

SECTION B VII: GENERAL TECHNICAL REQUIREMENTS (CIVIL WORKS)
220KV, 66KV AND 33KV GRID SUB-STATIONS

1.00.00 SCOPE OF WORK

The scope is to cover design, preparation of general arrangement drawings and working drawings, supply of materials and construction of all civil, structural and architectural works.

Description of the various sections of work under this specification and detailed scope are given herein after. The whole work under this scope is referred to as civil works.

The work to be performed under this specification consists of providing all labour, materials, plants, equipment, temporary works, constructional plant, fuel supplies, transportation and all incidental items not shown or specified but reasonably implied, or necessary for the proper completion of the work, all in strict accordance with the specifications and including revisions and amendments there to as may be required during the execution of the work.

The work under this specification shall consist of but not be limited to items mentioned below:-

- i) Control Room cum switchgear Building including internal electrification based on the drawing of the owner.
- ii) Security gummy based on the owners drawing including internal electrification.
- iii) Pump House for pumping out the storm water from the yard including supplying & installations of pumps motors & electrical fittings for operation of the pump house.
- iv) Yard fencing with gates in accordance with the drawing of the owner.
- v) Transformer foundations/gantry foundation/equipment foundations etc. in the 33,66 & 220KV yard based on the type of equipment as per the requirement for establishment of the sub-stn.
- vi) Supply and erection of gantry structures, columns, beams and supporting structure for all the equipments.
- vii) Construction of cable trenches including cable trays as per drawing/specification.
- viii) Development of yard/cement concrete roads.
- ix) Laying of sewers, storm water drains, water supply lines etc including making connection with the municipal services after obtaining approval from Municipal Authorities.

- x) Any other work required for functional requirement of establishment of the sub-stn.
- xi) Soil investigation.
- xii) Making arrangement for construction water, drinking water.
- xiii) Construction of septic tank & soakpit etc. if municipal sewers are not existing.

The scope shall also includes carrying out all relevant tests required for the civil works for the project.

The works shall be carried out according to the design Structural/ Architectural to be developed by the Contractor and approved by the owner. For all building, structures, foundations etc. necessary layout and details are to be developed by the Contractor keeping in view the functional requirement parameters/drawing. Certain minimum requirements are indicated in this specification for guidance and the bid shall cover complete requirement.

Land with boundary wall will be given to the Contractor by the owner. The layout and levels of all structures etc. shall be made by the contractor at his own cost from the general grid of the plot and bench marks given by the Engineer-in-Charge. The contractor shall give all help including instruments, materials and personnel to the Engineer-in-charge for checking the detailed layout and correctness of the layout and levels. All the quality standards, fabrication and erection check lists, welding standards and other technical requirements shall be strictly adhered to by the Contractor.

The work in general, shall be executed as per detailed specifications for the civil works. However, in case specifications for a particular item are not specified, the same shall be governed as per the latest Indian Standard specifications/CPWD specifications as per directions of the Engineer-in-charge, whose decision shall be final and binding.

2.00.00 MISCELLANEOUS GENERAL SPECIFICATIONS:

- 2.01.00 All underground water retaining concrete structures shall have water proofing cement additive conforming to IS:2645 water proofing for walls and base slab of all underground concrete structures like basements pump houses etc. shall be by "Injection Method".
- 2.02.00 All brick work shall be designed as per latest Indian standards and shall be plastered on both faces. All brick walls shall be minimum 230mm thick (excluding plaster). All RCC ceiling shall be plastered with 6 mm thick plaster.
- 2.03.00 All roofs shall have heavy duty water proofing with roof insulation and grading underbed which shall be provided to give an ultimate run off gradient of not less than 1:100 to effectively dispose off the rain water. The minimum height of masonry parapets on roof shall be 900mm and

2.12.00 All foundations embedments, inserts, blockouts required for equipments shall be provided by bidder.

2.13.00 All stairs shall have maximum riser height of 180mm and shall be minimum 1000 mm wide and tread of 300mm width.

2.14.00 Edges of steps shall be protected with PVC nosing as approved by the owner.

2.15.00 Angles 50x50x6 mm minimum with lugs shall be provided for edge protection around cut-outs/openings in floor slab, edges of drains supporting grating covers, edges of RCC trenches supporting covers, edges of precast covers and any other places where breakage of corners is expected.

2.16.00 Anti termite treatment shall be given to column pits, wall trenches, foundations, etc. as per relevant IS and other relevant codes.

2.17.00 50mm thick DPC shall be provided before laying of masonry.

2.18.00 Water stops shall be 230mm wide of PVC.

2.19.00 All steel section and fabricated structures which are required to be transported by sea shall be provided with anti corrosive paint to take care of sea worthiness.

2.20.00 Bidders shall submit following documents for the proposed buildings along with the offer:

- i) Architectural floor plans, elevations, cross-sections and perspective view in colour of all buildings. (Bidder shall submit three different schemes).
- ii) Blow-up sketch of any typical detail.
- iii) Finishing schedules of both material and colour for both internal and external areas.

3.00.00 FINISHING SCHEDULE

3.01.00 The finishing schedule as given below shall be adhered to by the Bidders. For detailed specifications of the finishing items; the technical specification shall be followed. However, at the time of detailed engineering, the owner reserves the right to alter the finishing schedule and specification and such changes shall have no financial implication whatsoever to the owner. The bidder shall also submit the colour scheme for the various structures for the approval of the owner.

3.02.00 FLOORING

3.02.01 All W.C. and urinals shall have cast-in-situ terrazo floor with suitable Glass strip dividers and glazed tiles upto 2.2M height dado.

3.02.02 Floors of battery room including walls upto 2.1m height Acid resistance tile lining.

3.02.03 Treads in R.C. staircases shall be provided with Kota Stone tiles. Steel staircases shall have gratings or chequered plates as per the requirements.

3.03.00 ROOFING

3.03.01 All buildings shall have RCC roof with extra heavy duty water proofing, with roof insulation.

3.04.00 CEILING

3.04.01 Reinforced cement concrete slab ceilings shall be of fair finish concrete. A 6 mm thick cement sand plaster (1:4 proportion) shall be applied to give smooth and uniform finish. Wherever false ceiling is to be provided, the same will be with Luxolon type, and R.C.C. ceiling shall be left unplastered. *412*

3.05.00 PLASTER

3.05.01 For all buildings, outside cement plaster shall be in two layers 18mm thick. Inside plaster shall be 12mm/15mm thick cement mortar (1:4).

4.00 GRADES OF CONCRETE

M-15 For trenches & minor equipment foundation or 1:2:4

M-20 For super structure work in buildings, basement, raft, piles, or 1:1-1/2:3 pile caps, water retaining structure, grade beams, raft foundation/ major equipment foundation.

5.00 ACID PROOF/CHEMICAL RESISTANT TREATMENT FOR BATTERY ROOM

5.01 SCOPE

This section covers the supply and furnishing of all labour materials and equipment and performance of all operations necessary to complete the acid proof/Chemical resistant lining in accordance with specifications given here under:-

a) Preparation of surface:

The surface on which acid proof/chemical resistant lining is to be given shall be levelled, smooth, dry and clean. The entire surface shall be tapped by wooden hammer in order to determine hollows, if any. If hollows are found by the above test, they shall be suitably sealed with concrete or other materials as the case may be. For filling the hollows the following general specification shall apply.

- b) Repair and Replacement of Unsatisfactory concrete which in the opinion of the Engineer-in-charge is unsatisfactory shall be cut and replaced by new concrete as soon as practicable after removal of forms. Anchors, key dovetail slots or extra reinforcement if necessary, shall be provided to ensure proper bond between the new and old concrete. Surface to be prepared shall be wetted for 24 hours prior to the commencement of operation. Clearance shall be taken from the Engineer-in Charge before undertaking any repair work. The use of epoxy resins for binding fresh concrete during repairs shall be permitted only on the written approval of the Engineer-in-Charge and application of such epoxy resins shall be strictly in accordance with the manufacturers instructions. Small holes shall be filled by dark pack fillings. All patches areas shall be properly cured by sprinkling water for a period of not less than ten days. All materials, procedure and operations used in repair of concrete or other surfaces on which lining has to be provided shall be subject to prior approval of Engineer-in-Charge.

Material : 150X150X20mm thick acid/Alkali resistant tiles.

- i) Floor : Cement concrete floor of the battery room will be provided with 20mm thick Acid/Alkali resistant tiles over a base of cement mortar 20mm thick. The joints of the tiles will be filled up with acid resistant cement mortar.
- ii) Walls : The entire area of the walls upto 2.2 mtr. height will be lined with 20mm thick Acid/Alkali resistant tiles over a base of 20mm thick cement mortar and the joints suitably grouted with acid resistant cement mortar. The entire area of the walls/ceilings above 2.2M height will be painted with acid resistant Epoxy paint. Similarly the doors, windows and ventilators should also be painted with acid resistant paint to avoid corrosion due to acid fumes in the battery room.

5 00 Acid resistant tiles flooring - The entire floor of the battery room will have flooring of Acid resistant tiles flooring over the base concrete of 1:4:8 (1 cement: 4 Coarse sand : 8 stone aggregate). The joints of the Acid resistant tile flooring should be filled with acid resistance cement mortar upto a depth of 25 mm.

Wall Lining - The wall lining upto 2.2M height will be with Acid resistant tile flooring with base plaster of 1:4 (1 cement : 4 coarse sand) 12 to 15mm thick (Depending on the rough/smooth surface of wall). The joints should be with acid resistance cement mortar depth of 25mm.

Control Room : 50mm thick C.C. (1:2:4) & 2mm thick Veryle flooring after erection of flooring. Plastic emulsion, paint will be provided on the wall of the control room. The venyle flooring will be in sheets (PVC based).

Switch gear room : 52mm thick (1:2:4) with Hardnite topping. Dry distemper shall be provided on walls.

7.00 SWITCHYARD CIVIL WORKS

7.01 Scope

The scope under this item covers all structural and civil works associated with successful erection and commissioning of station switchyard. The details of scope is as follows: This is only a guideline and shall not be taken as exhaustive.

7.01.01 a) Design, engineering, fabrication, galvanising, supply and erection of all lighting mast, towers, beams, equipment lattice support, equipment pipe support inclusive of all fixtures such as nuts, bolts, hangers, shackles, clamps, anticlimbing devices, danger and phase plates, inserts in concrete, foundation bolts, base plates, cap plates, stiffeners, dampers fixtures, for supporting of operating mechanism boxes, control cabinet, and any other item required to complete the job.

b) Design, engineering, fabrication, supply, erection and painting of supports, embedment in cable trenches, bolts and nuts and any other accessories required to complete the job.

c) Excavation dewatering, carriage of excavated earth materials, P.C.C. mudmat piling, casting of concrete foundations pile caps, backfilling etc.

d) Design, Engineering, excavation, dewatering, carriage of excavated earth, P.C.C. mudmat, construction of R.C.C. cable trench and pipe trenches with necessary precast R.C.C. covers with lifting facilities, sump pit, etc. wherever trenches cross road or rail track the sections below such crossings shall be designed as per Indian Road Congress or Indian Railway Specification. Drainage of the trenches shall be suitably designed.

e) Drainage of the area is also in Bidder's scope. It may be noted that the cable trench should not be used for drainage purpose.

f) The finished level of the Civil Works in the grid sub-station should be fixed in relation to the outside road (Municipal Road) as under:

i) Outside road (Municipal Road) Final finished level after mettalling	100.00M (Reference point)
ii) Formation level	100.20M
iii) Yard level	100.35M
iv) Inside roads and top of trenches in yard	100.45M
v) Equipment foundations	100.50M

vi) Plinth level of the control room building 101.20M

7.02.00 General Conditions

7.02.01 Typical design/drawings for each kind of structures, equipment, supports, foundations and cable/pipe trenches shall be furnished along with bid for owner's review. After award of contract design, foundations, cable/pipe trenches, shall be submitted for Owner's approval.

7.02.02 Switchyard shall be graded to final grade level by the contractor. Final dressing and gravel pitching is in bidder's scope. After laying the earthing network the area in the switch yard will be given the following treatment for prevention of growth of weeds/ grass:-

- i) 8 cm thick cement concrete flooring with M-10 grade of concrete.
- ii) Over burnt (Jhamma) flat bricks floor-over mortar bed of 20mm thick (1:6). The brick joint will be grouted with cement mortar 1 (cement) : 6 (fine sand).
- iii) 10cm thick layer of stone aggregate (DQS of 20mm single size).

7.02.03

- i) Drainage of the area in the switchyard is in bidder scope. The drainage water should be collected in suitable sump and arrangements for pumping out water including the provision of pump and pump house is in the bidder scope.
- ii) Cable trenches / drains should be provided with RCC trench covers with angle iron nosing all round. Thickness of the trench covers should not be less than 50mm. All trench covers should be provided with suitable arrangement for lifting.
- iii) The cable trenches should be provided with suitable hangers to support the cables.

7.03.00 General Requirements

7.03.01 All foundations for the switchyard structures shall be designed as per relevant IS:4091 "Code of practice for design and construction of foundations for transmission line towers and poles" and IS:456 (latest) "Code of practice for plain and reinforced concrete".

7.03.02 Supporting structures for equipment may comprise lattice structural steel supports as per requirements. The lattice steel supports shall be designed

as per IS:802, "Code of practice for use of structural steel in overhead transmission line towers".

- 7.03.03 The steel girders shall be designed for static tension (with deviation wherever specified), dead load of conductors, insulators and accessories, erection load, short circuit forces, wind/seismic loads and secondary stresses. The girders will be connected with lattice columns by bolted joints.
- 7.03.04 The fabrication and erection of the works shall be carried out generally in accordance with IS:802 Part II (Latest), IS:800 (latest) as well as the stipulation contained in this specification. All materials shall be completely shop fabricated.
- 7.03.05 The design of foundation and all trenches should take care of any sub-soil water pressure that may be encountered. The design shall be as per relevant IS codes. Approved water proofing cement additive are to be used in the concrete for cable duct.
- 7.03.06 No foundations shall rest on filled up soil. All foundations shall be founded at a level at least 500mm below the virgin soil.
- 7.03.07 All anchors, anchor bolts, insert pipes, conduct sleeves, bolts etc. and any other item that is required to be embedded in concrete shall be placed in position before concreting. Extra care shall be taken to maintain their position. These inserts shall be welded to the nearest reinforcement to keep them in position.