

**S.13: ADDITIONAL SPECIFICATION FOR
FABRICATION & ERECTION OF OPEN WEB GIRDER****13.1 General:**

This chapter covers the supply of material, fabrication, assembly and erection of Open Web Girder (OWG) and bearings. The following are the brief specifications and general guidelines for fabricating and erecting the girders but not limited to and shall be read in conjunction with Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001).

High Strength Friction Grip Bolts (HSFGB) shall be used as per drawings.

Protection screen is to be provided portion as per RDSO Drawing No. RDSO/ETI/0068 (latest version).

All workshop fabrication shall be done using Automatic SAW (Submerged Arc Welding) process only. All welding, other than workshop welding, shall be done through Gas Shielded FCAW (Flux Core Arc Welding) process only. SMAW (Shielded Metal Arc Welding) also known as Manual Metal Arc Welding shall NOT be permitted anywhere in the structure. FCAW wire to be used shall be Flux Core Tubular consumable electrode to generate flux gas in addition to gas cover of CO₂, Argon or /CO 2- Argon mixture only. In FCAW process, wind screen and /or enclosures shall be providing around the welding location to prevent shielding gas from blown out. Welding shall be performed on prepared metal surfaces free from rust, dust, moisture etc. And before every new pass, slag must be carefully chipped off from weld surface. Radiography test shall be conducted to ensure weld quality. Method of launching shall be approved by Indian Railways for which no extra payment will be made to the Contractor.

13.2 Site Inspection:

Tenderers are requested to inspect the site and carry out careful examination to satisfy them as to the nature of work involved and facilities available at the site. They should note carefully all the existing structures and those under construction through other agencies. They should also study the suitability of utilizing the different equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of locating their store yard, laboratory, staff quarters etc., and satisfy themselves with regard to the feasibility of transporting the plate girders from the yard to the final site of placement etc.

13.3 Materials:

Steel (Plates and Rolled sections) should conform to IS: 2062-2011. It shall have Sub quality 'B0' & Grade E250 (Fe410) or E350 (Fe 490) as mentioned in the tender schedule/drawing and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans.

Material supplied by the manufacturers shall be ultrasonically tested as per codal provisions at the manufacturer's premises before dispatch. The contractor on receipt of supply in his factory premises/fabrication workshop may have to carry out random USFD testing as per standards laid down in various codes and verify them with the list received from manufacturers, if instructed by the inspection agency/ Site Engineer. Only tested steel shall be used for fabrication. The steel shall comply in all respects with the requirements of approved drawings and relevant codes and specifications, and it may be noted that quality of steel used for fabrication shall be the essence of the contract & shall be rigidly followed.

Structural Steel shall be procured as per specification mentioned in BIS's documents – IS: 2062- 2011. Independent tests shall be conducted, wherever required, to ensure that the materials procured

conform to the Specifications. These steel shall be procured only from manufacturer's in the approved vendor's list of The Client.

13.4 Test Certificates & Testing:

All materials for the work shall pass Mechanical test, Charpy test, Chemical Analysis, etc. prescribed by the relevant IS specifications or such other equivalent specifications. For all materials including HSFG bolts, the contractor shall furnish copies of test certificates from the manufacturers including proof sheets, mill test certificates, etc. showing that the materials have been tested in accordance with the requirements of various specifications and codal provisions. If any further testing of materials is required by Engineer in respect of these and other items, it shall be arranged for by the contractor at approved laboratory/NABL accredited Laboratory as approved by Engineer. For this, nothing extra shall be payable and accepted rates in the schedule of items shall be deemed to include this.

Even satisfactory outcome of such tests or analysis shall in no way limit, dilute or interfere with the absolute right of the Engineer to reject the whole or part of such materials supplied, which in the judgement of the inspecting authority does not comply with the conditions of the contract. The decision of the Engineer in this regard shall be final, binding and conclusive for all purposes.

The test shall be carried out by the Contractor, for which Contractor shall provide all facilities including supply of labour and plant. Engineer may at his/her discretion direct the Contractor to despatch such tests pieces as he/she may require to the National Test House or elsewhere as he/she may think fit for such testing purposes. The Engineer may at his/her discretion, check test results obtained at Contractor's work by independent tests at NABL accredited Laboratory.

13.5 Packing:

All projecting plates or bars shall be kept in shape by timber or angle bars spiked or bolted to them and the ends of chord lengths, end posts etc at their shipping joints shall be protected and stiffened so as to prevent damage or distortion in transit as the Engineer may direct. All threaded ends and machined surfaces are to be efficiently protected against damage in transit. The parts shall be transported in convenient lengths. All straight bars and plates except small pieces are to be transported in convenient bundles temporarily riveted or bolted together or bound with wrought iron or suitable wire as the Engineer may direct. All bolts, nuts, washers, plates under 300mm square and small articles generally are to be packed separately for each span. HSFG & other temporary Bolts of different sizes shall be separately packed in bags, each bag having a label indicating its contents. A list of contents shall be placed on top of each case or cask.

13.6 Fabrication:

13.6.1 General:

The fabrication of the girder and its accessories shall be carried out by the contractor in a workshop which is in the approved vendor list of RDSO for 'Steel Bridge Girder' or in a site workshop duly approved by RDSO. The workshop staff shall have requisite experience, proven skill and experience in the technique of fabricating large components. Accuracy of fabrication shall be realized through controlled high precision jigs, fixtures and templates, which shall be inspected and passed by Engineer specifically approved in prior by Engineer-In-Charge. The fabrication shall be preceded by Quality Assurance plans to be submitted by the contractor and every activity shall be documented in detail. The Quality Assurance Plans shall clearly indicate how individual processes such as cutting of raw steel, making, drilling, assembly bolting, welding, painting, handling etc. shall be monitored for quality. The quality parameters for monitoring shall be identified. These identified quality parameters shall also be specified in these quality plans. The contractor shall get these quality plans approved from Engineer before start of fabrication work. The Engineer shall be empowered to check the manufacturing process from time to time to ensure that the work is executed as per approved quality plans. The quality records

shall be submitted to Engineer for record, after completion of fabrication work. The works of fabrication in contractor's fabrication shop will at all times be open for inspection by Engineer / agency as nominated by Engineer. Before dispatch of fabricated steel work from the shops, the same will be inspected in the contractor's fabrication workshop by Engineer who will thereafter issue inspection certificate. Any defect noticed during inspection in the execution of work shall be rectified or replaced by the contractor at his own cost. The decision of Engineer or any other agency nominated for inspection as to be rectified or replaced, shall be final and conclusive.

13.6.2 Fabrication Drawings:

The contractor shall prepare detailed shop drawings including drawing office dispatch lists on the basis of design drawings approved by Engineer in such size and in such details as may be specified by Engineer. The shop drawings shall be submitted to Engineer in triplicate. No work of fabrication will be started without such approval being obtained. Contractor has to arrange the proof checking of the working fabrication drawings from the nominated Institution / Consultant. The cost of the same will be borne by the contractor. Nomination of the Institution/Consultant for proof checking works will be decided by the Client. Engineer will make all efforts to approve the drawings submitted by the contractor within reasonable time but no claim from contractor for any delay on this account shall be entertained by Engineer. For Engineer's use and record, the contractor shall supply free of charge, four sets of prints on string paper and one set of neatly executed tracings of all approved detailed drawings and fabrication drawings, soon after communication of approval for use at site.

13.6.6 Maintenance of records by Fabricators:

During fabrication as per approved QAP, stage wise records to be maintained by the fabricator which can ascertain the approved raw material and consumables, approved welding consumables, approved welders, approved set of jigs are being used. The Engineer or his nominated agency shall check all such records and necessary sign/certification should be done during fabrication at regular intervals. On completion of the work, fabricator should handover the original copy of such record to the Engineer.

The records of fabrication shall be maintained by the fabricator in the registers such as Jigs register, HSFG bolt checking register, Material offering and inspection register, RDSO / Inspecting Agency inspection notes and compliance register, Welding procedure data register, Radiographic inspection register and Statement of material test certificates, etc. The formats are given in Appendix I of IRS B1 – 2001. Inspections will be carried out by the agency/official nominated by The Client .

13.6.4 Tolerance in Fabrication:

Fabrication tolerance shall be as stipulated in Appendix II of IRS–B1– 2001. All members of the girder and joints are to be either welded or bolted as shown in the approved structural drawings. No welding except where approved by the Engineer is to be carried out at site. All welding and bolting are to be carried out as per relevant IRS Specifications.

13.6.5 Method of fabrication:

The Contractor shall submit the detailed method statement of fabrication, conforming to IRS: B1-2001 (with up-to-date correction slip) unless otherwise specified in these specification, for the approval of Engineer-In-Charge. The method statement of fabrication shall consist of but not limited to Flattening and Straightening, Planning and Shearing, Flame/CNC Plasma Cutting, Drilling and Sub-punching, Tack Assembly, Temporary Bolts, Nuts & Washers, Welding operation, Sequence of welding and welding pass, **Welding Procedure Specification Sheet (WPSS), Welding Procedure Qualification Records (WPQR)**, and Painting operation. No work of fabrication shall be started without such approval being obtained.

13.6.6 Shear Studs/Shear Connectors:

Shear Studs/Connectors specifications, Testing & Installations shall conform to Guidelines for Composite Construction Including Stud Shear Connectors Report No BS-115 (Revision 1) April 2016, unless otherwise specified in this specification.

The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above. **The rate for Shear Stud/Connector is included in the respective item for girder fabrication, so no separate payment for this item will be made.**

13.6.7 HSFG Bolts:

HSFG bolts specifications, Testing & Installation shall conform to Guidelines for use of High Strength Friction Grip (HSFG) bolts on bridges on Indian Railways Report no BS-111 (Revision 5), unless otherwise specified in this specification. Contractor has to provide DTI washer in case HSFG bolts is specified to be used in the approved drawing.

The rate shall include the cost of material, labour, equipments, tools and plants, etc. complete required for all operations described above. **The rate for HSFG Bolts is included in the respective item for girder fabrication, so no separate payment for this item will be made.**

13.6.8 Camber:

When supported on blocks or staging, the girders shall be erected to the camber specified in the fabrication drawings according to which the girders have been manufactured.

Camber shall be checked while the girder is supported on the nodal points on camber jacks and after releasing jacks i.e. for residual camber with girder resting on bearing ends. The camber measurements should be done with appropriate levelling instrument.

Frequent checks shall be made of the camber of girders during erection and care taken to see that the camber as per drawing is obtained when the girder is completely assembled. When span is supported on ends and intermediate supports are removed the dead load camber shall be recorded and entered in bridge register. This will provide the reference to compare the camber checked during technical inspection to ascertain the loss of camber.

13.6.9 Care during Assembly at Workshop:

All components shall be offered for inspection prior to painting. All approved components shall be stamped defect free, painted as per specifications prior to dispatch to bridge site. On final finishing of each component, it shall be marked distinctly with paint with shipping mark for guidance, during assembly of component.

The appearance test and test to check the fixing of shear studs shall be as per IRS BS-115.

13.6.10 Trial Assembly:

The contractor is required to undertake test assembly of the girders, before painting, in his fabrication workshop to prove accuracy of templates and Jigs. This assembly can be done in horizontal position. The test assembly shall be certified by the Inspecting agency of the Engineer. **Every span is to be temporarily erected complete in Fabricator's workshop for Engineer's Inspection before dispatch and all parts as marked to their place.** Any defect noticed during inspection in the execution of work shall be rectified or replaced by the contractor at his own cost. The decision of Engineer or any other agency nominated for inspection as to be rectified or replaced, shall be final and conclusive.

13.6.11 Painting:

Specification for surface preparation, metalizing and painting shall be done as per Clause no. 39.2.1 of Indian Railway Specification for Fabrication and Erection of Steel Girder Bridges and Locomotive Turn-Tables (Serial No B1-2001). All approved components shall be stamped defect free, painted as per specifications prior to dispatch to bridge site. On final finishing of each component, it shall be marked distinctly with paint with shipping mark for guidance, during assembly of component.

13.6.11.1 Paints: Source & Quality:

Paint and other accessories including those for metallising work will be supplied by the contractor from the manufacturer's in the approved list of RDSO and final approval by the Engineer. The contractor shall furnish to the Engineer, the date of manufacture of paint as certified by the manufacturers with the necessary container marking and test certificate for paint conforming to relevant IS code. In addition to this, he shall also submit the necessary vouchers in respect of paint purchased by him. The Engineer reserves the right to get the paint tested at contractor's expenses as considered necessary by the Engineer. If the test results do not conform to relevant IS specifications fully, then the lot of paint shall be rejected and got removed from the contractor(s) storage. If the paint has already been applied it shall be removed.

In addition to above, the following tests are required to be carried out in the field.

- Weight per litre
- Consistency test - Scratch test.
- Flexibility and adhesive test.

The Engineer reserves the right to reject the lot of paint even on the basis of field results.

13.7 Transports from Workshop & Stacking at Site:

All items fabricated in the workshop shall be marked and packaged with accompanying package list. The items after fabrication shall be transported by contractor to site by Rail/Road in a manner as to cause no damage to the components. Contractor shall be liable for all losses and damages in transit for the materials consigned by him till materials are erected and work completed and taken over by the Engineer. Insurance against loss or damage in transit, if any, shall be the responsibility of the contractor.

After identification & correct marking, all components of each girder shall be dismantled & similar components shall be grouped together & labelled; bolts and plates of each size shall be packed separately, after approval by the Engineer. The packages shall be of such size by length & weight that they are safely transportable by Rail/Road. The components shall be provided with necessary packing to avoid damage to painting & members in transit. Dimensions for transport shall be as per standard schedules.

13.8 ASSEMBLY & ERECTION:

13.8.1 General:

The contractor shall provide at his own cost all tools, machinery, equipment and erection material, including all temporary works and shall assemble all components in every respect as stipulated in the contract and in accordance with approved drawings and specifications.

Before starting the work the contractor shall seek the Engineer's approval as to the method he proposes to follow and the type and suitability of equipment he proposes to use for assembly of girder components and launching of girder. The approval of the Engineer shall however not in any way relieve the contractor of the responsibility for the adequacy and safety of methods and/or equipments he proposes to use for carrying out work in full accordance with drawings and specifications.

All temporary work shall be properly designed and substantially constructed for the loads, which it will be called upon to support. Adequate allowance and provision of a lateral forces and wind loads shall be made according to local conditions and ensure that support shall not settle during erection. Temporary bracing shall be provided to take care of stresses caused by erection equipment or other incidental loads during erection. The method use for lifting and slinging flexible members shall be brought to the notice of the Engineer and shall be subject to his approval. The contractor shall observe sufficient accuracy in the assembly of every part of the work to ensure that all parts fit accurately together.

13.8.2 Assembly at site:

Cleaning of permanent contact surfaces:- Surfaces which will have permanent contact shall be removed of paints and mill scale down to bare metal, clean and dried and immediately a coating of zinc chrome red oxide priming to IS:2074 shall be applied. Care shall be taken to see that all burrs are removed, and no surface defects exist before the parts are assembled. They shall be painted immediately before assembly with one coat of suitable primer and raw linseed oil freshly ground and the surface prepared for painting as per painting specification at Clause 2.5.38.

Reaming:- No reaming shall be undertaken without the written authority of Engineer or his authorized representative except for under drilled holes meant for turned bolts. The contractor shall supply special bolts to fill reamed hole, where reaming is approved. Record of all such variations shall be kept. However, these provisions should not apply for under drilled holes meant for turned bolts. Copies of all correspondence pertaining to the recourse of reaming and the use of oversize bolts shall be sent by the contractor for information to Engineer.

13.8.3 Requirement of Traffic blocks/OHE Power Blocks for works adjacent to Live Railways:

- i. The contractor shall obtain Power / Traffic / Shut down in the name of authorized representative of The Client. KRIDE/Engineer will facilitate to make arrangements to obtain power blocks / shutdown (hereinafter referred to as blocks)for works to be carried out along or adjacent to the track work. Works such as foundations of abutments/piers shall generally be done without blocks. However, if block is required due to safety considerations, the construction shall be done under block. The requirement of shut down, power blocks etc .shall be assessed by the contractor and will be submitted to the Engineer/Engineer's representative. All the erection of girders etc. shall be done under minimum power block/shut down.
- ii. The Contractor shall confirm that he will equip himself to carry out all construction during night blocks efficiently by suitable special lighting equipment without any extra cost.
- iii. Block period shall be counted from the time the TR-line is placed at the Contractors disposal at the work-spot till it is cleared by the Contractor.
- iv. **Any charges which may be levied by Indian Railway on account of "Possessions of Traffic/OHE Blocks" shall be payable by the Employer.** However, penalties, if any, levied by Indian Railways caused due to any careless working or otherwise of violation of the Terms and Conditions of the track block, shall be payable by the contractor.
- v. The contractor shall not be entitled to any extra payment due to hindrance resulting from normal Railway operations, such as delay on account of adequate number of, and duration of blocks not being granted.
- vi. **Additional 100% (or as directed by Indian Railways) reserve/standby cranes, machineries, tools and plants shall also be made available by the contractor in advance of work, to cater for any failure/ eventualities during the launching operation. The cost of the same is included in the respective item for girder fabrication, so no separate payment for this item will be made.**
- vii. **Safety Measures during Traffic/Power block:** Contractor shall conform that provision of IRPWM, Railway Board Instructions and general instructions under Sub-Clause 37 of SHE

manual related to block protection, safety precaution of work must be followed. The contractor shall abide by all Railway regulations in force for the time being and ensure that the same are followed by his representatives, Agents or sub-contractors or workmen. **Nothing extra shall be payable on this account.**

- viii. The employer shall remain indemnified by the contractor in the event of any accident occurring in the normal course of work, arising out of the failure of contractor or his men to exercise reasonable precaution at all places of work.

13.8.4 Erection of Open Web Girder Span:

13.8.4.1 General:

Once sufficient number of girders are assembled and the sub-structure has been certified to be ready, launching of girders shall be taken up. The launching/erection of girders shall be done as per approved drawings. For this purpose, the contractor shall submit in triplicate, detailed launching schemes of all the girders including design calculations, safety procedures and method statement with such plans, sketches and other details as may be necessary to determine the suitability and adequacy of the schemes proposed. The scheme will be checked by Engineer/KRIDE. **After approval of Engineer-In-Charge, the contractor must also obtain the approval for Launching/Erection scheme by Indian Railways and any statutory clearances such as CRS sanction. The Client will only facilitate the contractor for getting the necessary approval from concerned regulatory authorities. Contractor will be responsible for getting approval of launching scheme submitted by him.** No work of Erection/Launching shall be started without such approval being obtained.

The contractor shall provide full structural details of the temporary members and their connections to the girder, along with necessary design calculations not only justifying member's sizes but also for the entire launching system adopted. The methods adopted shall not, under any circumstances, cause the stresses in various members of girder spans to exceed permissible and safe limits at any stage of launching. One copy duly approved by the Engineer shall be returned to the contractor.

The launching system shall be test tried, if directed by the Engineer, and no separate payment for this shall be made. Nothing extra will be paid to the contractor for adopting any scheme for launching. All temporary members shall be removed after launching and may be taken back by the contractor.

13.8.4.2 Temporary Strengthening:

The launching arrangement may include fabrication of launching nose or restraining girders, sway restraining devices such as sway ropes, restraining cables etc. the supply and fixing of members for temporary strengthening of girder members to take care of erection stresses and strains and other relevant components for satisfactory and successful completion of the defined scope of work. Erection stresses must be kept within safe and permissible limits at every stage of erection.

The contractor has to make arrangements at his own cost for the steel for temporary arrangements including fabrication of launching nose, sway restraining devices for launching and temporary strengthening of girder, as may be required for the launching operations. The rate quoted should take into account these factors as nothing extra shall be paid.

13.8.4.3 Inspection and Rectification:

During erection of girders, the contractor shall provide all facilities and permit the Engineer to inspect the field assembly, site bolting and erection of spans. After inspection by the Engineer, the contractor shall identify cause of any defect, imperfection and/or fault noticed during such inspection and initiate corrective action as per the direction of the Engineer. All defects, imperfections of faults for which the contractor is liable under the contract, shall be made good by the contractor to Engineer's satisfaction.

and the cost of identifying and rectifying such defects, imperfection or faults shall be borne by the contractor.

13.8.4.4 Commencement of the Erection Work at site:

The contractor shall commence the erection work when and as soon as, but not until, he receives instructions from Engineer to do so. On such order being given, possession of site/authority shall be given to the contractor of such portion or portions of the site as the Engineer may determine.

13.8.4.5 Contractor'(s) Liability:

Any fitting, accessory or apparatus which may not have been mentioned in this specification or the drawings, but which are usual or necessary in the execution of such work, are to be provided by the Contractor without extra payment. The whole work must be completed in all details, whether mentioned in this specification or not, with the exception of such work as has been specified in the schedule of items to be separately provided for in the Contract.

Notwithstanding the specifications and conditions stated in the contract, the contractor shall keep the Engineer/ Employer authority fully indemnified and free from all liabilities and risks consequential to any lapse on his part in respect of material quality, standard of workmanship, accuracy of fabrication and the like. He shall provide all labour and material required for execution of the work as per all standards and specifications.

13.9 Quality Assurance:

13.9.1 Quality Assurance Plan (QAP):

The Contractor has to submit the Quality Assurance Plan (QAP), in line with **Standard QAP for the Open Web Girder (OWG)** as per Annexure-I of RDSO's BS-125, for the scrutiny and approval of the Engineer-In-Charge. The contractor should ensure that work is carried out strictly as per the approved QAP and no deviation takes place from QAP.

13.9.2 Raw Material:

Passing of raw material is done on the basis of visual inspection and lab test, as per approved QAP, for mechanical properties, chemical composition, ultrasonic examination, Charpy Impact Test, lab test report etc. HSFG Bolts, Shear Studs and other consumables like paint, welding rods etc. should also be got tested from NABL Lab as per relevant codes/specification.

All the required test should be got done through independent NABL Labs and compared with the mill test results given by the supplier before passing the material for use. Material test certificate register must be maintained by fabricator as per Annexure available in IRS: B1-2001(appendix-I, Performa-7) and signed by Inspecting agency/Engineer as well as fabricator.

In addition to above visual inspection shall be done to ensure that steel is free from surface defects like pitting, laminations, imperfect edges, twist, other harmful defects etc. and recorded in the register.

13.9.3 Inspection of Open Web Girders (OWG):

The standard stages of inspection for Open Web Girders (OWG) is detailed below:

(I)	Prefabrication stage :	Inspection/ Approval
	(1) Approval of Quality Assurance Plan (QAP)	Engineer/KRIDE

	(2) Scrutiny of Welding Procedure Specifications Sheets (WPSS)	Engineer/KRIDE
	(3) Welders Qualification Test i.e. Welding Procedure Qualification Records (WPQR)	Engineer/KRIDE
	(4) Inspection and clearance of raw material	Engineer/KRIDE
	(5) Inspection of layout on template floor (Nominal Camber)	Engineer/KRIDE
	(6) Inspection of jigs and fixtures with master plates	Engineer/KRIDE
(II)	During Fabrication :	
	(1) Use of approved raw material	Engineer/KRIDE
	(2) Use of approved welding consumables	Engineer/KRIDE
	(3) Use of approved welders	Engineer/KRIDE
	(4) Use of approved welding procedures and parameters (WPDS) Welding Procedure Data Sheet to be maintained for all welds.	Engineer/KRIDE
	(5) Fabrication with approved set of jigs	Engineer/KRIDE
(III)	After Fabrication :	
	(1) Inspection of welds	Engineer/KRIDE
	(2) Structural and dimensional inspection	Engineer/KRIDE
	(3) Trial assembly (First Girder)- Camber Values, Dimensions, Fairness of Holes by Go-No-Go Gauge, Butting of Flange in Top Chord.	Engineer/KRIDE
	(4) Inspection of Dismantled Components of 1 st Trial Assembly – Check for elongation of Holes/Abnormal stress marks/cuts etc. & Removal of shortcomings noted during Trial Assembly.	Engineer/KRIDE
	(5) Inspect of only components for further spans- welding inspection & Dimensional checks.	Engineer/KRIDE
	(6) Metalizing/ Painting	Engineer/KRIDE

Note: The Contractor has to arrange all the facilities viz. transportation, lodging, assisting inspection etc. for the Engineer/KRIDE to carry-out the inspections during all the stages mentioned above at his own cost. Nothing extra shall be payable regarding this.

13.10 Measurement for Payment:

For the purpose of payment, quoted rates apply to the weights of structural steel work calculated from final working drawings based on theoretical weights as specified on the approved drawings, no deductions being made for skew cuts, holes or notches. Each gusset shall be measured as equivalent to the dimension of the smallest enclosing rectangle. The rates items quoted by the tenderer shall include all wastage. The wastage of steel in the form of skew cuts etc shall be the property of the contractor.

The payment for steel work as per item in the schedule of items shall be released in stages of accepted item rates for quantities executed, as mentioned in the tender schedule. The payment after receipt of material in fabrication shop shall be made on the basis of measurements contained in the supplier's vouchers, if required, these measurements shall be further verified by the representative of Engineer in charge by measuring dimensions/sizes of the sections and multiplying the same by standard weight.

Sampling for actual weight of the sections shall also be done by him as per procedure and frequency prescribed by Engineer.

No separate payment shall be made for the field bolts, nuts and service accessories for temporary works.

The cost of temporary erection and testing at the Contractor's workshop, marking, packing and delivery at the site of work is to be included in the price quoted on the tender. Rate include fabrication of all the types of battens, bracings, ties, stiffeners, packing, diaphragms, shop bolts / welding, T&F bolts, drifts, shop welds, templates, jigs, fixtures, back up supports, accessories, transporting various components from fabrication shop to site including loading, unloading, lift and taxes complete including assembly of girders .

Rate of girder item includes assembling of temporary support for side slewing, raising of girders to the bed block level, providing sliding arrangements and slewing the girder in position and lowering of girder on bearings.

Grouting of holes with approved epoxy-based compounds in the bed block for fixing of HD bolts/anchor pins of bed plates as directed by Engineer are included in the bearing rates.

13.11 Bearing:

The detailed specification for bearing and it's installation is provided in the section S.10. The bearing sets will be paid separately as per relevant item, but it includes the cost of H. D. Bolts also. (If required). Bearings shall be provided before concreting of deck slab is taken up.

Bearings shall be protected during concreting or providing holding down bolts operations. Any mortar or foreign material contaminating the bearing shall be completely removed.

13.12 Deflection Tests:

The deflection test shall be carried out as per relevant Indian standard or as specified in the specifications. Load testing will be paid separately as per relevant item.