



TITLE:

**TECHNICAL SPECIFICATION FOR
ERECTION OF STRUCTURAL
STEELWORK**

SPECIFICATION NO. PE-TS-329-616-C001

VOLUME - II B

SECTION - D – SUB-SECTION : D18

REV.NO. 1

DATE 05/12/2009

SHEET 1

OF 17

JINDAL POWER LIMITED

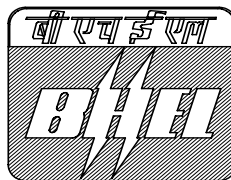
**4X600MW OPJ STPP, PHASE-III
RAIGARH**

VOLUME: II B

**SECTION - D
SUB-SECTION – D18**

ERECTION OF STRUCTURAL STEELWORK

SPECIFICATION NO. PE-TS-329-616-C001



**Bharat Heavy Electricals Limited
Project Engineering Management
Power Sector, PPEI Building
Noida – 201 301**



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<div data-bbox="405 291 1189 331" data-label="Section-Header"> <h2 style="text-align: center;"><u>ERECTION OF STRUCTURAL STEELWORK</u></h2> </div> <div data-bbox="189 369 494 403" data-label="Section-Header"> <h3>1.00.00 SCOPE</h3> </div> <div data-bbox="384 443 1406 624" data-label="Text"> <p>This specification covers the erection of structural steelwork including receiving and taking delivery of fabricated structural steel materials arriving at site, installing the same in position, painting and grouting the stanchion bases all complete as per Drawings, this Specification and other provision of the Contract.</p> </div> <div data-bbox="189 665 545 698" data-label="Section-Header"> <h3>2.00.00 GENERAL</h3> </div> <div data-bbox="189 739 1406 813" data-label="Text"> <p>2.01.00 Work to be provided for by the Contractor, unless otherwise specified in the Contract, shall include but not be limited to the following:</p> </div> <div data-bbox="384 853 1406 1892" data-label="List-Group"> <ol style="list-style-type: none"> a) The Contractor shall provide all construction and transport equipment, tools, tackle, consumables, materials, labour, and supervision required for erection of the structural steelwork. b) Receiving, unloading, checking, and moving to storage yard at Site including prompt attendance to all insurance matters as necessary for all fabricated steel materials arriving at Site. The Contractor shall pay all demurrage and/or wharfage charges etc. on account of default on his part. c) Transportation of all fabricated structural steel materials from Site storage yard, handling, rigging, assembling, riveting, bolting, welding and satisfactory installation of all fabricated structural steel materials in proper location according to approved erection drawings and/or as directed by the Engineer. If necessary suitable temporary approach roads to be built for transportation of fabricated steel structures. d) Checking center lines, levels of all foundation blocks including checking line, level, position and plumb of all bolts and pockets. Any defect observed in the foundation shall be rectified with Engineer's approval. The Contractor shall fully satisfy himself regarding the correctness of the foundations before installing the fabricated steel structures on the foundation blocks. e) Aligning, plumbing, levelling, riveting, bolting, welding and securely fixing the fabricated steel structures including floor gratings, chequered plates etc. in accordance with the Drawings or as directed by the Engineer. f) Painting of the erected steel structures. </div>		

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	<p>g) All minor modifications of the fabricated steel structures as directed by the Engineer including but not limited to the following:</p> <ul style="list-style-type: none"> i) Removal of bends, kinks, twists etc. for parts damaged during transport and handling. ii) Cutting, chipping, filling, grinding, etc. if required for preparation and finishing of site connections. iii) Reaming of holes for use of higher size rivet or bolt if required. iv) Refabrication of parts damaged beyond repair during transport and handling or refabrication of parts, which are incorrectly fabricated. v) Fabrication of parts omitted during fabrication by error, or subsequently found necessary. vi) Drilling of holes which are either not drilled at all or are drilled in incorrect location during fabrication. vii) Carry out tests in accordance with this specification. 	
2.02.00	Work by Others No work under this Specification will be provided for by any agency other than the Contractor unless specifically mentioned elsewhere in the contract.	
2.03.00	Codes and Standards All work under this Specification shall, unless specified otherwise, conform to the latest revisions and/or replacements of the following or any other Indian Standard Specification and codes of Practice of equivalent: IS: 800 - Code of practice for general construction in steel. IS: 12843 – Tolerances for Erection of structural steel	
2.04.00	Conformity with Designs The Contractor will erect the entire fabricated steel structure, align all the members, complete all field connections and grout the foundations all as per the provisions of this specification and the sequence and the design criteria laid down by the Engineer. All work shall conform to the provisions of this specification and /or instructions of the engineer. The testing and acceptance of the erected structures shall be in accordance with the provisions of this Specifications and/or the instructions o the Engineer.	
2.05.00	Material	

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2.05.01	General	<p>All fabricated steel structures and connection materials shall be supplied by the Contractor to the site. The Contractor shall take delivery from railway wagons or trucks at site, and unload the materials and perform all formalities like checking of materials and attend to insurance matters in accordance with Sub-Clause 2.01.00 and as specified hereinbefore.</p>
2.05.02	Materials to conform to Indian standards	<p>All materials required to be supplied by the Contractor under this contract shall conform to the relevant Indian Standard specifications.</p>
2.06.00	Storage of Materials	
2.06.01	General	<p>All material shall be so stored as to prevent deterioration and to ensure the preservation of their quality and fitness for use in the works. Any material which has been deteriorated or damaged beyond repairs and has become unfit for use shall be removed immediately from the site, failing which, the engineer shall be at liberty to get the materials removed by agency and the cost incurred thereof shall be realised from the Contractor's dues.</p>
2.06.02	Yard	<p>The Contractor will have to establish a suitable yard in an approved location at site for storing the fabricated steel structures and other raw steel materials such as structural sections and plates as required. The yard shall have facilities like drainage, lighting, and suitable access for large cranes, trailers, and other heavy equipments. The yard shall be fenced all around with security arrangement and shall be of sufficiently large area to permit systematic storage of the fabricated steel structures without overcrowding and with suitable access for cranes, trailers and other equipment for use in erection work in proper sequence in accordance with the approved Programme of work.</p> <p>The Tenderer must visit the site prior to submission of his tender to acquaint himself with the availability of land and the development necessary by way of filling, drainage, access roads, fences, sheds etc. all of which shall be carried out by the Contractor at his own cost as directed by the Engineer.</p>
2.06.03	Covered Store	<p>All field connection materials, paints, cement etc. shall be stored on well designed racks and platforms off the ground in a properly covered store building to be built at the cost of the Contractor.</p>

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2.07.00	Quality Control <p>The contractor shall establish and maintain quality control procedures for different items of work and materials as may be directed by the Engineer to assure compliance with the provisions of the Contract and shall submit the records of the same to the Engineer. The quality control operation shall include but not be limited to the Following items of work :</p> <ul style="list-style-type: none"> i) Erection: Lines, levels, grades, plumbs, joint characteristics including tightness of bolts. ii) Grouting: Cleaning and roughness of foundation, quality of materials used for grouting, admixtures, consistency, and strength of grout. iii) Painting: Preparation of surface for painting, quality of primers and paints, thinners, application and uniformity of coats. 2.08.00	Taking Delivery <p>The Contractor shall take delivery of fabricated structural steel and necessary connection materials from railhead/trucks as may be necessary and as directed by the Engineer. He shall check, unload; transport the materials to his stores for proper storing at his own cost. The Contractor shall submit claims to insurance or other authorities and pursue the same in case of loss or damage during transit and handling and all loss thereof shall be borne by him.</p> <p>The Contractor shall also take all precautions against damage of the materials in his custody after taking delivery and till the same are erected in place and accepted. The Contractor shall salvage, collect, and deliver all the packing materials to the Owner free of charge.</p> 3.00.00
3.00.00	WORKMANSHIP	
3.01.00	Erection	
3.01.01	Plant and Equipment <p>The suitability and adequacy of all erection tools and plant and equipment proposed to be used shall be thoroughly verified. They shall be efficient, dependable, in good working condition and shall have the approval of the Engineer.</p>	
3.01.02	Method and sequence of erection <p>The method and sequence of erection shall have the prior approval of the</p>	

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<p>Engineer. The Contractor shall arrange for most economical method and sequence available to him consistent with the drawings and specifications and other relevant stipulations of the contract.</p>				
3.01.03	Temporary Bracing			
<p>Unless adequate bracing is included as a part of the permanent framing, the erector during erection shall install, free of cost to the Owner, temporary guys and bracings where needed to secure the framing against loads such as wind or seismic forces comparable in intensity to that for which the structure has been designed, acting upon exposed framing as well as loads due to erection equipment and erection operations.</p>				
<p>If additional temporary guys are required to resist wind or seismic forces acting upon components of the finished structure installed by others during the course of the erection of the steel framing, arrangement for their installation by the erector shall be made free of cost to the Owner.</p>				
<p>The requirement of temporary bracings and guys shall cease when the structural steel is once located, plumbed, levelled, aligned, and grouted within the tolerances permitted under the specification and guyed and braced to the satisfaction of the Engineer.</p>				
<p>The temporary guys, braces, false work, and cribbing shall not be the property of the Owner and they may be removed immediately upon completion of the steel erection.</p>				
3.01.04	Temporary Floors for Buildings			
<p>It shall be the responsibility of the Contractor to provide free of cost planking and to cover such floors during the work in progress as may be required by any Act of Parliament and/or bylaws of state, Municipal or other local authorities.</p>				
3.01.05	Setting Out			
<p>Positioning and levelling of all steelwork, plumbing of stanchions and placing of every part of the structure with accuracy shall be in accordance with the approved Drawings and to the satisfaction of the Engineer. For heavy columns, etc. the Contractor shall set proper screed bars to maintain proper level. No extra payment shall be made for this.</p>				
<p>Each tier of column shall be plumbed and maintained in a true vertical position subject to the limits of tolerance under this Specification.</p>				
<p>No permanent field connections by riveting, bolting or shall be carried out until proper alignment and plumbing has been attained.</p>				

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3.01.06

Field Riveting

All rivets shall be heated and driven with pneumatic tools. Hand passing or "throwing" of rivets are desirable. Any other method of conveying hot rivets from the furnace to the driving point must be approved by the engineer. No-cold rivets shall be driven. All other requirements of riveting including quality and acceptance criteria shall be in accordance with the relevant portions of the Specification for Fabrication of Structural Steelwork of the Project.

3.01.07

Field Bolting

All relevant Portions in respect of bolted construction of the Specification for Fabrication of Structural Steelwork applicable to the Project shall also be applicable for field bolting in addition to the following:

Bolts shall be inserted in such a way so that they may remain in position under gravity even before fixing the nut. Bolted parts shall fit solidly together when assembled and shall not be separated by gaskets or any other interposed compressible materials. When assembled, all joint surfaces, including those adjacent to the washers shall be free of scales except tight mill scales. They shall be free of dirt, loose scales, burns, and other, defects that would prevent solid seating of the parts. Contact surfaces within friction type joints shall be free of oil, paint, lacquer, or galvanizing.

All high tensile bolts shall be tightened to provide, when all fasteners in the joint are tight, the required minimum bolt tension by any of the following methods.

a) Turn-of-nut Method

When the turn-of-nut method is used to provide the bolt tension, there shall first be enough bolts brought to a "snug tight" condition to ensure that the parts of the Joint are brought into good contact with each other. "Snug tight" is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. All bolts in the joint shall then be tightened additionally by the applicable amount of nut rotation specified in Table-I with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

TABLE-I

Bolts length not exceeding 8 times	Bolt length exceeding 8 times	Remarks
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dia or 200 mm

dia or 200 mm

1/2 turn

2/3 turn

Nut rotation is relative to bolt regardless of the element (nut or bolt) being turned.
Tolerance on rotation-30° over or under.

Bolts may be installed without hardened washers when tightening is done by the turn -of-nut -method. However, normal washers shall be used.

Bolts tightened by the turn-of-nut method may have the outer face of the match-marked with the protruding bolt point before final tightening, thus affording the inspector visual means of noting the actual nut rotation. Such marks can be made by the wrench operator by suitable means after the bolts have been brought up snug tight.

b) Torque Wrench Tightening

When torque wrenches are used to provide the bolt tensions, the bolts shall be tightened to the torques specified in TABLE-II (See Note below the Table). Nuts shall be in tightening motion when torque is measured. When using torque wrenches to install several bolts in a single joint, the wrench shall be returned to touch up bolts previously tightened, which may have been loosened by the tightening of subsequent bolts, until all are tightened to the required tension.


TABLE-II

Nominal Bolt Diameter (mm) (Kg.M) of IS:1367	Torque to be applied for bolt class 8.8
20	59.94
22	81.63
24	103.73

Note: The above torque values are approximate for providing tensions of 14.7 T for 20 mm dia.; and 21.2 T for 24 mm dia. bolts under moderately lubricated condition. The torque wrench shall be calibrated at least once daily to find out the actual torque required to produce the above required tension in the bolt by placing it in a tension indicating device. These torques shall be applied for tightening the bolts on that day with the particular wrench.

In either of the above two methods, if required, for bolt entering and wrench

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	<p>operation clearances, tightening may be done by turning the bolt while the nut is prevented from rotating.</p> <p>Impact wrenches if used shall be of adequate capacity and sufficiently supplied with air to perform the required tightening of each bolt in approximately ten seconds. Holes for turned bolts to be inserted in the field shall be reamed in the field. All drilling and reaming for turned bolts shall be done only after the parts to be connected are assembled. Tolerances applicable in the fit of the bolts shall be in accordance with relevant Indian Standard Specifications. All other requirements regarding assembly and bolt tightening shall be in accordance with this sub clause.</p>	
3.01.08	Field Welding <p>All field assembly and welding shall be carried out in accordance with the requirements of the specification for fabrication work applicable to the project, excepting such provisions therein which manifestly apply to shop conditions only. Where the fabricated structural steel members have been delivered painted, the paint shall be removed before field welding for a distance of at least 50 mm on either side of the joints.</p>	
3.01.09	Holes, Cutting and Fitting <p>No cutting of sections, flanges, webs, cleats, rivets, bolts, welds etc. shall be done unless specifically approved and /or instructed by the Engineer.</p> <p>The erector shall not cut, drill, or otherwise alter the work of other trades, unless such work is clearly specified in the Contract or directed by the Engineer. Wherever such work is obtain specified the Contractor shall obtain complete information as to size, location and number of alterations prior to carrying out any work. The Contractor shall not be entitled for any payment on account of any such work.</p>	
3.02.00	Drifting <p>Correction of minor misfits and reasonable amount of reaming and cutting of excess stock from rivets will be considered as permissible. For this, light drifting may be used to draw holes together and drills shall be used to enlarge holes as necessary to make connections. Reaming, that weakens the member or makes it impossible to fill the holes properly or to adjust accurately after reaming, shall not be allowed.</p> <p>Any error in shop work which prevents the proper assembling and fitting of parts by moderate use of drift pins and reamers shall immediately be called to the attention of the Engineer and approval of the method of correction obtained. The use of gas cutting torches at erection site is prohibited.</p>	

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3.03.00

Grouting of stanchion bases and bearings of beams and girders on stone, brick or concrete (Plain or reinforced)

Grouting shall be carried out with Ordinary Cement grout as described below:

The mix shall be one (1) part cement and one (1) part sand and just enough water to make it workable. The positions to be grouted shall be cleaned thoroughly with compressed air jet and wetted with water and any accumulated water shall be removed. These shall be placed under expert supervision, taking care to avoid air locks. Edges shall be finished properly. If the thickness of grout is 25 mm or more, two (2) parts of 6 mm down graded stone chips may be added to the above noted cement-sand grout mix, if required, by the Engineer or shown on the drawings.

No grouting shall be carried out until a sufficient number of bottom lengths of stanchions have been properly lined, leveled, and plumbed and sufficient floor beams are tied in position.

Whatever method of grouting is employed, the operation shall not be carried out until the steelwork has been finally levelled and plumbed, the stanchion bases being supported meanwhile by steel wedges, and immediately before grouting, the space under steel shall be thoroughly cleaned.

If required by the Engineer, certain admixtures like aluminium powder, “ironite” or equivalent, may be required to be added to the grout to enhance certain desirable properties of the grout. Approved non-shrink pre-mixed grout having required flowability and compressive strength may also be used with Engineer's approval.

3.04.00

Painting after Erection

Field painting shall only be done after the structure is erected, levelled, plumbed, aligned and grouted in its final position, tested and accepted by the Engineer. Normally, final painting shall be done only after the floor slabs are concreted and masonry walls are built. However, touch up painting, making good any damaged shop painting and completing any unfinished portion of the shop coat shall be carried out by the Contractor free of cost to the Owner. The materials and specification for such painting in the field shall be in accordance with the requirements of the specification for fabrication of structural steelwork applicable for the project.

Painting shall not be done in frosty or foggy weather or when humidity is such as to cause condensation on the surfaces to be painted. Before painting of steel, which is delivered unpainted, is commenced, all surfaces to be painted shall be dried and thoroughly cleaned from all loose scale and rust.

All field rivets, bolts, welds, and abrasions to the shop coat shall be spot

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<p> painted with the same paint used for the shop coat. Where specified, surfaces, which will be in contact after site assembling, shall receive a coat of paint (in addition to the shop coat, if any) and shall be brought together while the paint is still wet. </p> <p> Surface, which will be inaccessible after field assembly shall receive the full, specified protective treatment before Bolts and fabricated steel members who are galvanized or otherwise treated and steel members to be encased shall not be painted. </p> <p> The final painting shall be of two coats of Synthetics Enamel painting or Aluminium paint of approved manufacture as per the approved “Schedule of Painting”. The shades shall also be as per the approved schedule. Synthetic enamel paint shall conform to IS: 2932. </p> <p> 3.05.00 Final cleaning up </p> <p> Upon completion of erection and before final acceptance of the work by the Engineer, the contractor shall remove free of cost all false work, rubbish and all Temporary Works resulting in connection with the performance of his work. </p> <p> 4.00.00 TESTING AND ACCEPTANCE CRITERIA </p> <p> 4.01.00 General </p> <p> Loading tests shall be carried out on erected structures, if required by the Engineer, to check adequacy of fabrication and/or erection. Any structure or a part thereof found to be unsuitable for acceptance as a result of the test shall have to be dismantled and replaced with suitable member as per the Contract and no payment towards the cost of the dismantled portion and any connected work shall be made to the contractor. In course of dismantling, if any damage is done to any other parts of the structure or to any fixtures, the same shall be made good free of cost by the Contractor, to the satisfaction of the Engineer. The Cost of the tests specified hereinafter shall be borne by the Owner; but if the structure fails to pass the tests, the cost of the tests shall be recovered from the Contractor. Any extra claim due to loss of time, idle labour, etc. arising out of these testing operations shall not be entertained, however, only reasonable and appropriate time extensions will be allowed. </p> <p> The structure or structural member under consideration shall be loaded with its actual dead load for as long a time as possible before testing and the tests shall be conducted as indicated in the following sub-clauses 4.01.01, 4.01.02 and 4.01.03. The method of testing and application of loading shall be as approved by the Engineer. </p> <p> 4.01.01 Stiffness Test </p>		

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4.01.02 Strength Test		
<p>The structure or structural member under consideration shall be subjected, in addition to its actual dead load, to a test load equal to the sum of the dead load and twice the specified superimposed load, and this load shall be maintained for 24 hours.</p> <p>In the case of wind load, a load corresponding to twice the specified wind load shall be applied and maintained for 24 hours, either with or without the vertical test load for more severe condition in the member under consideration or the structure as a whole. Complete tests under both conditions may be necessary to verify the strength of the structure. The structure shall be deemed to have adequate strength if, during the test, no part fails and if on the removal of the test load, the structure shows a recovery of at least 20 per cent of the maximum deflection or strain recorded during the 24 hours under load.</p>		
4.01.03 Structure of same design		
<p>Where several structures are built to the same design and it is considered unnecessary to test all of them, one structure, as a prototype, shall be fully tested, as described in previous Sub-clauses, but in addition, during the first application of the test load, particular note shall be taken of the strain or deflection when the test load 1.5 times the specified superimposed load has been maintained for 24 hours. This information is required as a basis of comparison in any check test carried out on samples of the structure.</p> <p>When a structure of the same type is selected for a check test, it shall be subjected, in addition to its actual dead load, to a superimposed test load, equal to 1.5 time the specified live load, in a manner and to an extent prescribed by the Engineer. This load shall be maintained for 24 hours, during which time, the maximum deflection shall be recorded. The check test shall be considered satisfactory, provided that the maximum strain or deflection recorded in the check test does not exceed by more than 20% of the maximum strain or deflection recorded at similar load in the test on the prototype.</p>		

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4.01.04	Repair for subsequent test and use after strength tests																								
	An actual structure which has passed the “Strength Test” as specified in Sub-clause 4.1.2 hereinbefore and is subsequently to be erected for use, shall be considered satisfactory for use after it has been strengthened by replacing any distorted members and has subsequently satisfied the 'Stiffness Test' as specified in Sub-clause 4.01.01 hereinbefore.																								
4.02.00	Tolerances																								
	Some variation is to be expected in the finished dimensions of structural steel frames. Unless otherwise specified, such variations are deemed to be within the limits of good practice when they are not in excess of the cumulative effect of detailed erection clearances, fabricating tolerances for the finished parts and the rolling tolerances for the profile dimensions permitted under the Specifications for fabrication of structural steel work applicable to this Project and as specified below:																								
	I. For Buildings Containing Cranes																								
	<table> <tr> <th data-bbox="384 1032 536 1059">Component</th><th data-bbox="675 1032 826 1059">Description</th><th data-bbox="1059 1032 1302 1059">Variation Allowed</th></tr> <tr> <th data-bbox="483 1104 504 1131">1.</th><th data-bbox="770 1104 791 1131">2.</th><th data-bbox="1155 1104 1176 1131">3.</th></tr> <tr> <td data-bbox="384 1176 571 1202" rowspan="6">Main columns</td><td data-bbox="675 1176 1007 1288" rowspan="2">a) shifting of column axis at foundation level with respect to building line</td><td></td></tr> <tr> <td></td></tr> <tr> <td data-bbox="675 1332 1031 1359">i) In longitudinal direction</td><td data-bbox="1155 1332 1302 1359">i) ± 3.0 mm</td></tr> <tr> <td data-bbox="675 1404 967 1431">ii) In lateral direction</td><td data-bbox="1155 1404 1310 1431">ii) ± 3.0 mm</td></tr> <tr> <td data-bbox="675 1476 1019 1655" rowspan="2">b) Deviation of both major column axis from vertical between foundation and other member connection levels:</td><td></td></tr> <tr> <td></td></tr> <tr> <td></td><td data-bbox="675 1700 1003 1771">i) For a column upto and including 10M height</td><td data-bbox="1117 1700 1402 1771">i) ± 3.5 mm from true vertical</td></tr> <tr> <td></td><td data-bbox="675 1816 991 1924">ii) For a column greater than 10M but less than 40M height</td><td data-bbox="1112 1816 1402 2036">ii) ± 3.5 mm from true vertical for any 10 M length measured between connection levels, but not more than ± 7 mm per 30m</td></tr> </table>	Component	Description	Variation Allowed	1.	2.	3.	Main columns	a) shifting of column axis at foundation level with respect to building line			i) In longitudinal direction	i) ± 3.0 mm	ii) In lateral direction	ii) ± 3.0 mm	b) Deviation of both major column axis from vertical between foundation and other member connection levels:				i) For a column upto and including 10M height	i) ± 3.5 mm from true vertical		ii) For a column greater than 10M but less than 40M height	ii) ± 3.5 mm from true vertical for any 10 M length measured between connection levels, but not more than ± 7 mm per 30m	
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	ii) In lateral direction	ii) ± 3.0 mm																							
	b) Deviation of both major column axis from vertical between foundation and other member connection levels:																								
	i) For a column upto and including 10M height	i) ± 3.5 mm from true vertical																							
	ii) For a column greater than 10M but less than 40M height	ii) ± 3.5 mm from true vertical for any 10 M length measured between connection levels, but not more than ± 7 mm per 30m																							

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		length.
	c) For adjacent pairs of columns across the width of the building prior to placing of truss	± 9.0 mm on true span.
	d) For any individual column deviation of any bearing or resting level from levels shown on drawings.	± 3.0 mm
	e) For adjacent pairs of columns either across the width of building or longitudinally level difference allowed between bearing or seating	3.0 mm
Trusses	a) Deviation at centre of span of upper chord member from vertical plane running through centre of bottom chord.	1/1500 of the span or greater than 10mm whichever is the least.
Trusses	b) Lateral displacement of top chord at center of span from vertical plane running through center of supports.	1/250 of depth of truss or 20 mm which ever is the - least.
Crane Cirders	a) Difference in levels of crane rail measured between adjacent columns.	2.0 mm.
	b) Deviation to crane rail-gauge	± 3.0 mm
	c) Relative shifting of ends of adjacent crane rail in plan and elevation after thermite welding.	1.0 mm.
	d) Deviation of crane rail axis from centre line of web.	± 3.5 mm
Setting of Expansion gaps	At the time of setting of the expansion gaps, due regard shall be taken of the ambient temperature above	

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<p>or below 30°C. The coefficient of expansion or contraction shall be taken as 0.000012 per °C per unit length.</p> <p>iv) For Building without Cranes</p> <p>The maximum tolerances for line and level of the steel work shall be ±3.0 mm on any part of the structure. The structure shall not be Out of Plumb more than 3.5 mm on each lox section of height and not more than 7.0 mm per 30 m section.</p> <p>These tolerances shall apply to all parts of the structure unless the drawings issued for erection purposes state otherwise.</p> <p>4.03.00 Acceptance</p> <p>Structures and members have passed the tests and conform to all requirements specified in the foregoing Sub-clause 4.01.00, 4.01.01, 4.01.02, 4.01.03 and 4.01.04 and other applicable provisions of this specification and are within the limits of tolerances specified in Sub-clause 4.02.00 and/or otherwise approved by the Engineer shall be treated as approved and accepted for the purpose of fulfillment of the provisions of this contract.</p> <p>5.00.00 INFORMATION TO BE SUBMITTED</p> <p>5.01.00 Before Tender</p> <p>5.01.01 Tentative Programme</p> <p>The Tenderer shall submit a tentative programme based on the information available in the Tender Document and visit to site indicating the structure-wise erection schedule proposed to be maintained by the Contractor to complete the job in time in accordance with the Contract.</p> <p>5.01.02 Constructional Plant and Equipment, Tools, Temporary works & manpower A detailed list Of all constructional plant and equipment like cranes, derricks, winches, welding sets, erection tools etc. along with their make, model, present condition and location available with the Tenderer which he will be able to employ on the job to maintain the progress of work in accordance with the Contract shall be submitted along with the Tender. The total number of each category of experienced personnel like fitters, welders, riggers etc. that he will be able to employ on the job shall also be indicated.</p> <p>5.01.03 Erection Yard</p> <p>A site plan showing the layout and location of the erection yard proposed to be</p>		

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	<p>established by the tenderer shall also be attached with the tender indicating the storage space for fabricated steel materials, site-fabrication and repair shop, covered stores, offices, locations of erection equipments and other facilities. The Engineer shall have the right to modify the arrangement and location of the proposed yard to suit site conditions and the Contractor shall comply with the same without any claim whatsoever.</p>	
5.02.00	After award of the Contract After award of the contract, the Contractor shall submit the following:	
5.02.01	Detailed Programme The Contractor shall submit a detailed erection programme within a month of the award of the Contract for completion of the work in time in accordance with the Contract. This will show the target programme, with details of erection proposed to be carried out in each fortnight, details of major equipment required, and an assessment of required strength of various categories of workers in a proforma approved by the Engineer.	
5.02.02	Fortnightly Progress Report The Contractor shall submit fortnightly progress reports in triplicate to the Engineer showing along with necessary photographs, 125 mm x 90 mm size, and all details of actual achievements against the target programme specified in Sub-clause 5.02.01 above. Any shortfall in the achievement in a particular fortnight must be made up within the next fortnight. Along with this report, the Contractor shall also furnish details of fabricated materials in hand at site and the strength of his workers.	