



**BHARAT HEAVY ELECTRICALS LIMITED**  
**TRANSMISSION PROJECTS ENGINEERING MANAGEMENT**  
**NEW DELHI**

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<b>CUSTOMER/CONSULTANT</b>	<b>MADHYAPRADESH POWER TRANSMISSION CO. LTD.</b>
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<b>PROJECT</b>	<b>400KV LINES AT BALAGHAT AND BADANAWAR</b>
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## **SECTION - 1**

### **SCOPE, SPECIFIC TECHNICAL REQUIREMENTS & QUANTITIES**

#### **1.1 SCOPE**

The scope of this specification is to specify all details required by a supplier for preparation detailed fabrication drawings (structure assembly drawings), fabrication, proto assembly, galvanising and supply of galvanized steel structures for 400kv transmission lines Badnawar and Balaghat being executed by BHEL on turnkey basis for Madhyapradesh Power Transmission Co. Ltd..

The detailed scope of work is preparation, submission and approval of detailed fabrication drawings (structure assembly drawings), proto-corrected drawings, fabrication, galvanizing, testing and supply of all type of transmission line towers including stub assembly and stub templates made of channels, angles, etc., base plates, stiffener plates and other such items required to complete the job excluding all fixtures, such as nuts, bolts, step bolts and washers. However, detailed and accurate bill of quantities for nuts, bolts, step bolts and washers shall be given by the supplier in the drawings submitted by him. The detailed structure assembly drawing shall be prepared based on input/line sketches provided by BHEL.

**Structure drawing will be provided by BHEL in pdf format.**

#### **1.2 SPECIFIC TECHNICAL REQUIREMENTS**

The specific technical requirements shall be as per Standard Technical Specification (Refer Section 2).

#### **1.3 QUANTITIES**

The quantities indicated are tentative & it may change to any extent during detailed engineering at contract stage.

S.No	Item description	Unit	Quantity		
			Balaghat	Badnawar	Total
1	Preparation of shop drawings based on fabrication drawings (Line diagram) provided by BHEL, fabrication of 400 kV and 11 kV line towers (mild steel and HT steel as required) , proto assembly, submission of proto corrected drawings/BOMs, mass fabrication, galvanising, inspection and supply of lattice type galvanized steel structures including stub assembly. (Zinc coating 610 gms/sq.m)				
a	Mild steel (Galvanized)	MT	149	244	393
b	HT (High Tensile) steel (Galvanized)	MT	107	180	287
2	Supply of MS templates made of channels, angles etc. for stub setting	MT	7.5	7.5	15

## **SECTION - 2**

### **2.0 GENERAL**

This section covers the standard technical specification for GI Structures.

(In case any variance in Section-2 , Customer specification MPPTCL/TECH/PROC/13/JULY13 shall prevail.)

### **2.1 STEEL MATERIAL**

Mild Steel (MS) and High Tensile (HT) Steel materials shall be tested quality and shall conform to IS:2062, IS:8500 and other relevant IS Codes. Steel material (Both HT and MS) should be procured from Customer approved source.

Steel shall not be pitted and should be free from scales and rust. If the rolled section and plates are bent or distorted, bend or distortion shall normally be removed by the cold treatment. Straightening under hot stage shall be resorted to only under specific permission from BHEL. If any rolling defects viz., laminations, cracks etc. are discovered in the steel during the processing, it is to be rejected.

#### **TOLERANCE:**

The dimensional and weight tolerances for rolled shapes shall be in accordance with IS:1852-1991.

No rolled or fabricated member shall deviate from straightness by more than 1/1000 of the axial length or 10mm which ever is smaller.

### **2.2 FABRICATION**

#### **GENERAL:**

All the workmanship and finish shall be of the best quality and shall conform to the best approved method of fabrication. All materials shall be finished straight and shall be machined true and square where so specified. All holes and edges shall be free of burrs. Shearing and cropping shall be neatly and accurately done and all portions of work exposed to view shall be neatly finished. Material at the shops shall be kept clean and protected from weather.

The fabrication of galvanized steel structures shall be carried out generally in accordance with IS:802 part. II, IS:800-1984. All materials shall be completely shop fabricated. Normally, butt splices shall be used. The components constituting the joint shall have a total strength greater than the heavier of the members connected. Lap splices may be used for connecting members of unequal sizes. The inside angle of lap splice shall be grounded at the heel to fit the fillet of the outside angle. The splices shall develop full strength of the members connected through bolts. Butt as well as lap splices shall be made as close to the main panel points as possible.

Joints shall be so designed and detailed as to avoid eccentricity as far as possible. However, where joints are such that the elimination of gusset plates would result into eccentric joints, gusset plates and spacer plates may be used in conformity with modern practices.

The use of filler in the connections shall be avoided as far as possible. The diagonal members in tension may be connected entirely to the gusset plate where necessary to avoid the use of fillers. Each diagonal shall be in one piece without splices or center gussets, and it shall be connected at the point of intersection by one or more bolts.

The gap between the ends of two connected members in butt joints shall not be more than 6 mm and less than 4mm.

The tower structure members shall be accurately fabricated to bolt together easily at site without any undue strain on them or the bolts.

Drain holes shall be provided at all points where pockets or depressions are likely to hold water.

For designing of towers , preferably rationalized steel sections shall be used. During execution of the project, if any particular section is not available same shall be substituted by higher section at no extra cost to owner and the same shall be borne by the bidder. However design approval for such substitution shall be obtained from owner before submission.

#### **STRAIGHTENING:**

For rolled steel material, if straightening or flattening is necessary, it shall be done by methods that will not injure the materials.

#### **CUTTING:**

Cutting may be affected by chopping, cropping, sawing or machine flame cutting. Sheared or cropped edges shall be dressed to a neat workmanlike finish and shall be free from distortion and burrs.

#### **PUNCHING AND DRILLING:**

Holes in members may be punched full size through material not over 12mm thick. Holes must be cleaned of burrs and ragged edges. Drilled holes shall be preferred. Holes made by drilling shall also be cleaned of burrs and ragged edges. Where several parts are to be drilled, they shall be first assembled, tightly clamped together and drilled through.

Punched holes must be square with plates and the walls of the holes shall be parallel. The following maximum allowance in accuracy of punched holes is permissible:

- i) Holes must be perfectly circular and no tolerance in this respect is permissible.

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- ii) The maximum allowable difference in diameter of the holes on the two sides of plates or angle is 0.8 mm, i.e. the allowable taper in punched holes should not exceed 0.8 mm in diameter.
- iii) Holes must be square with the plates. Holes at angle or slant shall not be permitted.

The minimum spacing of bolts and edge distances shall be as given below:

Bolt Diameter	Minimum Bolt Spacing	Maximum edge distance	
		Hole center To rolled Edge (mm)	Hole center to cut/ flame edge (mm)
(mm)	(mm)	(mm)	(mm)
16	40	20	23

**WELDING:**

The work shall be done as per approved fabrication drawings, qualified welding procedure specifications (WPS) and by qualified welders. Procedure qualification records (PQR) shall be maintained. Electrodes for shielded arc manual welds shall comply with the requirements of IS:814 - 1991. All welds shall be free from defects like blow holes, slag inclusions, lack of penetration, under cutting, cracks etc. All welds shall be cleaned of all slag or flux before galvanizing.

**MARKING OF MEMBERS FOR IDENTIFICATION.**

All members shall be marked for identification during erection. This mark shall correspond to distinguishing marks on approved erection drawings and shall be legibly painted and stamped on. The erection mark shall be stamped with a metal dye with figures at least 16 mm high and to such optimum depth as to be clearly visible, even after a member is galvanized. All erection marks shall be on outer surface of all sections and near one end, but clear of bolt holes. Marking shall be so stamped that they are easily discernible when sorting out members. The stamped marking shall be encircled boldly by a distinguishable paint to facilitate easy location.

Erection marks on like pieces shall be in identical locations. Members having lengths of 3.0 M or more shall have the erection mark at both ends.

**PROTOTYPE ASSEMBLY:**

Towers shall be trial assembled at shop before galvanizing i.e. prototype assembly keeping in view the actual site condition prior to dispatch to testing station/erection sites. The prototype assembly of each structure shall be got approved from BHEL/Customer as directed. Necessary match marks shall be made on each components before dismantling the prototype assembly and galvanizing. Any error shall be rectified at the expense of the contractor.

No extra charge on account of erecting the assemblies or getting them inspected will be permissible. It is however to be mentioned that the responsibility for proper fitting of various members for the erection of the structure in the field will rest with the supplier and any discrepancy found at the time of erection will have to be rectified by the contractor at his cost.

### **2.3 GALVANISING:**

All structural steel works shall be hot dip galvanized after fabrication. Galvanizing of each members shall be carried out in one complete immersion and double dipping shall not be permitted.

Zinc required for galvanizing will have to be arranged for by the Contractor. Purity of zinc to be used for galvanizing shall be 99.5% as per IS:209-1992.

All burrs and irregular edges shall be ground smooth before galvanizing.

After all shop work is complete, all structural materials shall be punched with the Erection Mark and be hot dip galvanized. Before galvanizing the steel section shall thoroughly be cleaned of any paint, grease, rust, scale, acid/alkali or such other foreign matters as are likely to interfere with the galvanizing process or with the quality and durability of the zinc coating. Pickling shall be carefully done and shall be proper.

Minimum weight of zinc coating shall be 610gms/sqm. However, higher coating may be provided as per requirement.

The galvanized surface shall consist of a continuous and uniformly thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discolored patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel, globules, spiky deposits, blistered surface flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

There shall be no flaking or loosening when struck squarely with a chisel faced hammer. The galvanized steel member shall withstand minimum four one minute dips in copper sulphate solution as per IS: 2633 - 1986.

When the steel section is removed from the galvanizing kettle excess spelter shall be removed by 'bumping'. The processes known as 'wiping' or 'scrapping' shall not be used for this purpose.

Defects in certain members indicating presence of impurities in the galvanizing bath in quantities larger than that permitted by the specification, or lack of quality control in any manner in the galvanizing plant shall render the entire production in the relevant shift liable to rejection.

All the galvanized structural steel members and accessories shall be treated with sodium dichromate or an approved equivalent solution after galvanizing, so as to prevent white storage stains.

If the galvanizing of any member is damaged, BHEL shall be shown of the extent of damage and if so directed the galvanizing may have to be redone in the similar manner as stated above at no extra cost.

Contractor shall also furnish sufficient quantity of appropriate paint, free of cost, for repairing galvanized surfaces damaged in transit, and minor modifications done at site during erection.

Galvanizing tests shall be made from time to time on as many samples as may be considered necessary. The supplier shall supply all samples and equipment and carry out the tests without any extra cost.

## **2.4 INSPECTION OF MATERIALS**

### **GENERAL:**

Contractor shall give notice to BHEL/ Customer in advance for inspection of materials. All rejected material shall be promptly removed from the shop and replaced with new material for BHEL/ Customer approval/ inspection. The fact that certain material has been accepted at Contractor's shop shall not invalidate final rejection at site by BHEL/ Customer if it fails to be in proper condition or has fabrication inaccuracies which prevent proper assembly. No materials shall be painted, galvanized or dispatched to site without the inspection and approval by BHEL/ Customer unless such inspection is waived off in writing by BHEL/ Customer.

Shop inspection by BHEL/ Customer, for submission of test certificates and acceptance thereof by BHEL/ Customer shall not relieve contractor from the responsibility of furnishing material conforming to the requirements of these specifications, nor shall it invalidate any claim which BHEL/ Customer may make because of defective or unsatisfactory material and workmanship.

Contractor shall provide all the testing and inspection services and facilities for shop work. For fabrication work carried out in the field the standard of supervision and quality control shall be maintained as in shop fabricated work. The inspection and testing shall be conducted in a manner satisfactory to BHEL/ Customer.

The supplier shall submit QP (Quality Plan) detailing each stage of manufacturing i.e. raw-material, in process and final inspection for approval by BHEL/Customer in the prescribed format. The final Quality plan shall be approved by BHEL/ Customer.

### **MATERIAL TESTING**

If mill test reports are not available for any steel materials the same shall be got tested by the contractor and demonstrate conformity with the relevant specification to the full satisfaction of BHEL/ Customer. The cost of such tests shall be borne by the contractor.

#### **DIMENSIONS AND WORKMANSHIP:**

The Structural Steel members shall be inspected at all stages of fabrication and assembly to verify that dimensions, tolerances, alignment and surface finish, are in accordance with the requirements shown in Contractor's approved shop drawings.

#### **INSPECTION OF TEST FAILURE:**

In the event of any failure of structural steel members to meet an inspection or test requirement, contractor shall inform BHEL/ Customer and must obtain permission from the BHEL/ Customer before repair is undertaken. The quality control procedures to be allowed to ensure satisfactory repair shall be subject to approval by BHEL/ Customer.

### **2.5 PACKING TRANSPORTATION AND DELIVERY**

After completion of final inspection and marking, the fabricated galvanized structural items shall be packed and loaded for transportation.

Packing must be adequate to protect items against bending and any mechanical injuries and damage to galvanized film during loading and unloading. As far as possible, like member should be bundled together and tied.

Proper lifting devices shall be used for loading at shop and unloading at site in order to protect items against bending, mechanical injuries and damage to galvanized film.

Loading, transporting and unloading shall be done in compliance with transportation rules.

Slender and projected parts shall be braced properly with additional spacer steel bars, spacer wood etc, before loading for transportation, to protect against bending or any other damages during transportation.

If certain parts cannot be transported in the lengths stipulated in the design drawing, the position and type of additional splice joints shall be got approved from BHEL/ Customer.

Items must be carefully loaded and tied up properly to prevent bending, falling etc. during transportation.

The small parts such as plates, gussets, cleats etc. shall be securely tied with the wire, and packed in wooden boxes and properly identified.

As far as possible the delivery of fabricated galvanized structural steel shall be as per the order stipulated by BHEL/ Customer and to suit the erection sequence.

Contractor shall make good/ replace at his own cost any damage occurred during loading, transporting, unloading and stacking of fabricated galvanized



steel structures as directed by BHEL/ Customer. No extra payment on this account shall be entertained under any circumstances.

## **2.6 APPLICABLE STANDARDS**

Unless otherwise specified, materials, and workmanship shall conform to the following standards of their latest editions:

- |     |   |   |
|-----|---|---|
| 1.  | IS : 209  | - Zinc Ingot.   |
| 2.  | IS : 228  | - Method of chemical analysis of pig iron, cast iron, plain carbon and low alloy steel. |
| 3.  | IS : 406  | - Methods of analysis of zinc (Spelter).  |
| 4.  | IS : 800  | - Code of practice for general construction.  |
| 5.  | IS : 802 - Part1 -<br>Part1/Sec.2<br>- Part 2<br>- Part 3 | - - Code of Practice for use of structural in over head Transmission line towers.       |
| 6.  | IS : 806  | - Code of practice for use of steel tubes in general building construction.             |
| 7.  | IS : 808  | - Dimensions for hot rolled steel beam, column, channel and angle sections.             |
| 8.  | IS : 814  | - Covered electrodes for manual metal arc welding of carbon and carbon manganese steel. |
| 9.  | IS : 816  | - Code of Practice for use of metal arc welding for general construction in mild steel. |
| 10. | IS : 817  | - Code of practice for training & testing of Metal Arc welders.                         |
| 11. | IS : 1161   | - Steel tubes for structural purposes.  |
| 12. | IS : 1599   | - Method of bend test   |
| 13. | IS : 1608   | - Method of tensile testing of steel  |

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products.

- |     |           |   |
|-----|-----------|---|
| 14. | IS : 1852 | - Rolling and cutting tolerances for hot rolled steel products.                           |
| 15. | IS : 1978 | - Line pipe   |
| 16. | IS : 2062 | - Steel for general structural purposes.  |
| 17. | IS : 2074 | - Ready Mixed Paint, air drying red oxide zinc, chrome, priming.                          |
| 18. | IS : 2629 | - Recommended practice for hot dipped galvanising on Iron & Steel.                        |
| 19  | IS : 2633 | - Methods for testing uniformity of coating on zinc coated articles.                      |
| 20. | IS : 3502 | - Steel chequered plates.   |
| 21. | IS : 4759 | - Hot dip zinc coating on structural steel and other allied products.                     |
| 22. | IS : 6745 | - Method for determination of mass of zinc coating on zinc coated iron and steel articles |
| 23. | IS : 8500 | - Specification for micro-alloyed structural steel  |

# **CUSTOMER SPECIFICATION FOR TRANSMISSION LINE**

**(In case of any variance in Section -2 , Customer specification shall prevail.)**

**MADHYA PRADESH POWER TRANSMISSION CO. LTD.**

**SHAKTI BHAWAN RAMPUR: JABALPUR**



**VOLUME –V(Part-2)**

**Technical Book Serial No.  
MPPTCL/TECH/PROC/13/JULY13**

**TECHNICAL SPECIFICATION FOR SUPPLY  
OF MATERIALS AND CONSTRUCTION OF  
400KV TRANSMISSION LINES.**

**O/o CHIEF ENGINEER (PROCUREMENT)  
MPPTCL, JABALPUR.**

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## SECTION-1

### COMMON TECHNICAL REQUIREMENT

#### 1.1 SCOPE:

**1.1.1 The provisions under this section are to supplement common requirements for supply of Transmission Line Materials and Installation work. Section-2 to Section-8 contains technical specification for all the Materials to be used for Construction of Transmission Lines. The bidders shall furnish catalogues, engineering data / technical information, drawing etc. in conformity with the technical specification.**

**1.1.2 The scope of work involves fabrication, galvanizing and delivery of 400kV Double Circuit towers, their body extensions, river crossing Towers, Hangers, U bolts, D Shackles, Bolts and Nuts, Spring washers, pack washers, step bolts, tower accessories (earthing rod with clamps, Danger Boards, Number plates, Phase plates and Anti-climbing Devices (including fixing arrangements and barbed wire), ACSR Conductor, Earth wire, Disc insulators, hardware and accessories for conductor and Earth wire and complete erection of transmission lines including, detailed survey/check survey, casting of foundations, tower erection, stringing etc. and testing & commissioning of the transmission lines. Cement and reinforcement steel for foundation of towers, extensions, river/ line crossing structures and any such materials required for erection work shall also be provided by the successful Bidder. **The Bidder is also required to provide required number of stub setting templates for each installation work at his own cost.****

**1.1.3 This section also provides for the Design, manufacturing, stage testing, inspection and testing before despatch, packing and delivery of materials for use on 400kV transmission lines in the State of Madhya Pradesh.**

**1.1.4 It is not the intent to specify completely herein all details of the design and construction of Material. However, the Material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing the duties specified herein. The Material offered shall be complete with all components necessary for its effective and trouble free operation. Such components shall be deemed to be within the scope of Bidder's supply, irrespective of whether these are specifically brought out in this specification or not.**

**1.1.5 If due to site condition any other type of tower (which is not envisaged at present) is required to be provided, the same will also be supplied by the bidder at the same rates terms and conditions.**

#### 1.2 CLIMATIC CONDITION

**The equipments and materials shall be suitable for satisfactory continuous operation under the following climatic conditions:**

1	Location in the state of	MADHYA PRADESH
2	Maximum ambient air temperature ( $^{\circ}\text{C}$ )	50
3	Minimum temperature in shade ( $^{\circ}\text{C}$ )	1
4	Maximum relative humidity (%)	95(sometimes approaches saturation)
5	Average daily ambient air temperature ( $^{\circ}\text{C}$ )	32 $^{\circ}$ Centigrade

6	ISOCERANIC Level (days/year) (Average number of thunder storm days)	50
7	Average rainfall(mm)	1250
8	Wind Zone as per IS 802(Part-I)- 1995	4
9	Max. Altitudes above mean sea level (meters)	1000
10	Seismic level (Horizontal acceleration) (g)	0.3

NOTE: **Moderately hot and humid tropical climate conducive to rust and fungus growth. The climatic conditions are also prone to wide variations in ambient conditions. Smoke is also present in the atmosphere. Heavy lightening also occurs during June to October.**

### 1.3 STANDARDS:

- 1.3.1 Bidders may please note that all offered materials shall be manufactured, tested and supplied with all guaranteed technical particulars generally conforming to meet the requirement of technical specification as brought out in various Sections and latest revisions of relevant standards of international electro technical commission or equivalent national standards of India with latest amendments of relevant standards rules and codes. The lists of standards are specified in relevant Sections of bid document.
- 1.3.2 The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules Laws and Regulations of India.
- 1.3.3 The Contractor shall also note that list of standards presented in this specification is not complete. Wherever necessary the list of standards shall be considered in conjunction with specific IS/IEC.
- 1.3.4 When the specific requirements stipulated in the specifications exceed or differ than those required by the applicable standards, the stipulation of the specification shall take precedence.

### 1.4 ACCEPTANCE OF OTHER AUTHORITATIVE STANDARDS :

- 1.4.1 The lists of Indian standards are specified in individual sections for various materials and Installation work of bid document. However, the Material and Installation work meeting any other authoritative International Standard, which ensures equal or better quality than the Standards mentioned in bid document, shall also be acceptable. **Material for which Indian Standards are not available, any equivalent International Standards will be applicable. Please attach photocopy of all such Standards according to which the material and Installation work have been offered.**
- 1.4.2 If the material offered by the Bidder conform to any other standards, salient points of comparison between the standards adopted and the specific standards shall be clearly brought out in relevant schedule of deviation. It will be sole responsibility of Bidder to prove that the salient features of offered materials are equivalent or better than Indian standards as indicated in Section-2 to Section- 8 of Volume-V(Part-1) of bid document.
- 1.4.3 The Material and Installation work conforming to standards other than specified in individual sections for various Material and Installation work shall be subject to Employer's approval.

**1.5 TYPE TESTS:**

1.5.1 Type tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the Material.

1.5.2 The offered Material (except Towers & Tower Accessories) should be fully type tested as per the relevant standards. Bidder shall invariably furnish type test reports from the reputed and approved national/international laboratory/Government approved test houses to prove that specifications of Material to be supplied conform to the relevant standard. Test certificates shall clearly indicate the type and other details etc., so that relevant details of offered Material could be verified. While submitting the bid the details and type etc., shall be clearly indicated. Type test reports so furnished should not pertain to the period earlier than five years from the date of opening of Bid. In case the type tests were carried out earlier than five years, the manufacturer will have to conduct these tests without any extra cost to the Employer. In both the above cases type test certificate must be submitted with the offer. The Bidders have to submit one complete set of Test reports for the offered Material. Further, for any change in the design/type already type tested and the design/type offered against this specification, the Employer reserves the right to demand repetition of tests without any extra cost.

**1.6 DISCREPANCY IN TECHNICAL PARTICULARS:**

The bidders will have to furnish confirmation in regard to compliance of our entire technical requirement. The bid should clearly describe various technical particulars of the material as per this specification.

**1.7 MANUFACTURER'S AUTHORISATION:**

The bidders shall have to submit the documentation from the manufacturer of the Material on the format specified in this volume that they are authorised to supply the material indicated in their bids in the employer's country

**1.8 SCHEDULE OF QUANTITIES:**

1.8.1 The requirements of various Materials and Installation work are indicated in Price Schedules. In these schedules short description of material has been given. The details of all such description are given in relevant sections of Volume-V(Part-1) of bid document. The bidder shall refer these detailed descriptions for clarity.

1.8.2 Although all the quantity of Material and Installation work have been included in the bid as mentioned in Price Schedules. However there may be requirement of some minor nature items required for successful erection / commissioning of transmission line work covered under this Bid. Bidder should include all such items in the bid proposal sheets which are not specifically mentioned but are essential for the execution of the contract. The cost of supply of such item which explicitly may not appear in various schedules and are required for successful commissioning of transmission line shall deemed to be inclusive in the bid price and shall be provided at no extra cost to Employer.

**1.9 PERFORMANCE GUARANTEE PERIOD:**

All the Material & its accessories and Installation work covered under the Bid shall guaranteed for performance and quality for a period of 24 months from the date of completion of facilities (or any part thereof). In case after commissioning of transmission line, any operational problem is observed in



any Material/ installation work because of which any major rectification or replacement work is done, then the guarantee for such Material / installation work shall be extended by a period equal to the period during which the facilities or such part can not be used by the EMPLOYER.

**1.10 WORKMANSHIP:**

All Material shall be of the best class and quality most suitable for the conditions of operation under the climate conditions as per clause no. 1.02 above for supply of Material. The workmanship shall be of the best grade and the entire construction in accordance with the best modern practice.

**1.11 DRAWINGS AND DOCUMENTS:**

1.11.1 In addition to those stipulated in Vol. I of bidding document, the following also shall apply in respect of Contractor drawings.

1.11.2 With in one month from the award of contract, the contractor shall submit the drawing of all Material for approval. Each drawing submitted by the Contractor shall be clearly marked with the name of the EMPLOYER, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in S.I. units.

1.11.3 The comments/ approval to drawings submitted by the Contractor shall be conveyed by the EMPLOYER as far as practicable within 15 days and shall be modified by the Contractor if any modifications and/or corrections are required by the EMPLOYER. The Contractor shall incorporate such modifications and/or corrections and submit the final drawings for approval with 15 days from date of EMPLOYERs comments. Any delays arising out of failure by the Contractor to rectify the drawings in good time shall not alter the Contractual Time Schedule.

1.11.4 The drawings submitted for approval to the EMPLOYER shall be in quadruplicate. One print of such drawings shall be returned to the Contractor by the EMPLOYER marked "approved/approved with corrections". The contractor shall there upon furnish the EMPLOYER additional prints as may be required along with one reproducible in original of the drawings after incorporating all corrections.

1.11.5 The work shall be performed by the Contractor strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the EMPLOYER, if so required.

1.11.6 All manufacturing, fabrication and Installation work under the scope of Contractor, prior to the approval of the drawings shall be at the Contractor's risk. The contractor may incorporate any changes in the design, which are necessary to confirm to the provisions and intent of the contract and such changes will again be subject to approval by the EMPLOYER.

1.11.7 The approval of the documents and drawings by the EMPLOYER shall mean that the EMPLOYER is satisfied that:

- a. The Contractor has completed the part of the Works covered by the subject documents (i.e. confirmation of progress of work).
- b. The Works appear to comply with requirements of Specifications.

In no case the approval by the EMPLOYER of any document does imply compliance with all technical requirements or the absence of errors in such documents.

If errors are discovered any time during the validity of the contract, then the Contractor shall be responsible for consequences.

- 1.11.8 All drawings shall be prepared using AutoCAD software. After final approval all the drawings and documents (structural drawings, BOMs, shop sketches, tower accessories drawings and drawings of other materials) shall be submitted to the EMPLOYER in CDs.

A copy of each drawing reviewed will be returned to the Contractor as stipulated herein.

- 1.11.9 Copies of drawings returned to the Contractor will be in the form of a print with the EMPLOYER's marking.

- 1.11.10 All rights of the design/drawing for all Material and Installation work drawings shall be strictly reserved with the EMPLOYER only and any designs/drawings/data sheets submitted by the contractor from time to time shall become the property of the EMPLOYER. Under no circumstances, the contractor shall be allowed to use/offer above designs/drawings/data sheets to any other authority without prior written permission of the EMPLOYER. Any deviation to above is not acceptable and may be a cause for rejection of the bid.

- 1.11.11 The manufacturing of the material shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the EMPLOYER. All manufacturing and fabrication work in connection with the material prior to the approval of the drawing shall be at Contractor's risk.

- 1.11.12 Approval of drawing/works by EMPLOYER shall not relieve the Contractor of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The plant shall conform in all respect to high standards of engineering, design, workmanship and latest revisions of relevant standards. EMPLOYER shall have the power to reject any work or material, which in his judgment is not in full accordance therewith.

#### **1.12 QUALITY ASSURANCE PROGRAM:**

- 1.12.1 Quality Assurance Program : To ensure that the Material and Services under the scope of this contract whether manufactured or performed within the Contractor's works or at his Sub-Contractor's premises or at the EMPLOYER's site or at any other place of work are in accordance with the Specifications, the Contractor shall adopt suitable Quality Assurance Program (QAP) with hold points for EMPLOYER's inspection to control such activities at all necessary points. Such program shall be outlined by the Contractor and shall be finally accepted by the EMPLOYER after discussions.

- 1.12.2 Immediately after award of contract, the contractor shall submit to the EMPLOYER, the quality assurance plan for all major items of Material covering the manufacture and Installation activities of the transmission line. The list of selected sub vendors for supply of minor items like Bolts & Nuts, tower accessories etc. shall also be submitted.

1.12.3 The contractor shall ensure that manufacturer must establish that they are following the accepted quality assurance programme for manufacture of offered equipments.

1.12.4 The contractor shall ensure that manufacturers of major items of Material invariably furnish following information:-

- (i) Statement giving list of important raw materials, names of sub supplier for the raw material, list of standards according to which the raw material are tested, list of tests normally carried out on raw material in presence of manufacturers representative, copies of test certificates.
- (ii) Information and copies of test certificates as in (i) above in respect of bought out items.
- (iii) List of manufacturing facilities available.
- (iv) Levels of automation achieved and list of areas where manual processing exists.
- (v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection.
- (vi) Special features provided in the equipment to make it maintenance free.
- (vii) List of testing equipment available with the manufacturer for final testing of equipment specified and test plant limitations, if any vis-à-vis type, special, acceptance and routine tests specified in the relevant Indian Standards or equivalent international standard. These limitations shall be very clearly brought out in schedule of deviations from specified test equipments.

1.12.5 The Contractor shall follow the accepted Quality Assurance Plan in true spirit. If desired by the EMPLOYER, he shall give access to all the Specifications, equipments and records so as to satisfy the EMPLOYER that Quality Assurance Plan (QAP) is being followed properly.

1.12.6 All Material shall be subjected to the routine and acceptance tests before dispatch, as specified in this Specification.

### **1.13 INSPECTION AND TEST CERTIFICATES:**

1.13.1 All Material to be supplied will be subject to inspection and approval by the EMPLOYER's representative before despatch. Inspection before despatch will not however relieve the contractor of his responsibility to supply the Material strictly in accordance with the specifications.

1.13.2 For Inspection / testing, the contractor shall intimate the EMPLOYER at least 15 days in advance about readiness of Material as per the scheduled delivery so that action may be taken for getting the Material inspected. While notifying the readiness of the Material, the factory test certificate in respect of offered Material shall invariably be sent. The EMPLOYER will depute authorized representative for inspection of Material or alternatively may issue waiver of inspection.

1.13.3 The contractor will submit a test certificate to the EMPLOYER after inspection of offered Material by EMPLOYER's authorized representative. These test certificates should be in accordance with latest issue of the relevant Indian Standards or as approved by the order placing authority.

- 1.13.4 The Material shall not be dispatched unless the test certificates approval and despatch instructions have been issued by the EMPLOYER.
- 1.13.5 All Material shall conform to provisions of any statutory acts such as the Indian Electricity Act, Indian Factory Act, the Indian Boiler Act, etc. and corresponding rules and regulations as may be applicable.
- 1.13.6 The EMPLOYER's representatives shall be entitled at all reasonable time during manufacture to inspect, examine and test at the contractor's premises the material and workmanship of the plant to be supplied under this contract.
- 1.13.7 A copy of the accepted Quality Assurance Plan must be available at the manufacturer's works of the Material for reviewing by inspecting officer of the EMPLOYER.
- 1.13.8 The acceptance of any quantity of plant shall in no way relieve the Contractor of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such plant is later found to be defective. The Contractor will have to assume the responsibility for free replacement/rectification of such defects.
- 1.13.9 Testing Expenses:  
The entire cost of testing for the acceptance and routine tests and tests during manufacture specified in the bid document shall be treated as included in the quoted unit price of plant.

**1.14 SPECIAL REQUIREMENTS:**

- 1.14.1 EMPLOYER expects that participating bidder will take all necessary precautions to supply best quality Material, which may provide trouble free performance and also it is expected that the modern practices for erection and commissioning shall be adopted to ensure timely and trouble free commissioning of installation and also to ensure aesthetic overall view of finished transmission line installation.
- 1.14.2 Some of the conditions which will have to be essentially accepted and followed by the Bidders for the purpose of participating against the Bid and also for undertaking construction activities are enumerated below for specific confirmation by the Bidders.

**1.15 STORE FOR SUPPLY OF MATERIAL:**

The Contractor shall supply the Material at selected destination set up by him along the route of the transmission line. The Contractor will set up above site store within one month from the date of contract and inform the EMPLOYER. The Contractor will have to supply above materials and receive them at these places only and the rates quoted by the Bidder should include charges for delivery of such materials at the store set up by him, receipt and proper stacking/ stocking at the store.

**1.16 COMMENCEMENT OF ACTIVITIES:**

Commencement of following activities is subject to prior and specific approval of the items mentioned against each:-

S. No.	Activity	Items for which prior approval is necessary from Employer
1.	Manufacturing of tower parts.	Inspection of Proto Assembly of each type of tower. Submission of quality assurance plan.
2.	Manufacturing of Conductors, Ground wire, Insulators, Hardware fittings & Accessories for Conductor and Earth wire.	Submission of Quality Assurance Plan, approval of drawings.
3.	Dispatch of towers, Conductors, Earth wire, Insulators, Hardware fittings & Accessories for Conductor and Earth wire.	Acceptance test and issue of test certificate approval
4.	Foundation work.	Classification of foundation.
5.	Erection of tower	Quality Assurance Plan for erection.
6.	Stringing of Conductor and Earth wire.	Stringing chart and stringing method.

#### **1.17 RESPONSIBILITY FOR OBTAINING INFORMATION AND TAKING ACTION IN TIME:**

Whenever any information or clarifications in respect of construction of line has to be obtained from various authorities, the Contractor shall be responsible for taking action well in time so that there are no delays on this account. The completion period specified in the bidding document is deemed to include the time taken for such incidental works. Request for extension of the completion date on such ground will not be entertained.

#### **1.18 PERMITS AND PRIORITIES:**

- 1.18.1 Necessary permits, if any, required for the execution of the contract shall be arranged by the Contractor himself. The Contractor shall obtain the necessary license/permission as per Central/State/local statutory bodies at his cost.
- 1.18.2 The Purchaser may, however, furnish to the Contractor such certificates (on receipt of such written request from the Contractor) as may be required for the necessary permits/priorities for the execution of works, if it considers the demand as justified.
- 1.18.3 The Purchaser however, shall not be responsible for the delay in execution of contract, if permits/priorities are not granted in time in spite of issuance of such certificate.

#### **1.19 WAY LEAVE:**

The purchaser will arrange for necessary way leave and clearance of trees. The Purchaser only will pay the way leave compensation along the route.

The purchaser will also arrange for the following: -

- (i) Railway clearance
- (ii) PTCC clearance
- (iii) Forest clearance

- (iv) Any other necessary clearance if required/requested.

The Contractor shall inform the purchaser about the places where there is a way leave problem, sufficiently in advance (preferably 30 days) so that required way leave can be arranged in time.

#### 1.20 USE OF PRIVATE ROADS/APPROACH ROAD TO SITE:

1.20.1 The purchaser will help in getting necessary permission for use of private/forest/canal, roads for transportation of materials and construction personnels, wherever possible under the rules. Any charges/tole tax etc. levied by the concerned authorities for use of such roads etc. shall be borne by the Contractor.

1.20.2 During the erection work, if approach roads are required to be constructed for reaching the construction sites for transportation of men/materials, the cost of construction of such approach roads and any other expenses incurred in obtaining clearance/permission shall be borne by the Contractor.

#### 1.21 MATERIALS TO BE ARRANGED BY THE CONTRACTOR FOR ERECTION WORK:

1.21.1 The supply of cement for foundation work would be arranged by the Contractor of the quality as per IS - 269 :1989 (Ordinary Portland Cement 33 Grade) or IS - 8112 : 1987 (Ordinary Portland Cement 43 Grade) or IS - 12269 : 1987 (Ordinary Portland Cement 53 Grade) or IS:1489 (Portland-Pozzolana Cement (PPC)). The cost of cement shall be deemed to be included in the quoted unit rates of concreting.

1.21.2 The cement used shall be procured from reputed manufacturer like JP Cement, L&T, Birla Cement, ACC, Ambuja etc. The Contractor shall submit the manufacturer's certificate, for each consignment of cement procured, to the Purchaser. The cement shall be arranged in conventional Jute/HD bags each weighing 50 Kgs net with necessary IS certification mark on it. In case of any dispute regarding quality of cement, sample for testing may be taken jointly by contractor's representative and Engineer in- charge of work or any authorized representative of the Company. The sample taken shall be tested for standard test as per IS code in Govt. Engineering/Polytechnic College and testing charge shall be borne by the contractor. In case the material is found defective i.e. not as per relevant ISS, the same shall be replaced by the contractor at his cost. The Contractor shall also have no claim towards suspension of work due to time taken in conducting tests in the laboratory. Changing of brand or type of cement within the same structure shall not be permitted without the prior approval of the Purchaser.

1.21.3 The Quantity of cement to be used per unit quantity of consumption for different mix (nominal mix) of concrete should be as follows:

S. No.	Description	Unit	Quantity of minimum Cement to be used per Unit quantity of work(in kgs)
1	1:1.5:3 nominal mix concrete	Cu.m.	400
2	1:2:4 nominal mix concrete	Cu.m.	330
3	1:3:6 nominal mix concrete	Cu.m.	220
4	Random Rubble Masonry with 1:6 cement mortar	Cu.m	83

- 1.21.4 The Contractor shall arrange metal, sand, stone and water required for foundation/revetment work. The transport, octroi, levy or duty on these materials shall be borne by the Contractor himself and the purchaser will not accept any liability on this account.
- 1.21.5 The Contractor will also arrange steel rods and binding wires etc. for foundation, reinforcement and the cost incurred will be borne by him. Materials for proper earthing of towers i.e. earthing rod, connecting clamps and connecting wires etc. would also be arranged by the Contractor as already specified.

\* \* \*

**SECTION-2**  
**TECHNICAL SPECIFICATIONS FOR TOWERS**

<b>Clause No.</b>	<b>Name of Clause</b>
2.01	INDIAN STANDARDS/CODE
2.02	TYPE OF TOWERS
2.03	EXTENSIONS
2.04	STUB SETTING TEMPLATES
2.05	DESIGN
2.06	GALVANIZING PASSIVATION AND PAINTING
2.07	MATERIAL
2.08	WEIGHTS
2.09	BOLTS AND NUTS AND WASHERS:
2.10	STEP BOLTS
2.11	DANGER BOARD, NUMBER PLATE AND PHASE PLATES
2.12	ANTICLIMBING DEVICE WITH BARBED WIRE:
2.13	EARTHING
2.14	ATTACHMENT FOR INSULATOR STRING & GROUNDWIRE CLAMPS
2.15	FABRICATION WORKMANSHIP
2.16	BENDING
2.17	DRILLING AND PUNCHING
2.18	TOLERANCES
2.19	MARKING



**SECTION-2**  
**TECHNICAL SPECIFICATIONS FOR TOWERS**

**2.01 INDIAN STANDARDS/CODE :**

The material and services under this specification shall be performed as per the requirements of the latest revisions and amendments available at the time of placement of order of all the relevant Indian standards/codes listed here under or equivalent International Standards , except as modified in this document.

S.No.	Indian standards	Title
1.	IS:209-1992	Zinc ingot- Specification.
2.	IS:278-1991	Galvanized Steel Barbed Wire.
3.	IS:800-1991	Code of Practice for General Building Construction in Steel.
4.	IS:802 -1990 ( Part-II)	Code of practice for use of structural steel in over-head Transmission Line : Fabrication, Galvanising, Inspection & packing.
5.	IS:802 -1990 ( Part-III)	Code of practice for use of structural steel in over-head Transmission Line Towers: Testing
6.	IS:808-1991	Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections.
7.	IS:1363(Part-III)-1992	Specification for Hexagon head bolts, screws and nut for product grade - "C" Hexagon nuts of property class 5.
8.	IS:1367-1979	Technical supply conditions for threaded fasteners (1 <sup>st</sup> Revision).
9.	IS:1367(Part-III)-1991	Mechanical properties and test method for bolts, screws & studs with full loadability.
10.	IS:1367(Part-VI)-1994	Mechanical properties and test method for nuts with specified proof loads.
11.	IS-1367(Part-XIII)-1983	The hot dip galvanized coating of fasteners.
12.	IS:1573-1991	Specification for electroplated coating of zinc on Iron & steel.
13.	IS:1586-1968	Methods of Rock well hardness test ( `B' & `C' scales) for steel (first revision).
14.	IS:1852-1991	Rolling and Cutting Tolerances of Hot Rolled Steel Products.
15.	IS:2016-1992	Plain Washers.
16.	IS:2062-1992	Steel for general Structural purposes - Specification.
17.	IS:2614-1969	Method for sampling of fasteners.
18.	IS:2629-1990	Recommended practice for hot dip galvanizing of iron and steel.
19.	IS:2633-1992	Method of testing uniformity of coating of zinc coated articles.

S.No.	Indian standards	Title
20.	IS:3063-1994	Single Coil Rectangular Section spring washers for bolts, nuts, and screws.
21.	IS:3202-1972	Methods for testing local thickness of electro plated coatings.
22.	IS:3218(Part-V)-1979	Isometric screw threads "Tolerance".
23.	IS:3757-1992	High Strength Structural Bolts.
24.	IS:4072-1975	Specification for steel for spring washers (first revision).
25.	IS:4218(Part-VI)-1978	Isometric screw threads limits of sizes for commercial bolts & nuts.
26.	IS:4759-1990	Specification, for Hot dip Zinc coatings on Structural Steel and other Allied products.
27.	IS:5358-1969	Hot dip galvanized coatings on fasteners.
28.	IS:5369-1991	General Requirements for Plain Washers.
29.	IS:5613-1995 (part-II)	Code of practice for design, installation and maintenance of overhead power lines. Sec.-1 - Designs. Sec.-2 - Installation & Maintenance
30.	IS:6610-1991	Specification for Heavy Washers for Steel Structures.
31.	IS:6623-1992	High Strength Structural Nuts.
32.	IS:6745-1972	Methods for determination of weight of zinc coating of zinc coated iron and steel articles.
33.	IS:6821-1973	Methods for sampling of non threaded fasteners.
34.	IS:8500-1992	Specification for weldable structural steel (Medium & High Strength Qualities).
35.	IS:10238-1989	Step Bolts for Steel Structures.
36.	IS:12427-1992	Specification for Transmission Tower Bolts of property class 5.6
37.	IS:269-1967	Ordinary rapid hardening and low heat Portland cement.
38.	IS:456-2000	Code of practice for plain and reinforced concrete
39.	IS:1786-1966	Cold twisted steel bars for concrete reinforcements
40.	IS:4091-1967	Code of practice for design & construction of foundation for transmission line towers & poles

## 2.02 TYPE OF TOWERS:

The towers are self supporting lattice type, designed for the specified loading conditions. There will generally be following type of towers:-

- a. Tower type FD-0: Tangent type tower with maximum line deviation up to 2° to be used with Single/Double suspension insulator strings.
- b. Tower type FD-30/FDT: Medium angle tower to be used for line deviation from 0° to 30° with Single/Double tension insulator strings. FD-30 type tower is also used as Transposition tower with modified cross arms.
- c. Tower type FD-60: Heavy angle tower to be used for line deviation from 0° to 60° and also as dead end tower with Single/Double tension insulator strings.
- d. River Crossing Towers:- The Bidder will have to supply River Crossing Towers for crossing major river. Similarly for crossing 400kV line if FD60+ 30/35M extension tower is required, the same will have to be supplied by the contractor after approval of the Purchaser.

### **2.03 EXTENSIONS:**

Suitable extension of 3M, 6M, 10M height shall be supplied for use with the FD-0, FD-30 and FD-60 type towers. 18/25M extension shall be supplied for FD-0 type tower depending upon the requirement intimated by the Purchaser.

### **2.04 STUB SETTING TEMPLATES:**

The stub setting template shall be required for each type of tower and its respective extensions and shall be supplied by the Bidder for each type of tower and its respective extensions. The template shall be of adjustable type i.e. for use with normal towers as well as extensions.

### **2.05 DESIGN:**

**2.05.1** 400kV Towers/extensions to be supplied are designed as per IS 802(Part-I)-1977.

**2.05.2** The towers have square base with twin MOOSE ACSR conductor per phase in vertical formation and two ground-wires of 7/3.66 mm galvanized stranded steel wire of 95kg/sq.mm grade placed on the top of the towers. .

### **2.06 GALVANIZING PASSIVATION AND PAINTING:**

The tower parts, stubs and pack washers shall be hot dip galvanized. The galvanization shall be done as per requirements of IS 4759 after all fabrication work is completed. The contractor shall also take guidelines from the recommended practices for hot dip galvanizing laid down in IS 2629 while deciding and implementing galvanizing procedure. The mandatory requirements however, are specified herein.

Unless otherwise specified the fabricated tower parts and stubs shall have a minimum overall Zinc coating of 610 gms per sq. m of surface except for plates & sections below 5mm which shall have Zinc coating of 460 gms per sq. m of surface. The average zinc coating for all sections and plates 5mm & above shall be maintained as 87 microns and that for plates and sections below 5mm shall be maintained as 65 microns.

The zinc coating shall be adherent, reasonably uniform, smooth, continuous and free from imperfections such as black/bare spots, ash rust strains, bulky white deposits/wet storage strains and blisters.

The surface preparation for fabricated tower parts and stubs for hot dip galvanizing shall be carried out as indicated herein below:

- (i) **Degreasing & Cleaning of Surface:** Degreasing and cleaning of surface, wherever required, shall be carried out in accordance with clause 4.1 of IS 2629-1985. After degreasing the article shall be thoroughly rinsed. However, if acidic degreasers are used rinsing is not required.
- (ii) **Pickling:** pickling shall be done using either hydrochloric or sulphuric acid as recommended at clause 4.3 of IS 2629-1985. The actual concentration of the acids and the time duration of immersion shall be determined by the Contractor depending on the nature of material to be pickled. Suitable inhibitors also shall be used with the acids to avoid over pickling. The acid concentration, inhibitors used, and maximum allowable iron content shall form part of plant standard to be formulated and submitted to MPPTCL along with Quality Assurance Program.
- (iii) **Rinsing:** After pickling, the material shall be rinsed, preferably in running water to remove acid traces, iron particles or any other impurities from the surface. Two rinse tanks are preferable, with water cascading from the second tank to the first to ensure thorough cleaning. Wherever single tank is employed, the water shall be periodically changed to avoid acid contamination, and removal of other residue from the tank.
- (iv) **Fluxing:** The rinsed article shall be dipped in a solution of zinc ammonium chloride. The concentration and temperature of the flux solution shall be standardized by the contractor depending on the article to be galvanized and individual circumstances. These shall form part of plant standard to be formulated and submitted to MPPTCL along with Quality Assurance Program. The specific gravity of the flux solution shall be periodically monitored and controlled by adding required quantity of flux crystals to compensate for drag-out losses. Free acid content of the flux solution also shall be periodically checked and when it is more than two (2) grams of free acid per litre of the solution, it shall be neutralized. Alternatively, Ph value should be monitored periodically and maintained between 5.0 to 5.5.
- (v) **Drying:** When dry galvanizing is adopted the article shall be thoroughly dried after fluxing. For the purpose of drying, the contractor may use hot plate, air oven or any other proven method ensuring complete drying of the article after fluxing and prior to dipping in the molten zinc bath. The drying process shall be such that the article shall not attain a temperature at which the flux shall get decomposed. The article thus dried shall be galvanized before the flux coating picks up moisture from the atmosphere or the flux layer gets damaged or removed from the surface. The drying procedure, time duration, temperature limits, time lag between fluxing, drying, galvanizing etc shall form part of plant standard to be formulated and submitted to MPPTCL along with Quality Assurance Program.
- (vi) **Quality of Zinc:** Any one or combination of the grades of zinc specified in IS 209 or IS 13229 or other comparable international standard shall be used for galvanizing. The contractor shall declare the grade(s) of zinc proposed to be used by them for galvanizing. The molten metal in the zinc bath shall contain

minimum 98.5 % zinc by mass. It shall be periodically measured and recorded. Zinc aluminium alloy shall be added as per IS 2629.

- (vii) **Dipping Process:** The temperature of the galvanizing bath shall be continuously monitored and controlled. The working temperature of the galvanizing bath shall be maintained at  $450 \pm 10^{\circ}\text{C}$ . The article should be immersed in the bath as rapidly as possible without compromising on safety aspects. The galvanizing bath temperature, immersion angle & time, time duration of immersion, rate of withdrawal etc. shall be monitored and controlled depending upon the size, shape, thickness and chemical composition of the article such that the mass of zinc coating and its uniformity meets the specified requirements and the galvanized surface is free from imperfections and galvanizing defects.
- (viii) **Post Treatment:** The article shall be quenched in water. The quench water is to be changed / drained periodically to prevent corrosive salts from accumulating in it. If water quenching is not done then necessary cooling arrangements should be made. The galvanized articles shall be dipped in chromating solution containing sodium dichromate and sulphuric acid or chromic acid base additive at a predetermined concentration and kept at room temperature to retard while rust attack. The temperature of the chromate solution shall not exceed  $65^{\circ}\text{C}$ . The articles shall not be stacked immediately after quenching and dichromating. It shall be ensured that the articles are dry before any further handling operation.
- (ix) **Storing, Picking and Handling:** In order to prevent while rust formation sufficient care should be exercised while storing handling and transporting galvanized products. The articles shall be stored in an adequately ventilated area. The articles shall be stored with spacers in between them and kept at an inclination to facilitate easy drainage of any water collected on the articles. Similar care is to be taken while transporting and storing the articles at site.
- (x) The Contractor shall prepare a detailed galvanizing procedure including Flow Chart with control parameters and all plant standards as required above and submit to Purchaser for approvals as part of Quality Assurance Plan.
- (xi) Minor defects in hot-dip galvanised members shall be repaired by applying zinc rich primer and two coats of enamel paint to the satisfaction of the Owner before erection.

## 2.07 MATERIAL :

**2.07.1** IS Steel Sections of tested quality in conformity with IS:2062 : 2006 grade E250 (Designated Yield Strength. 250 MPa) and/ or grade E350 (Designated Yield Strength 350 MPa) are to be used in towers, extensions, stubs and stub setting templates. The Contractor can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards. However, use of steel grade having designated yield strength more than that of EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) is not permitted, unless otherwise indicated in this specification.

**2.07.2** Steel plates below 6mm size exclusively used for packing plates/packing washers produced as per IS : 1079 -1994 (Grade -0) are also acceptable. However, if below 6mm size plate are used as load bearing plates viz gusset plates , joint splices etc. the same shall conform to IS : 2062 or equivalent standard meeting mechanical strength/metallurgical properties corresponding to grade E250 or E350 (designated yield strength not more than 355MPa),

depending upon the type of grade incorporated into design. Flats of equivalent grade meeting mechanical strength/ metallurgical properties may also be used in place of plates for packing plates/ packing washers. The chequered plates shall conform to IS : 3502. SAILMA 350HI grade plate can also be accepted in place of HT plates (EN 10025 grade S355 JR/JO / IS 2062:2006 – grade 350, as applicable) provide SAILMA 350HI grade plate meet all the mechanical properties of plate as per EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) / IS 2062:2006 – grade 350.

- 2.07.3** For designing of towers, preferably rationalised steel sections has been used. During execution of the project, if any particular section is not available, the same shall be substituted by higher section. Any cost on account of the same shall be borne by the Contractor. However, design approval for such substitution shall be obtained from the Owner before any substitution and records of such substitutions shall be maintained by the Contractor.

**2.08 WEIGHTS :**

The unit weight of each type of tower and extension including bolts and nuts, accessories, attachments and step bolts is indicated in the Bill of Materials which shall be supplied by the Employer to the successful Bidder. The weight of structure means the weight calculated using black sectional (i.e. ungalvanised) weights of all steel members of the sizes indicated in the fabrication drawings without taking into consideration the reduction in weight due to drilling of bolts, holes, skew cuts, chamfering etc. or increase in weight due to galvanising. The weight of gusset plates shall mean the weight of its circumscribing rectangle, without taking into considerations the reductions in weight due to holes, notches etc.

**2.09 GALVANISED BOLTS AND NUTS AND WASHERS :**

- 2.09.1** The design of the towers and extensions are based on use of HRH mild steel hot dip galvanized bolts (5.6 quality) and nuts (5.0 quality). The connections are designed on the basis of use of 16mm dia bolts. The spring washers shall be provided for insertion under all nuts.
- 2.09.2** The nuts shall be forged and tapped after galvanizing and then lubricated. The nuts shall be chamfered on one face only, the other face shall be machined.
- 2.09.3** The Bolts up to M16 and having length up to 10 times the diameter of the bolt should be manufactured by cold forging and thread rolling process to obtain good and reliable mechanical properties and effective dimensional control. The shear strength of bolts for 5.6 grade should be 310 MPa minimum as per IS:12427. Bolts should be provided with washer face in accordance with IS:1363 (Part-I) to ensure proper bearing.
- 2.09.4** Nuts for hexagonal bolts should be double chamfered as per the requirement of IS:1363 Part-III. It should be ensured by the manufacturer that nuts should not be over tapped beyond 0.4mm oversize on effective diameter for size up to M16.
- 2.09.5** Fully threaded bolts shall not be used. The length of bolts shall be such that the threaded portion will not extend into the place of contact of the members
- 2.09.6** All bolts shall be threaded to take the full depth of the nuts and threaded for enough to permit firm gripping of the members, but not further. It shall be ensured that the threaded portion of each bolt protrudes not less than 3mm

and not more than 8mm when fully tightened. All nuts shall fit tight to the point where the shank of the bolt connects to the head.

- 2.09.7** Flat and tapered washers shall be provided wherever necessary. Spring washers shall be provided for insertion under all nuts. These washers shall be steel electrogalvanised, positive lock type and 3.5mm in thickness for 16mm dia bolt and 4.5mm for 24mm bolt.
- 2.09.8** To avoid bending stress in bolts or to reduce it to minimum, no bolt shall connect aggregate thickness of members more than three (3) times its diameter.
- 2.09.9** The bolt positions in assembled towers shall be as per structural drawing.
- 2.09.10** Bolts at the joints shall be so staggered that nuts shall be tightened with spanners without fouling.
- 2.09.11** To ensure effective in-process Quality control it is desirable that the manufacturer should have in house testing facility for all tests like weight of zinc coating, shear strength and other tests etc. The manufacturer should also have proper Quality Assurance System which should be in line with the requirement of this specification and IS:14000 series Quality System Standard
- 2.09.12** The bolts and nuts shall be free from forging and threading defects such as cuts, splits, burrs, bulging, taper, eccentricity, loose fit etc.
- 2.09.13** The bolts shall be threaded up to standard length only as per relevant Indian Standard and not to full length.
- 2.09.14** The bolts and nuts shall confirm to IS 1967-1971 Part-III and Part-IV, IS 12427, IS 1363-92, IS 1367 Part-XIII with latest amendment.
- 2.09.15** The spring washers designated as M 16-B suitable for 16mm dia galvanized bolt shall be manufactured out of rectangular section with tolerances as per IS 3063-1994 with latest amendments. The spring steel shall conform to IS- 4072-1975 with latest amendments "Specification for steel for spring washers".
- 2.09.16** The spring washers after coiling shall be suitably heat treated so as to result in the finished washer having hardness 43 to 50 HRC when tested in accordance with IS 1586- 1968.
- 2.09.17** The surface of the washers shall be free of scales and burrs. The washers shall be coiled without any kinks (except for the shape with turned-up ends). The ends of the washer shall not abut when the washers are compressed. The ends shall be so served as to prevent tangling.
- 2.09.18** The approximate weight of 1000 pieces of spring washers suitable for 16mm dia bolt shall be 8.91 kg. in natural black finish as shown in IS 3063-1972 with latest amendments.
- 2.09.19** The spring washer shall be electro galvanized with chromate passivation. The electro galvanizing of washers should conform to 'severe' grading service conditions incorporated in IS 1573-1986 as "Service Grade No.4", classification Fe Zn 25. The local thickness of zinc coating should

be minimum 25 microns and average thickness 38 microns. It should be further suitably heat treated to avoid any danger of hydrogen embrittlement.

**2.10 STEP BOLTS :**

Each tower will be provided, on one of the legs, with step-bolts of 16mm dia and 175mm long, spaced not more than 450mm and extending from 3 meters approx. above ground level up to the top portion of the tower. The step bolts shall be confirm to IS 1363-1992, IS 10238:1989 and IS 1367(Part-XIII): 1983.

**2.11 DANGER BOARD, NUMBER PLATE AND PHASE PLATES :**

Each tower will be fitted with danger board, number plate and phase plates. The tower to be supplied shall have provision to fix these plates at a height of about 3 meters above ground level. Necessary provision in tower & extensions for fixing of these items shall be made. The Danger board, number plate and phase plates shall be supplied conforming to following technical details:-

- 2.11.1 The danger boards shall conform to IS-2551-1982 and their revision, if any except where modified in this specification.
- 2.11.2 The danger boards, number plates and phase plates shall conform to the drawings enclosed in this specification.
- 2.11.3 The colour scheme of the enamel and size of figures and dimensions of lettering shall be as shown in the drawing as also the overall size. The holes as indicated in the drawing shall be provided before enamellings.
- 2.11.4 The thickness of the plate out of which the danger board, number plate and phase plate will be manufactured, shall not be less than 1.6mm.
- 2.11.5 The enamellings shall be done by vitreous enameling process only.
- 2.11.6 All letterings shall be centrally spaced. The dimensions of the letters, figures and their respective positions shall be as given in drawings. The size of each letter in the word in each language and the spacing between them for the purpose of scribing shall be so chosen that they are uniformly written in the space earmarked for them.
- 2.11.7 The corners of the plate shall be rounded off. The location of the fixing holes shall be according to drawing annexed with this specification.
- 2.11.8 The plate shall be made from mild steel at least 1.6mm thick and vitreous enameled white, with letters, figures and the conventional skull and cross-bones in signal red colour on the front side. The rear side of the plate shall also be enameled.
- 2.11.9 The corners of the danger, number and circuit plates shall be rounded off to remove sharp edges.
- 2.11.10 The letters of number and phase plates shall be red enameled with white enameled background.



## **2.12 ANTICLIMBING DEVICE WITH BARBED WIRE :**

The barbed wire type anticlimbing device shall be used at a height of approximately 3 meters as an anticlimbing deterrent measure, as per the details given in IS:5613(Part- 2/Sec-I)1985. The towers to be supplied by the Bidder shall have provision to fix the barbed wire as indicated above.

Thus the angle pieces with notches for accommodating barbed wire shall be supplied with the towers alongwith with provision for suitable bolt holes on leg members for fitting the angles. It should have the facility of the locking arrangement. The Barbed wire shall confirm to IS:278/1978 with latest amendment and shall be type 'A-3'.

The Barbed wire shall be made of Hot dip Galvanised MS solid wire of size 2.5mm dia (for line wire) and 2.0 mm dia (for point wire). The barbs shall have four points and shall be formed by twisting 2 point wires, each two turns, tightly around both line wires making altogether four complete turns. The wire shall be galvanised by Hot dip process as per IS:2629/1966 (with latest amendment). The galvanised wire shall confirm to the requirement as per IS:4826/1971 with latest amendment in all respect. IS:2633/1972 and IS 6745/1972 for testing of uniformity & mass of zinc coating. The zinc coating shall be medium type on line wire and light type on point wire i.e. having zinc coating minimum 110 gm/m<sup>2</sup> on line wire and 70 gm/m<sup>2</sup> on point wire.

## **2.13 EARTHING :**

**2.13.1** A provision shall be made in the stub for fixing earthing material. The stub will be provided with a hole at a distance of 250 mm from bottom end and at a distance of 500 mm below ground level for connection with earthing materials. The hole will be of 17.5 mm dia.

**2.13.2** The Bidder shall also supply the following materials per earthing set for earthing of towers (four sets per tower): -

- (i) One no. Hot dip galvanized earthing Mild Steel Rod (2 Meter long, 25 mm diameter);
- (ii) Hot dip galvanized connecting clamps (‘F’ type and ‘U’ type- 2 Nos. per set);
- (iii) Hot dip galvanized stranded steel wire of size 7/4.00mm, Grade 5 to be used as connecting wire conforming to Indian Standard:2141:1992 and Indian Standard 4826: (5 Meter per earthing set).

**2.13.3** The details of earthing rod and clamps and earthing arrangement for towers are shown in the drawing enclosed.

**2.13.4** The earthing rod shall be of mild steel solid rod of 2 meters in length and 25mm in diameter with one end pointed. The rods shall be galvanized as per relevant Indian Standard . The zinc coating on the rod shall not be less than 610 gm/m<sup>2</sup> of surface area.

**2.13.5** The tower end-connecting clamp shall be of flat type and rod end connecting clamp shall be of ‘U’ type. The clamps shall be of forged steel cast iron / malleable iron. The clamps should be hot dip galvanized as per Indian

Standard:2629:1990 . The zinc coating on the clamps shall not be less than 610 gm/m<sup>2</sup> of surface area.

- 2.13.6** The hot dip galvanized stranded steel wire of size 7/4.00mm shall be supplied for connection between the earthing rod and the stub. The steel wire shall conform to Indian Standard 2141: 1992 and Indian Standard:4826: 1979 and latest revision thereof and shall consist of seven strands, each strand having a diameter of 4 mm and Grade-5. The galvanizing shall be done as per Indian Standard specification 2141: 1992 and 4826: 1979 and latest revision thereof for heavy zinc coating. The coating of zinc shall not be less than 260 gm/m<sup>2</sup>.

**2.14 ATTACHMENT FOR INSULATOR STRING & GROUNDWIRE CLAMPS:**

- 2.14.1** The towers shall be provided with suitable attachment for supporting insulator strings and ground-wire suspension and tension assembly.

- 2.14.2** The towers shall be provided with the cleats to support the hanger. The details of hanger are shown in the drawing enclosed.

- 2.14.3** The ground-wire suspension assembly has got a 'D' shackle. There shall be a suitable arrangement to support the same.

- 2.14.4** On angle towers, strain plates shall be provided for purpose of attaching the tension insulator string. For fixing ground-wire tension assembly a hole 17.5mm dia shall be provided in the strain plate.

**2.15 FABRICATION WORKMANSHIP :**

- 2.15.1** Except where hereinafter modified, details of fabrication shall conform to IS-802(Part-II)-1990.

- 2.15.2** The fabrication of towers shall be done strictly in accordance with the drawing supplied by the Employer.

- 2.15.3** The towers shall be of bolted construction.

- 2.15.4** Normally lap splice shall be used for connecting members of un-equal size and the inside angles of lap splice shall be rounded at the heel to fit the fillet of the outside angle. All splices shall develop full stress in the members connected through bolts. Butt-joint as well as lap joint splices shall be made as above and as close to the main panel as possible.

- 2.15.5** Joints are designed and detailed to avoid eccentricity as far as possible. The use of gusset plates for joining tower members shall be avoided as far as possible. However, where the connections are such that the eliminations of the gusset plates would result in eccentric joints, gusset plates and spacer plates may be used in conformity with modern practice.

- 2.15.6** The tower structures shall be accurately fabricated to bolt together easily at site without any undue strain on the bolts.

- 2.15.7** No angle member shall have two leg flanges brought together by closing the angle.

- 2.15.8** The diameter of the hole shall be equal to the diameter of the bolt plus 1.5 mm.

**2.15.9** All similar parts shall be made strictly interchangeable. All steel section before any work is done on them shall be carefully leveled, straightened and made true to detailed drawings by methods which will not injure the materials so that when assembled the adjacent matching surfaces are in close contact throughout. No rough edges shall be permitted in the entire structures. Hammering is not permitted for straightening.

**2.15.10** Cutting may be done by shearing, cropping, flame cutting or sawing. The surface so cut shall be cleaned smooth, reasonably square and free from deformation and distortion.

**2.16 BENDING :**

**2.16.1** Mild steel angle sections up to 75x75 mm (up to 6mm thick) shall be bent cold up to and including bend angle of 10° Angles. Above 75x75mm (thickness up to 6mm) and up to and including 100x100 mm (thickness up to 8 mm) may also be bent cold up to the bend angle of 5 Deg. All other angle sections and bend angles not covered above shall be bent hot.

**2.16.2** All plates up to 12mm thickness shall be bent cold up to a maximum bend angle of 15 Deg. Plates of thickness more than 12mm with bends greater than 15 Degree shall be bent hot.

**2.16.3** All hot bend material shall be air-cooled. The bends shall be of even profile and free from any surface damages.

**2.17 DRILLING AND PUNCHING :**

**2.17.1** The holes in the member shall either be drilled or punched with a jig, the former process will be preferred.

**2.17.2** Punching may be adopted for sections up to 12 mm thickness. For thicker sections drilling shall be done.

**2.17.3** The holes shall be punched/drilled after bending and related position of these holes shall be maintained with the use of proper templates/jigs and fixtures.

**2.17.4** The holes shall be perfectly circular and no tolerance in this respect is permissible. The holes shall be perpendicular to the plate and angle flanges.

**2.17.5** Holes must be square with the plates or angles and have their walls parallel.

**2.17.6** All burrs left by drills or punch shall be removed completely. When the tower members are in positions, the holes shall be truly opposite to each other. Drilling or ramming to enlarge defective holes shall not be permitted.

**2.17.7** The minimum spacings of bolt and edge distance shall be as under :-

- a. For 16 mm dia bolt edge distance of 20 mm from hole center to rolled or swaged edge and 23mm from hole center to sheared or flame cut edge, hole center to hole center distance minimum 40mm (the hole size being 17.5mm).
- b. The gap between the edges of the connected members in butt joint shall not be more than 6mm and less than 4mm.

- c. The bolt gauge distance in flanges of angle sections shall generally be in accordance with Table XXXI of SF6(1)-1961-ISI "Hand Book for structural Engineers-Structural Steel Sections (Revised)."
- d. The bolt gauge distance in flanges of angle sections shall generally be in accordance with Table XXXI of SF6(1)-1961-ISI "Hand Book for structural Engineers-Structural Steel Sections (Revised)."

**2.18 TOLERANCES :**

- 2.18.1 The maximum allowable difference in the diameter of the hole on the two sides of the plate or angle shall not exceed 0.8 mm on diameter. The allowable taper in drilled/punched hole shall not exceed 0.8 mm on diameter.
- 2.18.2 The tolerance cumulative or between consecutive holes shall be within +/- 0.5mm.
- 2.18.3 The tolerance on the overall length of member shall be within +/- 1.6 mm.
- 2.18.4 The tolerance on gauge distance shall be within +/- 0.5mm.
- 2.18.5 Rolling and weight tolerance of steel sections shall be as per Indian Standard: 1852 and Indian Standard: 808.

**2.19 MARKING :**

All members shall be distinctly given punch mark similar to those given in structural drawings. The mark shall be given with marking dies of minimum 18 mm size and this mark shall be legible. Letter XMPTFD0, XMPTFD30 and XMPTFD60 shall precede erection mark where 'X' stands for manufacturer's name, 'MPT' stands for Madhya Pradesh Power Transmission Company and FD0, FD30 & FD60 stands for type towers.

**2.20 QUALITY ASSURANCE PROGRAM :**

The contractor shall submit the Quality Assurance Programme as specified in clause 1.12 Section-1 of the bidding document. A copy of the accepted Quality Assurance Plan must be available at the manufacturer's works of the Plant for reviewing by inspecting officer of the employer.

**2.21 INSPECTION OF PROTOTYPES :**

- 2.21.1 Proto type of each type of structure/extensions shall be offered by the successful bidder for inspection within three month's time from the date of contract.
- 2.21.2 Notwithstanding any thing covered in the drawings and other details furnished by the Employer, the successful bidder shall make minor modifications, if any, in length, size, notching etc. according to the proto assembly which are necessary for easy assembly of the structure.

**2.22 INSPECTION :**

- 2.22.1 As specified in clause 1.13 Section-1 of the bidding document, Plant to be supplied will be subject to inspection and approval by the Employer's representative before despatch.

- 2.22.2** Each consignment ready for transportation shall be offered to the Employer for inspection before dispatch giving a minimum time of not less than fifteen days. Only complete sets of towers/extensions shall be offered for inspection. All materials constituting towers (Steel parts, Bolts & nuts, spring and pack washers, earthing sets) shall be offered simultaneously. Samples of fabricated tower materials and accessories shall be subjected to tests as per relevant Indian Standard or equivalent International Standard. The Employer shall be kept informed about the source of procurement of raw-steel, particularly through re-rollers. The Employer reserves right to inspect and get the samples of raw-steel tested as per Indian Standard-2062 and relevant standards or equivalent International Standard. The cost of testing shall be borne by the bidder.
- 2.22.3** The Contractor shall keep the Employer informed in advance of the time of starting and of the progress of manufacture and fabrication of structures at various stages.
- 2.22.4** In case, any member of the structure is not found to comply with the relevant drawing, it shall be liable for rejection even after receipt.
- 2.22.5** Defects, which may appear during fabrication, shall be made good. Any member once rejected shall be cut into pieces in front of the Employer's representative so that it is not offered again by mistake.

## **2.23 GENERAL GUIDE-LINE FOR INSPECTION :**

### **2.23.1 Fabricated Structure Members :**

- (i) Visual examination and quantity verification of offered lot.
- (ii) Sample selection from the offered lot at a ratio of 40 MT (or part thereof) 1 no. each for all tests.
- (iii) Dimension, fabrication and trueness verification of structure member from fabrication sketch.
- (iv) Galvanising test of each sample i.e. dip test, hammer test and mass of zinc test.
- (v) Random verification of Zinc coating of galvanized surface by Alko-meter.
- (vi) Tensile test and bend test of each sample.
- (vii) Chemical composition test of at least two samples per offered lot of 50 MT for inspection.
- (viii) Verification of manufacturer's test certificate for mild steel used in structure members.

### **2.23.2 Bolts-Nuts, Washer, Accessories, Attachments etc.: (To be carried out at manufacturers works of these items)**

- (i) Visual examination and quantity verification of offered lot.
- (ii) Sample selection from the offered lot as per relevant Indian Standard for each item.
- (iii) Dimension, fabrication and trueness verification from fabrication sketch.

- (iv) Galvanising test of each sample.
- (v) Other acceptance tests for respective items as per relevant Indian standard.

**2.23.3** The supplier shall submit the factory test certificates of bought out accessories at the time of acceptance tests of towers.

**2.23.4** Since at the time of inspection only fabricated tower members and accessories will be verified, acceptance of any lot shall in no way relieve the bidder of his responsibility to meet all technical requirements of this specification for fabricated towers. In case any shortcoming is noticed at the time of actual assembly and erection, the Employer may reject any part or item or accessory and the contractor will have to assume the responsibility for free replacement/rectification of such defects.

**2.24 PACKING AND MARKING ON PACKING :**

**2.24.1** The material shall be boxed or bundled for transport in the following manner:

- (i) Angle shall be packed in bundles securely wrapped four times around at each end and over 900 mm with No.9 SWG steel wire with ends twisted tightly. Gross weight of any bundle shall not be less than 450 Kg and more than 2000 Kg. The bundle shall be in complete Tower form only.
- (ii) Cleat angles, brackets, filler plates and similar small loose pieces shall be nested and bolted together through holes and wrapped around at least four times with No.9 SWG wire with ends twisted tightly or packed in wooden crates. Gross weight of each bundle shall not exceed 200 Kg.
- (iii) Correct number of bolts, nuts and washers required for structures shall be packed in heavy gunny bags accurately tagged in accordance with the contents and a number of bags packed in a solid box of 22mm thick lumber with paneled ends to be accurately nailed and further reinforced with 22 mm x 75 mm Batons round the sides and at the ends with 25 mm x No.18 SWG iron band stretched entirely around the batons with ends overlapping at least 150mm. Gross weight of each box shall not exceed 200 Kg.
- (iv) Packing list incorporating all relevant details e.g. quantity of structures (complete sets), number and size of steel sections, quantity of nuts, bolts, washers etc. shall be forwarded along with each consignment.
- (v) In the nutshell the packing arrangement should be such that all lots of one particular type of structure are identifiable at site for the purpose of allocation for a particular work. In case more than one structure of a particular type is delivered in area store/work site, combined packing arrangement by way of clubbing members of similar type (for more than one structure) in a combined package should not be done. Uniform packing procedure for each structure should be adopted.

**2.24.2** All above packing are subject to the approval of the Employer or his appointed representatives.

**2.24.3** Each bundle or packing shall have the following marks:

- (i) The name of the consignee (as per dispatch instructions given by the Employer).
- (ii) Ultimate destination as required by the Employer.

- (iii) The relevant marks and number of structure members or reference or bolts, nuts and small components like gusset plats, various attachment, etc. for easy identification.

**2.24.4** The marking shall be stenciled and indelibly inked on the top members in the bundles, on wooden boxes and also on gunny bas containing smaller components.

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## **SECTION - 3**

### **PROJECT DETAILS AND GENERAL SPECIFICATIONS**

#### **3.0 GENERAL**

This section stipulates the General Technical Requirements under the contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipment and services covered under other sections and is not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

#### **3.1 QUALIFYING REQUIREMENT**

The contractor shall have adequate galvanizing facilities to galvanize the longest single steel member of 7.5m length in one dip.

All structural assembly drawings shall be prepared in Auto Cad 2008 or Later.

#### **3.2 SITE INFORMATION**

<b>SL.NO.</b>	<b>DESCRIPTION</b>	
<b>3.2.1</b>	<b>PROJECT INFORMATION</b>	
	a) Customer	
	b) Project	
	c) Project location	
	d) Transport facilities Nearest Railway Station/Gauge Distance from Railway Station	
	e) Access roads	

#### **3.3 STANDARDS**

All materials shall comply in all respect with the requirement of the latest edition of the relevant codes as listed in Section 2.

#### **3.4 UNIT**

Metric (System International) units of measurements shall be used in all drawings.

#### **3.5 DRAWINGS, BILL OF MATERIALS AND CDs**

At each stage following set of fabrication drawings/Bill of materials shall be submitted.

- |     |                      |          |
|-----|----------------------|----------|
| i)  | Fabrication Drawings | : 4 sets |
| ii) | Bill of Materials    | : 4 sets |

After final approval of proto –type assembly of structures, the drawings shall be updated as per proto and marked "PROTO CORRECTED". The following sets of



fabrication drawings/shop drawings/bill of materials/CDs shall be submitted for distribution:

- |      |  |          |
|------|--|----------|
| i)   | Fabrication Drawings (proto-corrected) | : 4 sets |
| ii)  | Shop Drawings                          | : 1 set  |
| ii)  | Bill Of Materials                      | : 4 sets |
| iii) | CDs                                    | : 2 sets |

### **3.6 CATEGORIES OF APPROVAL**

CATEGORY I            This means that the documents/drawings is approved.

CATEGORY II           This means that the document/drawing is approved with comments i.e, some corrections are required but the contractor can go ahead with the manufacture after incorporating comments.

CATEGORY III           This means that the document/drawing is not approved i.e major revisions are required and the contractor can not proceed with the manufacture.

### **3.7 ERRORS**

Any error in fabrication work preventing proper assembly and fitting up of parts in the field, shall be classified as defective workmanship. All changes incurred by BHEL either directly or indirectly because of this shall be deducted from the amount due to the contractor.

### **3.8 PURCHASE ORDER NUMBER**

The P.O No. shall be mentioned on all documents and drawings.

## **SECTION – 5**

### **MANUFACTURING QUALITY PLAN**

- 5.1** Material shall be inspected in accordance to the QP duly approved by BHEL/Customer

## **SECTION-6**

### **CHECK LIST FOR INFORMATION TO BE FURNISHED WITH OFFER RETURN THIS CHECKLIST AS PART OF THE OFFER DULY SIGNED**

The offer may not be considered if the following information and this Checklist are not enclosed with the Offer.

**BHEL ENQUIRY. NO:**

**BIDDER:OFFER REFERENCE:**

**6.1 Deviations**

Tick

YES

NO

If yes,

S.No.	Deviation	Clause No.
1		
2		
3		
4		

(Signature & Seal of Bidder)