REF: IS-1-13-2000 **CUSTOMER: RRVUNL**

INDENT SPECIFICATIONS FOR BALANCE ELECTRICAL AND C&I E&C WORKS OF WT# 3&4 PERTAINING TO CONVEYOR PACKAGE FOR 2X660MW SUPER CRITICAL THERMAL POWER STATION, STAGE-V, UNIT #7 AND 8 AT SURATGARH, RAJASTHAN

The bidder shall confirm compliance to the following by signing/ stamping this sheet and furnishing same with the offer.

1. The scope of supply, works, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There is no deviation with respect to specification.

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in Price Bid/Unpriced Bid of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE

PREPARED BY V. VENKATESHWAR RAO	CHECKED AND APPROVED BY BINDU L Digitally signed by L Bindu DN: cn=L Bindu, o, ou, email=lb@bhel.in, c=US Date: 2021.05.22 12:27:51 +05'30'

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ENCLOSURES:
ANNEXURE-A: DRAWING AND DOCUMENTS

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SECTION I: SITE CONDITIONS

1.1	**GENERAL SITE CONDITIONS**		
1.	Owner / Purchaser	:	Rajasthan Rajya Vidyut Utpadan Nigam Ltd. (RRVUNL)
2.	Engineer/consultant	:	Tata Consulting Engineers Ltd (TCE) 73/1, St. Marks Road, Bangalore – 560 001
3.	Project Title	:	2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan
4.	Project location	:	Prabat Nagar, Suratgarh, Sriganganagar district, Rajasthan.
5.	Elevation (above Sea level)	:	186 m (approximate)
6.	Temperatures : Monthly basis	:	Mean of daily max. 32.8 deg.C (in the month of May) Mean of daily min. 17.6 deg.C (in the month of Jan)
7.	Temperatures : Annual basis	:	Mean of daily max. 32.3 deg.C Mean of daily min. 19.6 deg.C
8.	Highest temperature recorded	:	50 deg.C
9.	Lowest temperature recorded	:	(-) 2.8 deg.C
10.	Design temperature	:	50 deg. C
11.	Relative humidity	:	Varies between 21% and 81%
12.	Annual average rain fall	:	312 mm
13.	Annual mean wind speed : Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following	:	4 km/hr a) Basic wind speed = 47 m/sec b) Factor K1 = 1.07 c) Category of terrain = Category 2 d) K3 – as per IS 875
14.	Seismic data (As per IS: 1893 latest issue)	:	Zone II; Designs & design coefficients will be based on IS 1893:2002
15.	Nearest railway station	:	Suratgarh JN
16.	Nearest airport	:	Jaipur
1.2	**POWER SUPPLY SYSTEMS**		
1.2.1	**MV System**		
	System Voltage	:	6.6 kV ± 10%, 3 Phase, 3 wire
	System Frequency	:	50 Hz ± 5%
	Combined Variation	:	10% (absolute)
	System Fault level	:	40 kA for 3s
	System Earthing	:	Non effectively earthed
	Drives	:	161kW-1500kW
1.2.2	**LV System**		
	System A.C voltage	:	415 V ± 10%
	System Frequency	:	50 Hz ± 5%
	Combined Variation	:	10% (absolute)
	Phase	:	3 ph, 3- wire
	System fault level	:	50 kA for 1s
	System Earthing	:	Solidly grounded
	Panel space heater, lighting, AC Control & Protection Supply	:	240V, Single phase
	Drives	:	up to 160kW
1.2.3	**DC System**		
	System Voltage	:	220V, +10%, -15%, 2-wire
	Fault level	:	20 kA
	System Earthing	:	Unearthed

SECTION II: APPLICABLE STANDARDS

CODES AND STANDARDS

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/codes as applicable.

Sl. No.	Standard	Description
1.	IS 12943	Brass glands for PVC cables
2.	IS-2148 BS-4683	Flame-proof enclosures of electrical apparatus
3.	IS-8309 BS-4683	Compression type tubular terminal ends for aluminum conductors of insulated cables
4.	IS-3043 BS-1013	Code of practice for earthing
5.	IS 9537	Rigid conduits
6.	IS 3837	Accessories for rigid steel conduits for electrical wiring
7.	IS 2667	Fittings for rigid steel conduits for electrical wiring
8.	IS 3419	Fittings for rigid non-metallic conduits
9.	IS 3480	Flexible steel conduits for electrical wiring
10.	IS 6946	Flexible non-metallic conduits for electrical installation
11.	IS 4649	Adaptors for flexible steel conduits
12.	IS 1293	Plugs and socket outlets
13.	IS-3070 BSEN-60099 IEC-60099	Lightning arrester
14.	IS : 3043	Code of practice for earthing
15.	IS: 2309	Protection of buildings and allied structures against lightning
16.	IEEE:80	-
17.	IS: 2629	Galvanizing
18.	IS:9537	Conduits
19.	IS: 3480	-
20.	IS: 1239	-
21.	IS: 4985	-
22.	-	Indian Electricity Rules
23.	-	IS Code of practice
24.	-	National electricity code
25.	-	National Fire code Vol 14, USA, NFPA 850
26.	-	National Building Code of India
27.	IS 1255	Code of practice for installation & maintenance of power cables up to and including 33KV

This above list is not exhaustive. Standards not listed above but are applicable also to be followed to meet the requirement.

Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to

standards listed above. In such a case, the bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

Indian Electricity Act & Rules framed there under. Regulations laid and obtaining all statutory clearances such as clearance from chief Electrical inspector to Government.

- Rajasthan State Factory Rules / Acts.
- Indian Electricity Rules / Acts.
- Electricity Regulatory Commission Acts
- Indian Petroleum Regulations / Acts.
- Indian Explosives Acts.
- Gas Cylinders Rules /Acts.
- Static and mobile Pressure Vessels Code (Unfired) Rules / Acts.
- Fire Protection Manual issued by Tariff Advisory Committee (India)
- Pollution Control Regulations/Acts.
- All Applicable/Workmen related Acts such as Minimum wages, PF, ESI etc.

Any other regulations laid down by the local authorities & Rajasthan Electricity Board & Authority. All clearances, permissions and licenses required to carry out a super critical thermal power project.

The electrical installation shall meet the requirements of Indian Electricity Rules as amended up to date and relevant IS codes of Practice and Indian Electricity Act. In addition, other rules or regulations applicable to the work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding.

SECTION III: SCOPE OF SUPPLY & WORK

Erection, Commissioning and Testing of Electrical and C&I work including transportation from stores to site required for this project and providing skilled & unskilled manpower assistance, providing tools/instruments/ for commissioning, Testing and conducting Performance Guarantee Test till handing over the project to the customer. All tools, electrical instruments, hardware and consumables required for erection, commissioning and testing shall be arranged by the bidder.

Detailed scope of work along with quantity is mentioned in enclosed Annexure-I.

The details of work given are only indicative and not exhaustive. The work will be inclusive of, but not limited to the description given, which is only brief in nature. The bidder should include all the works required to complete the job in the scope of work. Accordingly, Bidder to Quote Rate against each item.

Scope includes Transportation of materials required for completion of work from BEVCON/BHEL stores to erection site/temporary storage near the erection site. Collection of loose items and assembly as required.

CABLE TRAY:

The cable tray work includes associated accessories, like horizontal bend, vertical bend, tee, cross, reducer (LHS), reducer (RHS), coupler plate, fixing accessories etc.

Fabrication of irregular cable tray bends at site, if required, is included in the scope of the work. Fabrication of cable tray, or similar bends are considered part of the normal tray erection work and shall be done by the bidder within the tray erection rates. Tray numbering/marking and touch up paint (**including supply**) for welding points is also in the scope of bidder. Scope includes submission of approved (BHEL &RRVUNL) copy of Erection Protocol and Commissioning Protocol for billing.

LAYING & DRESSING OF CABLES:

Scope includes transportation of cable drums from BHEL/BEVCON Stores to site.

Scope includes laying, dressing and **supply** & fixing of **aluminum tags, nylon ties, clamps, cable cleats** etc. and use them as stipulated to ensure proper dressing and clearing of all sorts of the debris is also in the scope of bidder.

Standard Engineering Practice of Cable laying like segregation by category, identification labelling at regular intervals etc to be followed. Cable runs shall be uniformly spaced, properly supported and protected in an approved manner. All bends and joints in runs shall be well defined and made with due consideration to avoid sharp bending and kinking of the cables. Scope includes submission of approved (BHEL &RRVUNL) copy of Erection Protocol and Commissioning Protocol for billing.

CABLE TERMINATION:

1 (One) Run of Termination indicates termination of Cable at one end for all cores including cable glanding, fixing of lugs & cable tag and Patch cord & Pigtails, continuity checking, drilling of gland plates, supply & fixing of ferrule for all cores etc.. Ferrules/sleeves shall be from electronic ferrule machine printed and the electronic ferrule shall be arranged by bidder. Continuity test shall be carried out once termination work is done and this shall be certified by site site-in charge/ Engineer. **SCOPE INCLUDES SUPPLY of Cable Glands, Lugs and Patch cord & Pigtails etc.**

Making of Gland holes as per the size of gland, if required by punching the plates at site using Gland cutters (gas cutting will not be allowed).

Cable Glands: Type of Cable glands shall be Double compressed, weather proof brass for Power/Control/Instrumentation Cables. Make shall be **Commet or Dowells.**
Cable Lugs: Type of Cable Lugs shall be Heavy duty, tinned copper, long barrel type for Power, Control & Instrumentation Cables (Pin/Ring/U shape as required). Make shall be **Commet or Dowells.**
Patch cord and Pigtails: Make – **D-link**.

PANELS AND JB's:
Fabrication and Fixing of supports (base channels), brackets, alignment, leveling of support & equipment, erection, testing and commissioning including earthing, checking of wiring, terminating protective relay, instrument, switch, etc. of connecting internal wiring, testing of current transformer, potential transformer & other internal components mounted in the above equipment shall be under scope of the bidder. **Bidder's Scope includes supply of** required hardware also.

Removable undrilled gland plates with gaskets are provided in each panel to facilitate for cable glanding and termination of external cables in the scope of the bidder. If removable gland plates are not provided, making holes on the fixed plate by drilling and glanding, tapping is also under the scope of the bidder for which bidder shall not claim any extra cost.

The bidder will have to co-ordinate in a proper manner during commissioning of system with other agencies and will ensure successful commissioning of the system in a sequential way without any hazard and interruption in work under the direction and subject to the approval of BHEL.
Scope includes submission of approved (BHEL &RRVUNL) copy of Erection Protocol and Commissioning Protocol for billing. Closing of extra/unused gland holes shall be closed by bidder.

EARTHING:
Scope includes Receipt of Earth Flats of different sizes from BHEL/BEVCON site store and Transportation of Materials from BHEL/BEVCON stores to respective location envisaged at site for laying the earth flats. Connecting Earth Flats to the electrical and C&I equipment viz., Panels, Cable trays, LPBS, JB's, PCS, BSS etc. in all respects to the nearest earth grid. Submission of Approved copy of Erection Protocol and Commissioning Protocol for billing.

Below ground welded joints for earthing to be painted with two coats of bituminous paint for buried areas. Above ground welded joints for earthing to be painted with aluminium touch up paint. **Supply of paints shall be in the scope of bidder.**

Earth Pit for Electronic System Earthing: Scope includes a) Earth Pit for Electronic System Earthing (Size 1.5m x 1.5m x 3.5m) and connecting to panel thro' cable. Pit making involves Concrete Bed making, watering, Earth Flat / cable entry provisions etc. and shall also conform to all the latest, relevant Standards and as per BHEL approved drawings. Scope includes Supply of earth electrodes & accessories etc. for making of earth pit complete, excavation, supply of **Bentonite clay** / salt, backfilling, RCC pit with cover to ensure completeness of the earth pit is in contractor scope.
b) Measurement of earth pit resistance at site using earth resistance test kit.
c) Submission of Approved copy of Erection Protocol and Commissioning Protocol for billing.

EOT:

Mounting of Isolator, Erection of DSL with supporting structure, erection of Control panel, erection of Limit switches, associated cable tray, cabling and termination (**including supply of Gland and Lugs etc**.) and earthing is in the scope of bidder. The details of work given above are only indicative and not exhaustive. The bidder should include all the Electrical works required to complete the job in the scope of work.

ELECTERIC HOIST:

Mounting of Isolator, Erection of DSL with supporting structure, erection of Control panel, erection of Limit switches, associated cable tray, cable tray and termination (**including supply of Gland and Lugs etc**.) and earthing is in the scope of bidder. The details of work given above are only indicative and not exhaustive. The bidder should include all the Electrical works required to complete the job in the scope of work.

ELEVATOR:

Mounting of Isolator, Erection of Control panel & ARD Panel, erection of Speaker Box, Fireman Switch, Limit switches, junction box, associated cable tray, cable tray cabling and termination (**including supply of Gland and Lugs etc**.), Laying and termination of Trailing cables (**including supply of Gland and Lugs etc**.), and earthing is in the scope of bidder. Lighting of Elevator is in the scope of bidder. The details of work given above are only indicative and not exhaustive. The bidder should include all the Electrical works required to complete the job in the scope of work.

PCS, BSS, ZSS, CHUTE JAMMING SWITCH, PROXIMITY SWITCHES, LIMIT SWITCHES TERMINATION SENSORS, PULL CORD HOOK, PULL CORD ROPE, PULL CORD:

Erection of items includes fixing of main item and fabrication and fixing of all associated accessories e.g. bracket etc. and supply of required hardware.
Scope includes submission of approved (BHEL &RRVUNL) copy of Erection Protocol and Commissioning Protocol for billing

FIRE BREAK:

Fire break system for the project is in the scope of bidder which includes scope of cable trays & Cables covered in this tender and for the cable trays & Cables already erected at site.

1.Fire break shall be provided by applying a suitable fire-resistant coating on cables for the required length to meet the fire rating of 30 minutes.

2.Fire break shall be provided at an interval of 15m in the straight portion of each of the cable tray above ground, at intervals of 30m in cable trenches and at 5m for all vertical trays. All cable inter section and tee offs shall be provided with firebreaks.

When pipe sleeves are provided for cables from outdoor areas to indoor areas, the pipe opening at the outdoor side shall be sealed by fire proof sealing material, which is also continuously waterproof. The indoor side of the pipe opening shall also be sealed by continuous fire proof sealing materials. The duct banks in outdoor areas also need to be sealed by waterproof seals. It is necessary to explore possibility of applying waterproof coating on fireproof sealing.

Scope also includes **supply** of material and submission of approved (BHEL &RRVUNL) copy of Erection Protocol and Commissioning Protocol for billing.

SUPPLY:

Any material supplied by bidder (whether billable or non-billable) must be of approved make. Item make approval shall be obtained from BHEL, wherever not available. Before procuring or brining such material bidder shall mandatorily take approval from BHEL.

TOOLS & TACKLES:

The bidder shall arrange all tools, tackles, implements, mobile equipment, instruments, hardware, consumables, such as crane, hydra, trailers, scaffoldings, ladders, welding machines, welding rods, gas cutting, bending machine, hand cart, chain pulley blocks wire clues, hydraulic jack/motorized jack, wooden sleeper, drill machine, crimping, hand/hydraulic compression tools for cable termination, wire stripper, cutting/nose plier, vacuum cleaners, air blower, spanner of various size etc. which are required for transportation, handling and erection, testing and commissioning of the equipment. Multimeter, continuity tester, Megger 1kV, Megger 5kV, clamp meter, micro-ohm meter, temperature gun, vibration meter, earth tester etc. required for testing shall be arranged by the bidder.

SECURITY:

Bidder shall consider adequate security for materials in his custody based on discussion with BHEL's site in charge. Round the clock security during erection period for safeguarding the equipment till charging/commissioning of equipment, other erection locations etc. shall also be provided by the bidder. Payment for these shall not be made separately and is deemed to be included in the prices quoted by the bidder for the contract.

DRAWING & DOCUMENTS:

Cable tray & Earthing layouts, Drg/docs of EOT, Electric Hoist, Elevator are enclosed in **Annexure-A** for reference.

Bidder to visit the site before quoting to understand the site conditions and balance work to be executed.

SECTION IV: TECHNICAL SPECIFICATION

1. RECEIPT, STORAGE & MANAGEMENT OF MATERIAL

1.1 Bidder should take all necessary care to make safe unloading /shifting/stacking of equipment without damaging it and injury to the working persons and surrounding property. Equipment/Boxes to be lifted, slings should be put at the prescribed locations/lifting lugs.

1.2 All the lifting tools and tackles shall be tested and should have valid certificate for prescribed load. At no circumstance under sized slings, shall be used. Damaged tools shall not be used.

1.3 While unloading the material, using crane, hoists bidder shall ensure usage of proper size of clamps/slings/tools/tackles depending upon volume and weight of the item.

1.4 Bidder has to arrange tarpaulin/Polythene for covering the materials as suggested by BHEL. Storage place should be kept clean and provide regular maintenance. Adequate quantity of portable fire extinguishers as directed by customer/BHEL should be provided both at open yard and covered storage place. Bidder shall provide wooden/concrete sleepers for material stacked/stored in open yard, if required. Tarpaulin/Polythene cover, Fire extinguishers, sleepers to be supplied by the bidder as per requirement.

1.5 Supervisor/worker/Rigger engaged by the bidder shall be skilled and they shall have the desired experience and knowledge for such equipment handling.

1.6 If any pilferage/theft happens, bidder has to report to police and BHEL. Lodging FIR on behalf of BHEL and arranging inspection by concerned officials shall be by bidder.

1.7 Security for BHEL stores is not in bidders scope. All the BHEL supplied items shall be issued in bulk to the bidder during erection time, not in small quantities. Accordingly, these will be assumed in bidders custody then onwards.

1.8 All local safety rules and regulations for carry out work inside / outside plant is to be adhered strictly and binding on the bidder.

1.9 Bidder shall maintain up to date proper record of the job carried in prescribed format as desired by BHEL engineer at site.

1.10 Entry to project site shall be with gate passes only. Any relevant details/information of worker to obtain such pass to be furnished in advance to BHEL before expiry of gate pass, request to be made for revalidation well in advance.

1.11 Unloading during night if essential to be made with enough illumination in the surrounding area.

1.12 Material shall be taken out of BEVCON/BHEL store/office through issue of official gate pass as described by BHEL. Bidder should ensure the full control of material moving out of BEVCON/BHEL store/office.

1.13 Reconciliation of materials shall be done by bidder after completion of all the erection works. Bidder shall coordinate with authorities in arranging necessary OUT gate passes for these materials. NO separate payment shall be made against this activity.

1.14 All expenses incurred towards liaising for obtaining necessary IN/OUT gate passes for the materials and the persons engaged by the bidder for the above job as well as for the BHEL representatives shall be borne by the bidder.

1.15 All travelling expenses including provisions of all necessary transport to and from Site, lodging allowances and other payments to the bidder's employees shall be the sole responsibility of the bidder.

2. ERECTION OF ELECTRICAL EQUIPMENT

2.1 Painting

All equipment after erection shall be Touch Painted by bidder as per the standard/approved color schemes (if necessary). The required primer & paint has to be procured by bidder.

All structural steel supplied by the bidder and exposed surfaces of embedded steel for cable tray mountings, JB, panels, shall be painted as follows unless otherwise noted:

For indoor installations: One shop coat of red oxide zinc chromate primer (site coat for exposed surfaces of embedded steel) and two site coats of aluminum alkyd paint.

For outdoor installations: Painting with a two pack epoxy coating.

BIDDER'S SCOPE INCLUDES SUPPLY of Paint required for completion of work.

2.2 Co-ordination with other Contractors

The bidder and his personnel shall co-operate with personnel of other Contractor's working at the project, co-coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole. BHEL Engineers at site will do the co-ordination of the various works/activities with the Contractors working in the same area and the bidder shall abide by the decision of BHEL Engineers at site.

2.3 Water for construction: Bidder shall make his own arrangement for water from the nearest source made available at site (free of charge) or make separate bore well with pumping and storage facilities.

2.4 Construction power of 415V, 3 phase, 3-wire shall be provided at one point free of charge. Further distribution (including Tariff Meter installation) shall be carried out by the bidder as per requirement. In case work progress is affected due to non-availability of construction power, bidder shall arrange power using DG Sets and fuel at his own cost.

2.5 Bidder has to consider and envisage mobilization of all resources required, including manpower, in the shortest possible time during E&C at site. For this, bidder has to consider advance resource planning so that erection works is not delayed.

2.6 Sufficient Illumination shall be arranged by bidder at work areas at their own cost.

SECTION V: INSPECTION AND TESTING

- Complete testing & commissioning of all the equipment erected by bidder as per this contract. All the testing equipment shall be duly calibrated by NABL/NPL accredited laboratories/accreditation agencies. Preparation and arranging customer certification of joint commissioning protocol/ commissioning reports for all the equipment erected by bidder. Any tests & testing equipment required for complete testing of the equipment shall be deemed included in bidder's scope.
- The bidder must have the requisite testing equipment/instruments of his own to complete the job in time. The instruments must be maintained in good working condition with valid calibration / inspection labels.
- FQPs for Electrical equipment shall be shared with the successful bidder. The same shall be followed.

SECTION VI: DOCUMENTATION

- During the erection of the equipment, all such readings which will form part of the final erection Protocol/Commissioning Report of the Equipment shall be maintained by the bidder in a permanent manner.
- All drawings, sheets, correspondence, measurements, bills etc. shall be in English language only.

Following documents are to be submitted by the bidder:

1. As commissioned modified drawing in triplicate.
2. Material reconciliation statement for all the equipment/material received at site
3. Certification that wages ESI, EPF have been paid to the workers in full for complete period of work along with submission of RAB.
4. No further demand certificate
5. Bidder shall maintain day book for progress of work done on daily basis and shall sign all the measurement w.r.t. laying of cable, cable tray, earthing strip etc. duly certified by BHEL Engineer after verification.
6. Bidder shall be responsible for signing the protocol with RRVUNL along with BHEL, accordingly bidder RAB may be raised.
7. RAB with accepted measurement sheets for the work carried out shall be submitted regularly.
8. Defect/damage/loss reports shall be submitted from time to time.
9. Any untoward development regarding the safety and security of equipment's / work force shall be brought to the notice of BHEL - ISG in writing, immediately.
10. Attendance report for the work for deployed shall be submitted on a day to day basis.
11. List of all Hand operated electrical items have to be maintained along with their next due date of inspection – so that they will be checked for the healthiness and problem, if any, will be rectified OR equipment is replaced so that they are always safe to work with.
12. All the electrical portable equipment must be identified and their healthiness tags are provided over them - with the next due date of inspection.
13. The bidder shall record Results of all Erection Tests and Measurements and submit them along with the erection Protocol.
14. Completion certificate for work.
15. Shall maintain day book for progress of work done on daily basis and shall sign all the measurement w.r.t laying of cable tray, termination etc. has to get this duly certified by BHEL Engineer after verification.
16. Any other as per the instructions of BHEL-ISG Site-in-charge.