

VOLUME – IIA

TECHNICAL SPECIFICATION

SECTION – 7

STRUCTURES

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Clause No.	Particulars
1.1	General
1.2	Lighting Masts void
1.3	Design drawings, Bill of materials and Documents
1.4	Fabrication of steel
1.5	Assembly
1.6	Bolting
1.7	Welding
1.8	Foundation Bolts
1.9	Stability of structures
1.10	Grouting
1.11	Galvanizing
1.12	Inspection before dispatch
1.13	Test certificate
1.14	Erection
1.15	Safety Precautions

**VOLUME - IIA**  
**TECHNICAL SPECIFICATIONS**  
**SECTION 7.0**  
**(STRUCTURE)**

**1.0 GENERAL**

- 1.1 The scope of specification covers fabrication, proto-assembly, supply & erection of galvanized steel structure of towers, girders, lightning masts & equipments structure. Towers, girders, lightning masts, support structure shall be lattice/tubular type structure fabricated from structural steel conforming to IS:2062 (latest). Single line diagrams are provided for lattice type towers/ girders/lightning mass. Bidder has to develop the structural drawing for the same based on the single- line diagrams and switchyard diagram. Based on the switchyard requirements like live- point height, phase to phase dimension and weight, dimensions of the equipment / post insulators, the supporting structures are to be designed by the successful bidder, which shall be approved by the owner. Lattice type structures are proposed for all equipments and tubular type is proposed for post insulators.

The scope shall include all types of structures include bolts, nuts, hangers shackles, clamps step bolts, inserts in concrete , gusset plates, equipment mounting bolts, structure earthing bolts, foundation bolts, spring washers, fixing plates angles & bolts for structure mounted or ground mounted marshalling boxes AC/DC Marshalling box & equipment control cabinets) and any other item as required to complete the job.

The connection of all structures to their foundations shall be by base plates embedded anchor/ foundation bolts. All steel structures & anchor/ foundation bolts shall be fully galvanized. The weight of the zinc coating shall be atleast 0.610Kg/sq m for anchor/ foundation bolts & for structural members. One additional nut shall be provided below the base plate, which may be used for the purpose of leveling.

**1.2 Lighting masts**

The lighting masts shall be fabricated as per owner's design and fabrication drawings lighting masts shall be provided with the structural steel ladder. The ladder shall be provided with protection rings. Platform shall be provided for mounting of lighting fixtures. The platform shall also have protection railing.

**1.3 DESIGN DRAWINGS, BILL OF MATERIALS AND DOCUMENTS**

The towers beams and lightning masts shall be fabricated as per the single line diagrams furnished. In the part 1 of Technical specifications, only the single line diagrams enclosed.

In respect of support (mounting) structures, the bidder has to quote as per the respective equipment structure designs. Successful bidder has to furnish the fabrication drawings based on the equipments to be supplied, heights to be maintained which shall be approved by owner. Only after getting the due approval of the owner the fabrication work shall be taken up.

i. FOR STANDARD STRUCTURES

- a. Towers, Girders, Beams, Lightning masts, equipment support structures etc of 110KV/66KV class have all been standardized by the owner and fabrication drawings (structure assembly drawing) alongwith bill of material shall be provided by the owner for all these standard structures to the successful bidder after the letter of award based on which structures shall be supplied.
- b. Contractor shall however not be relieved of his responsibility for the safety of the structure and good connections and any loss or damage occurring due to defective fabrication, erection or workmanship shall be borne by the contractor.

ii. FOR STRUCTURES DESIGNED BY THE CONTRACTOR (To be referred only for structures for which design is included in the scope of the Contractor)

- a) The Contractor shall furnish design, drawing and BOMs and shop manufacturing drawings for every member to the owner after award of the Contract. The design drawing should indicate not only profile, but section, numbers and sizes of bolts and details of typical joints. In case owner feels that any design drawing, BOM are to be modified even after its approval, Contractor shall modify the designs and drawings and resubmit the design drawings, BOM as required in the specifications.
- b) The fabrication drawings to be prepared and furnished by the Contractor shall be based on the design approved by the owner. These fabrication drawings shall indicate complete details of fabrication and erection including all erection splicing details and typical fabrication splicing details, lacing details, weld sizes and lengths. Bolt details and all customary details in accordance with standard structural engineering practice whether or not given by the owner. The fabrication drawings shall be submitted to the owner. Proto shall be made only after approval of fabrication drawings

- c) Such approval shall, however, not relieve the contractor of his responsibility for the safety of the structure and good connections and any loss or damage occurring due to defective fabrication, design or workmanship shall be borne by the Contractor.
- iii. The mass fabrication work shall start only after the final approval to the proto corrected fabrication drawing is accorded by the owner. Proto assembly shall be required to be carried out only for these structures that have not been proto-assembled by the fabricators for this contract or for earlier contracts from KPTCL. Wherever proto-assembly is not to be repeated, proto-corrected drawings shall be submitted directly with a note on the drawing stating that proto-assembly has been carried out under a particular previous contract.

#### 1.4 FABRICATION OF STEEL :

- i. The contractor shall bear the expenditure at all stage on account of loading unloading transportation and other miscellaneous expenses and losses and damages for all materials up to the fabrication yard shop and there-after to the erection site including all other expenses till the erection of work has been completed and accepted. The unit rates shall be deemed to be inclusive of all such incidental expenses and nothing extra shall be payable on any account in this regard.
- ii. The fabrication and erection shall be carried out generally in accordance with IS: 802 (latest). A reference however may be made to IS: 800(latest) in case of non-stipulation of some particular provision in IS: 802 (latest). All materials shall be completely shop fabricated furnished with proper connection material & erection marks for ready assembly in the field.

#### 1.5 PROTO ASSEMBLY:

- i) The component parts shall be assembled in such a manner that they are neither twisted nor otherwise damaged & shall be so prepared that the specified camber, if any, is provided. In order to minimize distortion in member the component parts shall be positioned by using the clamps, clips, dogs, jigs & other suitable means & fasteners (bolts & welds) shall be placed in a balanced pattern. If the individual components are to be bolted paralleled & tapered, drifts shall be used to align the part so that the bolts can be accurately positioned.
- ii) Sample towers, beams & lightening masts shall be trial assembled keeping in view the actual site conditions, before erection, in the fabrication shop & shall be inspected & approved by owner before mass fabrication. Necessary match marks shall be made on these components in the shop before disassembly & dispatching. For all structures, bill of materials alongwith proto connected fabrication

drawing shall be prepared and submitted to owner as document for information. Such Bill of material, which shall be duly certified by the Contractor for its conformity to the drawing issued by owner shall be the basis for owner to carry out inspection.

#### 1.6 BOLTING

- i) Every bolt shall be provided with a spring washer under the nut so that no part of the threaded portion of the bolt is within the thickness of the parts bolted together.
- ii) All steel items, bolts, nuts & washers shall be hot dip galvanized.
- iii) 2% extra nuts & bolts shall be supplied for erection-

#### 1.7 WELDING:

The work shall be done as per approved fabrication drawing which clearly indicate various details of joints to be welded, type of weld, length & size of weld, whether shop or site weld. Symbols for welding on erection & shop drawings shall be according to IS: 813. Efforts shall be made to reduce site welding so as to avoid improper welding due to constructional difficulties.

#### 1.7 FOUNDATION BOLTS:

- 1.7.1 Foundation bolts for the towers & equipment supporting structures & elsewhere shall be embedded in first stage concrete while the foundation is cast. The contractor shall ensure the proper alignment of these bolts to match the holes in the base plate.
- 1.7.2 The contractor shall be responsible for the correct alignment & leveling of all steelwork on site to ensure that the towers/ structures are plumb.
- 1.7.3 All foundation bolts for lattice structure, pipe structure are to be supplied by the contractor.
- 1.7.4 All foundation bolts shall be fully galvanized so as to achieve 0.61 Kg per.sq m. of zinc coating as per specifications

#### 1.8 STABILITY OF STRUCTURE:

The supplier shall be responsible for the stability of the structure at all stages of its erection at site & take all necessary measures by the additions of temporary bracing's and guying to ensure adequate resistance to wind and also to loads due to erection equipment and their operation.

#### 1.9 GROUTING:

The method of grouting the column bases shall be subject to approval of owner & shall be such as to ensure a complete uniformity of contact over

the whole area of the steel base. The contractor will be fully responsible for the grouting operations.

1.10 GALVANIZING:

- 1.10.1 All structural steel works & single pipe supports shall be galvanized after fabrication as per IS:2629(latest) IS:4759 (latest).
- 1.10.2 Zinc required for galvanizing shall have to be arranged by the manufacturer. Purity of zinc to be used shall be 99.5% as per IS:209 (latest revision)
- 1.10.3 The contractor shall be required to make arrangement for frequent inspection by the owner as well as continuous inspection by a resident representative of the owner, if so desired for fabrication work.

1.11 INSPECTION BEFORE DISPATCH:

Each part of the fabricated steelwork shall be inspected certified by the owner or his authorized representative as satisfactory before it is dispatched to the erection site. Such certification shall not relieve the contractor of his responsibility regarding adequately & completeness of fabrication.

1.12 TEST CERTIFICATE:

Copies of all test certificates relating to materials procured by the contractor for the works shall be forwarded to the owner.

1.13 ERECTION:

The contractor should arrange his own erection plant & equipment, welding- set, tools tackles, scaffolding, trestles equipment's etc-, & any other accessories & ancillaries required for the work. The erection work shall be started after concrete has acquired its full strength i.e, 14 days . The members shall not be subjected to any undue stress, damage to steel or galvanizing during erection.

1.14 SAFETY PRECAUTIONS:

The contractor shall strictly follow at all stages of fabrication, transportation & erection of steel structures, raw materials & other tools & Tackles, the stipulation contained in Indian Standard Code for erection for structural steel work as per IS: 7205. (Latest revision).