

ISO9001:2015	Doc. No. BS-S-7.5.3.1-4	Version No: 4.3	Date Effective: 28-06-2021
Document Title: SCHEDULE OF TECHNICAL REQUIREMENTS FOR FABRICATION OF STEEL GIRDERS			

**RESEARCH DESIGNS AND STANDARD ORGANISATION
MANAK NAGAR, LUCKNOW-226011**

Document No. : **BS-S- 7.5.3.1-4**

Document Title: **SCHEDULE OF TECHNICAL REQUIREMENTS FOR
FABRICATION OF STEEL GIRDERS**

AMENDMENT HISTORY:

S.No.	Amendment Date	Version	Reasons for Amendments
1.	14-09-2010	1.0	STR approved by Railway Board.
2.	22-06-2012	1.1	Minor change in procedure for ONLINE facility only (Facility of Hard Copy with drawn).
3.	23-10-2012	2.0	Modification in Para 2.2, 2.4,2.5, 4.3 & 7.8 and addition of Para 4.14 & 4.15
4.	27-06-2014	3.0	Modification in para 2.2.1, 2.2.2, 4.1 to 4.12, 6.2, 7.1, 7.4, 7.5 & 7.8, deletion of para 2.2.2 to 2.6 and addition of para 4.16
5.	21-09-2015	3.1	Minor Modification in Para 2.2 & 2.2.1.
6.	25-01-2018	4.0	Complete revision of STR as approved by railway Board. It will be effective from 01.02.2019
7.	15-12-2018	4.1	Minor Modification in Para 4.2 & 5.2
8.	21-02-2019	4.2	Change in cut-off date, after approval of Railway Board. It will be effective from 01.12.2019.
9.	28-06-2021	4.3	Modification in Para 5.8.

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SCHEDULE OF TECHNICAL REQUIREMENTS (STR) FOR FABRICATION OF COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-B)

1.0 Scope

This schedule covers the norms for evaluation of the capability and the capacity of any firm for fabrication and supply of composite & other Steel Plate Girders. Intended fabricators will be required to fabricate riveted/bolted/welded plate girders.

2.0 Requirement for registration of firms for fabrication of girders.

- 2.1 The firm will ensure availability of the following for registration as fabricator of girders-
- i) The required infrastructure, machinery & Plants.
 - ii) Testing and measuring equipments duly calibrated.
 - iii) Trained technical manpower and Quality Assurance Programme (QAP)
 - iv) Equipments meeting the requirements of relevant specifications.
 - v) Space required for manufacturing/fabrication testing and storage viz. manufacturing/fabrication floor, godown, store, office and test lab etc.
- 2.2 For detailed procedure for Registration and other related aspects, refer to Doc No. BS-G-4.2.3-1 (latest version) titled "Guidelines for Registration and Quality Audit of Vendors in Bridge & structure Directorate".

3.0 Norms for Acceptance

To qualify for steel bridge girders production, the firm must satisfy the requirements as laid down in para 4 to 6 as under.

4.0 General and Infrastructural Requirements:- Detail Information on items given below should be furnished enclosing necessary documents in support as applicable:-

- 4.1 The fabricator must have proper organization including supervisors, skilled workers and adequate manpower to execute the fabrication work in competent manner. (Enclose list of staff along with qualification & experience of employees.)
- 4.2 Various raw materials and consumables etc. required for fabricating steel girders must be purchased by fabricators and a proper organization must exist to perform the functions of purchasing of various raw materials and consumables

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etc. and maintaining related inspection certificates & test certificates etc. (Enclose list of staff along with Qualification & experience of employees).

4.3 Previous experience of fabricating steel such as bridge girders, heavy industrial steel structures etc. as under:

a) Firm should have fabricated minimum 3 Spans of Plate Girders of Railway Bridges not less than 9.15m

OR

b) Firm should have fabricated minimum 3 Spans of composite Girders of ROB not less than 9.15m

OR

c) Firm should have fabricated minimum 1000 MT heavy Industrial Structures involving built up I-Girders of depth not less than 700mm or Box section with X- sectional area of Box not less than 90000 mm²

OR

d) Firm should have fabricated minimum 1000 MT Railway Foot Over Bridges, Plate form Shelters & Bridge Girder Pathway etc.

Note:- i) Previous experience will be considered only for the works completed during the last five financial years & upto the date of application in the current financial year.

ii) For items (a) to (d), the applicant has to submit the concerned fabrication details along with performance certificate from client, explicitly as supporting documents and in absence of documents, experience will not be considered. Certificate issued only by Govt./ Semi Govt./PSU's will be accepted for this purpose.

iii) Performance certificate from Private individuals can also be accepted provided the average annual turnover for last three financial years of private firm is not less than 50 Crores. In support of this the applicant has to submit necessary certificates and Audited Balance Sheets of Chartered Accountant or Income tax returns.

4.4 A proper procedure for maintaining of records for receipt and consumption of raw material should be in vogue or developed so as to permit verification by railway's representative.

4.5 Adequate power supply should be available through power distribution agencies. In addition to above adequate power backup shall also be available through captive generation. (Necessary documents in support to be enclosed).

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- 4.6 Covered bay/shed duly protected from rain/wind and dust for fabrication should be available. (Necessary documents in support to be enclosed).
- 4.7 Enough area to store raw material, sub assemblies and finished product should be available.
- 4.8 A separate line/space for inspection and testing of girders by railway's inspecting engineers should be available.
- 4.9 Covered shed area protected from rain/wind, dust etc. should be available for surface preparation/painting/metalizing of steel girders. As no part of the fabricated items shall be painted unless it has been finally passed and cleared by inspecting officials. Adequate space for storing fabricated component awaiting painting shall be available.
- 4.10 For full scale layout of drawings to which girders are to be manufactured, template shop with level steel/concrete floor should be available. For symmetrical girders, central half of the layout may be done and for non-symmetrical girders full-length layout shall be required. Further, for development of jigs and fixtures this shop should have in-house jigs manufacturing facilities.
- 4.11 Sufficient space for trial erection of the girder after manufacture shall be available. For this purpose, proper handling equipment, stacking space and other facilities shall be available and same should be marked clearly in the factory plan to be submitted along with application of registration.
- 4.12 An adequately equipped and staffed drawing office is required for preparation of fabrication drawings. (Enclose list of staff along with Qualification & experience of employees).

Note: For the above paras, applicant has to submit neat copies of plans of works premises & details of items.

5.0 Machinery & Plants:

Following machinery and plants shall be available with the fabricator:

- 5.1 CNC Cutting Machine (Gas /Plasma) or CNC Cutting Cum Drilling Machine.
- 5.2 CNC/Automatic Beam Welding Machine.
- 5.3 CNC Plate Drilling Machine or CNC Cutting Cum Drilling Machine.
- 5.4 Shot Blasting Machine/Grit Blasting Machine/Sand Blasting Machine and Metalizing Guns.

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- 5.5 EOT/Portal/mobile Crane of minimum 20T capacity for handling of materials for fabrication of girders, unloading of raw materials and loading of finished products etc.
- 5.6 Compressors of adequate capacity suitable for riveting/bolting and for other applications etc.
- 5.7 Radial drilling machines of adequate capacity to drill holes up to 50 mm diameter.
- 5.8 (a) Plate & structural sections straightening machines
(b) End Milling Machine
- 5.9 Minimum three number of portable pneumatic tools such as grinders, drilling machines, chipping machines, wrenches, elcometers, calibrated steel measuring tapes etc.
- 5.10 Facilities for surface preparation/painting/metalizing as per IRS B-1 specification.
- 5.11 Testing facilities for testing of mechanical properties, chemical composition, microstructure etc. which can be in-house or may be arranged from outside.
- Note:-** If facility is in house details of equipments like, make, model number, capacity, year of manufacture/commissioning and copy of test certificates issued earlier etc. should be provided. In case in-house facility is not available then testing can also be got done from outside agencies provided the agency is accredited by NABL Laboratory/NABCB Laboratory. An undertaking to that effect should be submitted.
- 5.12 Testing facilities for ultrasonic flaw detection which can be in-house or may be arranged from outside.
- Note:-** If facility is in house provide details of equipments like, like, make, model number, capacity, year of manufacture/commissioning and proficiency certificate of minimum level-II of personal conducting UT Test and copy of some test certificates issued earlier should be provided. In case in-house facility is not available then testing can also be got done from outside agency provided the agency is accredited by NABL Laboratory /NABCB Laboratory/Authorized Institute. The testing will be done only by authorized persons having proficiency certificate of minimum level-II. An undertaking to that effect should be submitted.
- 5.13 System of periodical maintenance of M&P must be in vogue and proper records shall be maintained.

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- 5.14 The following facilities should also be available for fabrication of welded girders.
- a) Welding Transformers/Rectifiers for Manual Metal Arc Welding (MMAW)
 - b) MIG/CO2 Welding Equipment sets.
 - c) Single headed or Multi headed Automatic/Semi Automatic Submerged Arc Welding (SAW) Machine/Equipment.
 - d) Suitable Welding Manipulators.
 - e) Macro Etching, Dye –Penetrant or Magnetic Particle testing facilities.
 - f) Stud Welding Machine in house or from external agency with Generator/ Rectifier of appropriate capacity.
 - g) Arrangement for radiographic test either in house or from external agency

Note:- If facility is in house details of equipment like, make, model number, year of manufacture/commissioning and proficiency certificate of minimum level-II of personal conducting RT Test and copy of test certificates issued earlier should be provided. In case in house facility is not available then testing can also be got done from outside agencies provided the agency is approved by BARC/Atomic Energy Regulatory Board. The testing will be done only by authorized persons having proficiency certificate of minimum level–II. An undertaking to that effect should be submitted
 - h) Tongue testers for measuring current and voltage.
 - i) Gauges for checking weld size, throat thickness and edge preparation etc.
- 5.15 Fabricators must-ensure that welding and gas cutting equipment/accessories meet BIS or other international standard requirements. It will be fabricator’s responsibility to satisfy the inspecting engineer that all the welding equipment/accessories conform to the BIS standard or any other international standards in the absence of proper marking on such equipments/accessories.
- 5.16 Only trained and qualified Welders shall be deployed for welding. The welders Must be trained in accordance with the provision of IS:817. They must be trained either from recognized welding institutes or by in-house training, if proper facilities exist. The welders must be tested as per requirement of IS:7310 and proper records shall be maintained. The welders engaged should be at least high school pass and preferably trained from ITI or reputed welding training institute. Fabricators of submit copy of welding procedures and Welders Qualification followed at their works.
- 5.17 All welding shall be carried out under the overall supervision of qualified welding supervisors who have been trained in welding technology from any government

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approved welding institutes. Details of staff, their qualification and experience should be submitted by Fabricators.

5.18 Welding instructions shall be prominently displayed on the shop floor.

Note: i) Machinery & Plants owned by sister concern will not be accepted.

ii) During the inspection by RDSO officials, if any machinery is found deficient from the requirement, the firm's registration will be withdrawn.

6.0 Quality Infrastructure:

6.1 Fabricator shall have proper infrastructure to ensure the quality product as per requirement of latest issue of IRS-B1 Specification and IRS-Welded Bridge Code as applicable.

6.2 A system should be in force for analysis of defects noticed during internal and external inspections of the final product and sub-assemblies. A dynamic arrangement for a feed back to the source of defects and for rectification should be in vogue. Performa being followed to be enclosed.

6.3 Following specifications/codes (Latest version) commonly referred in connection with fabrication of steel girders must be available with fabricator.

IRS : B1	Specification for fabrication and erection of Steel Girder Bridges and locomotive Turn Tables.
IRS	Steel Bridge Code
IS: 1148	Steel rivet bars (medium & high tensile) for structural purposes.
IS: 1149	Specification for High tensile steel rivet bars for structural purpose.
IS : 1852	Specification for Rolling and cutting tolerances for Hot Rolled Steel Products
IS : 2062	Hot rolled medium and high tensile structural steel- specification.
IRS:	Welding Bridge Code
IS : 817	Code of practice for training and testing of metal arc welders
IS : 818	Code of Practice for Safety and health requirements in electric and gas welding and cutting operations
IS : 822	Code of Procedure for inspection of welds

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IS : 4353	Submerged arc welding of mild steel and low alloy steels recommendations
IS : 7307 (Pt-1)	Approval tests for welding procedures– fusion welding of steel
IS : 7310 (Pt-1)	Approval tests for welders working to approved welding procedures –fusion welding of steel
IS : 9595	Metal-arc welding of carbon and carbon manganese steels-recommendation.
IS : 3935	Code of practice for composite construction
BS : 5400-6	Steel, concrete and composite bridges, Specification for materials and workmanship, steel
ISO : 8692	Code of mechanical properties of Stud Shear Connector
BS EN ISO : 13918	Welding-Studs and ceramic ferrules for arc stud welding
IS : 3757	Specification for high strength structural bolts
IS : 4000	Code of practice for high strength bolts in steel structures
IS : 6623	High Strength Structural Nuts- Specifications
IS : 6649	Hardened and Tempered Washers for High Strength Structural Bolts and Nuts
BS-111	RDSO guidelines for use of High Strength Friction Grip (HSFG) bolts on bridges on Indian Railways.

7.0 Quality Audit

7.1 Quality Audit of the Registered Vendors will be done every five year.

7.2 The firm should satisfy the following requirements to continue as approved vendor

- a) The firm should continue to maintain the infrastructure, facilities and Machineries & plants as required at the time of Quality Audit as per prevailing STR.
- b) The firm should have executed/completed at least one work of Railway Bridge Girder Fabrication. For the purpose of this clause, fabrication of at least one span against a multiple span will be considered/treated as completed work.
- c) The firm should not have any adverse report from any of the Railways.

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- 7.3 For Quality Audit, firm will be inspected for facilities provided as per Para 4 to 6 of this STR, which in turn will be verified, after inspection by the RDSO team. The firm should also give an undertaking that organizational and infrastructural requirement as required at the time of Quality Audit have been maintained.
- 7.4 If the firm does not satisfy the criteria given in Para 7.2 & 7.3 above, its name will be removed from approved list and firm shall have to apply afresh in case it desires to be registered again.

8 RESPONSIBILITY AND AUTHORITY:

The following table indicates responsibility related to this document:-

Activity	Responsible	Approver	Supporting	Consulted	Informed
Creation, maintenance of this document	DBS	ED/B&S/Steel	ADE/B&S and Staff.	-	Through intranet/soft copy.
Compliance of Directive contained in this document	ADE/B&S	DBS/IV	Directorate staff	-	-
Requirement of Deviation from Directive	DBS	ED/B&S/Steel	ADE/B&S	-	Through intranet/soft copy

9.0 ABBREVIATION:

- ED = Executive Director/B&S/Steel
- DBS = Director/Joint Director (B&S) Concerned.
- ADE = Assistant Design Engineer concerned
- SE = Section Engineer Concerned
- JE/D = Junior Engineer (Design)

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