

**SPECIAL CONDITIONS OF CONTRACT (TECHNICAL)**  
**(H-Beam /Channel Sleepers & Fittings)**

1. The work covered in this tender is for manufacturing, supplying and fixing of BG galvanised **Steel channels /H-BEAM** Sleepers along with all fittings and fixtures (also galvanised).
2. Fabrication and workmanship: Fabrication, workmanship shall generally comply with current IRS specification with latest correction/ amendments thereof unless otherwise specified in special condition of this contract or as specially directed by the Engineer-in writing.

Any modification in standard dimensions of sleepers/ fittings if recognized as per site conditions to be complied by the contractor after approval of competent authority.

The contractor shall submit test certificates conforming to appropriate standards of all steel material used for fabrications. All structural steel shall be free from rust, scales, laminations, cracks, fissures and other surface defects.

The workmanship and finish shall be equal to the best general practice in modern structural shops. The greatest accuracy shall be observed in the manufacture of every part of the work all similar parts shall be strictly interchangeable.

NOTE:- Only weld able steel conforming to IS 2062- 1992 Grade B fully Killed shall be used for **Steel channels/ H-BEAM** Sleepers . The **Steel channels / H-BEAM** Sleepers manufactured by SAIL, TISCO, JINDAL and Vizag Steel PLANT only shall be used.

Following specifications shall be followed: -

- a) Indian Railway Steel Bridge Code as corrected up to date.
- b) Indian Railway Welded Bridge Code 1972.
- c) Indian Railway Schedule of Dimension for Broad Gauge 1939 (Reprinted in Metric Units in 1973).
- d) IS 2062-1992 GR-Specifications for Structural Steel Standard Quality.
- e) Indian Railway Specification B-1, 1979: Fabrication and erection of Steel Girder Bridges.
- f) IRS H-5 rivets.
- g) IS 2155-1962: Rivets for General purposes (Below 12mm diameter).
- h) IRS H-19, for bolts and nuts.
- i) IS 102-1962, Ready mixed paints, Brushing Red Lead. Non- setting priming.
- j) IS: 2339-1963: Aluminium paint for General purposes, in dual container.
- k) IS: 123-1963: Ready mixed paints, brushing, finishing Semi gloss for General purpose to Indian Standard Colours, Red Oxide.
- l) B.S.S. 916 and /or IS: 1963-1967: black Hexagonal Bolts/Nuts etc., Black Hexagonal Bolts/Nuts and lock nuts (6 to 39mm) and black Hexagonal screws ( dia 6 to 24 mm).
- m) IS: 800- 1984.
- n) IS: 1148- 1973: Hot Rolled Steel Rivet Bars for Structural purposes.
- o) IS: 2062-1992: Steel grade 'B' for structural purposes.

The tenderer/s shall maintain the master- steel tape of approved make for which he has obtained a certificate of accuracy from the National Laboratory.

Roller materials before being laid off or worked, must be made straight. If straightening or flattening is necessary, it shall be done by method that will not damage the material. Sharp kinks and bends shall be rejected.

Holing: Holes for rivets and bolts shall be drilled to conform to Cl. 10 of IS: 7215. All holes, excepts as stated hereunder shall be drilled to the required size or sub punched 2mm. less in diameters and reamed thereafter to the required size. Thickness of the materials for sub punching shall not be greater than 16mm. All matching holes, for rivets or bolts shall register with each other so that a gauge of 0.8mm. less in diameter than the holes can pass freely through the members assembled for leveling or bolting in the direction at right angle to such members. All holes for turned and fitted bolts shall be drilled under sized by 1mm. and after assembly reamed to a tolerance of 0.13mm- 0mm. unless otherwise specified. When the number of members to be riveted in assembly exceeds three or the total thickness is 90mm. or more, the holes shall be drilled or reamed in position after assembly except when seal bushed

jigs are used. The parts shall be finally bolted together during such block together during such block drilling and taken apart for removal of burrs after drilling. Holes in purlin, side sheeting runners, packing plates and lacing bars may be punched full size, provided the thickness of the materials does not exceed 13mm. All punching and sub-punching shall be cleared and accurate and all drilling shall be free from burns. No holes shall be made by Gas Cutting process.

**Bolting:** All turned and fitted bolts shall be carefully turned and shall be paralleled through out the barrel. The following limits of tolerance shall be permitted upon the diameter of the barrels of turned bolts and holes, which they are to fit.

Limit of Tolerance	<u>Barrel of Bolts</u>	<u>Holes</u>
	High - 0.00mm	+ 0.13 mm.
	Low - 0.13mm.	- 0.00 mm.

The barrels of each turned bolts shall be of such a length so that it is in full contact with the work through out the screwed portion, being made at least 1.6mm. less in diameter than the barrel or to suit the next smaller size of metric screw thread. The barrel portion shall be jointed to the thread portion by a degree chamfer within the thickness of washer, unless otherwise specified. Faces of heads and nuts bearing on steel work shall be machined. All such bolts shall be provided with washers having a hole of 1.5mm. larger in diameter than the barrel and thickness of not less than 6mm. so that the nut, when tightened, shall not bear on the unthreaded body of the bolt. In all cases where the full bearing area of the bolt is to be enveloped, the threaded portion of the bolt shall not be within the thickness of the parts bolted together. The threaded portion of each bolt shall project through the nut by at least one thread. Tapered washers shall be provided for all heads and nuts bearing on beveled surface.

### 3. **Welding:**

**General:** The welding and welded work shall generally conform to IRS bridge code and subject to further specifications given in the following paragraphs.

Only welder possessing competency certificate may do manual metal arc welding, or where access of the location of welds do not permit automatic welding.

The welding should be done by submerged arc welding process either fully automatic or semi automatic wherever specified by the Railway.

Except for special types of edge preparation such as single and double 'U', single and double 'J', the fusion edges of all the parts which are to be joined by welding may be prepared by using mechanically controlled automatic flame cutting equipments and to be ground to a smooth finish special edge preparation should be made by machinery or gauging.

All welding work shall be done in shops and the Layout and sequence of operation shall be so arranged as to eliminate distortion and shrinkage stresses.

**Electrodes:** All electrodes shall be kept under dry conditions. Any electrode with parts of its flux coating broken away or otherwise damaged shall be rejected.

Any Electrode older than six months from the date of manufacture or older than the date of expiry as specified by manufacturer should not be used.

Welding electrodes to be used in the work should conform to RDSO approved Firm and quality only.

**The electrodes shall conform to class A2 of IRSM-28 and wire for CO2 welding shall conform to class I of IRSM-46.**

The electrodes to be used in the work shall be of approved type and manufactures approved by RDSO.

**Preparation of joints:** The edge shall be prepared with an automatically controlled flame cutting torch correctly to the size and dimension of the groove prescribed in the design and shop drawing. In case of “U” grooved joints the edges shall be prepared with an automatic flame torch on two phases following a bevel out with grinding pass or by machining.

The welding surfaces shall be smooth, uniform and free from fine tears notches or any other defects which may adversely effect welding and shall be free of loose scales, slag rust, grease, paint, moisture or any other foreign material.

**Welding Procedures:** The welding procedure shall be arranged by the contractor to suit the details of the joints as indicated on the drawing and the position at which welding has to be carried out. Working procedure shall cover the following:

- a) Type and size of Electrodes.
- b) Current for automatic welding arc voltage.
- c) Length of run for Electrode, or for automatic welding speed of travel.
- d) Number and arrangement of runs in multi run welding.
- e) Position and set up of parts.
- f) Preparation and set up of parts.
- g) Welding sequence.
- h) Pre or post heating.
- i) Any other relevant information.

The welding procedure shall be so arranged that the distortion and shrinkage stress are reduced to a minimum and the welds meet requirement and quality specified, hereunder.

Any weld found defective shall be cut by using either chipping hammer or gauging torch in such a manner that adjacent materials is not injured in any way.

Planning of the welds involving deformation of the surface either during de-slagging operation or thereafter shall not be allowed.

Fusion faces and surrounding surfaces within 50mm. of welds shall be free from all mill scale and free from oil, paint or any substance which might effect the quality of the welds and impede the quality/progress of welding. They shall be free from irregularities, which interfere with the deposition of specified size of weld or be the cause of defects.

All mill scale within 50mm. of welds shall be removed on welding either by picking followed by through power weld brushing or by other approved methods. If preparation or cutting of the fusion faces is necessary the same shall be carried out by sheering, chipping, gas cutting or flame gauging. Where no Gas cutter or hand gauging is employed the blowpipe or gauging blowpipe shall be properly guided.

**Assembly for Welding:** Before taking of mass production of any type of sleeper the production of 20 sleepers shall be taken up and the dimensions thereafter shall be checked by means of a test track 13 Mtrs. Long assembled at the Railway. The rails for linking of the steel track shall be made available free of charge by Railway at a point convenient to the Railways. The contractor at his own cost shall do transport of the Rails and sleepers from this point to the Contractors workshop and returning the same to the point of collection. The parts to be welded shall be properly assembled and held firmly in position by means of jigs and fixtures prior to and during welding.

Automatic submerged arc welding shall be employed for fabrication of welded steel channel sleepers wherever specified.

**Accuracy of fit up:** Parts to be fillet welded shall be brought into as close contact as practicable and the gap due to faulty workmanship or incorrect fit up shall not exceed 1.5mm. If greater separation occurs at any position the size of fillet weld shall be increased at such position by the amount of the gap.

**Jigs and manipulators:** Jigs and manipulators shall be used where practicable and shall be designed to facilitate and to ensure that all welds are easily accessible to the operators.

**Minimum leg length for thickness in fillet welds:** The minimum leg length of a fillet weld as deposited shall not be less than the specified size. In no case shall a concave weld be deposited unless specifically permitted. Where permitted, leg length shall be increased above that specified, so that the resultant throat thickness remains the same, as would have been by the deposition of a flat faced weld of the specified leg length.

**De-slugging:** After making each run of welding all slag shall be thoroughly removed and the surface cleaned.

**Quality of welding:** The weld metal as deposited, including track weld if to be incorporated shall be free from cracks, slag inclusion, porosity, cavities and other de-position faults. The weld steel shall be properly fused with the present steel metal without under cutting or over lapping at the toes of the weld. The surface of the weld shall have a uniform consistent contour and regular appearance.

**Weather conditions:** Welding shall not be done under open weather conditions which might adversely effect the efficiency of the welding. It should be done only under a covered shed in a workshop.

**Qualifications and testing of welders:** The contractors shall satisfy the Engineer that the welders are suitable for the work for which they will be employed shall produce evidence to the effect that the welders have satisfactorily completed appropriate test as prescribed in I.S.877. The Engineer may at his own discretion order periodic tests of the welder and /or of the welds produced by them. Such tests shall be at the expense of the contractor.

**Supervisor:** The Contractor shall employ a competent welding supervisor to ensure that the standard of workmanship and the quality of materials comply with the requirements laid down in the specifications.

5. **Erection marking:** Each fabricated member whether assembled prior to despatch or not so assembled shall bear an erection mark which will help to identify the member and its position in respect of the whole structure to facilitate re-erection at site.

These erection marks shall be suitably incorporated in the shop detail and erection drawings.

## 6. **CONTROL IN THE FABRICATION AND ASSEMBLY OF VARIOUS STRUCTURES:**

**Criteria for testing:** The contractor shall conduct tests in accordance with the following norms.

- a) Visual examination 100%(one hundred percent).
- b) Mechanical Test.
- c) Dye Penetrate Examination.

### **Tests:**

- a) **Visual Examination:** The Contractor shall conduct the visual examination and measurements of the external dimensions of the welds for all joints. Before examining the welded joints surface area close to it on both side of the weld for a width not less than 20mm. , shall be cleaned of slag and other impurities . Examination shall be done by a magnifying glass which has a magnification power of 10 and measuring instruments which has an accuracy of  $\pm 0.1\text{mm}$ . or by weld gauges. Welded joints shall be examined from both sides.

The Contractor shall examine the following during the visual checks:

- a) Correctness and shape of the weld joint.
- b) Incomplete penetration of weld metal.
- c) Influx.
- d) Burns.
- e) Un-welded craters.
- f) Undercuts.
- g) Cracks in welded parts and heat affected zones.
- h) Porosity in welds and spot welds.
- i) Compression in welded joints and a result of electrode while carrying out contact welding .
- j) Displacement of welded elements.

The contractor shall document all data as per sound laboratory practices.

b) **Mechanical Test:** The Contractor shall carryout various mechanical tests to determine weldability, the metal alloy ability, nature of break, correct sizes and type of electrodes, degree of pre-heat and post-heat treatment etc. The type, cope and sample of various mechanical tests shall be determined in agreement with the Engineer. The number of tests conducted shall depend on the result obtained to satisfy the Engineer that the correct type of size of electrode, degree of pre-heating and post- heating and weldability of different metal are being followed.

c) **Dye Penetrate Examination:** All welds as desired by Engineer will be examined by Dye penetrates for detection of discontinuities as per IS-3658-'81, IS-12889-'89 and RDSO's SPC. No. MRC/NDT/4/91/APPD.

7. **Inspection and testing of fabrication:** The Engineer shall have free access at all reasonable times to the Contractor's works where the fabrication of steel work is carried out and shall be afforded by all reasonable facilities by the Contractor for satisfying himself that the fabrication is being under taken in accordance with the provision of the drawings and specifications.

The Contractor shall continuously inform the Engineer of the progress in fabrication as and when the individual pieces get ready for inspection. The Contractor shall give a minimum of 3(three) working days notice to the Engineer for inspection of the individual pieces.

Unless directed otherwise, inspection shall be made at the place of manufacture prior to dispatch by an authorized representative of Railway. Should any structure found not to comply with any of the provisions of this specification it shall be liable for rejection. No structure or part of the structure, once rejected shall be re-submit for inspection / test, except in cases where the Engineer considers the defects as rectifiable.

Defects which may appear during fabrication shall be made good with the consent of and according to the procedure laid down by the Engineer. All Gauges and templates necessary to satisfy the Engineer shall be supplied by the Contractor. The Engineer, may at his discretion, check the test results obtained at the contractors works by independent tests at the Government Test House or elsewhere and should the materials so tested be found to be unsatisfactory the costs of such tests shall be borne by the contractor.

8. **Marking, packing and despatching:** Each piece shall be distinctly marked before delivery in accordance with the approved marking diagram and shall bear such other marks as will facilitate erection. For easy identification at site a small distinguishing mark shall be painted on each and every member before despatch from fabrication shop. The fabricated steel work shall be despatched by the Contractor in such portions as may be found convenient for erection or as ordered by the Engineer to meet the time schedule.

All projecting plates or bars and all ends of members at joint shall be stiffened, all straight bars and plates shall be bundled, all screwed ends and machined surfaces shall be suitably packed and all rivets, bolts, nuts, washers and small loose parts shall be packed separately in boxes so as to prevent damage or distortion during transit.

9. **Template:** Templates need through out the work shall be of steel packed in such cases as the inspecting Officer may consider necessary.

10. **Supervision of work:** During the entire progress of the work the Contractor shall have competent supervisor in personal charge of the work. All works shall be done by skilled competent workmen.

11. **Fixing of H-BEAM sleepers at site:** The **H-BEAM Sleepers / Steel Channel Sleepers** shall be provided on the nominated bridges by the Contractor.

**Working in the vicinity of Railway Track:** All works, which may affect the safety of Railway working shall be under the direct supervision of the Engineer-in Charge at site or his authorized representative for the said bridge. The contractor shall in consultation with the Engineer decide the sequence of work required to be done for efficient provision of **H-BEAM Sleepers / Steel Channel Sleeper**.

The gauge, level, alignment of the track shall be adjusted by the Contractor suitably as per satisfaction of the Engineer, and as per tolerances laid down in Indian Railway Permanent Way Manual for New Track.

12. The fabricator's name & Drg. No. should be indicated on all **H-BEAM** Sleepers / **Steel Channel** sleeper suitably on a plaque fixed on the web of the **H-BEAM** Sleepers / **Steel Channel** sleeper at one end.

13. Galvanised **H-BEAM** Sleepers / **Steel Channel** sleepers are to be supplied and fixed to the girder of Br. No. .... at Km.....of.....Division. The existing track on the bridges is to be dismantled including guardrails, running rails and Bridge timbers. New **H-BEAM** Sleepers / **Steel Channel** sleepers are to be fixed as per Drg. No. .... The track is to be re-linked over the **H-BEAM** Sleepers / **Steel Channel** sleepers with the same running and guardrails by the fittings and fixtures supplied by the Contractor.

14. Released U/S small fittings, Bridge Timbers, Channel sleeper and worn-out-rails (if any) etc. will have to be transported by the contractor to the nearest store depot of PWI/BRI at his own expenditure.

15. Dip lorries for the transportation of the materials will be supplied by the Railway as per the convenience and free of hire/charges.

16. Carrying of materials and protection of Dip lorries by trained staff will have to be done by contractor ensuring safe running of traffic under the supervision of Rly's representative.

17. Contractor has to arrange for adequate number of skilled workers and competent supervisors for the execution of this work, their safety during dismantling, transporting and linking of the track over the girders will be the sole responsibility of the contractor.

18. Serviceable materials released from dismantling of the track should be properly accounted and kept in the custody of contractor for re use. Unserviceable materials will be made good by the Railway (For rails, F/bolts, Fish plates etc.)

19. Materials supplied free by the Railway to the contractor will not form part of the value of the contract entered into and will fall outside the purview of the price variation clause.

20. All the mild steel fittings and fixtures have to be galvanized at the contractors cost before use.

21. The Contractor should preferably have the following equipments :-

- i. Profile Gas cutting machine.
- ii. Drilling machine.
- iii. Punching machine.
- iv. Shaping machine.
- v. Welding Generator & equipment for arc welding of adequate capacity.
- vi. Planning machine.
- vii. Air Compressor & riveting equipment.
- viii. Jigs & fixtures for fabrication of channel sleepers.
- ix. Facility for testing of welding work by dye penetration test/ultrasonic testing.
- x. Master tape of approved quality duly certified for accuracy by National lab.

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Note for TBTR by **H-Beam/Steel channel** sleepers:-

1. The work is of trial nature and may need modification during fabrication to suit RDSO requirement.
2. The work may need modification during fabrication to suit RDSO requirement and bridge type. Accordingly, contractor shall submit the drawings to suit site condition for approval of the Engineer.
3. The tenderer should procure fittings from RDSO approved Vendors. The indented fittings should be offered for RDSO/RITES inspection by the RDSO approved firm directly to RDSO/RITES with intimation to firm and Railway only after inspection and passing of fittings by RDSO/RITES, the fittings should be supplied by the approved vendors to the tenderer/ firm for fixing on **H-Beam/Steel channel** sleepers.
4. To ensure this procedure the tenderer should execute a legal undertaking with the RDSO approved different firms for all items involved in fittings of H-Beam sleeper.
5. (i) The length of sleepers may vary by ( + ) / ( - ) 100mm as per site condition. The contractor also required to fabricate the **H-Beam/Steel channel** sleeper with minor modifications for providing fixing arrangements of hook bolts, altering width from 230mm to 250mm etc. for which he shall be responsible for taking required measurements at the site with his site engineer, and getting it approved from Railway's Engineer - in - charge for fabrication purpose. The rate quoted here - in itemwise for all the items of this tender schedule shall accommodate all such miscellaneous works if any.  
 (ii) The rates are inclusive of cleaning of rust, etc. at the sleeper and girder contact area and painting with one coat of Epoxy paint to a thickness of 110 micron dry film thickness. If required, the contractor will have to under take pre block arrangements for shifting existing channel sleepers/timbers for doing painting work. The rate is inclusive of all these works.  
 (iii) Any defects in alignment and X- level of girder is to be rectified by the contractor at the time of fixing sleepers in presence of Railway Supervisor/ Site-in-charge.
6. Note:-The rate of items of **Schedule -'A'** is inclusive of trial assembling and fixing minimum 10 sleepers ( selected at random ) on a nominated bridge. The large scale manufacturing is to be taken up only when satisfactory performance will be obtained on trial.
7. Payment Schedule:- **H-Beam/Steel channel** sleepers and it's complete fittings and fixtures ( For items of **Schedule -'A'** of the Tender schedule), a) On arrival of **H-Beam/Steel channel** sleepers with all matching fittings components for the numbers of sleepers and its fittings received at bridge work site- 60% (Sixty percent) ( duly passed by Inspecting Officials and supported by relevant test/inspection certificate), (b) Fixation of **H-Beam/Steel channel** sleepers on the girder after dismantling the existing bridge timbers/Steel Channel Sleepers and painting the sleepers seat by epoxy paint which will be supplied by the contractor and completion of linking of running and guardrail over the H-Beam sleeper with all fittings and fixtures in correct gauge level and alignment as per I.R.P.W.M.--20 % (Twenty percent ). (c )Transportation and stacking of the released materials ( small fittings, bridge timbers, Steel Channel sleepers, worn out rails etc.) to the nearest stores depot of PWI / BRI - 20%(Twenty Percent).
8. Fixing of all elastomeric pads must be done by Epoxy adhesive as approved by Railway supplied by contractor at his cost.
9. For all the supplied items the contractor has to give one indemnity Bond and has to keep the items in safe custody by deputing day and night watchman up to the completion of the work. Railway will have no responsibility on this account for theft, damage, loss etc . Payment will be entertained accounting the materials fitted and fixed on the running lines. For the materials paid for as per Note 7 but not fixed on a bridge, prorata recoveries will be made.

10. Provision for fixing hook bolts to **H-Beam/Steel channel** sleeper will be made in the workshop along with the fabrication of the **H-Beam/Steel channel** sleepers after verifying the site conditions.
11. Painting of the galvanised surface advertantly damaged due to transportation, if any, welding and drilling holes at site will be done as advised below:- ( Care should be taken during the transportation, loading, unloading etc.to ensure that no damage is done to the galvanised surface. However, galvanised surface if damaged, should be painted as detailed below):-(a) Application of two coats of paint Red lead conforming to IS: 102 as priming coat on an approved surface. (b)Application of two coats of Aluminium paint conforming to IS:2339 as covering coat as per the approval of the Engineer-in-charge.
12. INSPECTIONS :-(a) The finished **H-Beam/Steel channel** sleepers and M.S.grooved pad plates which are inspected and passed for the work by the nominated Railway officials, not below the rank of junior Engineer ( Br.) / Gr.I should only be brought to the work site by the Contractor. The inspection shall be in two stages.(i) Before galvanising ( to check up the quality of fabrication as per Spl.condition Tech.) (ii) After galvanising ( to check up the quality of galvanising as per Spl. Tech.). (b) Materials shall be despatched to site of work by the contractor in full sets i.e. **H-Beam/Steel channel** sleepers with all matching fittings components complete.The matching fittings components will be supplied duly inspected and passed by RDSO/RITES in sealed gunny bags. The contractor will have to arrange for RDSO/RITES inspection at his/their own cost and will be responsible for furnishing all test certificate during the despatch of fittings.(c )(i) 2(two) sets of tools and spanner etc. related to fixing of H-Beam sleepers to be supplied on free of cost to the sectional PWI. (ii) For measuring the thickness of various paint films, contractor has to provide one digital elcometer at his own cost for inspection of the inspecting official, which after completion of the work, has to be handed over to Railways in a sound working condition.
13. Location is tentative and may change or some bridges may be added or deleted as per requirement during execution.
14. The contractor shall bear in full any taxes / duties levied by State Government and / or Central Government from time to time. This would be entirely a matter between the contractor and the State / Central Government and no claim what so ever of this account shall be entertained by the Railways.

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