

Corrigendum - 02 dated 14/08/2026 to CPC Tender No. BHEL/CPC/TAL/E C&I/27/022

Name of Work: Package A : Erection, Testing & Commissioning of C&I Pkg including providing labour, supervision, T&Ps, consumables, etc for receipt of material from store/ storage yard, watch & ward, transportation to site {from inside or outside plant boundary}, pre-assembly, erection, testing, commissioning, trial run, handing over, etc., receipt & storage of self-supplied materials, for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of Broad Scope of Work, etc **for Main Plant Area-Unit #1 & Common Systems (Except AHP, CHP, LHP & GHP)** of 2X660MW Talcher Thermal Power Project, Angul, Odisha.

Package B: Erection, Testing & Commissioning of C&I Pkg including providing labour, supervision, T&Ps, consumables, etc for receipt of material from store/ storage yard, watch & ward, transportation to site {from inside or outside plant boundary}, pre-assembly, erection, testing, commissioning, trial run, handing over, etc., receipt & storage of self-supplied materials, supply of consumables as per BOQ for total scope defined in tender and terms & conditions of tender, taking into account of all clarifications, confirmations, agreements till date for complete work of Broad Scope of Work, etc **for Main Plant Area-Unit #2 and AHP, CHP, LHP & GHP** of 2X660MW Talcher Thermal Power Project, Angul, Odisha.

A) Modification in TECHNICAL CONDITIONS OF CONTRACT (TCC): Following TCC clauses have been revised:

Sl. No	Reference clause of Tender Document	Existing Clause		Revised Clause	
1	TCC Clause No. 6.3	Schedule of Completion:		Schedule of Completion:	
		Package	Contractual Schedule (Month)	Package	Contractual Schedule (Month)
		ERECTION, TESTING & COMMISSIONING OF C&I PKG OF MAIN PLANT AREA-U#1 & COMMON SYSTEMS (Except AHP, CHP, LHP & GHP)	13 Months	ERECTION, TESTING & COMMISSIONING OF C&I PKG OF MAIN PLANT AREA-U#1 & COMMON SYSTEMS (Except AHP, CHP, LHP & GHP)	18 Months
		ERECTION, TESTING & COMMISSIONING OF C&I PKG OF MAIN PLANT AREA-U#2 including AHP, CHP, LHP & GHP	13 Months	ERECTION, TESTING & COMMISSIONING OF C&I PKG OF MAIN PLANT AREA-U#2 including AHP, CHP, LHP & GHP	18 Months

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2	TCC Clause No. 6.4	The contractor has to subsequently augment his resources in such a manner that C&I readiness for following major milestones are achieved on specified schedules: <table border="1"> <thead> <tr> <th>S. No.</th><th>C&I READINESS FOR MAJOR MILESTONE</th><th>Tentative Schedule from start of work of Package - A</th><th>Tentative Schedule from start of work of Package - B</th></tr> </thead> <tbody> <tr> <td></td><td></td><td>Unit-1</td><td>Unit-2</td></tr> <tr> <td>1</td><td>ND HYDRO TEST</td><td>3rd Month</td><td>3rd Month</td></tr> <tr> <td>2</td><td>BOILER LIGHT UP</td><td>5th Month</td><td>5th Month</td></tr> <tr> <td>3</td><td>SYNCHRONIZATION</td><td>9th Month</td><td>9th Month</td></tr> <tr> <td>4</td><td>COMPLETION OF FACILITIES</td><td>13th Month</td><td>13th Month</td></tr> </tbody> </table>	S. No.	C&I READINESS FOR MAJOR MILESTONE	Tentative Schedule from start of work of Package - A	Tentative Schedule from start of work of Package - B			Unit-1	Unit-2	1	ND HYDRO TEST	3 rd Month	3 rd Month	2	BOILER LIGHT UP	5 th Month	5 th Month	3	SYNCHRONIZATION	9 th Month	9 th Month	4	COMPLETION OF FACILITIES	13 th Month	13 th Month	The contractor has to subsequently augment his resources in such a manner that C&I readiness for following major milestones are achieved on specified schedules: <table border="1"> <thead> <tr> <th>S. No.</th><th>C&I READINESS FOR MAJOR MILESTONE</th><th>Tentative Schedule from start of work of Package - A</th><th>Tentative Schedule from start of work of Package - B</th></tr> </thead> <tbody> <tr> <td></td><td></td><td>Unit-1</td><td>Unit-2</td></tr> <tr> <td>1</td><td>ND HYDRO TEST</td><td>8th Month</td><td>8th Month</td></tr> <tr> <td>2</td><td>BOILER LIGHT UP</td><td>10th Month</td><td>10th Month</td></tr> <tr> <td>3</td><td>SYNCHRONIZATION</td><td>14th Month</td><td>14th Month</td></tr> <tr> <td>4</td><td>COMPLETION OF FACILITIES</td><td>18th Month</td><td>18th Month</td></tr> </tbody> </table>	S. No.	C&I READINESS FOR MAJOR MILESTONE	Tentative Schedule from start of work of Package - A	Tentative Schedule from start of work of Package - B			Unit-1	Unit-2	1	ND HYDRO TEST	8 th Month	8 th Month	2	BOILER LIGHT UP	10 th Month	10 th Month	3	SYNCHRONIZATION	14 th Month	14 th Month	4	COMPLETION OF FACILITIES	18 th Month	18 th Month
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4	TCC Clause No. 7.1.11		Supply of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)			Supply of consumables mentioned in BOQ for Package-B in Vendor Scope (For AHP, CHP, GHP & LHP Area only)	
		A)	Supply of consumables mentioned in BOQ for Package-B in Vendor Scope on receipt of MDCC (Material Dispatch Clearance Certificate) from BHEL (For AHP, CHP, GHP & LHP Area only)	54%		A) Supply of consumables mentioned in BOQ for Package-B in Vendor Scope on receipt of MDCC (Material Dispatch Clearance Certificate) from BHEL (For AHP, CHP, GHP & LHP Area only)	85%
		B)	Erection of consumables mentioned in BOQ for Package-B in Vendor Scope (On Physical verification at Site) (For AHP, CHP, GHP & LHP Area only)	36%		B) Receipt of consumables at Site mentioned in BOQ for Package-B in Vendor Scope (On Physical verification at Site) (For AHP, CHP, GHP & LHP Area only)	5%
			Total =	90%		Total =	90%
5	TCC Clause No. 10.3	TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS			TECHNICAL REQUIREMENTS FOR SUPPLY ITEMS (Refer Annexure-5 & 6)		
6	TCC Clause No. 11.5 (Annexure-5)	New clause			Specification for Supply items of Pkg-B is attached as Annexure-5		
7	TCC Clause No. 11.6 (Annexure-6)	New clause			List of Sub-Vendor for approval-Electrical is attached as Annexure-6		

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B) Some of the Bidders had asked queries in the published tender specification. The clarifications issued by BHEL are furnished below:

Sl. No.	Bidder's Query	BHEL Reply
1	Package A – Fire Detection & Alarm (FDA) System (I9C Series) a) Completion Timeline Based on our execution experience at the Wanakbori and Bhusawal projects, the BTG package was completed within the contractual schedule. However, the Fire Detection & Alarm (FDA) System was commissioned nearly one year later because its completion depended on the readiness of Mechanical, Civil, and other interfacing packages. As a result, the final bill certification and project closure were also delayed. We therefore request that the FDA System be assigned a separate completion timeline and milestone schedule. Since its execution is dependent on external package readiness, the FDA System should be considered independently from the BTG package completion and project closure. b) Commercial Weightage The weightage assigned to the FDA items is not aligned with the actual execution cost under prevailing market conditions. We request you to review and revise the weightage to ensure commercial feasibility.	Tender condition shall prevail.
2	Package B – Supply Portion The supply line item covers cable glands and cable lugs required for cable termination. These are separate materials with different specifications, quantities, and procurement costs. Accordingly, they should be evaluated independently for commercial purposes. The present weightage does not represent the actual market value of these materials. Even if a package is quoted at ₹10 Crore, the allocated weightage results in a realization of only approximately ₹26 per unit, whereas the prevailing procurement cost of cable glands alone starts from around ₹230 per unit. Further, the total value allocated for the supply portion is only approximately ₹6.51 lakhs, while the actual vendor procurement cost is approximately ₹50–60 lakhs, excluding transportation, handling, overheads, and other associated expenses. Under these conditions, the current allocation is commercially unworkable. We therefore request you to review the supply weightage based on the prevailing market prices of cable glands and cable lugs.	Tender condition shall prevail.

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3	Payment Terms for the supply portion – Package B The tender stipulates the following payment terms: • 54% against supply of consumables upon receipt of the Material Dispatch Clearance Certificate (MDCC) from BHEL (Applicable for AHP, CHP, GHP & LHP areas). • 36% against erection of consumables upon physical verification at site. In our earlier projects executed with BHEL-ISG, the supply and erection portions were treated as separate activities with independent payment milestones. Supply Portion • 85% against supply and receipt of materials at site with supporting documents. • 5% against submission of the Material Receipt Certificate (MRC). • 10% upon successful completion of the system. Erection Portion • 90% upon completion of installation and termination. • 10% upon achievement of the respective milestone. The payment structure proposed in the present tender links a major portion of the supply payment to MDCC issuance and physical verification, although the contractor is required to procure the complete quantity of materials in advance. This creates a significant working capital burden and affects project cash flow. We request you to consider adopting the payment methodology followed in previous BHEL-ISG projects by treating the supply and erection portions independently with separate payment milestones. This approach will support timely procurement, improve cash flow, and ensure uninterrupted project execution.	Payment Terms revised. Please refer SI No. A.4 as mentioned above in this Corrigendum.
4	Overall Package Pricing Based on the single-order scope specified in the PQR, we have prepared our detailed cost estimate. The estimated execution cost is substantially higher than the present budget allocation. In addition, the NTPC project location involves significantly higher labour wages and execution costs compared to similar projects executed elsewhere. We therefore request you to review the overall commercial provisions and provide a practical and workable pricing structure to enable successful execution of the project.	Tender conditions shall prevail.
5	Impulse Line Erection – Package A & Package B The commercial weightage provided for Impulse Line Erection under both Package A and Package B does not adequately reflect the scope of work and technical requirements. We request you to review the scope, specifications, and execution methodology and revise the corresponding weightage accordingly.	Tender conditions shall prevail.

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6	For extend Contract period / Time extension – Package A & Package B for ORC limited for the 10% of executed value. The contract period for this package is specified as 13 months. We understand that, in the event of an extension, the contract may continue under the applicable Over Run Compensation (ORC) and Price Variation Clause (PVC) provisions in accordance with BHEL's contractual terms. The current ORC/PVC compensation is limited to 10% of the contract value. We kindly request BHEL to increase this limit to 20% of the contract value, as the existing ceiling is likely to be exhausted during the first extension itself. Considering the continued escalation in labour wages, material prices, transportation charges, statutory compliance costs, and other project overheads, the enhanced limit would provide adequate support for the extended execution period. In addition, if the total contract duration exceeds 26 months due to reasons beyond the control of Chemin/Contractor, we request BHEL to revise the contract rates for the subsequent extension period. Such a revision would offset the significant increase in project costs beyond the coverage available under the existing ORC/PVC provisions.	a) Payment Terms revised. Please refer SI No. A.1 as mentioned above in this Corrigendum. b) Tender condition shall prevail.															
7	As per the BOQ, the following items have similar sizes; however, the applicable factors differ significantly, resulting in a substantial variation in the quoted rates. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">BOQ Ref.</th><th style="text-align: left;">Description</th><th style="text-align: left;">Factor</th></tr> </thead> <tbody> <tr> <td>I4.1</td><td>ASTM A106 Gr. C, Size: 1/2" NB SCH 160</td><td>0.0067584470</td></tr> <tr> <td>I4.8</td><td>Pipe OD 21.3 × 7.47 – SA335 P22</td><td>0.0010944353</td></tr> <tr> <td>I4.29</td><td>GI Pipe (1/2", 1") Heavy Grade</td><td>0.0001473508</td></tr> <tr> <td>I4.32</td><td>GI Rigid Conduit Pipe / PVC Conduit Pipe – 1"</td><td>0.0028155086</td></tr> </tbody> </table>	BOQ Ref.	Description	Factor	I4.1	ASTM A106 Gr. C, Size: 1/2" NB SCH 160	0.0067584470	I4.8	Pipe OD 21.3 × 7.47 – SA335 P22	0.0010944353	I4.29	GI Pipe (1/2", 1") Heavy Grade	0.0001473508	I4.32	GI Rigid Conduit Pipe / PVC Conduit Pipe – 1"	0.0028155086	Tender conditions shall prevail. Material of Construction for following pipe sizes are Carbon Steel, Alloy Steel, GI and PVC respectively. Therefore, their erection rates involving cutting and welding shall vary substantially.
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Enclosure: -

1) Annexure-5 (Specification for Supply items of Pkg-B)

2) Annexure-6 (List of Sub-Vendor for approval-Electrical)

Note:

- 1) All other terms and conditions against this NIT shall remain unchanged.**
- 2) This corrigendum is to be submitted duly signed and stamped along with the Techno-commercial bid (Part- I).**

**for BHARAT HEAVY ELECTRICALS LTD
Manager/ SCT- CPC**



SUB-SECTION-B – 10

CABLING EARTHING AND LIGHTNING PROTECTION

CLAUSE NO.	TECHNICAL REQUIREMENTS																																																						
1.00.00	CODES AND STANDARDS																																																						
1.01.00	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 . <table><tr><td>IS:513</td><td>Cold rolled low carbon steel sheets and strips.</td></tr><tr><td>IS:802</td><td>Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.</td></tr><tr><td>IS:1079</td><td>Hot Rolled carbon steel sheet & strips</td></tr><tr><td>IS:1239</td><td>Mild steel tubes, tubulars and other wrought steel fittings</td></tr><tr><td>IS:1255</td><td>Code of practice for installation and maintenance of power cables upto and including 33 KV rating</td></tr><tr><td>IS:1367 Part-13</td><td>Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).</td></tr><tr><td>IS:2147</td><td>Degree of protection provided by enclosures for low voltage switchgear and control gear</td></tr><tr><td>IS:2309</td><td>Code of Practice for the protection of building and allied structures against lightning.</td></tr><tr><td>IS:2629</td><td>Recommended practice for hot dip galvanising of iron & steel</td></tr><tr><td>IS:2633</td><td>Method for testing uniformity of coating on zinc coated articles.</td></tr><tr><td>IS:3043</td><td>Code of practice for Earthing</td></tr><tr><td>IS:3063</td><td>Fasteners single coil rectangular section spring washers.</td></tr><tr><td>IS:6745</td><td>Methods for determination of mass of zinc coating on zinc coated iron & steel articles.</td></tr><tr><td>IS:8308</td><td>Compression type tubular in- line connectors for aluminium conductors of insulated cables</td></tr><tr><td>IS:8309</td><td>Compression type tubular terminal ends for aluminium conductors of insulated cables.</td></tr><tr><td>IS:9537</td><td>Conduits for electrical installation.</td></tr><tr><td>IS:9595</td><td>Metal - arc welding of carbon and carbon manganese steels - recommendations.</td></tr><tr><td>IS:13573</td><td>Joints and terminations for polymeric cables.</td></tr><tr><td>BS:476</td><td>Fire tests on building materials and structures</td></tr><tr><td>IEEE:80</td><td>IEEE guide for safety in AC substation grounding</td></tr><tr><td>IEEE:142</td><td>Grounding of Industrial & commercial power systems</td></tr><tr><td>DIN 46267 (Part-II)</td><td>Non tension proof compression joints for Aluminium conductors.</td></tr><tr><td>DIN 46329</td><td>Cable lugs for compression connections, ring type ,for Aluminium conductors</td></tr><tr><td>BS:6121</td><td>Specification for mechanical Cable glands for elastomers and plastic insulated cables.</td></tr><tr><td></td><td>Indian Electricity Act.</td></tr><tr><td></td><td>Indian Electricity Rules.</td></tr></table>			IS:513	Cold rolled low carbon steel sheets and strips.	IS:802	Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.	IS:1079	Hot Rolled carbon steel sheet & strips	IS:1239	Mild steel tubes, tubulars and other wrought steel fittings	IS:1255	Code of practice for installation and maintenance of power cables upto and including 33 KV rating	IS:1367 Part-13	Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).	IS:2147	Degree of protection provided by enclosures for low voltage switchgear and control gear	IS:2309	Code of Practice for the protection of building and allied structures against lightning.	IS:2629	Recommended practice for hot dip galvanising of iron & steel	IS:2633	Method for testing uniformity of coating on zinc coated articles.	IS:3043	Code of practice for Earthing	IS:3063	Fasteners single coil rectangular section spring washers.	IS:6745	Methods for determination of mass of zinc coating on zinc coated iron & steel articles.	IS:8308	Compression type tubular in- line connectors for aluminium conductors of insulated cables	IS:8309	Compression type tubular terminal ends for aluminium conductors of insulated cables.	IS:9537	Conduits for electrical installation.	IS:9595	Metal - arc welding of carbon and carbon manganese steels - recommendations.	IS:13573	Joints and terminations for polymeric cables.	BS:476	Fire tests on building materials and structures	IEEE:80	IEEE guide for safety in AC substation grounding	IEEE:142	Grounding of Industrial & commercial power systems	DIN 46267 (Part-II)	Non tension proof compression joints for Aluminium conductors.	DIN 46329	Cable lugs for compression connections, ring type ,for Aluminium conductors	BS:6121	Specification for mechanical Cable glands for elastomers and plastic insulated cables.		Indian Electricity Act.		Indian Electricity Rules.
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1.02.00	Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA 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 alongwith 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.																																																						
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE		TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION																																																				
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CLAUSE NO.	TECHNICAL REQUIREMENTS	
2.00.00	DESIGN AND CONSTRUCTIONAL FEATURE	
2.01.00	Inter Plant Cabling	
2.01.01	Interplant cabling for main routes shall be laid along overhead trestles/duct banks. Cables from main plant to switchyard control room shall be laid in overhead trestles or duct bank. In case of Duct banks, pull-pits shall be filled with sand and provided with a PCC covering. Directly buried cables, if essential, shall not have concentration of more than 4 cables in one route. Cables crossing Railway line (if applicable) shall be laid underground through nearest culvert. Necessary statutory clearance if required shall be taken by Bidder. All HT, LT and control cable shall be armoured.	
2.01.02	Transformer yard In transformer yard cables shall be laid in overhead trestle. The main cable routes coming out from Main plant building and crossing the Transformer yard shall be laid in overhead trestles. In transformer yard, trestle height for rail/road crossing shall be suitable for movement of Generator Transformer with bushing.	
2.01.03	Trenches PCC flooring of built up trenches shall be sloped for effective drainage with sump pits and sump pumps.	
2.01.04	No sub zero level cable vault/trenches shall be provided below control building/switchgear rooms in main plant.	
2.01.05	Cable Vault The cable vault/ / cable spreader room space below the HT / LT switchgear room, Control Rooms, unit control equipment room, Programmer room, UPS, Charger & Battery Rooms, shall have 800 mm wide and 2.1 m high movement passage all around the cable trays in the cable vault/ cable spreader room for easy laying/maintenance of cables Cable vaults shall be provided with adequate drainage facilities for drainage of fire water. Each cable vault should have at least two doors. Exit signs shall be provided near doors for personnel escape in case of emergency	
2.01.06	Boiler Area Cable trays in boiler & ESP area shall be supported from the boiler and ESP structures. The same shall be coordinated with SG/ESP contractor. Cable trays in these areas shall be in vertical formation to avoid dust accumulation. No cable trenches shall be provided in boiler/ESP area.	
2.01.07	Two separate cable routes shall be provided for cable routing of working and standby drives or different set/group (say 50% capacity) of auxiliaries.	
2.01.08	OffSite Area For feeder in bidder's scope for offsite areas, overhead cable tray arrangement shall be followed. However cable trenches/slit may also be acceptable, for some areas, if found to be required during detailed engineering. Cable trenches provided shall be separated from fuel oil area to avoid oil accumulation.	
2.01.09	The cable slits to be used for motor/equipment power/control supply shall be sand filled & covered with PCC after cabling.	
2.01.10	Sizing criteria, derating factors for the cables shall be met as per respective chapters. However for the power cables, the minimum conductor size shall be 6 sq.mm. for aluminium conductor and 2.5 sq.mm. for copper conductor cable.	
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2.01.11	Conscious exceptions to the above guidelines may be accepted under special conditions but suitable measures should be taken at such location to: • Meet all safety requirements • Safeguard against fire hazards, mechanical damage, flooding of water, oil accumulation, electrical faults/interferences, etc	
3.00.00	EQUIPMENT DESCRIPTION	
3.01.00	Cable trays, Fittings & Accessories	
3.01.01	Cable trays shall be ladder/perforated type as specified complete with matching fittings (like brackets, elbows, bends, reducers, tees, crosses, etc.) accessories (like side coupler plates, etc. and hardware (like bolts, nuts, washers, G.I. strap, hook etc.) as required. Cable tray shall be ladder type for power & control cables and perforated for instrumentation cables.	
3.01.02	Cable trays, fittings and accessories shall be fabricated out of rolled mild steel sheets free from flaws such as laminations, rolling marks, pitting etc. These (including hardware) shall be hot dip galvanized as per Clause No. 3.13.00 of this chapter.	
3.01.03	Cable trays shall have standard width of 150 mm, 300 mm & 600 mm and standard lengths of 2.5 metre. Thickness of mild steel sheets used for fabrication of cable trays and fittings shall be 2 mm. The thickness of side coupler plates shall be 3 mm.	
3.01.04	Cable troughs shall be required for branching out few cables from main cable route. These shall be U-shaped, fabricated of mild steel sheets of thickness 2 mm and shall be hot dip galvanized as per Clause No. 3.13.00 of this chapter. Troughs shall be standard width of 50 mm & 75 mm with depth of 25 mm.	
3.01.05	The tolerance for cable tray and accessories shall be as per IS 2102 (Part-1). Tolerance Class: - Coarse	
3.02.00	Support System for Cable Trays	
3.02.01	Cable tray support system shall be pre-fabricated out of single sheet as per enclosed tender drawings.	
3.02.02	Support system for cable trays shall essentially comprise of the two components i.e. main support channel and cantilever arms. The main support channel shall be of two types : (i) C1:- having provision of supporting cable trays on one side and (ii) C2:-having provision of supporting cable trays on both sides. The support system shall be the type described hereunder - Cable supporting steel work for cable racks/cables shall comprise of various channel sections, cantilever arms, various brackets, clamps, floor plates, all hardwares such as lock washers, hexagon nuts, hexagon head bolt, support hooks, stud nuts, hexagon head screw, channel nut, channel nut with springs, fixing studs, etc. - The system shall be designed such that it allows easy assembly at site by using bolting. All cable supporting steel work, hardwares fittings and accessories shall be prefabricated factory galvanised. - The main support and cantilever arms shall be fixed at site using necessary brackets, clamps, fittings, bolts, nuts and other hardware etc. to form various arrangements required to support the cable trays. Welding of the components shall not be allowed. However, welding of the bracket (to which the main support channel is bolted) to the overhead beams, structural steel, insert plates or reinforcement bars will be permitted. Any cutting or welding of the galvansied surface shall be brushed and red lead primer, oil primer & aluminium paint shall be applied	
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	d. All steel components, accessories, fittings and hardware shall be hot dip galvanised after completing welding, cutting, drilling and other machining operation. e. The typical arrangement of flexible support system is shown in the enclosed drawings and described briefly below: The main support channel and cantilever arms shall be fabricated out of 2.5 thick rolled steel sheet conforming to IS 1079. f. Cantilever arms of 320 mm, 620mm and 750 mm in length are required, and shall be as shown in the enclosed drawing. The arm portion shall be suitable for assembling the complete arm assembly on to component constructed of standard channel section. The back plate shall allow sufficient clearance for fixing bolt to be tightened with tray in position. g. Support system shall be able to withstand • weight of the cable trays • weight of the cables (75 Kg/Metre run of each cable tray) • Concentrated load of 75 Kg between every support span. • Factor of safety of minimum 1.5 shall be considered.	
3.02.03	The size of structural steel members or thickness of sheet steel of main support channel and cantilever arms and other accessories as indicated above or in the enclosed drawings are indicative only. Nevertheless, the support system shall be designed by the bidder to fully meet the requirements of type tests as specified. In case the system fails in the tests, the components design modification shall be done by the Bidder without any additional cost to the Employer. The bidder shall submit the detailed drawings of the system offered by him alongwith the bid.	
3.02.04	Four legged structure shall be provided wherever there is change in elevation and change in direction	
3.02.05	FOR COAL HANDLING PLANT/FGD PLANT/ ESP AREA THE FOLLOWING SHALL ALSO BE APPLICABLE: a) All overhead cable routes shall be along the route of the conveyor gallery on separate supporting structures and cables shall be laid in vertical trays. The bottom of the steel shall be such that the existing facilities, movement of trucks/human beings etc. does not get affected. The cable trestle shall have a minimum 600mm clear walk way and shall have maintenance platforms as required. The bottom of the steel supporting structure shall be generally at 3.0M above the grade level except for rail/road crossings where it shall be at 8.0M above grade level. Tap offs from the overhead cable trestle can be through shallow trenches with prior approval of the Employer. Directly buried cable, if essential, shall not have concentration of more than 4 cables on one route. b) Cable trenches shall be provided only in Switchgear/MCC rooms. c) Cables shall not be routed through the conveyor galleries except for the equipment located in the conveyor galleries for a particular conveyor i.e. protection switches, receptacles etc. d) Cables for PCS and BSS shall be routed along the conveyors through GI conduits.	
3.03.00	Pipes, Fittings & Accessories	
3.03.01	Pipes offered shall be complete with fittings and accessories (like tees, elbows, bends, check nuts, bushings, reducers, enlargers, coupling caps, nipples etc.) The size of the pipe shall be selected on the basis of maximum 40% fill criteria	
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3.03.02	GI Pipes shall be of medium duty as per IS: 1239	
3.03.03	Duct banks shall be High Density PE pipes encased in PCC (10% spare of each size, subject to minimum one) with suitable water-proof manholes.	
3.03.04	Hume pipes shall be NP3 type as per IS 458.	
3.03.05	TERNE Coated Flexible Steel Conduits shall be water proof and rust proof made of heat resistant lead coated steel. Conduit diameter shall be uniform throughout its length. Internal surface of the conduit shall be free from burrs and sharp edges. Conduits shall be complete with necessary accessories for proper termination of the conduit with junction boxes and lighting fixtures	
3.03.06	HDPE pipes and conduits shall be PE-80, PN-10 type as per IS 4984/IS 8008 part-I.	
3.04.00	Junction Boxes	
3.04.01	Junction box shall be made of Fire retardant material. Material of JB shall be Thermoplastic or thermosetting or FRP type. The box shall be provided with the terminal blocks, mounting bracket and screws etc. The cable entry shall be through galvanized steel conduits of suitable diameter. The JB shall have suitable for installing glands of suitable size on the bottom of the box. The JB shall be suitable for surface mounting on ceiling/structures. The JB shall be of grey color RAL 7035. All the metal parts shall be corrosion protected. Junction box surface should be such that it is free from crazings, blisterings, wrinkling, colour blots/striations. There should not be any mending or repair of surface. JB's will be provided with captive screws so that screws don't fall off when cover is opened. JB's mounting brackets should be of powder coated MS. Type test reports for the following tests shall be furnished:-	
	(a) Impact resistance for impact energy of 2 Joules (IK07) as per BS EN50102	
	(b) Thermal ageing at 70deg C for 96 hours as per IEC60068-2-2Bb.	
	(c) Class of protection shall be IP 55.	
	(d) HV test.	
3.04.02	Terminal blocks shall be 1100V grade, of suitable current rating, made up of unbreakable polyamide 6.6 grade. The terminals shall be screw type or screw-less (spring loaded) / cage clamp type with lugs. Marking on terminal strips shall correspond to the terminal numbering in wiring diagrams. All metal parts shall be of non-ferrous material. In case of screw type terminals the screw shall be captive, preferably with screw locking design. All terminal blocks shall be suitable for terminating on each side the required cables/wire size. All internal wiring shall be of cu. Conductor PVC wire.	
3.05.00	Terminations & Straight Through Joints	
3.05.01	Termination and jointing kits for 33kV, 11 kV, 6.6 KV and 3.3 kV grade XLPE insulated cables shall be of proven design and make which have already been extensively used and type tested. Termination kits and jointing kits shall be Pre-moulded type or heat shrinkable type. Further Cold shrinkable type termination and jointing kits are also acceptable. The Cold shrinkable type kits shall be type tested as per relevant standards. Calculation to withstand the required fault level shall also be furnished in case of cold shrinkable type kits. 33 kV, 11 kV, 6.6 KV and 3.3kV grade joints and terminations shall be type tested and Type test reports as per IS:13573 Part-II and IEC60502 shall be furnished. Also, heat shrink material shall comply with requirements of ESI 09-13 (external tests). Critical components used in cable accessories shall be of tested and proven quality as per relevant product specification/ESI specification. Cable joints and terminations should be with FRLS properties as per IEC 60754-1&2. Kit contents shall be supplied from the same source as were used for type testing. The kit shall be complete with the tinned copper solderless	
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	crimping type cable lugs & ferrule or mechanical connectors (wherein bolts are tightened that shear off at an appropriate torque) as per DIN standard suitable for aluminium compacted conductor cables.	
3.05.02	Straight through joint and termination shall be capable of withstanding the fault level of 21 KA for 0.12 Sec. with dynamic peak of 52 KA for 33 KV system & of 40 kA for 0.12 sec with a dynamic peak of 100 kA for 11 kV, 6.6 KV & 3.3 KV system. Straight through joints shall have provisions for shield connection and earthing wherever required and complete with all accessories and consumables suitable for storage without deterioration at a temperature of 50 deg. C with shelf life of more than five years. 1.1 kV grade straight through joints shall also be of proven design	
3.05.03	1.1 KV grade Straight Through Joint shall be of proven design.	
3.06.00	Cable glands	
3.06.01	Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands shall be suitable for the sizes of cable supplied/erected.	
3.07.00	Cable lugs/ferrules	
3.07.01	Cable lugs/ferrules shall be solderless crimping type suitable for power and control cables as per the DIN 46239. Aluminium solderless crimping lugs/ ferrules shall be used for Aluminium cables and Copper lugs/ferrules shall be used for Copper cables. Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections. Crimping tool for crimping (from 1.5sqmm cable to 630sqmm cables) above mentioned lugs shall be of Hexagonal Type crimp profile, with suitable die of crimp match code. Characteristics of crimping tool: 1) To should generate enough pressure to pass pull out test as per IEC 61238-1. Relevant type test to be produced for the sizes specified in the tender. 2) Tool die shall be replaceable for assorted sizes and crimp code to be mentioned on both part the die. 3) Tool should be compliant of testing according to IEC, UL and GS standards. Tool shall have features such as: • Auto retraction system • Manual retraction stop. • Feedback signals for improper pressure • Better battery capacity and with status display • Flexible and rotating head for easy crimping.	
3.08.00	Trefoil clamps	
3.08.01	Trefoil clamps for single core cables shall be pressure die cast aluminum or fibre glass or nylon and shall include necessary fixing accessories like G.I. nuts, bolts, washers, etc. Trefoil clamps shall have adequate mechanical strength, when installed at 1 mtr intervals, to withstand the forces generated by the peak value of maximum system short circuit current.	
3.09.00	Cable Clamps & Ties	
3.09.01	The cable clamps/ties required to clamp multicore cables shall be of SS-316 material, 12mm wide, polyester coated ladder lock type. The clamps/ties shall have self locking arrangement	
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	& shall have sufficient strength. The cable clamps/ties shall be supplied in finished individual pieces of suitable length to meet the site requirements.	
3.10.00	Receptacles	
3.10.01	Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped gavanised or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polyimide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with RCCB/RCD of 30mA sensitivity having facility for manual testing/checking of operation of RCCB/RCD. Location and Minimum no of RC type receptacle TG and SG area shall be provided as per Annex-I attached.	
3.11.00	Cable Drum Lifting Jack The jack for cable drum lifting shall be of screw type with 10 ton capacity. The cable drum jacks shall be manufactured from fabricated steel. The spindles supplied with the cable drum jack shall be manufactured using BSEN-24 grade steel bar with locking collars. Jack nests shall be of SG cast steel. Cable drum jack supplied shall have undergone load testing and reports for the same shall be submitted. At least Two Nos. of jacks shall be supplied for NTPC use. Contractor has to make arrangements for his own jacks for cable reeling/unreeling under his scope of installation.	
3.12.00	Galvanising	
3.12.01	Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 & IS:2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots.	
3.12.02	The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367 . The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified	
3.13.00	Welding	
3.13.01	The welding shall be carried out in accordance with IS:9595. All welding procedures and welders qualification shall also be followed strictly in line with IS:9595	
4.00.00	INSTALLATION	
4.01.00	Cable tray and Support System Installation	
4.01.01	Cables shall run in cable trays mounted horizontally or vertically on cable tray support system which in turn shall be supported from floor, ceiling, overhead structures, trestles, pipe racks, trenches or other building structures.	
4.01.02	Horizontally running cable trays shall be clamped by bolting to cantilever arms and vertically running cable trays shall be bolted to main support channel by suitable bracket/clamps on both top and bottom side rails at an interval of 2000 mm in general. For vertical cable risers/shafts cable trays shall be supported at an interval of 1000mm in general. Fixing of cable trays to cantilever arms or main support channel by welding shall not be accepted.	
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	Cable tray installation shall generally be carried out as per the approved guidelines/ drawings. Vendor shall design the support system along with tray, spacing etc in line with tray loadings/drawings.		
4.01.03	The cantilever arms shall be positioned on the main support channel with a minimum vertical spacing of 300 mm unless otherwise indicated.		
4.01.04	The contractor shall fix the brackets/ clamps/ insert plates using anchor fasteners. Minimum size of anchor fasteners shall be M 8 X 50 and material shall be stainless steel grade 316 or better. Anchor fastener shall be fixed as recommended by manufacturer and as approved by site engineer. For brick wall suitable anchor fasteners shall be used as per the recommendations of manufacturer. Make of anchor fasteners subject to QA approval and the same shall be finalized at pre-award stage.		
4.01.05	All cable way sections shall have identification, designations as per cable way layout drawings and painted/stenciled at each end of cable way and where there is a branch connection to another cable way. Minimum height of letter shall be not less than 75 mm. For long lengths of trays, the identification shall be painted at every 10 meter. Risers shall additionally be painted/stenciled with identification numbers at every floor.		
4.01.06	In certain cases it may be necessary to site fabricate portions of trays, supports and other non standard bends where the normal prefabricated trays, supports and accessories may not be suitable. Fabricated sections of trays, supports and accessories to make the installation complete at site shall be neat in appearance and shall match with the prefabricated sections in the dimensions. They shall be applied with one coat of red lead primer, one coat of oil primer followed by two finishing coats of aluminium paint.		
4.01.07	In fire prone areas, like Boiler, TG, fuel oil area and any other strategic location etc, fire retardant paint to be applied after installation cables.		
4.02.00	Conduits/Pipes/Ducts Installation		
4.02.01	The Contractor shall ensure for properly embedding conduit pipe sleeves wherever necessary for cabling work. All openings in the floor/roof/wall / cable tunnel/cable trenches made for conduit installation shall be sealed and made water proof by the Contractor.		
4.02.02	GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc.		
4.02.03	Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material		
4.02.04	Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average spacing between the supports as given below, unless specified otherwise		
	Conduit /pipe size (dia).	Spacing	
	Upto 40 mm	1 M	
	50 mm	2.0 M	
	65-85 mm	2.5 M	
	100 mm and above	3.0 M	
4.02.05	For bending of conduits, bending machine shall be arranged at site by the contractor to facilitate cold bending. The bends formed shall be smooth.		
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4.03.00	Junction Boxes Installation	
4.03.01	Junction boxes shall be mounted at a height of 1200mm above floor level or as specified in the drawings and shall be adequately supported/mounted on masonry wall by means of anchor fasteners/ expandable bolts or shall be mounted on an angle, plate or other structural supports fixed to floor, wall, ceiling or equipment foundations.	
4.04.00	Cable Installation	
4.04.01	Cable installation shall be carried out as per IS:1255 and other applicable standards.	
4.04.02	For Cable unloading, pulling etc following guidelines shall be followed in general:	
	a) Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e. with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture. b) While laying cable, ground rollers shall be used at every 2 meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Project Manager.	
4.04.03	Cables shall be laid on cable trays strictly in line with cable schedule	
4.04.04	Power and control cables shall be laid on separate tiers inline with the approved guidelines/drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, H.T. cables shall be laid on top most tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every one metre. All multicore cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with cable clamps/ties with self locking arrangement. For horizontal trays arrangements, multicore power cables and control cables shall be secured at every five meter interval. For vertical tray arrangement, individual multicore power cables and control cables shall be secured at every one meter. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by cable clamps/ties with self locking arrangement at every five meter interval and at every bend. Fibre Optical cable shall be laid in trenches/trays or as decided by Employer.	
4.04.05	Bending radii for cables shall be as per manufacturer's recommendations and IS:1255.	
4.04.06	Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.	
4.04.07	No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Vendor shall identify and accordingly procure the cable drum length.	
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4.04.08	In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.											
4.04.09	Wherever few cables are branching out from main trunk route troughs shall be used.											
4.04.10	Wind loading shall be considered for designing support as well Cable trays wherever required.											
4.04.11	Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.											
4.04.12	The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Contractor shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.											
4.04.13	Separation At least 300mm clearance shall be provided between: - HT power & LT power cables, - LT power & LT control/instrumentation cables,											
4.04.14	Segregation 1) Segregation means physical isolation to prevent fire jumping. 2) All cables associated with the unit shall be segregated from cables of other units. 3) Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set. 4) In switchyard, control cables of each bay shall be laid on separate racks/trays.											
4.04.15	Minimum number of spare cores required to be left for interconnection in control cables shall be as follows: Minimum number of spare cores required to be left for interconnection in control cables shall be as follows: <table><tr><td>No. of cores in cable</td><td>No. of spare cores</td></tr><tr><td>2C,3C</td><td>NIL</td></tr><tr><td>5C</td><td>1</td></tr><tr><td>7C-10C</td><td>2</td></tr><tr><td>14C and above</td><td>3</td></tr></table>	No. of cores in cable	No. of spare cores	2C,3C	NIL	5C	1	7C-10C	2	14C and above	3	
No. of cores in cable	No. of spare cores											
2C,3C	NIL											
5C	1											
7C-10C	2											
14C and above	3											
4.04.16	Directly Buried Cables a) Cable trenches shall be constructed for directly buried cables. Construction of cable trench for cables shall include excavation, preparation of sieved sand bedding, riddled soil cover, supply and installation of brick or concrete protective covers, back filling and compacting, supply and installation of route markers and joint markers. Laying of cables and providing protective covering shall be as per IS:1255 and the enclosed drawings showing cabling details. b) RCC cable route and RCC joint markers shall be provided wherever required. The voltage grade of the higher voltage cables in route shall be engraved on the marker. Location of underground cable joints shall be indicated with cable marker with an additional inscription "Cable Joint". The marker shall project 150 mm above ground											
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	and shall be spaced at an interval of 30 meters and at every change in direction. They shall be located on both sides of road crossings and drain crossings. Top of cable marker/joint marker shall be sloped to avoid accumulation of water/dust on marker. 4.04.17 Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Contractor may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. The cable tag requirements mentioned above shall prevail over Tag requirements mentioned elsewhere in this document for HT power, LT power & control cables. 4.04.18 While crossing the floors, unarmoured cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray. 4.05.00 Cable Terminations & Connections 4.05.01 The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer" instructions, drawings and/or as directed by Project Manager. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Contractor shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site. 4.05.02 Work shall include all clamps, fittings etc. and clamping, fitting, fixing, plumbing, soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Project Manager. 4.05.03 The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Contractor shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets. 4.05.04 Control cable cores entering control panel/switchgear/MCC/miscellaneous panels shall be neatly bunched, clamped and tied with self locking type nylon cable ties with de interlocking facility to keep them in position. 4.05.05 All the cores of the control cable to be terminated shall have identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, ---etc along with cable numbers and coiled up after end sealing. 4.05.06 All cable terminations shall be appropriately tightened to ensure secure and reliable connections. 5.00.00 EARTHING SYSTEM 5.01.00 Earthing system shall be in strict accordance with IS:3043 and Indian Electricity Rules/Acts	
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	The earthing system shall be designed for a life expectancy of at least forty (40) years, for a system fault current of 63 kA for 1.0 sec. The minimum rate of corrosion of steel for selection of earthing conductor shall be 0.12mm per year. Earthing system network/earthmat shall be interconnected mesh of mild steel rods buried in ground in the plant. All areas under contractor scope of supply shall be interconnected together by minimum two parallel conductors. The Contractor shall furnish the detailed design and calculations for Employer's approval. Contractor shall obtain all necessary statutory approvals for the system. All the columns shall be earthed by nearby risers and earthmat grid spacing shall be maximum 10 mts. Minimum two nos of risers shall be provided for each equipment in SG area. Separate dedicated riser shall be provided for C&I earthing purpose and also for Lightning down conductor connection purpose. Sufficient nos of risers near the equipment shall be provided as per the system requirement. Ring type earthing around the offsite building shall be provided with interconnection of with main grid at minimum two points.		
5.02.00	The earth conductors shall be free from pitting, laminations, rust, scale and other electrical, mechanical defects		
5.03.00	The material of the earthing conductors shall be as follows:		
	1)	Conductors above ground level and in built up trenches.	Galvanized steel
	2)	Conductors buried in earth	Mild steel
	3)	Earth electrodes	Mild steel rod
5.04.00	The sizes of earthing conductors for various electrical equipments shall be as below:		
	Equipment	Earth conductor buried in earth	Earth conductor above ground level & in built-up trenches
	a)	Main earth grid	Min 40 mm dia. MS rod or as per actual calculation whichever is more
	b)	33kV/11kV/6.6kV/3.3 kV/ switchgear equipment and 415V switchgear	65 x 8mm GS flat
	c)	415 V MCC/ Distribution boards / Transformers	50 x 6mm GS flat
	d)	LT Motors above 125 KW	50 x 6mm GS flat
		25 KW to 125 KW	25 x 6mm GS flat
		1KW to 25 KW	25 x 3mm GS flat
		Fractional House power motor	8 SWG GS wire
	e)	Control panel & control desk	25 x 3 mm GS flat
	f)	Push button station / Junction Box	8 SWG GI wire
	g)	Columns, structures, cable trays and bus ducts enclosures	50 x 6mm GS flat
	h)	Crane, rails, rail tracks & other non-current carrying metal parts	25 x 6mm GS flat
5.05.00	Metallic frame of all electrical equipment shall be earthed by two separate and distinct connections to earthing system, each of 100% capacity, Crane rails, tracks, metal pipes and conduits shall also be effectively earthed at two points. Steel RCC columns, metallic stairs,		
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	and rails etc. of the building housing electrical equipment shall be connected to the nearby earthing grid conductor by one earthing ensured by bonding the different sections of hand rails and metallic stairs. Metallic sheaths/screens, and armour of multi-core cables shall be earthed at both ends. Metallic Sheaths and armour of single core cables shall be earthed at switchgear end only unless otherwise approved. Every alternate post of the switchyard fence shall be connected to earthing grid by one GS flat and gates by flexible lead to the earthed post. Railway tracks within the plant area shall be bonded across fish plates and connected to earthing grid at several locations. Portable tools, appliances and welding equipment shall be earthed by flexible insulated cable. 5.06.00 Each continuous laid lengths of cable tray shall be earthed at minimum two places by G.S. flats to earthing system, the distance between earthing points shall not exceed 30 meter. Wherever earth mat is not available, necessary connections shall be done by driving an earth electrode in the ground 5.07.00 Neutral points of HT transformer shall be earthed through NG resistors. The Contractor shall connect the NGR earthing point to earth electrodes by suitable earth conductors. 5.08.00 Neutral connections and metallic conduits/pipes shall not be used for the equipment earthing. Lightning protection system down conductors shall not be connected to other earthing conductors above the ground level. 5.09.00 Connections between earth leads and equipment shall normally be of bolted type. Contact surfaces shall be thoroughly cleaned before connections. Equipment bolted connections after being tested and checked shall be painted with anti corrosive paint/compound. 5.10.00 Suitable earth risers as approved shall be provided above finished floor/ground level, if the equipment is not available at the time of laying of main earth conductor. 5.11.00 Connections between equipment earthing leads and between main earthing conductors shall be of welded type. For rust protection the welds should be treated with red lead compound and afterwards thickly coated with bitumen compound. All welded connections shall be made by electric arc welding. 5.12.00 Resistance of the joint shall not be more than the resistance of the equivalent length of conductors. 5.13.00 Earthing conductors buried in ground shall be laid minimum 600 mm below grade level unless otherwise indicated in the drawing. Back filling material to be placed over buried conductors shall be free from stones and harmful mixtures. Back filling shall be placed in layers of 150 mm. 5.14.00 Earthing conductors embedded in the concrete floor of the building shall have approximately 50 mm concrete cover. 5.15.00 A minimum earth coverage of 300 mm shall be provided between earth conductor and the bottom of trench/foundation/underground pipes at crossings. Earthing conductors crossings the road can be installed in pipes. Wherever earthing conductor crosses or runs at less than 300 mm distance along metallic structures such as gas, water, steam pipe lines, steel reinforcement in concrete, it shall be bonded to the same. 5.16.00 Earthing conductors along their run on columns, walls, etc. shall be supported by suitable welding / cleating at interval of 1000mm and 750mm respectively. 5.17.00 Earth pit shall be of treated type & shall be constructed as per IS:3043. Electrodes shall be embedded below permanent moisture level. Minimum spacing between electrodes shall be 600mm. Earth pits shall be treated with salt and charcoal as per IS:3043. Test links shall be	
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	provided with bolted arrangement alongwith each earth pit, in order to facilitate measurement of earth resistance as & when required.																																			
5.18.00	On completion of installation continuity of earth conductors and efficiency of all bonds and joints shall be checked. Earth resistance at earth terminations shall be measured and recorded. All equipment required for testing shall be furnished by contractor.																																			
5.19.00	Earthing conductor shall be buried at least 2000mm outside the fence of electrical installations. Every alternate post of the fences and all gates shall be connected to earthing grid by one lead.																																			
5.20.00	Other Requirements of Earthing System: <table><tr><td>Standard/Code</td><td colspan="2">IEEE 80, IS 3043</td></tr><tr><td>Earthing System</td><td colspan="2"></td></tr><tr><td>Life expectancy</td><td colspan="2">40 Years</td></tr><tr><td>System Fault Level</td><td colspan="2">System Fault Level 63 KA for 1 sec</td></tr><tr><td>Soil resistivity</td><td colspan="2">Actual as per site conditions.</td></tr><tr><td>Min. Steel corrosion</td><td colspan="2">0.12mm/year</td></tr><tr><td>Depth of burial of main earth conductor</td><td colspan="2">600mm below grade level; where it crosses trenches, pipes, ducts, tunnels, rail tracks, etc., it shall be at least 300mm below them.</td></tr><tr><td>Conductor joints</td><td colspan="2">By electric arc welding, with resistance of joint not more than that of the conductor.</td></tr><tr><td>Welds to be treated with red lead for compound for corrosion protection.</td><td colspan="2">rust protection and then coated with bitumen</td></tr><tr><td>Surface resistivity</td><td>- Gravel</td><td>3000 ohm-meter</td></tr><tr><td></td><td>- Concrete</td><td>500 ohm-meter</td></tr></table>			Standard/Code	IEEE 80, IS 3043		Earthing System			Life expectancy	40 Years		System Fault Level	System Fault Level 63 KA for 1 sec		Soil resistivity	Actual as per site conditions.		Min. Steel corrosion	0.12mm/year		Depth of burial of main earth conductor	600mm below grade level; where it crosses trenches, pipes, ducts, tunnels, rail tracks, etc., it shall be at least 300mm below them.		Conductor joints	By electric arc welding, with resistance of joint not more than that of the conductor.		Welds to be treated with red lead for compound for corrosion protection.	rust protection and then coated with bitumen		Surface resistivity	- Gravel	3000 ohm-meter		- Concrete	500 ohm-meter
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6.00.00	LIGHTNING PROTECTION SYSTEM																																			
6.01.01	Lightning protection system shall be in strict accordance with IEC : 62305 and latest IS standards.																																			
6.01.02	Lightning conductor shall be of 25x6mm GS strip when used above ground level and shall be connected through test link with earth electrode/earthing system																																			
6.01.03	Lightning system shall comprise of air terminations, down conductors, test links, earth electrode etc. as per approved drawings.																																			
6.02.00	Down Conductors 1. Down conductors shall be as short and straight as practicable and shall follow a direct path to earth electrode. 2. Each down conductor shall be provided with a test link at 1000 mm above ground level for testing but it shall be in accessible to interference. No connections other than the one direct to an earth electrode shall be made below a test point. 3. All joints in the down conductors shall be welded type. 4. Down conductors shall be cleated on outer side of building wall, at 750 mm interval or welded to outside building columns at 1000 mm interval. 5. Lightning conductor on roof shall not be directly cleated on surface of roof. Supporting blocks of PCC/insulating compound shall be used for conductor fixing at an interval of 1500 mm. 6. All metallic structures within a vicinity of two meters of the conductors shall be bonded to conductors of lightning protection system. 7. Lightning conductors shall not pass through or run inside GI Conduits. 8. Testing link shall be made of galvanized steel of size 25x 6mm. 9. Pulser system for lightning shall not be accepted. 10. Hazardous areas handling inflammable/explosive materials and associated storage areas shall be protected by a system of aerial earths.																																			
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7.00.00 7.02.00 7.02.01	TESTS Type Test reports shall be furnished for the following Type tests on Cable Trays support system a) Test 1A: On main support channel type-C2 for cantilever arms fixed on one side only. A 3.5 meter length of main support channel shall be fixed vertically at each end to a rigid structure as per the fixing arrangement as shown in the enclosed drawing. Eight (8) nos. 750 mm cantilever arms shall be fixed to the main channel and each arm shall be loaded over the outboard 600 mm with a uniform working load of 100 kg. Subsequently a point load of 100 kg shall be applied on arm 2. A uniform proof load on all the arms equal to twice the working load shall be then be applied. Deflections shall be measured at the points shown in the enclosed drawings and at the following load intervals: i) Working load ii) Working load + point load iii) Off load iv) Proof load + point load v) Off load The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied. B) Test 1B: Test 1A shall be repeated with Eight Cantilever arms uniformly loaded and with the same point load on arm 2 Test 2: On Main support channel type -C2 for cantilever arms fixed on both sides a) Test 2A: A 3.5 m length of main support channel C2 for cantilever arms fixing on both sides shall be fixed at each end to rigid structure as per the fixing arrangement as shown in the enclosed drawing. Six (6), 750 mm cantilever arms shall be attached to each sides and each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall than be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals. i) Working load ii) Working load + Point load iii) Off load iv) Proof load + Point load v) Off load The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied b) Test 2 B: The test 2 A shall be repeated with the assembly but with an asymmetrical load on the C2 column and point load applied to arm 8. The 100 kg and 200 kg uniformly distributed loads shall be applied to the upper three arms on one side and the lower three arms on the opposite side. Test 3 : Tests on Channel Fixed on Beam/Floor	
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	A length of main support channel section shall be fixed to steel structure/floor and have loads applied as shown in the drawing enclosed and as detailed below a) Test 3A : A length of steel structure shall be rigidly supported. It should be fitted on a meter length of channel section using beam clamps welded/bolted. A point load of 1200 kg shall be applied to the centre point via two brackets. No distortion or pulling of the components shall take place. b) Test 3B: With the components assembled as in Test 3A, two perpendicular point loads of 600 kg shall be simultaneously applied at positions 150 mm either side of the centre line, no distortion or pulling of the components shall take place. c) Test 3C: With the components assembled as in Test 3A, a perpendicular point load shall be applied at a point 150 mm on one side of the centre line. The load shall be gradually increased to the maximum value that can be applied without causing distortion or pulling of the components. This value shall be recorded. Test 4 : Channel Insert Test A 2.5 m length of C1 channel fixed to the concrete wall/ steel structure as per actual site installation conditions. 6 nos. of 750 mm cantilever arms shall be attached to C1 channel as shown in enclosed drawing. Each arm uniformly loaded to a working load of 100 kg over the out board 600 mm. A point load of 100 kg shall then be applied to arm 2, followed by a uniform proof load of twice the working load on all the arms; deflection shall be measured at points shown in the enclosed drawings at the following load intervals. i) Working Load ii) Working Load + Point Load iii) Off Load iv) Proof Load + Point Load v) Off load The deflection measured at working loads shall not exceed 16mm. The permanent deflection after removing the combination of working load and point load shall not exceed 10 mm at the arm tips and 6 mm on the channel. No collapse of the structure shall occur with a combination of proof load and point load applied Test 5 : Channel nut slip characteristics (what ever applicable) Tests 5A1,5A2,5A3 : A length of channel C1 section 200mm long shall have fitted bracket with the two bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing enclosed nut slip shall be determined with bolt torque of 30NM, 50 NM and 65 NM No fewer than three measurements shall be made for each torque setting. A minimum loading of 720 kg shall be obtained before nut slip with bolt torque of 65 NM. Tests 5B1,5B2,5B3: The length of channel C1 section 200 mm long shall have fitted bracket with the one bolt fixing as shown in drawing enclosed. With loads applied at the position shown in drawing, nut slip shall be determined with bolt torques of 30 NM, 50 NM and 65 NM. No fewer than three measurements shall be made for each torque setting.	
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	A minimum loading of 350 kg shall be obtained before nut slip with a bolt torque of 65 NM. Test 6 Weld Integrity Test After deflection test as per test 1A, 1B, 2, 3 & 4 weld integrity shall be checked by magnetic particle inspection to detect sub-surface cracks developed, if any. 7.02.02 Cable termination kit and straight through joints should have been tested as per IS:13573 for 3.3kV grade & above. 7.03.00 Routine/ Acceptance Tests 7.03.01 Routine Tests a) Routine tests as per specification and applicable standards shall be carried out on all requirements/items covered in the specification. b) Physical & dimensional check on all equipments as per approved drawings/standards c) HV/IR as applicable. d) Check/measurement of thickness of paint/zinc coating/nickel-chrome plating as per specification & applicable standard. 7.03.02 Acceptance Test a) Galvanising Tests as per applicable standards b) Welding checks c) Deflection tests on cable trays: One piece each of 2.5m length of cable tray of 300mm & above shall be taken as sample from each offered lot. It shall be supported at both end & loaded with uniform load of 76 kg/meter along the length of cable tray. The maximum deflection at the mid-span of each size shall not exceed 7mm. d) Proof load tests on cable tray support system i) Tests on Main Support Channel shall be done if only C1 Channel are in scope of supply and cantilever arms shall be fitted on one side. This test shall be same as test 4 of type test. ii) Test on Main Support Channel shall be done with C2 channel and cantilever arms fitted on both sides, if C2 channels are in scope of supply. This test shall be same as test 2A of type test. Then test (i) above shall not be done. iii) Nut slip characteristic test (it shall support minimum load of 350kg before nut slips with a bolt torque of 65 NM). This test shall be same as test 5B3 of type test. The procedure for carrying out tests at “d” above shall be as per details given in Type Tests in specification thereafter Die-Penetration test shall be carried out to check weld integrity. e) The above acceptance tests shall be done only on one sample from each offered lot. 8.00.00 COMMISSIONING 8.01.01 The Contractor shall carry out the following commissioning tests and checks after installation at site. In addition the Contractor shall carry out all other checks and tests as recommended by the Manufacturers or else required for satisfactory performance.. 8.01.02 Cables a) Check for physical damage b) Check for insulation resistance before and after termination/jointing.	
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	c) HT cables shall be pressure tested (test voltage as per IS:7098) before commissioning. d) Check of continuity of all cores of the cables. e) Check for correctness of all connections as per relevant wiring diagrams. Any minor modification to the panel wiring like removing/inserting, shorting, change in terminal connections, etc., shall be carried out by the Contractor. f) Check for correct polarity and phasing of cable connections. g) Check for proper earth connections for cable glands, cable boxes, cable armour, screens, etc. h) Check for provision of correct cable tags, core ferrules, tightness of connections.												
8.02.00	Cable trays / supports and accessories 1) Check for proper galvanizing/painting and identification number of the cable trays/supports and accessories. 2) Check for continuity of cable trays over the entire route. 3) Check that all sharp corners, burrs, and waste materials have been removed from the trays supports. 4) Check for earth continuity and earth connection of cable trays.												
8.03.00	Earthing and Lightning protection system 1) Earth continuity checks. 2) Earth resistance of the complete system as well as sub-system.												
9.00.00	ELECTRICAL LAYOUT PHILOSOPHY: While developing the layout the bidder must give due consideration to the following requirements: a) Adequate distance shall be maintained between the transformers. As basic guidelines following norms will be adhered to: 1) Transformers shall be separated from the adjacent building/structures and from each other by a minimum distance as defined below or by a fire wall of two hours of fire resisting of height at least 600 mm above bushing / pressure relief vent whichever is higher. <table><tr><th>Oil capacity of individual transformer (in liters)</th><th>Clear separating distance (in meters)</th></tr><tr><td>5,000 to 10,000</td><td>8.0</td></tr><tr><td>10,001 to 20,000</td><td>10.0</td></tr><tr><td>20,001 to 30,000</td><td>12.5</td></tr><tr><td>Over 30,001</td><td>15.0</td></tr></table> 2) In case of auxiliary transformers having an aggregate oil capacity in excess of 2300 liters but individual oil capacity of less than 5000 liters, the maximum separating distance between transformers and surrounding building shall be at least 6M unless they are separated by fire separating walls or are protected by high velocity spray system. 3.) Rail track shall be provided in Transformer yard for movement of each transformer. The rail track in Transformer yard shall be connected with TG area rail track The Foundation top of transformer & rail top shall be at EL +/- 0.0M. Bus duct support or Transformer body shall be at least 8.0M from A-Row of TG building to clear the movement of GT/ Stator/UT/ST/UAT on rail line. Jacking pads shall be provided where the rail track changes the direction. Mooring post shall be provided on rail track for handling the transformers.	Oil capacity of individual transformer (in liters)	Clear separating distance (in meters)	5,000 to 10,000	8.0	10,001 to 20,000	10.0	20,001 to 30,000	12.5	Over 30,001	15.0		
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	4) For each transformer a pit shall be provided all around at a distance of 1.5 m (minimum) from transformer outer edge. A sump pit shall be provided for each pit. A common oil retention pit per unit shall be provided to hold oil quantity of the largest transformer (by volume) & 10 minutes of water quantity of HVV spray system for the largest transformer. Sump pit of individual transformer shall be connected to common oil retention pit of that unit. 5) Rail track shall be provided for all outdoor transformers up to road for movement of each transformer of size more than or equal to 7.5MVA Transformer. Jacking pads shall be provided where the rail track changes the direction. Jacking pad shall also be provided at the location of installation of transformer and mooring post shall be provided on rail track for handling the transformers. 6.) The Transformer fencing shall be at 1.0 M (minimum) distance from the pit wall. The Height of fencing shall be 2.5 M (minimum) and fencing shall have personal entry gate and removable type fencing/gate for transformer withdrawal. 7) The transformer firewall, pit sizing and clearances from adjacent building/structures etc. shall be as per IS 1646/CBIP manual on Transformer 8) However, for all outdoor transformers of oil capacity less than 2000 litre, a trench of suitable size shall be provided all around at a distance of 1.0 m (minimum) from transformer outer edge. A sump pit shall be provided for each trench. b) Layout requirements for Electrical MCC/switchgear rooms 1. Separate Switchgear Rooms shall be provided for each unit. For TG building, all HT boards shall be provided in HT switchgear room at only one floor and all LT boards shall be provided in LT switchgear room at only one floor 2. The following clearances shall be maintained for HT Switchboard. a.) Front Clearance <table> <tr> <td>i) For one Row of Swgr.</td> <td>-</td> <td>2.0 M (Min)</td> </tr> <tr> <td>ii) For two Rows of Swgr.</td> <td>-</td> <td>2.5 M (Min)</td> </tr> </table> b.) Back Clearance - 1.5 M (Min.) c.) Side Clearance Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800+width of panel (including spare panels/dummy panels etc.) 3. The following clearances shall be maintained for LT Switchboard. a.) Front Clearance <table> <tr> <td>i) For one Row of Swgr</td> <td>-</td> <td>1.5M (Min)</td> </tr> <tr> <td>ii) For two Rows of Swgr</td> <td>-</td> <td>1.5/1.75M depending upon the depth of panels etc</td> </tr> </table> b.) Back Clearance <table> <tr> <td>i) For single front</td> <td>-</td> <td>1.0M (Min)</td> </tr> <tr> <td>ii) For double front</td> <td>-</td> <td>1.5M (Min)</td> </tr> </table>	i) For one Row of Swgr.	-	2.0 M (Min)	ii) For two Rows of Swgr.	-	2.5 M (Min)	i) For one Row of Swgr	-	1.5M (Min)	ii) For two Rows of Swgr	-	1.5/1.75M depending upon the depth of panels etc	i) For single front	-	1.0M (Min)	ii) For double front	-	1.5M (Min)	
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TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION																		

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	c.) Side Clearance:Min. 800 mm, however provision to be made for any additional panel in future at both ends. Therefore end clearance shall be 800 mm + width of panel. For offsite areas, HT Switchboard clearances shall be followed wherever both LT & HT switch boards are in the same MCC room. 4. Height of HT/LT Switchgear Room and Boiler MCC room i) With Bus Duct – 4.5 m (min) ii) Without Bus Duct – 4.0 m (min) Further no vertical bracings shall be envisaged in HT/LT switchgear room and associated cable vault area. 5. Cable trench/Cable vault For LT switchgear/MCC room at EL 0.0M, 1400 wide x 1400 deep cable trench shall be provided to route the cables. Horizontal cable trays shall be routed in cable trenches. c) Minimum clear working space around the equipment 1200mm d) In buildings having MCC, minimum 2 fire door along with one rolling shutter of adequate size/capacity shall be provided. e) The cable entry and exit from switchgear room shall be from 1.5 mtr (minimum) above FGL. f) Wash basin with mirror shall be provided in battery room. Annexure-I 1.0 LOCATION OF LP3 :- One number LP3 to be located in boiler MCC room at 28.0m in BC bay to supply RC receptacles in TG area. Location of RC Receptacles in Turbine hall <table><tr><th>Sl. No.</th><th>Name</th><th>Location of RC</th><th>No. of RC</th></tr><tr><td>1</td><td>Hot Well</td><td>0m (Near CEP)</td><td>2</td></tr><tr><td>2</td><td>Main Oil Tank</td><td>8.5m (AB Bay)</td><td>1</td></tr><tr><td>3</td><td>NGT Cubicle/ Gen Bushing</td><td>8.5m (AB Bay)</td><td>2</td></tr><tr><td>4</td><td>LAVT</td><td>7.5m (AB Bay)</td><td>2</td></tr><tr><td>5</td><td>HP-IP Turbine</td><td>17.0m (AB Bay)</td><td>2</td></tr><tr><td>6</td><td>LP Turbine</td><td>17.0m (AB Bay)</td><td>1</td></tr><tr><td>7</td><td>TD BFP</td><td>17.0m (AB Bay)</td><td>1</td></tr><tr><td>8</td><td>HP Heater - 5</td><td>17.0m (BC Bay)</td><td>2</td></tr><tr><td>9</td><td>Deaerator</td><td>38.0m (BC Bay)</td><td>2</td></tr><tr><td>10</td><td>LP Heater- 2</td><td>8.5m (BC Bay)</td><td>1</td></tr><tr><td>11</td><td>Valve Room</td><td>8.5m (AB Bay)</td><td>2</td></tr></table> Total - 18 nos. RC Receptacles in Turbine Hall. 2.0 LOCATION OF RC RECEPTACLES	Sl. No.	Name	Location of RC	No. of RC	1	Hot Well	0m (Near CEP)	2	2	Main Oil Tank	8.5m (AB Bay)	1	3	NGT Cubicle/ Gen Bushing	8.5m (AB Bay)	2	4	LAVT	7.5m (AB Bay)	2	5	HP-IP Turbine	17.0m (AB Bay)	2	6	LP Turbine	17.0m (AB Bay)	1	7	TD BFP	17.0m (AB Bay)	1	8	HP Heater - 5	17.0m (BC Bay)	2	9	Deaerator	38.0m (BC Bay)	2	10	LP Heater- 2	8.5m (BC Bay)	1	11	Valve Room	8.5m (AB Bay)	2	
Sl. No.	Name	Location of RC	No. of RC																																															
1	Hot Well	0m (Near CEP)	2																																															
2	Main Oil Tank	8.5m (AB Bay)	1																																															
3	NGT Cubicle/ Gen Bushing	8.5m (AB Bay)	2																																															
4	LAVT	7.5m (AB Bay)	2																																															
5	HP-IP Turbine	17.0m (AB Bay)	2																																															
6	LP Turbine	17.0m (AB Bay)	1																																															
7	TD BFP	17.0m (AB Bay)	1																																															
8	HP Heater - 5	17.0m (BC Bay)	2																																															
9	Deaerator	38.0m (BC Bay)	2																																															
10	LP Heater- 2	8.5m (BC Bay)	1																																															
11	Valve Room	8.5m (AB Bay)	2																																															
TALCHER THERMAL POWER PROJECT STAGE-III (2X660 MW) EPC PACKAGE	TECHNICAL SPECIFICATION SECTION – VI, PART-B BID DOC NO : CS-4540-001A-2	SUB SECTION-B-10 CABLING, EARTHING & LIGHTNING PROTECTION																																																
		Page 20 of 21																																																

CLAUSE NO.

TECHNICAL REQUIREMENTS

Location of Receptacles and Socket in Boiler area

FLOOR	63A WELDING RECEPTACLES		20A, 240V AC INDUSTRIAL SOCKET		20A, 24V AC INDUSTRIAL SOCKET	
			RA 		RC 	
	PROPOSED		PROPOSED		PROPOSED	
	QTY	LOCATION	QTY	LOCATION	QTY	LOCATION
GLI-200	10	S7L,R MILL-B,E,G S17 ID-A,B P3L,R	7	S8L,R S21L, P3L,R ID-A,B	4	P2L,R ID-A,B
4710	3	MILL-A,D,J	3	MILL-A,D, MILL-J	8	MILL-A,E,C,D,F,G,H,J
8900	1	S18	1	S18, S14R	1	S12L
9700	2	S7L,R	2	S8L,R	2	S8L,R
11450	2	S3L,R	3	S8L,R S21	4	S10L,R S22L,R
17600					1	F1L
20500(APH BOTTOM), 21850	4	S18(2) S19L,R	7	S8L,R S17, S19L,R S6L,R	7	S9L,R S12L,R S18, S20L,R
21700(FEEDER FLOOR)	2	FEEDER A,J	4	FEEDER-A,C,F,J	4	FEEDER-A,C,F,J
23000	1	S17	2	S13L, S19		
25000(BURNNER BOTTOM, SPRAY STATION)	4	S3L,R S11L,R	5	S1L,R S11L,R S17	5	S1L,R S11L,R S17
28000(APH)	2	S19L,R	2	S19L,R	2	S19L,R
29200(APH, WIND BOX)	4	S20L,R S9L,R	4	S8L,R S20L,R	4	S8L,R S10L,R
32200	2	S3L,R	2	S8L,R		
33400	2	S12L,R	2	S8L,R S19L,R	2	S19L,R
38500	2	S3R, S13L				
42500	2	S10L,R	3	S8L,R S17	3	S9L,R S17
45300	2	S10L,R	4	S8L,R S11L,R	4	S8L,R S10L,R
48000	1	S1R	2	S14R S15L	2	S9L,R
48900	4	S18(2) S12L,R	4	S11L,R S12L,R	2	S11L,R
53600	2	S5L,R	3	S14R S10L,R	2	S5L,R
58000	4	S11L,R S14L S15R	4	S14R S15L S11L,R	2	S11L,R
59200(TRIPPER FLOOR)	2	LEFT, RIGHT	2	L,R		
61400	4	S11L,R S14L S15R	3	S14R S11L,R	2	S11L,R
68100	2	S11L,R	2	S9L,R		
77300	2	S10L,R	4	S9L,R S11L,R	2	S4L,R
83500	2	S10L,R	2	S12L,R		
86700	2	S3L,R	2	S11L,R	2	S11L,R
88600	1	S11L	2	S8L,R	2	S8L,R
95900	1	S1R	1	S1L		
ESP/FG VL DUCT	4		2		4	
ESP/FG OIL DUCT	2		1		2	
ESP AT MANHOLE DOOR FLOOR	4	IN BETWEEN TWD PASS	4		4	
ESP AT TOP	2		1			
ESP AT -200	2	AT FRONT SIDE BOTH L&R	2			
TOTAL	66		92		77	

		Annexure 6				 ISG, BANGALORE	
DOCUMENT NAME		LIST OF SUB VENDOR FOR APPROVAL-Electrical					
PROJECT		Talcher-III (2X660MW)					
MAIN CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD, ISG, BANGALORE					
BHEL'S CONTRACTOR							SUB SYSTEM : CHP, LHP & GHP ELECTRICAL
REF NO.							REV- 0, DATE: 06.03.2024
1	BELT WEIGHER WITH ELECTRICALS & INSTRUMENTATION (AS PER OEM STANDARDS)	II	SCHENCK PROCESS	GURGAON			Approved
		II	IPA	BANGALORE			Approved
		II	Thermo Fisher Scientific India Pvt Ltd	NASIK			Approved
2	GI CABLE TRAYS AND ACCESSORIES (LADDER & PERFORATED TYPE), fitting & accessories including bends	II	Inar Profiles Ltd	Vishakhapatnam			Approved
		II	Vatco	Mumbai	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Indiana cable trays	Mumbai	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Industrial Perforation	Kolkata	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Ratan Projects	Howrah	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	India Electrical Syndicate	Kolkata	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Premier Power Products	Kolkata		Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Indiana Gratings	Pune	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	M.J. Engineering	Bhiwadi	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	T.R.G	Chennai	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved



DOCUMENT NAME		LIST OF SUB VENDOR FOR APPROVAL-Electrical					
PROJECT		Talcher-III (2X660MW)					
MAIN CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD, ISG, BANGALORE					
BHEL'S CONTRACTOR		SUB SYSTEM : CHP, LHP & GHP ELECTRICAL					
REF NO.		REV- 0, DATE: 06.03.2024					
2	GI CABLE TRAYS AND ACCESSORIES (LADDER & PERFORATED TYPE), fitting & accessories including bends	II	Amtech	Pune	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Rukmani	Raipur	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Unitech Fabricators & Engineers	Howrah/ Hoogly	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
3	GI FLEXIBLE CABLE TRAY SUPPORT SYSTEM	II	Vatco	Mumbai	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Inar profiles	Vishakhapatnam			Approved
		II	Industrial perforations	Kolkata	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Premier power products	Kolkata			Approved
		II	Indiana gratings	Pune	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Patny Systems	Hyderabad	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Am-tech	Pune	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved
		II	Ratan Projects	Kolkata	Galvanizing details required	Galvanization shall be done at M/s NTPC approved galvanizers which is part of tender document	Approved



DOCUMENT NAME		LIST OF SUB VENDOR FOR APPROVAL-Electrical					
PROJECT		Talcher-III (2X660MW)					
MAIN CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD, ISG, BANGALORE					
BHEL'S CONTRACTOR		SUB SYSTEM : CHP, LHP & GHP ELECTRICAL					
REF NO.		REV- 0, DATE: 06.03.2024					
4	VFD MOTOR	I	ABB	BANGALORE			Approved
		I	BHARAT BIJLEE	NAVI MUMBAI			Approved
5	GEARED MOTOR	II	PETL	AURANGABAD			Approved
		II	PBL	VV NAGAR			Approved
		II	INTERNATIONAL COMBUSTION	Aurangabad	Details Required	Annexure-II Doc No-SSC-C&M/CM/PBCMP/P-207571/NOA-FC-001 DATED 06-12-2021 Project : CM-Mechanical Transport & Loading arrangement from TP-10 to Banadag Railway Siding for Pakri Barwadih Package : CHP PACKAGE Contract No:SSC-C&M/CM/PBCMP/P-207571/NOA-FC-001 DATED	Approved
		II	ELECON EPC	SAVLI			Approved
		II	NEW ALLENBURY WORKS	Kolkata			Approved
		II	Wipro	Pune			Approved
6	Lighting fixtures with accessories (For Filament and LED)	II	Crompton	Mumbai			Approved
		II	Philips	Noida			Approved
		II	Bajaj	Mumbai			Approved
		II	Surya Roshni	Noida			Approved
		III	SCHEINDER	Nasik			Approved
7	Welding Recepticles	III	AJMER	Mumbai			Approved
		III	Best & Crompton	Chennai			Approved
		III	BCH	Faridabad			Approved
		III	Additionally Any make with VDE or CE or UL or CSA marking or BIS				Approved
		III	Any make with VDE or CE or UL or CSA marking or BIS approved with valid CML number is acceptable				Approved
8	Cable Gland	III	Dowells	Mumbai			Approved
		III	Chetna	Nasik			Approved
		III	3D	Umbergaon			Approved
		III	Any make with VDE or CE or UL or CSA marking or BIS approved with valid CML number is acceptable				Approved
9	Lugs	III	Dowells	Mumbai			Approved
		III	Chetna	Nasik			Approved
		III	3D	Umbergaon			Approved
		III	Any make with VDE or CE or UL or CSA marking or BIS approved with valid CML number is acceptable				Approved



DOCUMENT NAME		LIST OF SUB VENDOR FOR APPROVAL-Electrical					
PROJECT		Talcher-III (2X660MW)					
MAIN CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD, ISG, BANGALORE					
BHEL'S CONTRACTOR		SUB SYSTEM : CHP, LHP & GHP ELECTRICAL					
REF NO.		REV- 0, DATE: 06.03.2024					
10	Emergency Light, Trefoil Clamps, Ceiling Fans	III	Main Contractor Approved Sources				Approved
11	M.S. ROD, G.I. Flat, G.I. Wire, Earth Wire	III	Main Contractor Approved Sources (GALVANISING AT NTPC APPROVED SOURCES)				Approved
	Local Motor Starter Panels	II	SIEMENS	Mumbai			Approved
		II	L&T	Mumbai			Approved
		II	Any other make with VDE or CE or UL or CSA marking or BIS approved with valid CML number is acceptable				Approved
12	ACFB, DCFB, ACDB, DCDB, MLDB, WDB, LOCAL PANEL, UPS DB, SOLENOID BOARD, PUSH BUTTON, LOCAL MOTOR STARTER, POWER JB, LOCAL CONTROL STATIONS (LCS), REMOTE PANEL (NON PLC), OIL FILTRATION LOCAL PANEL ETC	I	SWITCHING CIRCUITS	KOLKATA			Approved
		I	HINDUSTAN CONTROL & EQUIPMENT LTD	KOLKATA			Approved
		I	JAKSON	GREATER NOIDA			Approved
		I	PYROTECH	UDAIPUR			Approved
		I	POSITRONICS	VADODARA			Approved
		I	CONTROL DEVICES	KOLKATA			Approved
13	Cable termination kits & straight through jointing kit	II	3M	Pune			Approved
		II	Raychem	Pune			Approved
14	GI EARTHWIRE / LIGHTING WIRE / EARTHING MATERIAL/Lighting Conduit	III	MAIN CONTRACTOR APPROVED SOURCES				Approved
15	PIANO SWITCHES	III	BIS APPROVED SOURCES				Approved
16	Weigh Bridge	I	AVERY INDIA	BALLABHGARH			Approved
		I	RICELAKE	SRIPEREMBUDUR			Approved
17	Electrohydro Thurster (EHT) Brake / EHT Rail Clamps	III	ELECTROMAG	MUMBAI			Approved
		III	INDUSTRIAL COMPONENT	KOLKATA			Approved



DOCUMENT NAME		LIST OF SUB VENDOR FOR APPROVAL-Electrical					
PROJECT		Talcher-III (2X660MW)					
MAIN CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD, ISG, BANGALORE					
BHEL'S CONTRACTOR		SUB SYSTEM : CHP, LHP & GHP ELECTRICAL					
REF NO.		REV- 0, DATE: 06.03.2024					
18	PULL CORD / BELTSWAY / INDICATION SYSTEM / UNDER BELT SWITCH	II	JAYASHREE	PUNE			Approved
		II	PROTO CONTROL	PUNE			Approved
		II	AG SYSTEMS	MUMBAI	Details required	Already approved with NTPC	Approved
19	ELECTRONIC SPEED SWITCH, ZSS, TILT SWITCH, MAGNETIC SWEITCH, PROXIMITY SWITCH	II	JAYASHREE	PUNE			Approved
		II	PROTO CONTROL	PUNE			Approved
20	HEAVY DUTY LIMIT SWITCHES	II	JAI BALAJEE	CHENNAI			Approved
		II	JAYASHREE	PUNE			Approved
		II	BCH	FARIDABAD			Approved
		II	A.G.SYSTEM	MUMBAI			Approved
21	CHUTE BLOCK SWITCH	II	EIP Enviro	Noida			Approved
		II	Nivo Controls	Indore			Approved
		II	Jayashree	Pune			Approved
22	POSITION MONITORING SYSTEM	II	JAYASHREE	Pune			Approved
		II	Parametric Instruments	Maharashtra			Approved
23	HOOTER/ SIREN	III	Kheraj	Mumbai			Approved
		III	Bemco	Kolkata			Approved
		III	Siren	Kolkata			Approved
24	ECHAIN	III	MAIN CONTRACTOR APPROVED SOURCES				Approved
25	JUNCTION BOX (POWER, CONTROL, PCCJB), LOCAL PUSH BUTTON STATION, Emergency Push Button Station	III	MAIN CONTRACTOR APPROVED SOURCES				Approved



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BHEL'S CONTRACTOR		SUB SYSTEM : CHP, LHP & GHP ELECTRICAL					
REF NO.		REV- 0, DATE: 06.03.2024					
26	LT Switchgear - Wall mounted fixed type indoor / outdoor LT Switchgear non compartmentalized Panel (Lighting panels / AC / DC Fuse boards etc.)	II	CONTROL DEVICES	KOLKATA			Approved
		II	SWITCHING CIRCUIT	KOLKATA			Approved
		II	PYROTECH	Udaipur			Approved
27	DISTRIBUTION BOARD / LOCAL ISOLATOR (i.e. HOIST PDB/ WR PDB	II	CONTROL DEVICES	KOLKATA			Approved
		II	SWITCHING CIRCUIT	KOLKATA			Approved
		II	PYROTECH	Udaipur			Approved
28	LT TRAILING CABLE / FLEXIBLE CABLE	I	NICCO	SHYAMNAGAR			Approved
		I	KEI	BHIWADI			Approved
		I	UNIVERSAL CABLE	SATNA			Approved