

SPECIAL CONDITIONS FOR ELECTRICAL WORKS **CONTRACT AT FTS MODERNISATION**

1 SCOPE OF WORK

- 1) The work covered under this specification is of highly sophisticated nature requiring the best quality of workmanship, engineering and construction management. The contractor should ensure timely completion of work. The contractor must have adequate quantity of tools. Measuring instruments, calibrating equipment etc. in his possession. He must also have on his rolls adequately trained. Qualified and experienced engineers supervisory staff and skilled personnel. The manpower deployment identified by contractor should match requirement of sophistication involving microprocessor-based systems.
- 2) The work shall be executed under the usual conditions. The contractor and his personnel shall co-operate with the personnel of other agencies. Co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as whole.
- 3) All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 4) The services, tests and support to be provided by the agency of the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.
- 5) Contractor shall erect, test and commission all the equipments, cabinets/panels, instruments and cabling etc. as per sequence prescribed by BHEL Engineer in-charge. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs or for any reasons whatsoever.

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- 6) The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, pre -assembly, erection, testing, assistance for commissioning of systems, achieving various activities. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be defective in workman ship or not conforming to drawings or other specifications the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies and recoveries will be effected from contractor's bills towards expenditure incurred including departmental charges.
- 7) The terminal points as decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.
- 8) All works such as cleaning, leveling aligning trial assembly, dismantling of certain equipments / components for checking and cleaning, fabrication as per general engineering practice and as per BHEL engineers instructions at site cutting, weld depositing, grinding ,straightening, chamfering filling of cut outs/openings for mounting of console inserts modules indicators recorders drilling of holes for gland entries reaming scrapping cable laying dressing fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work.
- 9) Housekeeping in the erection and pre-assembly area is as important as the well-planned and orderly work. The access to site for inspection by BHEL engineers and leading of the material shall be made available by the contractor at all times. The shifting and re-shifting of erection materials tools and plants and clearance of restrictions filling of ditches undulation near the pre-assembly and boiler area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/commissioning stages.

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2 ERECTION OF TRANSFORMER

- 2.1 The scope of work under this head is defined as below. OEM supplier will be available for all equipments erection before start up work and commissioning. Contractor has to coordinate with that team for commissioning.
- 2.2 Transportation of transformer and accessories from BHEL stores/ Storage yard to the transformer foundations, assembly of loose supplied items erection, testing & commissioning.
- 2.3 The transformers shall be handled in such a manner so that no jerk is transferred to the core, winding and internals of the transformer.
- 2.4 Placement on plinth, alignment with respect to the foundation and lay out drawings.
- 2.5 Topping up of Oil, Filtration of Oil.
- 2.6 All the accessories shall be assembled/mounted as per GA drawings and these should be thoroughly cleaned prior to installation.
- 2.7 Contractor shall arrange required testing equipments for carrying out electrical test like winding resistance measurements, BDV value of oil, insulation resistance, measurement of oil PPM etc.,
- 2.8 Contractor shall discuss and finalize installation and testing activity procedure with BHEL prior to starting the work.

3 ERECTION OF PLC PANEL PACKAGE

- 3.1 The scope of PLC system includes erection of sophisticated microprocessor based systems PLC panels, workstations, UPS and interconnecting cables like electronic earthing of the PLC panels etc.

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- 3.2 Unit rate quoted for PLC system shall cover installation & integration of all the above said equipment and providing necessary commissioning assistance. No separate unit rate applicable for installation of all loose items/ modules/ components or accessories etc, which is not explicitly mentioned in the rate schedule, but comes as part of the system.

4. INSTALLATION OF PANELS, ISOLATOR PANELS AND RESISTANCE PANELS.

- 4.1 OEM Supplier will be available for supervision of all equipments told in work schedule **Sl.No 1, 2,3,4,6,7,8,9**. Electrical control panels, electronic control panels, supervisory control desk, 415 Volt LTMCC, PLC panel, Instrument enclosures/panels, analyzer panels etc. are normally supplied. These panels may have to be installed as stand alone or in groups consisting of number of panels, depending upon the plant layout and foundation arrangement.
- 4.2 Installation of panel shall include fixing of base frame fabrication of base frame if required leveling alignment fixing of anti-vibration pads, removal of side covers fixing of cubicle interconnection hardware, bus bar jointing, wiring interconnection, welding and grouting of panels and base frames mounting of panel canopy wherever supplied as part of panel, drilling of gland plates (if additionally required) and sealing of cable entries.
- 4.3 The panels shall be transported from stores to place of installation in vertical position. Care shall be taken such that the switches, lamps, instruments etc., mounted on the panel do not get damaged during transit.
- 4.4 Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/moisture. This will have to be periodically cleaned and surroundings have to be kept tidy.
- 4.5 Wherever the panels to be mounted on cable trenches channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted.

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- 4.6 Normally the panels shall be supplied with instrument, relay, meters, electronic modules etc. mounted and pre-wired. However if these are supplied loose / separately for safety in transit contractor shall mount/wire such devices as part of the panel installation work and no separate rates shall be applicable unless otherwise specially listed in the rate schedule.
- 4.7 No separate payment shall be made for replacement of any devices like electronic modules relays conductors terminal block push buttons etc. which are found defective during pre-commissioning / post-commissioning of any equipment / item.
- 4.8 Minor civil works like drilling, chipping, punching holes and opening in concrete floors slabs and brick walls grouting related to Rack support installation minor civil works required for installation of control panels Junction boxes etc., shall be included in the erection cost of such items. The scope also includes supply of grouting material, if any.

5. STRUCTURAL STEEL FABRICATION AND ERECTION

- 5.1 Structural steel material like MS angles, channels, etc. shall be supplied in running meters by BHEL and same shall be used for fabrication of panel base frame, cable tray supports, supporting frames for instruments, junction boxes, distribution boards etc., canopies for instruments/ panels/ JB/ push button stations etc.
- 5.2 This shall include cutting to size, contouring of end for connections if required, welding, grinding of excess weld deposits/ burrs, drilling of holes for mounting of device/instrument, installation at location, leveling, alignment, providing bracings, painting etc. **No gas cut holes will be permitted.** Contractor to follow the BHEL supplied welding schedule and welding procedures.
- 5.3 All the fabricated supports/frames shall be painted as per painting schedule. **All paints, primers etc. are in the scope of the contractor.**
- 5.4 Frame installation/cable tray accessories installation may involve mounting either on concrete floor by grouting/using anchor fasteners or on steel structure by welding etc. All consumables shall be arranged by the contractor.

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- 5.5 In certain packages galvanized members of junction box frames and instrument racks shall be supplied in cut to sizes and frame assemblies are required to be done as per drawing by bolting/welding. The installation rate as quoted shall include the assembling of the frames.
- 5.6 Gas cutting of tray support and gas cut holes in frame shall be avoided. Only drilled hole shall be permitted in frame.
- 5.7 All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 5.8 The services, tests and support to be provided by the agency of the work mentioned in the various sections of this tender are indicative and not exhaustive, but not limited to these for the completion of the work in all respects.
- 5.9 Contractor shall erect, test and commission all the equipments, cabinets/panels, and cabling etc. as per sequence prescribed by BHEL. The sequence of erection / commissioning methodology will be decided by the BHEL engineers depending upon the availability of materials/work fronts etc. No Claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of erection / commissioning adopted in erection / commissioning of similar jobs or for any reasons whatsoever.
- 5.10 The work to be carried out under the scope of this specification covers the complete work of loading, handing, transporting, unloading, pre-assembly, erection, testing, air flushing, pre-commissioning tests, assistance for commissioning of systems, trial run of various auxiliaries, achieving various activities till handing over of the unit to BHEL. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection.

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If any portion of the work is found to be defective in workmanship or not conforming to drawings or other specifications the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done departmentally or by engaging other agencies and recoveries will be effected from contractor's bills towards expenditure incurred including departmental charges.

5.11 The terminal points as decided by BHEL shall be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

5.12 All works such as cleaning, dismantling of certain equipments / components for checking and cleaning, as per general engineering practice and as per BHEL engineers instructions at site cutting weld depositing, grinding straightening, chamfering filling of cut outs/openings for mounting of console inserts modules indicators recorders drilling of holes for gland entries reaming scrapping cable laying dressing fitting up etc. as may be applicable in such erection works are treated as incidentals to erection work and are necessary to complete the work satisfactorily shall be carried out by the contractor as part of the work.

5.13 Housekeeping in the erection and pre-assembly area is as important as the well-planned and orderly work. The shifting and re-shifting of erection materials tools and plants and clearance of restrictions Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/commissioning stages.

6. INSTALLATION OF CABLE TRAYS AND ACCESSORIES

6.1 Erection of Cable Trays includes installing ladder/perforated type cable trays in cable trenches, steel columns, overhead areas etc. on the supports already provided. Approximate quantity is indicated in the rate schedule.

6.2 Cable trays, coupler plates and fasteners shall be supplied by BHEL.

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6.3 Only straight trays will be supplied by BHEL. Other accessories like Bends Tees. Cross, etc... which may be required for proper laying of cable as per cable routing will be fabricated by the contractor. The fabricated trays shall conform to the shape and configuration of original bends etc that would have been supplied. The fabrication of the bends from straight trays will include cutting the ladder steps, bending the side plates to the required radius and re-welding the ladder steps with the bent plates. Trays supplied will be of G.I. and hence Suitable electrode only shall be used for welding purposes. All cuttings shall be done only with hack-saw and gas cutting should not be resorted to.

6.4 The cable trays shall be adequately tack welded to supporting steel work and shall be sufficiently supported to prevent sagging. The weld shall be painted using cold galvanizing paint (supply of paint is in the scope of contractor).

7. ERECTION OF JUNCTION BOXES AND PUSH BUTTON STATIONS

7.1 Various Junction Boxes and Push Button stations shall be supplied with required holes in the gland plates, required cable glands and lugs.

7.2 The unit rate quoted for erection of JB's and Push button stations shall cover installation of JB's/SSPB's on supporting frames, painting the tag nos. of JB or fixing separate tag plate on JB's/SSPB's.

7.3 Required fasteners shall be supplied by **Contractor**.

8. CABLE LAYING

8.1 Laying of power and Control Cable includes transportation from BHEL's stores, laying, dressing, clamping and tagging cable marker at both ends. The cable shall be laid in Ladder / perforated type cable trays The Cables shall be tied after dressing using 3mm dia nylon ropes/ties and the nylon ropes/ties shall be supplied by the contractor.

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- 8.2 The cable shall be clamped suitably with cable trays at maximum 1.5M interval using 3mm aluminum clamps/strips as per the instruction of BHEL Engineer. **Supply of necessary strips/ clamps and bolts for the above work is included in the contractor's scope.**
- 8.3 The contractor shall lay the cables on cable trays, in built-up cable trenches, vertical tray ways, overhead areas and supports, pulled through conduits, pipes, run clamped on wall / ceiling steel structure etc. A uniform rate to be quoted shall include laying, proper dressing, tying etc. Standard of Workmanship shall be to the approval of BHEL Engineers.
- 8.4 The arrangement of the Cable and all methods of laying shall be planned to provide an orderly formation to avoid bends and crossings and to facilitate easy removal of any one cable without undue disturbance to adjacent cables. The Standard of Workmanship shall be to the approval of BHEL Engineers.
- 8.5 Cable laid in (or) entering into (or) emerging from cable racks, cable trays, conduits, cable supports shall be suitably formed to avoid bearing against sharp edges.
- 8.6 When cables pass through floors, walls etc., it shall be passed through a pipe for mechanical protection and the pipe ends sealed suitably.
- 8.7 Care shall be taken to avoid sharp bending and kinking of conductor, damaging insulation and stressing the cable beyond the pulling force recommended by the manufactures. Cables shall be protected at all times from mechanical damage.
- 8.8 Where cabling passes through brickwork (or) concrete work suitable local protection against mechanical damage shall be provided by the contractor.
- 8.9 Jointing of cables, if necessary, shall be done by crimping type cable joints after getting the approval of BHEL Engineers.
- 8.10 Entry to the panels and JBs may be at top, sides or bottom. All cables are required to be properly supported and clamped near to the JB panel.

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8.11 Many of the cable trays and cables have to be laid in cable trenches. For this purpose the cover of the trenches have to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed. After completing the work the trenches have to be cleaned and covers put back into position Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc., at his cost.

8.12 Contractor shall carefully plan the cutting schedule of each cable drum in consultation with site engineer such that wastages are minimized.

9. TERMINATION OF CABLES

9.1 All the cables laid by the contractor shall be terminated by him. **Cable glands and lugs will be contractor scope.** Unit rates for various sizes of cables are to be indicated in rate schedule.

9.2 Termination includes dressing & glanding, splicing and dressing inside panels, JBs etc., providing printed ferrules (**contractor to arrange ferrule**) and crimping of lugs.

9.3 Supply of required PVC cable ties, PVC ferrules, PVC button and tapes, PVC sleeves, compounds, necessary tools, joining materials etc. shall be supplied by the contractor within the quoted rates for cable termination. The quality of material shall be got approved from BHEL engineer prior to their use on job. [in the contractor's scope]

9.4 Special tool clips, saddles, etc., required for the connections and terminations of cables shall also be provided by the Contractor at his cost.

9.5 At cable termination points, where the conductor and the cable insulation will be terminated shall be made in a neat workmanship.

9.6 Cable lugs shall be provided by compression, adapting necessary crimping tools. Insulating sleeves shall be provided over the barriers and conductors to prevent accidental contact with ground (or) adjacent terminals. The insulating sleeves shall be fire resistant and be long enough to over pass conductor insulation and shall be properly sized.

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9.7 Termination of all cables installed by the Contractor is included in his scope. The work of testing and reconnection, changing of connections, re-arrangement of leads to required extent shall be carried out by the contractor without additional cost.

9.8 Cable shielding – all signal cables are supplied with bare shielded copper wire/with braided wire shield. Generally shield wire is kept isolated at instrument/field device end and continuity is maintained through JB and grounded at panel end only. While terminating the shield wire, either in panel or JB, PVC sleeves are to be used to avoid two-point earthing.

10. INSTALLATION OF EARTHING

- 1) Installation of above-ground earthing for the complete system is the scope of the contractor. **Fixing fasteners are contractor's scope. Required quantity of GI flat and 3mm solid GI Wire will be supplied by BHEL at free of cost.**
- 2) Earthing of all motors, Switch gear Panels, LTMCC , PLC, Electronic Control Panel, Push Button Stations, Junction Boxes, Transformers, Heaters, thermostats, instruments, Cable trays and accessories, cable armours and conduits used for cable installation, etc. are in the scope of work.
- 3) Installation of earthing conductors and terminations at the equipments and at the earth rings / buses/ earth pits and the necessary clamping of the conductors shall be carried out by the contractor. The tentative quantities required for the earthing is indicated in the rate schedule.
- 4) All equipments shall be earthed by two separate and distinct connections. Earthing terminals will be available in all the equipment.
- 5) The earthing conductor of galvanized mild steel strips will be supplied by BHEL. All connections for the equipment to the main earthing conductor shall be made as indicated in during execution of work.

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- 6) A continuous earthing conductor shall be installed in all cable trays and securely clamped to each tray section by suitable connections to form a continuous earthing system. When two (or) more trays supporting power cables run parallel, a continuous earthing conductor shall be provided on one tray only with tap offs to the control cable trays.
- 7) All joints in the earthing system shall be welded type. Earthing connections to all equipment including motor shall be of bolted type.
- 8) Earthing connections shall be free from tinning, scale, paint, enamel, grease, rust (or) dirt at the time of making joint.
- 9) Screens / Shields and armour of all multi core cables shall be bonded and earthed.
- 10) Earthing conductors, along their run on columns, beams, walls etc. shall be supported by suitable cleats to intervals of 750mm.
- 11) Welded joints shall be painted with red oxide and Aluminium paint / Al. paste. Aluminium paint, red oxide and paste are in the scope of contractor.
- 12) Earth lead and riser connections shall be as short and direct as possible and shall be without any links and spacing.
- 13) All earthing works includes laying of earthing flat as per the schematic drawing and termination up to the earthing pit.

11. TESTING, PRE-COMMISSIONING, AND POST COMMISSIONING

11.1 The Equipments supplier commissioning Engineer will co-ordinate for all equipments in **Sl.No 1, 2,3,4,6,7,8,9** told in work schedule. Contractor shall perform various activities during pre-commissioning, Integrated Testing, post-commissioning stages of equipment covered under this tender specification. It is responsibility of contractor to arrange tools & plants, test equipments, experienced engineers and technicians.

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11.2 The contractor's commissioning group shall work as per the instruction of BHEL Engineer and they shall coordinate day-to-day activity with other agency and BHEL. The testing activity may have to be repeated till satisfactory results are obtained and also to satisfy the requirement of BHEL Engineer.

11.3 The equipments erected by the contractor will be tested and commissioned as per normal testing practices like panel charging. Meggering of cables, conducting of open circuit / short circuit testing etc. as per the instruction of BHEL engineers. The contractor will supply required manpower along with all required testing equipments like multi meter, megger, tong testers, test kit etc. and his quoted rates will be inclusive of all equipment / instruments like multi meter, megger, tong testers, test kit etc. and his quoted rates will be inclusive of all above aspects.

11.4 Before start of work for understanding

12. INTEGRATED ELECTRICAL TESTING/COMMISSIONING

12.1 **The brief scope of work under is defined as below, but not limited to the following.** Contractor shall discuss & finalize testing procedure with BHEL Engineer In-Charge for the test to be conducted. Drawing & documents shall be provided by BHEL at the time of testing. BHEL decision in this regard shall be final and binding on the contractor.

12.2 The contractor shall prepare all erection / commissioning log sheets and protocols / test certificates as per field quality plan, get is signed by the concerned BHEL Engineer and submit the same to BHEL engineer as per his instruction.

12.3 Contractor's quoted rates for all concerned items shall include Integrated Testing. Some of the testing activities involved are as below and these are not exhaustive.

13. LT CUBICAL TYPE MAIN PANELS

1. Checking of installation for correctness.
2. Mechanical functional checking/ adjustment of individual breaker.
3. Measurement of Insulation resistance of individual breaker, complete switchgear board and combined insulation resistance of individual breaker with cable connected to drives.

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4. Testing of Protection Relay, Thermal over relay, Energy/ Ammeters, Voltmeters, Power factor, frequency, in static & dynamic condition of relay.
5. Conducting test such as Insulation Resistance measurement, Ratio, polarity, winding resistance on CT and PT.
6. Checking of electrical control & protection interlock of individual breaker and integration with other system.
7. Provide assistance for checking the electrical operation of individuals breakers from local stations..
8. The contractor shall arrange all the required testing instruments/ test kits for testing.
9. Necessary terminations shall also be made as per work schedule enclosed.

14 SCOPE OF COMMISSIONING OF EQUIPMENT ERECTED BY THE ELECTRICAL CONTRACTOR

- 14.1 While testing and commissioning, if the equipment to which the cabling is connected is observed to be not functioning, it is the responsibility of the contractor to check, establish and demonstrate, in close coordination with the commissioning agencies, that there is no defect in the cabling. The contractor shall depute his supervisor and workmen to assist the commissioning agencies to check the interconnecting cables.

15 ELECTRICAL INSPECTORATE'S APPROVAL /STATUTORY INSPECTION

- 15.1 Contractor shall have/obtain valid Electrical Contractors License to carry out the Erection, Testing & Commissioning work on High/Low Voltage Electrical Equipments from the appropriate statutory authority of the concerned state or Central Electricity Authority, as the case may be. All fees and expenses in this regard shall be in the contractor's account.
- 15.2 Contractor shall ensure legal requirements as per IE Rules and prepare layout in line applicable rule there by obtaining approval from CEA on smooth manner and arrange inspection of concerned Statutory Authority for the installation, testing & commissioning of High / Low voltage equipments covered under the scope of work and including those erected by other agencies and obtain the statutory authorities approval in appropriate format prior to charging of the equipments.

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15.3 Contractor shall be responsible, drawing, documentation, Completion report and all necessary co-ordination work with Statutory Authority towards the certification of installation / works. BHEL will only pay Statutory Fees in respect of inspection of installations as per demand note/challan issued by the statutory authority. All other co-ordination expenses shall be borne by the Contractor. BHEL be providing technical assistance, for submission to Statutory Authority. Contractor shall provide all logistics services in this regard.

16. STANDARDS

Complete erection shall confirm to Indian Electricity Act with latest amendments and also to latest editions of the relevant Indian Standards.

- a) IS: 2274- Code of practice for electrical wiring installation. (System Voltage not exceeding –650 V)
- b) IS:732- Code of practice for electrical wiring installation. (System Voltage not exceeding –650 V)
- c) IS: 732 – Code of practice for earthing.
- d) IS: 3072 – Code of practice for installation and maintenance of switch gears.
- e) The latest edition of IE Act & IE Rules.
- f) Other relevant standards as applicable.
- g) Transformer erection as per relevant IS.

17. THE FOLLOWING CONDITIONS ARE ALSO TO APPLICABLE TO THE ERECTION CONTACTOR.

- 1. Data sheet, manufacturer manual and GA drawing of individual equipments will be given by **BHEL** during erection.
- 2. Supervision of Commissioning will be manufacturer's scope. Crew services including skilled technicians, tools, meters to be provided by **contractor**.

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3. **BHEL will provide required Hydro, Crane, Flow car, Turbo etc depending on need basis for free of cost.**
4. Transportation from existing storage area (within 500 mtrs) to erection site under contractor scope using facility provided by BHEL (sl no.6). Unpacking, assembly will be under **contractor** scope in the presence of supplier.
5. **Required channel, Angle will be provided by BHEL for free of cost.**
6. **Trimming holes, fabrication, supply and fixing of fasteners, welding, grouting will be under contractor scope.**
7. Supply of glands, pin/palm type copper sockets, **gland earthing** materials for terminated cables will be under **contractor** scope.
8. Supply of earthing materials like copper wire, GI pipes will be under contractor scope.
9. Supervision of OEM rep/ BHEL Engr in charge during unpacking/ Erection will be provided.
10. Skilled man power shall be deputed for erection& commissioning of Transformers and Drive panels.
11. Drinking water, Electricity at one Point will be provided by BHEL **free of cost.**

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SPECIAL INSTRUCTIONS TO TENDERERS

- 1 Fuse switches / switch fuses shall be of any one of the following make only Gec Alstom, L&T, GEC
- 2 The DP switches, SP Switches, plugs and sockets shall be of standard make agreeable to Engineer in charge and should have been certified by ISI.
- 3 All materials supplied by the contractor should conform to the relevant IS / BS specification.
- 4 Single core, Single / Multi strand cables shall be of ISI approved make only, The armored cable shall be of ISI approved make only, Test Certificate of cables are to be submitted.
- 5 The wiring shall conform to IS 732 or any other relevant INDIAN STANDARD SPECIFICATION and INDIAN ELECTRICITY RULES. The installation shall also conform to the regulation for the electrical equipments of building laid down by Insurance Association of India (FIRE SECTION).
- 6 In case of PVC / steel conduit wiring the switches, plug sockets, regulators and other controls should be mounted on metal boxes. These boxes as well as metal boxes used for street light controls should be fabricated as per IS:5133 (part – 1 1969)
- 7 Final lay out, as well as Electrical drawings etc, should be submitted in advance for BHEL's approval.
- 8 Preparation of Electrical drawings, submitting the same to CEA / Local TNEB authorities to obtain EB Service connection etc, are under the contractor's scope.
- 9 The contractor should be present at the time of inspection of the installation by the Electrical Inspector. Any defect pointed out by the Electrical Inspector in the equipments (or) installations supplied by the contractor should be immediately rectified by the contractor free of cost.
- 10 The 'Completion Report' should be submitted as per Appendix-F of IS 732.

- 11 Recommended makes of different accessories:

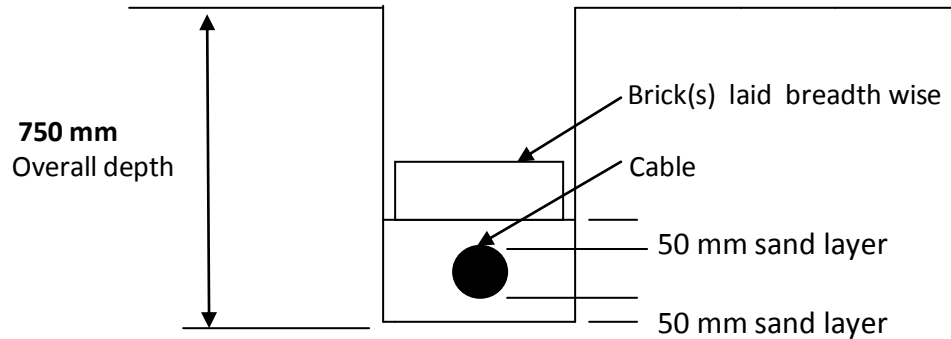
	Name of accessory	Recommended make
01	Luminaries	Philips, GEC, Crompton, Bajaj, Havells
02	Ceiling fans	Orient, Crompton, Usha, Khaitan, Havells, Almonard
03	Switches / Sockets	Anchor, Kundan, Record with FAN/LIGHT marking
04	ICDP / ICTPN Switches	Bosma, Standard, GEM, GE, Raj
05	MCBs /	MDS Loadster, legrand, L&T, Hager, Siemens
06	Rotary switches	Salzer, Kaycee, Siemens, L&T,
07	Metal Clad sockets	Sakthi Crown, B&C/Crompton, BCH
08	Single core cable	ISI approved make only
09	Armored cable	ISI approved make only
10	Fuse Distribution Boards	Bosma, Raj, GE, GEM, Standard
11	Exhaust fans	Orient, Crompton, Usha, Khaitan, Havells, Almonard
12	Combination Fuse Switches	GEC Alstom make
13	Metal Clad Sockets	Best & Crompton, Sakthi Crown

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IF CABLE / CABLES HAS TO BE LAID IN GROUND THE FOLLOWING SPECIFICATIONS SHOULD BE FOLLOWED.

A

For LOW TENSION cable SINGLE run

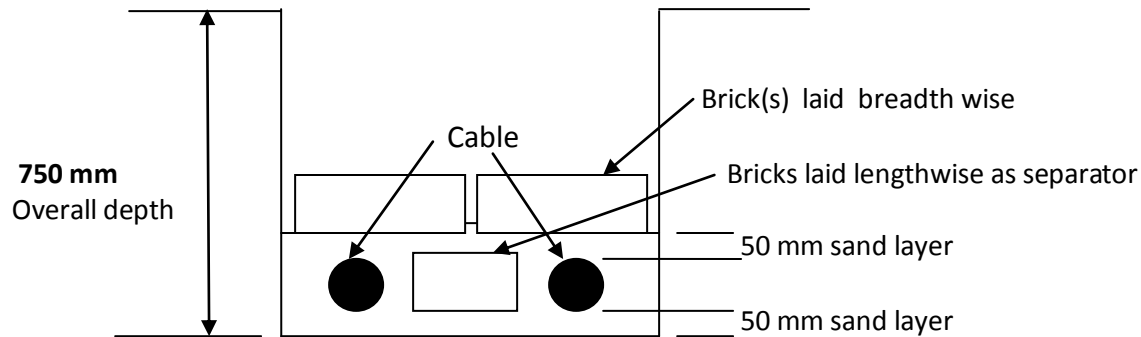


For ONE run of cable : The **trench should be excavated** to a depth, such that the cable will be laid at a **minimum depth of 750 mm** as shown above. Spread 50 mm deep layer of sand below the cable in trench, after laid the cable, also spread 50 mm deep layer of sand above the cable. Lay good quality bricks **breadth wise** only and cover the sand layer all along the cable / trench. Then complete the earth filling. The bricks shall be of good quality with size 100 mm x 75 mm x 225 mm.

If MORE than ONE cable :

B

For LOW TENSION cables DOUBLE run (or) more the cables shall be laid as shown below:



The cables should be laid in horizontal plane. The **trench should be excavated** to a depth and breadth, such that the cables will be laid at a **minimum depth of 750 mm in horizontal plane** as shown above. Spread 50 mm deep layer of sand below the cables. Lay the cables in horizontal plane & place **good quality bricks** in between **them length wise continuously all along the cable / trench**. Further sand filling to be done for 50 mm over the cables.

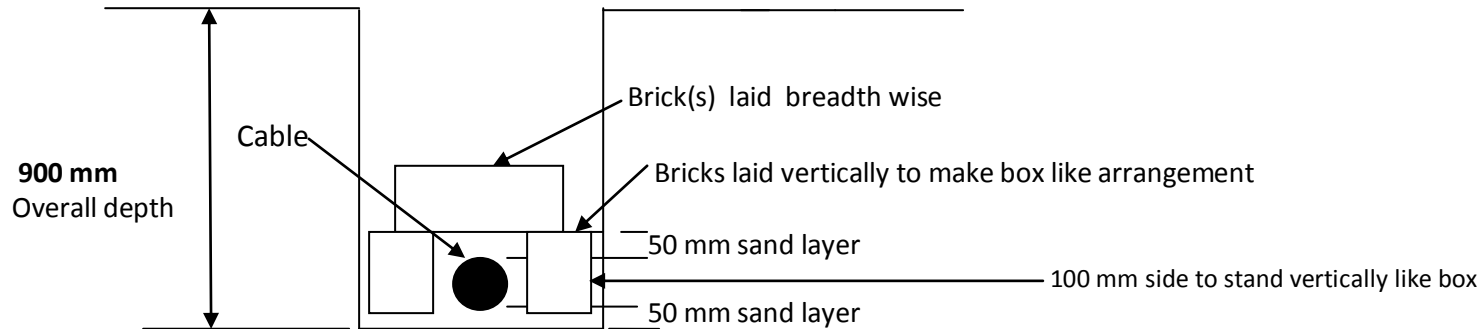
Lay **good quality bricks breadth wise only and cover the sand layer all along the cable / trench**. Then complete the earth filling. The bricks shall be of good quality with size 100 mm x 75 mm x 225 mm.

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For **HIGH TENSION / 11 KV** cable the **trench should be excavated to a depth**, such that the cable will be laid at **minimum depth of 900 mm**. Spread 50 mm deep layer of sand below the cable in trench. After laid the cable, lay good quality bricks length wise and vertically sideways to make box like arrangement covering both sides of the cable as shown below. Spread 50 mm deep layer of sand above the cable. Lay good quality bricks **breadth wise** only and cover the sand and brick layer all along the cable / trench. Then complete the earth filling. The bricks shall be of good quality with size 100 mm x 75 mm x 225 mm.

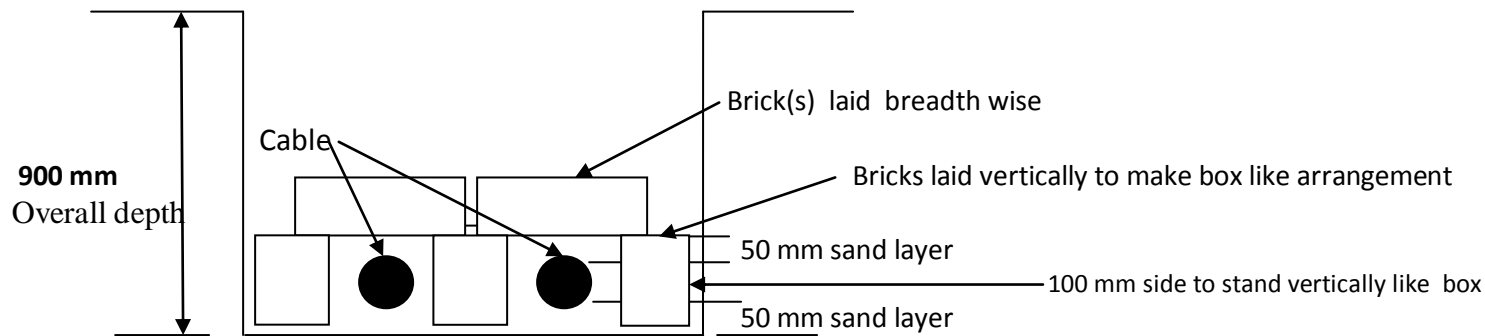
For HIGH TENSION cable SINGLE run

A



For HIGH TENSION cables DOUBLE run (or) more the cables shall be laid as shown below:

B



14

In case where cables have to be taken across the road, the pipes have to be laid across the road & the pipes will be supplied by BHEL. However if pipes are already available across the road, the cables have to be taken through that available pipes.

Cable 'Route Indicator' / 'Joint indicator' should be provided once in 20 Metre.

Cable 'Route Indicator' / 'Joint indicator' has to be supplied by the contractor.

In case of cable laying in open trench / wall / column, the cable has to be taken with proper clamping in cable trench / wall / column. The clamps are to be supplied by the contractor.

15

End termination of the cable is inclusive of supply and using of Pin / Eye type, Aluminium / Copper sockets, Glands, MS adopter boxes, Earthing of Glands & adopter boxes with 8 SWG (or) 7/20 GI wire.

16

PANELS:

Cubicle / Industrial type panel boards should be manufactured by any of the reputed manufacturers who have sufficient experience in the manufacturing of Electrical panel boards.

All sheet steel used in the manufacture of Main Panel boards should not be less than 2 mm thick Ms sheet metal. The Main Panel board has to be approved by BHEL before dispatch to the work spot.

For all sheet metal fabrication, pre treatment of all metal with acid and rust preventing chemicals has to be carried. Two coats of red oxide and one coat of recommended color paint has to be applied by spray painting.

SIGNATURE OF THE TENDERER
WITH SEAL AND ADDRESS