

BOQ: STANDARD TECHNICAL NOTES & SCOPE

<u>Following also forms the scope of ETC work in addition to above, but not limited to this.</u>	
1	Refer Consolidated T&P and Manpower list as per Annexure-2 to be arranged by ETC
2	Verification, handling, shifting to & from stores, proper storage, assembly, installation, pre-commissioning test and commissioning tests (As per Customer/BHEL FQP) are included in the scope. Necessary skilled electrician & labour to be provided by ETC contractor to OEM during testing & commissioning. The storage instructions of the equipment manufacturer/ Employer shall be strictly adhered to. Customer/BHEL Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.
3	All the drawings and documents as per Annexure-5 shall be followed for ETC work.
4	Erection guidelines shall be followed for ETC work.
5	Bidder Supplied Material - Bidder to offer items from Customer approved make only (as applicable). Bidder to supply material of proven design and make, which have already been extensively used and tested. Bidder to obtain approval from BHEL Engineer incharge / Customer prior to supply. Quantity of supply items are provisional and shall be finalised during contract stage. Qty of supply item may vary upto any extent and and even may get deleted.
6	All consumables required for successful erection testing & commissioning of present scope of work is in bidders scope, such as (not limited to) Welding Electrodes, Low hydrogen content welding electrode, Ferrules, Cable Lug, cable ties, , Paint, bitumen compound, Zinc riched enamel paint, red oxide and zinc chromate ..etc complete in all respect.
7	ETC of Power / Control / Instrument Cable: Scope includes Cable Laying tagging , dressing, ferruling, lugging, installation of cable gland, soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates and minor civil works for breaking of trench & repair- laying can be either on trays, hanger, supports, underground, buried in ground or through GI/PVC pipe over/under ground, through wall etc. All erection materials viz. Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes and flexible steel conduits etc shall be supplied by bidder. excluding supply of Cable Gland which are covered separately (as a separate BOQ item / free supply by BHEL). Machine ferruling shall be adopted. Extra holes closing in glands plates with GI sheet shall be in ETC contractor scope Refer Annexure-6 for cable details and its laying. Technical specification of cable tagging intervals, and lugs as per Customer /field approval shall be follow.
8	CABLE LUG: Supply of cable lug is in bidders scope. cable lugs shall be tinned copper solderless crimping type conforming to IS-8309 & 8394 for all control Cables and cables with copper wire. For Aluminium Bimetallic lugs for power cables as required shall be used depending upon type of cables and terminations. Solderless crimping of terminals shall be done by using corrosion inhibitory compound. The cable lugs shall suit the type of terminals provided. The bidder shall cover the exposed part of all cable lugs whether supplied by him or not with insulating tape, sleeve or paint. Bidder to supply cable lug from manufacturer's authorised representative / dealer. Make of cable lug is to be approved by Customer.
9	Cable TAGS & Markers - Bidder to supply and install cable tag & markers. The tag shall be of aluminium with the number punched on it and securely attached to the cable conduit by not less than two turns of 20 SWG GI wire conforming to IS:280. Cable tags shall be of rectangular shape for power cables and of circular shape for control cables.
10	Cable Gland: Tin/ Nickel, Nickel/chromium - Plated (coating thickness not less than 10 microns) Customer approved make brass cable glands, double compression heavy-duty type complete with necessary armour clamp & tapered washer etc. Bidder to offer the gland from authorised representative of manufacturer. Cable gland shall be subject to customer approval prior to dispatch. Cable glands shall match with the sizes of different HT/LT/Control cables.
11	Power and control cables shall be securely fixed to the trays/supports with self locking type nylon ties with de-interlocking facility at every 5 metre interval for horizontal run. Vertical and inclined cable runs shall be secured with 25 mm wide and 2 mm thick aluminium strip clamps at every 2m.
12	Vertical run of cables on equipment support structure shall be supported on ladder/perforated cable trays of suitable width which shall be suitably bolted/clamped with the equipment support structure. Tray shall be supplied by BHEL.

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13	<p>Earthing works - works including cutting, bending, bolting/ clamping to structure, Painting, welding with MS Flat/40 mm dia MS rod riser etc. equipment's to be earthed includes all switchyard equipment's, towers, lattice structure, cable trenches, fence, electrodes for neutral of LT transformer/ ICT Transformer/ /NGR/ Reactor/DG Set, Control Room equipment's, SPR equipment's using necessary Connectors for earthing flats. Earthing work to be done as per Drg. no. TB-4-394-316-012, Rev-01 for equipment's earthing and TANTRANSOCO Specification for earthing (Annexure-1)</p> <p>Note -1- Only cleat for earthing of MS flat on structure, MS flat and rod electrode shall be supply by BHEL.</p> <p>Note-2- All other required material for earthing shall be in ETC contractor scope.</p> <p>Note -4- The supply of Hardware (nut, bolt and washer) required for connecting flat on tower of structure, pad of equipment's, MOM box, junction box etc. For bolting of MS flat shall be in contractor scope. painting of MS flat shall be carried out as per customer /BHEL guidelines.</p> <p>Note -5- MS flat shall be painted by the MS Flat welding contractor.</p>
14	<p>Insulating Rubber Mats - The scope covers supply and laying of insulating mats of class-A conforming to IS: 15652-2006. These insulating mats shall be laid in front of all floor mounted ACDB, CRP, SAS (As applicable under present scope) in control room building/ Switchyard panel room. The insulating mats shall be made of elastomer material free from any insertions leading to deterioration of insulating properties. It shall be resistant to acid, oil and low temperature. Upper surface of the insulating mats shall have small aberration (rough surface without edges) to avoid slippery effects while the lower surface shall be plain or could be finished slip resistant without affecting adversely the dielectric property of the mat. The Insulating mat shall be of pastable type, to be fixed permanently on the front of the panels except for the chequered plate area which shall not be pasted as per requirement. The insulating mats shall generally be fixed and joints shall be welded as per recommendations in Annexure-A of IS:15652. Width of insulating mats shall generally be of 1.5 meters or as per site requirements. Length shall be supplied as per site requirements.</p>
15	<p>Cable ends shall be kept sealed to prevent damage. In cable vault, fire resistant seal shall be provided underneath the panels. Wherever cable pass through floor or through wall openings or other partitions, GI/PVC wall sleeves with bushes having a smooth curved internal surface so as not to damage the cable, shall be supplied, installed and properly sealed by the Contractor at no extra charges.</p>
16	<p>All welding done at site for equipment and structures, shall be painted with zinc rich paint immediately to avoid corrosion.</p>
17	<p>Supervision of testing and commissioning of Relay / Protection / SAS / Automation / Bus Bar Panels (as applicable) is in the scope of BHEL/ panel supplier. Necessary manpower support, tools, tackles and testing equipment to be in scope of ETC contractor</p>
18	<p>Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, finishing holes after erection, grouting, fixing of trench material, Removing and Replacing of RCC Trench Cover will be in the scope of ETC contractor.</p>
19	<p>Removal of gravel, if gravelling is already done, for connection of Equipment earthing strip to the existing mat (wherever earthing mat is already laid), and after completion of earthing, contractor should place the gravel to bring it in original shape.</p>
20	<p>Quoted rates are deemed to be inclusive of miscellaneous works viz erection of clamps and connectors and Accessories / Auxiliaries supplied with above main equipments.</p>
21	<p>All paint, welding electrodes & other consumable by contract supplies shall be part of ETC works. Paint /welding electrode make etc. is subject to BHEL/CUSTOMER site incharge approval.</p>
22	<p>Equipment erection (say Isolator) means complete erection, metallics, post insulator, connectors (expansion/rigid tubular for Al.Tube / single/double/quadruple conductor), connection to the next in line (if connected to overhead busbar or droppers) including PG clamps/Tee connectors etc. This will be clear from the enclosed electrical layout drawings.</p>
23	<p>Equipment and tower erection would include supply and erection of miscellaneous items, viz Phase colour discs, labels painting of equipments, phase colour painting, phase marking, bay identification board, danger plates, rubber mats, device number marking on the equipment, keyboard etc as per site requirements. Supply & Mounting of phase color discs & Danger plates shall be as per IS-2551; 1982 & IS 5; 1978.</p>
24	<p>Welding of Aluminium tubes (supply of welding sleeve excluded) as per Annexure-7 is in ETC contractor's scope and joints shall be tested by radiography. Welding and Bending machines and any other equipment will be in ETC Contractor scope.</p>
25	<p>Complete ETC package is under the scope of bidder. All TNP including oil filtering machine, cranes etc. required to complete the job shall be provided by bidder only.</p>
26	<p>Supervision of erection, Testing & commissioning of one no. Isolator of each type shall be done by supplier. Necessary manpower support, tools, tackles etc shall be in the scope of ETC contractor.</p>

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27	Testing instruments (dully calibrated) have to be arranged by ETC Contractor at it's own cost (List is only provided for information , if any other instrument not mentioned below but required for sucessful completion of ETC work shall be in ETC contractor's scope), (However OMICRON or equivalent kit for Numerical relay testing shall be arranged by BHEL). Bidder to submit valid calibration certificate during commencement of testing / commissioning works.
27.01	DCRM (OPERATIONAL ANALYZER)
27.02	Contact Resistance Measurement kit (CRM)
27.03	Capacitance and Tan delta measurement Kit
27.04	Dew Point Measurement kit
27.05	5kV/1kV Megger
27.06	Primary current Injection Kit
27.07	Secondary current/Voltgae Injection kit
27.08	1Ph Variac
27.09	Multimeters
27.10	Clamp on meter
27.11	Relay test kit
28	The scope of supply items as mentioned in the above BOQ are tentative. Items shall be supplied by Contractor as per exact site requirements only.
29	Man Lifters for ETC of 765kV equipment's shall be in ETC contractor scope.
30	For scope of supply items in ETC contractor scope following should be followed - (1) The approval of makes shall be obtained from BHEL/Customer. (2) Drawings and MQP shall be submitted for approval in line with specification and relevant IS. (3) Quality - Inspection & dispatch clearance shall be given by BHEL/Customer.

List of Annexures

Annexure -1 - Switchyard Erection and Earthing

Annexure -2 - Consolidated T&P and Manpower list

Annexure -3 - Fire Proof Sealing & Fire Breaks

Annexure -4 - Mandatory Spares List

Annexure -5 - Drawings List

Annexure -6 - Cabling

Annexure -7 - Procedure for Welding of Aluminium Buses

Annexure -8 - ETC of ICT

Annexure -9 - ETC of Reactor

Annexure -10 - 500MVA, 765/400/33kV, 1-Ph, Interconnection Autotransformer reimpregnation procedure

Annexure -11 - 80MVAr, 765kV, 1-Ph, Reactor reimpregnation procedure