

Sl.	BOQ_ANNEXURE_1: STANDARD TECHNICAL NOTES & SCOPE
1	<p>Bidder Supplied Material - For approved make of supply items, please visit "POWERGRID COMPENDIUM OF VENDORS OF THE EQUIPMENT" at following website address. https://apps.powergridindia.com/ims/50-0001-002.aspx</p> <p>Bidder to offer items from powergrid 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 extend and and even may get deleted.</p>
2	<p>All consumables required for sucessful erection testing & commissioning of present scope of work is in bidders scope, such as (not limited to) Welding Electrodes, Low hydrogen content welding electrode, Ferruls, Cable Lug, cable ties, , Paint, bitumen compound, Zinc riched enamel paint, red oxide and zinc chromate ..etc complete in all respect.</p>
3	<p>All pre/commissioning activities for substation equipment shall be carried out in accordance "Pre- Commissioning procedures for Switchyard Equipments (Doc. No. D-2-01-03-01-03)".</p>
4	<p>The storage instructions of the equipment manufacturer/ Employer shall be strictly adhered to. POWERGRID Field Quality Plan shall be followed alongwith the provision of Technical Specification for storage.</p>
5	<p>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- 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 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.</p>
6	<p>ETC of Directly Buried Cable (including sand bed & brick cover) - Scope includes laying of cables, directly in buried cable trench. All civil & erection activities such as excavation, supply and placement of sand, bricks, backfilling, compaction, tagging , dressing, ferruling, lugging, installation of cable gland ,soldering, tapping, jointing, crimping, termination, and drilling/ cutting holes in cable gland plates etc shall be in contractor's scope. All erection materials viz. Sand, Bricks, Cable Lug, ferrules, cable ties / straps, Al. tags, route markers, GI / PVC wall sleeves with rubber / nylon bushes 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.</p>

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7	<p>For Directly Buried Cable (as mentioned above) bidder to supply & install cable route marker. Location of cables laid directly underground shall be clearly indicated with cable route marker made of galvanised iron plate. The cable route marker shall project 150 mm above ground 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 and drain crossings as per relevant standard.</p>
8	<p>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.</p> <p>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.</p> <p>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.</p> <p>Bidder to supply cable lug from manufacturer's authorised representative / dealer. Make of cable lug is to be approved by Powergrid site i.e. DOWELLS /COMET/ JAIN ELECTRONICS/ JAICO ELECTRIC/ SI METAL WORKS / powergrid approved make etc. Please refer "powergrid compendium of vendors of the equipment" for details.</p>
9	<p>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.</p>
10	<p>Cable Gland: Tin/ Nickel, Nickel/chromium - Plated (coating thickness not less than 10 microns) Powergrid approved / Sunil & Co. / Arup/ Comet / QPIE 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.</p>
11	<p>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.</p>
12	<p>Vertical run of cables on equipment support structure shall be supported on perforated cable trays of suitable width which shall be suitably bolted/clamped with the equipment support structure. Tray shall be supplied by BHEL.</p>

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13	<p>Modular Multi-diameter Cable sealing system consisting of Openable frames, blocks and accessories shall be installed where the underground and over-ground cables enter or leave concrete bay kiosks /Switchyard panel room & control rooms in the substations. Cable sealing system shall consist of Multi-diameter type peel-able or adjustable blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system.</p> <p>Solid blocks shall not be used on frame. Openable frames & stay-plate material shall be of galvanized steel and for compression single piece wedge with galvanized steel bolts shall be used. Cable sealing system should have been tested for fire/ water/ smoke tightness. All the accessories of cable sealing system shall be suitable for mounting after the laying of cable.</p> <p>Modular Multi-diameter Cable sealing system should conformed relevant IS/IEC.</p>
14	<p>Modular Multi-diameter Cable sealing system</p> <ol style="list-style-type: none"> 1) Scope shall include all the items which are necessary for successful installation (including nuts and bolts, if required) and satisfactorily working/maintenance of the offered cable. 2) Compression tools and accessories necessary in the installation shall be considered in the supply scope that shall be required at a later stage for new cable. 3) The Contract shall be on lump-sum basis for the package. Within the scope of the contract, no variation shall be admissible to the Contractor so far the input remains unchanged. In case of change in scope after award of the contract, the additions/ deletions to the scope shall be as per the breakup unit rates for all the equipment and services furnished by the bidder in his offer. 4) Minor Civil work with brick masonry required for installation is in the scope of bidder. 5) Solid blocks shall not be used on frame. Frames & stay-plate material shall be of galvanized steel and for compression, single piece wedge with galvanized steel bolts shall be used. 30% spare blocks on the frame shall be provided for expansion in future. Cable sealing system should have been tested for fire/water/smoke tightness. 6) Cable sealing system shall consist of multi-diameter type peel-able or adjustable blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system. 7) Minor civil work required for installation of cable sealing system is included in the scope of bidder.
15	<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>
16	<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>

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17	All arc welding with shall be done with low hydrogen content electrodes for all earthing works i.e. MS Rod, GI Flat & MS Flat
18	The welds on 40MM MS Rod should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
19	50mm x 6mm MS flat shall run on the top tier and all along the cable trenches and the same shall be welded to each of the racks. Further this flat shall be earthed at both ends and at an interval of 30 mtrs. The M.S. flat shall be finally painted with two coats of Red oxide primer and two coats of Zinc riched enamel paint.
20	Connection between equipment earthing lead and main earthing conductors and between main earthing conductors shall be welded type. For rust protections, the welds should be treated with red oxide primer and afterwards coated with two layers bitumen compound to prevent corrosion.
21	All welding done at site for equipment and structures, shall be painted with zinc rich paint immediately to avoid corrosion.
22	Cable racks and supports shall be painted after installation with two coats of metal primer (comprising of red oxide and zinc chromate in a synthetic medium) followed by two finishing coats of aluminium paint. The red oxide and zinc chromate shall conform to IS:2074.
23	Supply of 110 MM & 50mm dia. PVC PIPES CLASS-IV PIPES including Bend and Tee etc shall be as per technical specification TB-XXX-316-041. (Supply of PVC Pipe (class 4) as per IS 4985, alongwith accessories like sockets, bends, tees etc, Customer accepted make.)
24	Supervision of testing and commissioning of Relay / Prtoection / SAS / Automation / Bus Bar Panes (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
25	Minor Civil works such as modification of civil foundations, making holes in the trenches/ control room building, grouting, fixing of trench material will be in the scope of ETC contractor.

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26	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.
27	Compleetete ETC package is under the scope of bidder. All T&P required to complete the job shall be provided by bidder only. Bidder to arrange MAN LIFTER for 765kV & 400kV equipment erection & testing. Height of manlifter shall be 14m approcah for 765kV Yard & 8m approach for 400KV Yard.
28	Any other item i.e. Portable Flood Light Panel etc if handling is in the scope of bidder - Receipt of material, unloading, proper storage, material reconciliation, safe keeping handing over to BHEL / Customer is in bidders scope. Mode of payment shall be made on unit weight basis in BOQ item "FIRE PROTECTION SYSTEM (material handling)".
29	Testing istruments (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.
29.01	DCRM (OPERATIONAL ANALYZER)
29.02	Contact Resistance Measurement kit (CRM)
29.03	Capacitance and Tan delta measurement Kit
29.04	Dew Point Measurement kit
29.05	5kV/1kV Insulation tester
29.06	Primary current Injection Kit
29.07	Single phase variac

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29.08	Secondary current/Voltgae Injection kit
29.09	1Ph Variac
29.10	Multimeters
29.11	Clamp on meter
29.12	Relay test kit