KERALA TRANSPORT DEVELOPMENT FINANCE CORPORATION LIMITED

Construction of Path Way around the Chiller Plant Unit / Roof Covering to D/G set, Panel Room and Fuel Tank / Covering the Open Floor Slaband Providing Canopy to the Transformer Room at Thampanoor Bus Terminal Complex, Thiruvananthapuram

TENDER NO. 33/BOTP/KTDFC/TPR/2015

TENDER DOCUMENTS

PART – II

GENERAL SPECIFICATIONS, ADDITIONAL CONDITIONS OF CONTRACT

KTDFC
Trans Towers
Thiruvananthapuram-14

Principal Project Consultant

GENERAL SPECIFICATIONS AND ADDITIONAL CONDITIONS OF CONTRACT

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SECTION - G

GENERAL SPECIFICATIONS AND ADDITIONAL CONDITIONS OF CONTRACT

G. 01 Scope and extent of the work

This contract is for the Construction of Path Way around the Chiller Plant Unit / Roof Covering to D/G set, Panel Room and Fuel Tank / Covering the Open Floor Slaband Providing Canopy to the Transformer Room at Thampanoor Bus Terminal Complex, Thiruvananthapuram as per the approved drawings and specifications. The items of works to be executed are as per the Tender Schedule attached as Part IV of the tender documents. The tender must be for the Construction of Path Way around the Chiller Plant Unit / Roof Covering to D/G set, Panel Room and Fuel Tank / Covering the Open Floor Slaband Providing Canopy to the Transformer Room at Thampanoor Bus Terminal Complex, Thiruvananthapuram detailed in the tender documents herein. Part tender will not be considered. The rate quoted by the tenderer should be for the finished works as per specifications and conditions of contract covering the cost of all materials and labour required for the work including supplies and installations and all incidentals, scaffolding etc and all kinds of taxes including service tax as applicable.

G. 02 Location and Access

The work site is at the Thampanoor Bus Terminal Complex, Thiruvananthapuram.

G. 03 General description of work

This tender is for the Construction of Path Way around the Chiller Plant Unit / Roof Covering to D/G set, Panel Room and Fuel Tank / Covering the Open Floor Slaband Providing Canopy to the Transformer Room at Thampanoor Bus Terminal Complex, Thiruvananthapuram and all extras and incidentals for proper completion of the work as indicated in the accompanying Tender Drawings and as detailed in the Tender Schedule and Technical Specifications.

All component works are to be done in accordance with the latest Indian Standard Specifications unless otherwise specified in the tender documents and as per direction of the Engineer-in-charge.

G. 04 Construction Facilities

a) Power Supply:

Power will not be supplied by KTDFC. Contractor shall make arrangement for power at his own cost including standby generator, if required.

b) Other Facilities:

All facilities required for the construction, required for the work shall be arranged by the Contractor at his own cost.

G. 05 Tools and Plant

No tools and plant will be supplied by the KTDFC. The Contractor will have to bring his own tools and plant and all equipments required for the smooth and efficient execution of the work.

G. 06 Watching Arrangements

The contractor shall make his own arrangements for watching, lighting and protecting the work and materials, labour and staff at site by day and night on all days including Sundays and holidays at his own cost, till completion and taking over.

G. 07 Materials required for the Work

All materials required for the work shall be brought by the Contractor and shall be of good quality as per Indian Standards and the Specifications. Samples of materials shall be got approved by the Engineer before effecting the supply and using on the work. Test certificates shall be produced for ensuring the quality of materials by the Contractor along with samples, as and when required.

G. 08 Priority of completing the work

The work shall be completed in all respects within the period of completion of one month. Priority for various works shall be decided with approval of Engineer in charge so as to ensure proper sequence of work to enable all works to proceed smoothly without hindrance.

G. 09 Safeguard and protection of men, materials and equipments

All required precautions and safety measures shall be adopted by the Contractor for the safety of men, materials and machinery including general public. Where required insurance coverage shall be ensured by the Contractor. Responsibility for the safety mentioned above is entirely that of the Contractor and KTDFC will not be liable for any loss or damage that may be occasioned.

G. 10 Statutory clearances and requirements

Statutory clearance if any is required for any of the works the same shall be obtained by the Contractor. Statutory Payments made, if any, for obtaining such clearance, the same shall be reimbursed by the KTDFC against proper vouchers in respect of such payments.

The contractor shall possess all licenses and certificates as required, for carrying out the work, as per statutes in force.

G. 11 Shop drawings and As built drawings

Shop drawings for all fabrication works and general lay outs of various other works in respect of services if any, shall be prepared by the Contractor and got approved by Chief Engineer/ Architect before carrying out the work. 3 sets of As built (As installed) drawings of all installations and constructions shall be furnished, as per requirements, on completion of works. Quoted rates shall include all the expenses on these accounts. Security deposit will not be released until these requirements as well as terms and conditions in respect of the 'defect liability period' are satisfied.

SECTION – 'T'
TECHNICAL SPECIFICATIONS

T1-CIVIL CONSTRUCTION WORKS

STEEL WORK GENERAL :

The contractor shall furnish all materials, labour, operations, equipments, tools & plant and incidentals necessary and required for the completion of all metal work in connection with steel doors, windows and other glazings, railings, flashings, inserts, hangers & other items of metal works as called for in the drawings, specifications and bill of quantities. The supply and installation of additional fastenings, accessory features and other items not specifically mentioned, but which are necessary to make a complete functioning installation shall form a part of this contract. All metal work shall be free from defects, impairing strength, durability and appearance and shall be of the best quality for purposes specified, made with structural properties to withstand safely, strains and stresses to which they shall normally be subjected.

SHOP DRAWINGS :

The contractor shall submit shop drawings and / or samples of each type of doors, windows, railings and other items of metal work called for to the Architect/Engineer for his approval, prior to procurement, considering lead time and to comply with the accepted time schedule / C.P.M. Chart. The shop drawings shall show full size sections of doors, windows and other components, thickness of metal, details of construction, hardware as well as connection of doors, windows and other metal work to adjacent work/supports. Samples of all joints and methods of fastening and joining shall be submitted to the Architect/Engineer for approval well in advance before commencing the work.

SAMPLES :

Samples of all typical metal work such as,doors, windows, railings and other metal components as called for shall be fabricated, assembled & erected or submitted to Architect /Engineer as directed by him, for his approval.

APPROVED MANUFACTURER :

All doors, windows, railings and other metal works as called for shall be manufactured by a manufacturer/ fabricator approved by the Architect/Engineer. The entire work shall be carried out by workmen skilled in the kind of work as called for in a shop fully equipped to carry out all phases of fabrication in accordance with the best accepted practices and as approved.

STRUCTURAL STEEL WORKS :

GENERAL :

This specification covers the supply, fabrication, transportation to site and erection on prepared foundations, structural steel work consisting of beams, columns vertical trusses, bracings shear connections etc. Fabrication, erection and approval of steel structures shall be in compliance with these general specifications and IS:800-1962, IS:806, IS:1161 and supplementary drawings to be supplied to the contractors during execution of the work.

FABRICATION DRAWINGS :

The contractor shall prepare all fabrication and erection drawings on the basis of design drawings supplied to him and submit the same in triplicate to the Engineer/ Architect for review, the Architects/ Engineer, shall review and comment, if any of the same. Such review, if any, by the Engineer/ Architec/ does not relieve the contractor of any of his required guarantees/ responsibilities. The contractor shall however be responsible to fabricate the structure strictly conforming to specifications and revised drawings.

Fabrication drawings shall include the following :

- member sizes and details
- types and dimensions of welds and bolts
- shapes and sizes of edge preparation for welding.
- details of shop & field joints, splices including sub-assemblies.

BILL OF MATERIALS :

Quality of structural steels, welding electrodes, bolts, nuts and washers etc. to be used, erection assemblies, identifying all transportable parts and sub-assemblies, shall be associated with special erection instructions if required. Calculations, splices etc. and other details not specifically detailed in design drawings shall be suitably given on fabrication drawings considering normal detailing practices and developing full member strengths. Where asked for calculations for the same it shall be submitted for approval. Any alternate design or chanage in section is allowed when approved in writing by Architect/Engineer. However, if any variation in the scheme is found necessary later, the contractor will be supplied with revised drawings. The contractors shall incorporate these changes in his drawings at no extra cost and resubmit for review. Architect's/ Engineer's review shall not absolve the contractor of his responsibility for the correctness of dimension, adequacy of details and connections. One copy will be returned reviewed with or without comments to the contractor for necessary action. In the former case further three copies of amended drawings shall be submitted by the contractor for final review. The contractor shall supply three prints each of the final reviewed drawings to the architects within a week since final review, at no extra cost for reference and records. The Architect/Engineer will verify the correct interpretation of their requirements. If any modification is made in the design drawing during the course of execution of the job, revised design drawings will be issued

to the contractor. Further changes arising out of these shall be incorporated by the contractor in the fabrication drawings already prepared at no extra cost and the revised fabrication drawings shall be duly got reviewed as per the above clauses.

MATERIALS :

ROLLED SECTIONS :

The following grades of steel shall be used for steel structures : Structural steel will generally be of standard quality conforming to IS:226. Whenever welded construction is specified plates of more than 200 mm thickness will generally conform to IS : 2062. Steel tubes for tubular structure shall conform to IS:1161.

WELDING MATERIALS :

Welding electrodes shall conform to IS : 814. Approval of welding procedures shall be as per IS : 823.

BOLTS, NUTS AND WASHERS :

Bolts & nuts shall be as per IS : 1367 & tested as per IS : 1608. It shall have a minimum tensile strength of 44 kg/sqmm and minimum elongation of 23% on a gauge length of 5.6 mm (on original cross sectional area of the gauge length). Washers shall be as per IS: 2016. All materials shall conform to respective specifications. The use of equivalent or higher grades or alternate materials will be considered only in very special cases subject to the approval of the Engineer / Architect in writing.

RECEIPT & STORING OF MATERIALS :

Steel materials supplied by the contractor must be marked for identification and each lot should be accompanied by Manufacturer's quality certificate, conforming chemical analysis and mechanical characteristics. All steel parts furnished and supplied shall be checked, sorted out, straightened & arranged by grades & qualities in stores. Structures with surface defects such as pitting, cracks, laminations etc. shall be rejected if the defects exceed the allowable tolerances specified in relevant standards or as directed by the Engineer/ Architects . Welding wire and electrodes shall be stored separately by qualities and lots inside a dry & enclosed room in compliance with IS:816-1968 & as per instructions given by the Engineer / Architects. Electrodes shall be perfectly dry. Checking of quality of bolts of any kind as well as storage of same shall be made conforming to relevant standards. Each lot of electrodes, bolts, nuts etc. shall be accompanied by manufacturer's test certificate. The contractor may use alternative materials as compared to the design specification only with the written approval of the Engineer / Architects .

MATERIAL TESTS

The contractor shall be required to produce manufacturer's quality certificates for materials supplied by the contractor. Not withstanding the manufacturer's certificates, the Engineer / Architects may ask for testing of materials in approved test houses. The test results shall

satisfy the requirements of the relevant Indian Standards. Whenever quality certificates are missing or incomplete or when material quality differs from standard specifications the contractor shall conduct all appropriate tests as directed by the Engineer / Architects at no extra cost.

Materials for which test certificates are not available or for which test results do not tally with the relevant standards specifications, shall not be used.

FABRICATION

Fabrication shall be in accordance with IS: 800 section V and IS:806 in addition to the following :-

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawing. The work shall also include fabricating built up sections.

Any defective material used shall be replaced by the contractor at his own expenses, care being taken to prevent any damage to the structure during removal.

All the fabricated and delivered items shall be suitably packed to be protected from any damage during transportation and handling. Any damage caused at any time shall be made good by the contractor at his own cost.

Any faulty fabrication pointed out at any stage of work shall be made good by the contractor at his own cost.

PREPARATION OF MATERIALS :

Prior to release for fabrication, all rolled sections warped beyond allowable limit shall be pressed or rolled straight and freed from twists, taking care that a uniform pressure is applied.

Minor warpings, corrugations etc. in rolled sections shall be rectified by cold working.

The sections shall be straightened by hot working where the Aarchitect/Engineer so direct and shall be cooled slowly after straightening.

Warped members like plates and flats may be used as such only if wave like deformation does not exceed l/1000 but limited to 10 mm

Surface of members that are to be joined by lap or fillet welding or bolting shall be even so that there is no gap between over lapping surfaces.

MARKING

Marking of members shall be made on horizontal pads of appropriate racks or supports in order to ensure horizontal and straight placement of such members.

Marking accuracy shall be at least + or -1 mm.

CUTTING :

Members shall be cut mechanically (by saw or shear) or by oxyacetylene flame. However, all tubes for structural purposes shall be cut by saw only.

All sharp, rough or broken edges, and all edges of joints which are subjected to tensile or oscillating stresses, shall be ground.

No electric metal arc cutting shall be allowed.

All edges cut by oxyacetylene shall be cleaned off impurities prior to assembly.

Cutting tolerance shall be as follows :-

A) For members connected at both ends + or -1 mm.

B) Elsewhere + or -3 mm.

The edge preparation for welding of members more than 12mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough.
Edge preparation shall be as per IS : 823.

DRILLING :

Bolt holes shall be drilled. Drillings shall be made to the diameter specified in drawings. No enlarging of holes filling by oxyacetylene flame shall be allowed.

Allowed variations for holes (out of roundness, eccentricity, plumb line deviation) shall be as per IS:800.

Maximum deviation for spacing of two holes on the same axis shall be +or -1 mm. Two perpendicular diameters of any oval hole shall not differ by any more than 1 mm.
Drilling faults in holes may be rectified by reaming holes to the next upper diameter, provided that spacing of new hole centers and distances of hole centers to the edges of members are not less than allowed and that the increase of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the number of faulty holes does not exceed 15% of the total number of holes for one joint.

PREPARATION OF MEMBERS FOR WELDING :

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, nodes etc.) Sharp edges, rust of cut edges, notches, irregularities, fissures due to faulty cutting etc shall be chipped or ground or filled over the length of the affected area, deep enough to remove faults completely. All steel tubes required for fabrication shall be cut only by a hacksaw/ handsaw and shall not be gas cut except where permitted by the Engineer-in-charge. Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint. Generally no special edge preparation shall be required for members under 8 mm thick. Edge preparation beveling denotes cutting of the same so as to result in V, X, K or U seam shapes as per IS 823. The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy, rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter, likely to get into the gaps between members to be welded. Before assembly, the edges to be welded as well as areas extending for at least 20 mm shall be cleaned (until metallic polish is achieved). When assembling members, proper care shall

be taken of welding shrinkage and distortions, as the drawing dimensions cover finished dimensions of the structure. The elements shall be got checked & approved by the Architect/Engineer before assembly. The permissible tolerance for assembly of members preparatory to welding shall be as per IS : 823-1964. After the assembly has been checked, temporary tack welding in position shall be done by electric welding keeping in view finished dimension of the structure.

WELDING PROCEDURE

Welding shall be carried out only by full trained and experienced welders as tested and approved by the Architect/Engineer. Any test carried out either by the architects or their representative or the inspectors shall constitute a right by them for such tests and the cost involved thereon shall be borne by the contractor himself. Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS:823. The nature of test for performance qualification of welders shall be commensurate with the quality of welding required on this job as judged by the Engineer / Architects . The steel structures shall be automatically semi-automatically or manually welded. Welding shall begin only after the checks mentioned under preparation of materials, marking, cutting, drilling & preparation of members for welding have been carried out and welding procedures and tests for welder's skill have been conducted as per IS:823 and approved by the Engineer / Architect . The welder shall mark with his identification on each element welded by him. When welding is carried out on open air, steps shall be taken to protect the place of welding against wind or rain. The electrodes wire and parts being welded shall be dry. Before beginning the welding operation, each joining shall be checked to assure the parts to be welded are clean and root gaps provided as per IS : 823. For continuing the welding of seams discontinued due to some reason, the end of the discontinued seam shall be melted in order to obtain a good continuity. Before resuming the welding operation, the groove as well as the adjacent parts shall be well cleaned for a length of approximately 50 mm. For single butt welds (in V, 1/2 V or U) and double butt welds (in K, double U etc.) the re-welding of the root is mandatory but only after the metal deposit of the root has been cleaned by back gauging or chipping. The welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other method. For multi layer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping &wire brushing. Packing strips shall not be allowed. The order & method of welding shall be so that no unacceptable deformation appears in the welded parts. Due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses. The defect in welds must be rectified according to IS:823 & as per instruction of Engineer / Architects .

WELD INSPECTION :

The weld seems shall satisfy the following :

Shall correspond to design shapes & dimension. Shall not have any defects such as cracks, incomplete penetration & fusion, under cuts, rough surfaces, burns, blow holes and

porosity etc. beyond permissible limits. During the welding operations and approval of finished elements, inspections & tests shall be made as per specifications The mechanical characteristics of the welded joints shall be as in IS : 823.

PREPARATION OF MEMBERS FOR BOLTING :

The members shall be assembled for bolting with proper jigs and fixtures to sustain the assemblies without deformation & bending. Before assembly all sharp edges, shavings, rust, dirt etc. shall be removed. Before assembly the contacting surfaces of the members shall be cleaned and given a coat of primer as per IS:2074.

The members which are bolt assembled shall be set according to drawings and temporarily fastened with erection bolts (minimum 4 pieces) to check the co-axiality of the holes. The members shall be finally bolted after the deviations have been corrected, after which there shall not be any gaps. Before assemblies, the members shall be checked and got approved by the Engineer / Architect . The difference in thickness of the sections that are butt assembled shall not be more than 3% or maximum 0.8mm whichever is less. If the difference is larger, it shall be corrected by grinding or filling. Reaming of holes to final diameter or cleaning of these shall be done only after the parts have been check assembled. As each hole is finished to final dimensions (reamed if necessary) it shall be set and bolted up. Erection bolts shall not be removed before other bolts are set.

BOLTING UP :

Final bolting of the members shall be done after the defects have been rectified and approval of the joints obtained. The bolts shall be tightened starting from the center of joint towards the edge.

PLANNING OF ENDS :

Planning of ends of members like column ends shall be done by grinding when so specified in the design. Planning of butt welded members shall be done after these have been assembled, the spare edges shall be removed with grinding machine or files.

The following tolerance shall be permitted on members that have been planed :

On the length of the member having both ends planed, maximum + or -2 mm with respect to design. Level differences of planed surface, maximum 0.3mm deviation between planed surface and member's axis maximum 1/1500.

HOLES FOR FIELD JOINTS :

Holes for field joints shall be drilled in the shop to final diameters and tested in the shop with trial assemblies. When three dimensional assembly is not possible in the shop, the holes for field joints may be drilled in shop & reamed onsite after erection on approval by the architect/Engineer. For bolted steel structures, trial assembly in shop is mandatory.

The tolerance for spacing of holes shall be + or - 1 mm.

TOLERANCES :

All tolerances regarding dimensions, geometrical shapes & sections of steel structures shall be as per specifications

MARKING FOR IDENTIFICATION :

All elements and members prior to dispatch for erection shall be shop marked. The members shall be visibly marked with a weather proof light coloured paint. The size and thickness of the members shall be chosen so as to facilitate the identification of members. For the small members that are delivered in bundles or crates the required marking shall be done on small metal tags securely tied to bundle while the crates shall be marked directly. Each bundle or crate shall be packed with members for one and same assembly in the same bundle or crate. General utility members such as bolts, gussets etc. may be packed. All bill of materials showing weight, quality and dimensions of contents shall be placed in the crates. The members shall be marked with a durable paint, in visible location, preferably at one end of the member so that these may be easily checked during storage and erection. All members shall be marked in the shop before inspection & acceptance. When the member is being painted, the marking area shall not be painted but bordered with white paint. The marking and job symbol shall be registered in all shop delivery documents (transportation, for erection etc.).

SHOP TEST PRE-ASSEMBLY :

For steel structures that have the same type of welding the shop test pre-assembly shall be performed on one cut of every 10 members minimum. For bolted steel structures, shop test pre-assembly is mandatory for all elements as well as for the entire structure in conformity with 'holes for field joints'.

SHOP INSPECTION AND APPROVAL :

GENERAL :

The Architect/Engineer shall have free access at all responsible times to the contractor's fabrication shop and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with drawings and specifications. Technical approval of the steel structure in the shop by the architects is mandatory. The contractor shall not limit the number and kinds of tests, final as well as intermediate ones, or extra tests required by the architects. The contractor shall furnish necessary tools, gauges, instruments etc. and technical and non-technical personnel for shop tests by the architects, free of cost.

SHOP ACCEPTANCE :

The architects shall inspect and approve at the following stages

The following approval may be given in shop.

- Immediate approval of work that cannot be inspected later.

- Partial approvals.

- Final approval.

Intermediate approval of work shall be given when a part of the work is performed later.

- Cannot be inspected later.

- Inspection would be difficult to perform and results would not be satisfactory.

Partial approval in the shop is given on members and assemblies of steel structures before the primer coat is applied and includes :-

Approval of materials
Approval of filed joints
Approval of parts with planed surfaces.
Test erection.
Approval of members.
Approval of markings.

Inspection & approvals of special features like rollers, loading platform mechanism etc. During the partial approval, intermediate approvals as well as all former approvals, shall be taken into consideration.

FINAL APPROVAL IN THE SHOP :

The final approval refers to all elements and assemblies of the steel structures, with shop primer coat, ready for delivery from shop to be loaded for transportation or stores.

The final approval comprises of :
Partial approvals
Approval of shop primer coat.
Approval of mode of loading and transport.
Approval of storage (for materials stored).

PAINTING & DELIVERY :

PREPARATION OF PARTS FOR SHOP PAINTING :

Painting shall consist of providing one coat of red oxide zinc chromate primer to steel members before dispatch from shop. Final painting shall be done with two coats of approved brand of enamel paint of required shade prior to erection. Primer coat shall not be applied unless : Surface have been wire brushed, cleaned of dust oil, rust etc. Erection gap between members, spots that can not be painted or where moisture of other aggressive agents may penetrate have been filled with approved type of oil and putty. The surface to be painted are completely dry. The parts where water or aggressive agents may collect

(during transportation, storage, erection and operation) are filled with putty and provided with holes for drainage of water. Members and parts have been inspected and accepted. Welds have been accepted.

The following are not to be painted or protected by any other product :

Surfaces which are in vicinity of joints to be welded at site. Surfaces bearing markings. Other surfaces indicated in the design.

The following shall be given a coat of hot oil or any approved resistant lubricant only.

Planned surfaces.

Holes for links.

The surfaces that are to be embedded or in contact with the concrete shall be given a coat of cement wash. The surfaces which are in contact with the ground, gravel or brickwork and subject to moisture, shall be given bituminous coat. The other surfaces shall be given a primer coating. Special attention shall be given to locations not easily accessible, where water can collect and which after assembly and erection cannot be inspected, painted and maintained. Holes shall be provided for water drainage and inaccessible box type sections shall be hermetically sealed by welds. If specified elsewhere in the schedule of quantities the contractor shall paint further course of red oxide after erection and placing in position of the steel structures.

PACKING, TRANSPORTATION, DELIVERY : After final shop acceptance and marking, the items shall be packed and loaded for transportation. Packing must be adequate to protect item against warping during loading and unloading. Lifting devices shall be used for loading in order to protect item against warping. Slender projecting parts shall be braced with additional steel bars, before loading, for protecting against warping during transportation. Loading and transportation shall be done in compliance with transportation rules. If certain parts cannot be transported in the lengths stipulated in the design, the position and type of additional splice joints shall be approved by the architects. Items must be carefully loaded on platforms of transportation means to prevent warping, bending or falling, during transportation. The small parts such as fish plates, plates, gussets etc. shall be securely tied with wire to their respective parts. Bolts, nuts and washers shall be packed and transported in crates.

The parts shall be delivered in the order stipulated by the Architect/Engineer and shall be accompanied by document showing :

- Quality and quantity of structure or members.
- Position of members in the structure.
- Particulars of structure.
- Identification number/job symbol.

FIELD ERECTION :

The erection work shall be permitted only after the foundation or other structure over which the steel work will be erected is approved and is ready for erection. The contractor shall satisfy himself about the levels, alignment etc. for the foundations well in advance, before starting the erection. Minor corrections shall be carried out by the contractor on his own expense.Any faulty erection done by the contractor shall be made good at his own cost.Approval by the Architect/Engineer at any stages of work does not relieve the contractor of any of his required guarantees of the contract.

STORAGE AND PREPARATION OF PARTS PRIOR TO ERECTION :

The storage place for steel parts shall be prepared in advance got approved by the Architect/Engineer before the steel structures start arriving from the shop. Platform shall be provided by the contractor near the erection site for preliminary erection work.

The contractor shall make the following verifications up to receipt of material at site :-

- For quality certificates regarding materials & workmanship according to these general specifications and drawings.

- Whether parts received are complete without defects due to transportation loading and unloading defects, if any are well within the admissible limit.

For the above work sufficient space must be allotted in the storage area. Steps shall be taken to prevent warping of items during unloading. The parts shall be stored according to construction symbol and markings so that these may be taken out in order of erection. The parts shall be at least 150 mm clear from ground on wooden or steel locks for protection against direct contact with ground and to permit drainage of water. If the rectification of members like straightening etc are required these shall be done in a special place allotted which shall be adequately equipped. The parts shall be clean when delivered for erection.

ERECTION AND TOLERANCES :

Erection in general shall be carried out as required and approved by architects. Positioning and leveling of the structure, alignment & plumbing of the stanchion & fixing every member of the structure shall be in accordance with the relevant drawings and to complete satisfaction of the architects.

The following checks and inspection shall be carried out before, during and after erection.

- Damage during transportation.
- Accuracy of alignment of structure
- Erection according to drawings & specifications
- Progress and workmanship.

In case there be any deviations regarding positions of foundations or anchor bolts, which would lead to erection deviations, the ArchitectEngineer shall be informed immediately. Minor rectifications in foundations, orientation of bolts holes etc. shall be carried out as a part of the work at no extra cost. The various parts of the steel structure shall be so erected as to ensure stability against inherent weight, wind and erection stresses. The structure shall be anchored & final erection joints completed after plan & elevation positions of the structural members have been verified with corresponding drawings and approved by the Architect/Engineer. The bolted joints shall be tightened so that the entire surface of the bolt heads and nuts shall rest on the member. For parts with slopping surfaces tapered washers shall be used.

FINAL ACCEPTANCE AND HANDING OVER THE STRUCTURE :

At acceptance, the contractor shall submit the following documents

- Shop and erection drawings - either in tracings or reproducible.
- 4 copies of each of the following :

Shop acceptance documents, Quality certificate for structural, plates, etc. (electrodes, welding wire, bolts, nuts, washers etc.) List of certified welders who worked on erection of structures. Acceptance & intermediate control procedure of erection operation.

Approval by the Architect/Engineer at any stage of work does not relieve the contractor of any of his required guarantees of contract.

METHOD OF PAYMENT :

Payment for steel work shall be made on the basis of admissible area of work and also as per weight of the structure accepted, the weight being determined as described below :-

The rate for supply, fabrication & erection shall include cost of all handling & transportation to owner's store/site of work where supply & fabrication only are involved, trimming, straightening, edge preparation, preparation and getting reviewed of fabrication drawings and providing one coat of red oxide zinc chromate primer & two coats of anti corrosive enamel painting permitted coating. In case, owner supplies materials, the rate shall include the cost of steel materials, taking delivery of the materials from owner’s store, all handling, re-handling, loading and unloading, transport to site of work, returning of surplus materials to owner's stores etc. complete as well as the cost of all handling and transport, scaffolding, temporary supports, tools and tackles, touching up primer coat, grouting etc. The weight for payment will be assessed from the approved fabrication drawings and the respective bill of material prepared by the contractor and approved by the Architect/Engineer. The weight of structural materials/ plate shall be calculated wherever necessary on the basis of IS handbook. If sections are different from IS section, then manufacturer,s handbook shall be adopted. No allowance in weights shall be made for rolling tolerance. Sections built out of plates structural shall be paid on the actual weight incorporated except for gussets which will be paid on the weight of the smallest rectangle enclosing the shape. No deductions shall be made for skew cuts in rolled steel

sections. Welds, bolts, nuts, washers etc. shall not be measured. Rates for structural steel work shall be deemed to include the same. No other payment either for temporary works connected with this contract or for any other item such as welds, shims, racing plates, etc. shall be made. Such item shall be deemed to have been allowed for in the rate quoted for steel work.

GROUTING OF POCKETS :

Grouting of pockets and under base plates will be done only after the steel work has been leveled and plumbed and the base of stanchions are supported by steel shims. The space below the base plate and pockets shall be thoroughly cleaned. The mortar used for grouting shall not be lesser than 1:2 (1 cement :2 sand) grade 300 in case of concrete) and shall be mixed to the minimum consistency required, it shall be poured under a suitable head and tamped until the space has been completely filled. For detailed specifications reference shall be made to clause 14.

Tolerances allowed in the erection of plant building Without Cranes:-

The maximum tolerances for line and level of the steel work shall be + or - 3.00 mm on any part of the structure. The structure shall not be out of plumb more than 3.5mm on each 10 m section of height and not more than 7.00 mm per 30 m section. The tolerances shall apply to all parts of the structure unless the drawings issued for erection purposes state otherwise.

Inadequate appearance of weld may be allowed if no other defects that might diminish weld strength are present. Sectional weld shape must comply with design indications. No concave welds shall be allowed for specified convex welds, or vice versa. Tolerance for concavity or convexity of welds shall be 1 x A ("A" being the height of the triangle within the section shown), but not more than 0.6 mm.

PROTECTION OF WORK :

The contractor shall be responsible for the temporary doors and closing in openings necessary for the protection of work during progress. He shall also provide & maintain any other temporary covering required for the protection of finished wood work if any, that may be damaged during the progress of work if left unprotected.

MAKE GOOD DEFECTIVE WORK :

The contractor shall be responsible for any shrinkages or warping or any other defects which may appear in any joinery work. All defective or damaged work shall be taken down and renewed or repaired to the entire satisfaction of the Architect/Engineer.