk of obsolesce at least for next 10 years.

Vendor is also required to guarantee spare and services support (from India) for at least next 15 years at reasonable agreed cost.

## 19.DOCUMENTATION

Drawings / Documents to be submitted after Award of Contract in soft as well as hard copy

1) 'Data sheet' incorporating all the comments agreed during tender stage.
2) Genera! arrangement, layout drawing and Section
3) Electrical Design Basis report
4) Civil Design Basis report
5) Single line diagrams
6) Equipment layout for Control Building
7) Complete technical particulars
8) Foundation plan, loading & fixing details
9) Protection & Synchronizing scheme diagram
10) CTA/T sizing calculation
11) Civil & Structural design calculations
12) Civil & Structural drawings
13) Sizing calculation for various equipment
14) Equipment control schematics
15) Bill of material
16) Wiring diagrams & terminal list for all equipment
17) Cable Schedule
18) Interconnection Schedule

19) Cable routing layout
20) Earthing drawings
21) Lightning protection drawings
22) Illumination drawings
23) Erection key diagram
24) Detailed erection & commissioning procedures
25) Test procedure
26) Type test certificates of all equipment
27) Routine test, type test. Acceptance test certificate
28) Quality plan QP.
29) Catalogues/drawings for all other bought out items
30) Painting & surface preparation procedure.
31) Field Quality Plan
32) Bar Chart
33) Billing Schedule
34) Operation & Maintenance Manual
35) As Built Drawings
36) Earthing calculation, detail layout of earthing connection to equipment &
37) Structure as per Is standards.
38) Any other drawings / documents listed in respective sections.

The documents listed are indicative. However, the vendor shall furnish all relevant documents as required by the Purchaser for successful completion of the project. Schedule for submission of various documents will be finalized during award of contract:

The modality of approval of technical documentation and priority of supply shall be mutually discussed and agreed upon with the successful Bidder in the kick-off meeting after the placement of LOA.

O&M manual for installation, operation and maintenance shall be furnished. Manual shall contain minimum following details:

i. Description of the equipment
ii. Salient construction features
iii. Packing details
iv. Storage at Site
v. Unpacking
vi. Handling at Site
vii. Erection procedure & checks
viii. Tests to be conducted at site
ix. Commissioning procedure
x. Maintenance instructions
xi. List of spares
xii. Approved GA drawing
xiii. Approved Data Sheets
xiv. Technical leaflets of all the items/ important components
xv. Copies of Test certificates

xvi.List of Maintenance tools
xvii.List of testing equipment required at site.

For all technical tables and diagrams, calculation results, drawings, test data and scales adopted in the design the standard international unit system (SI) as per International Standardization Organization (ISO) shall be uniformly maintain.
All engineering documents and drawings shall be of international "A" series sizes that is of AO, A1, A2, A3 & A4.

## 20.PROJECT SITE INFORMATION (Annexure-B)

| | | | | |
|---|---|---|---|---|
| 1.1) | Owner | : | - | BALCO Industries Ltd.,<br>KORBA,<br>Chattisgarh - 495689<br>Fax: 07759-243068<br>Tel: 07759 -243515 |
| 1.2) | Project | : | - | 1200 MW TPP |
| 1.3) | Site Location | : | - | KORBA |
| 1.4) | Nearest Airport | : | - | RAIPUR |
| 1.5) | Approach Road | : | - | YES |
| 1.6) | Nearest Railway Station | : | - | CHAMPA |
| 1.7) | Nearest Sea Port | : | - | Kolkata |
| 1.8) | Elevation above chart datum/mean Sea level | : | - | 295-300 |
| 1.10) | Seismic Zone | : | - | III |
| 2) | Metrological Information | | | |
| 2.1) | Ambient conditions | | | |
| | Design temperature for electrical Equipment / device | : | - | 55°C |
| 2.2) | Relative Humidity | : | - | |
| | a. Maximum | : | - | 80% |
| | b. Minimum | : | - | 20% |
| | a. Average | : | - | 60% |
| 2.3) | Wind Data | : | - | |
| | a. Basic wind speed | : | - | 39 m/Sec |
| 2.4) | Soil bearing capacity | : | - | To be measure |
| 2.5) | Tropicalization | : | - | Required |
| 3) | Electrical Details | : | | |
| 3.1) | EHV System | : | - | 220.000V (±) 10% volts, 3 |

| | | | | |
|---|---|---|---|---|
| | | | | phase (+) 3% to (-) 5% Hz, solidly grounded system<br><br>400,000V (±) 10% volts, phase (+) 3% to (-) 5% Hz, solidly grounded system |
| 3.3) | LV System | : | - | 415V(±) 10%,3 Phase, 50(+) 3%, (-5)% Hz, solidly grounded system |
| 3.4) | Auxiliary supply for lighting etc. | : | - | 240V (±) 10% volts, 1 phase, 50Hz, (Ph/N of 415Volts) |
| 3.5) | Combined voltage & frequency variation | : | - | 10% (Absolute sum) |

**********END**********