Document No. : BS-S-4.2.3 – 2 Versions 3.2

Document Title : SCHEDULE OF TECHNICAL REQUIREMENTS FOR FABRICATION OF STEEL GIRDERS (Existing)

AMENDMENT HISTORY:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Amendment Date</th>
<th>Version</th>
<th>Reasons for Amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>14-09-2010</td>
<td>1.0</td>
<td>STR approved by Railway Board.</td>
</tr>
<tr>
<td>2.</td>
<td>22-06-2012</td>
<td>1.1</td>
<td>Minor change in procedure for ONLINE facility only (Facility of Hard Copy with drawn).</td>
</tr>
<tr>
<td>3.</td>
<td>23-10-2012</td>
<td>2.0</td>
<td>Modification in Para 2.2, 2.4, 2.5, 4.3 &amp; 7.8 and addition of Para 4.14 &amp; 4.15</td>
</tr>
<tr>
<td>4.</td>
<td>27-06-2014</td>
<td>3.0</td>
<td>Modification in para 2.2.1, 2.2.2, 4.1 to 4.12, 6.2, 7.1, 7.4, 7.5 &amp; 7.8, deletion of para 2.2.2 to 2.6 and addition of para 4.16</td>
</tr>
<tr>
<td>5.</td>
<td>21-09-2015</td>
<td>3.1</td>
<td>Minor Modification in Para 2.2 &amp; 2.2.1.</td>
</tr>
<tr>
<td>6.</td>
<td>15-12-2018</td>
<td>3.2</td>
<td>Minor Modification in Para 4.2 &amp; 5.2</td>
</tr>
</tbody>
</table>
SCHEDULE OF TECHNICAL REQUIREMENTS FOR FABRICATION OF STEEL GIRDERS (EXISTING)

1. **Scope**

   This schedule covers the norms for evaluation of both the capability and the capacity of any firm to manufacture and supply Steel Bridge Girders. Intended fabricators will be required to fabricate riveted/welded plate girders and riveted/welded open web girders.

2. **Procedure for registration of firms for fabrication of girders.**

   2.1 The firm will ensure availability of:
      
      i) The required infrastructure, machinery & Plant.
      
      ii) Testing and measuring equipments duly calibrated.
      
      iii) Trained technical manpower and Quality Assurance Programme
      
      iv) Equipments meeting the requirements of relevant specifications.
      
      v) Space required for manufacturing, testing and storage viz. manufacturing floor, godown, store, office and test lab etc.

   2.2 In case fabricator is satisfied that the infrastructure available commensurate with the above stated requirements then firm shall apply for registration ON-LINE on the RDSO website. All relevant documents like Guidelines for Registration and Quality Audit of Vendors in Bridge & Structure Directorate, Application Form, Schedule of Technical Requirement (STR), latest version of relevant specifications (if applicable), RDSO Vendor Approval Process Guidelines, etc. are available on the RDSO website. The requisite charges as specified on website are to be deposited through the means as specified on the RDSO website.

   2.2.1 The firm has to submit ONLINE complete application form, self compliance of STR and all necessary documents in support of self compliance of STR and documents in support of other important aspects of application. The firm has also to submit the Undertakings and Documents as mentioned in Doc No. BS-G-4.2.3-1 (latest version) titled “Guidelines for Registration and Quality Audit of Vendors in Bridge & Structure Directorate.”

   2.2.2 For detail 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. **Norms for Acceptance**

   3.1 To qualify for riveted steel bridge girders production, the firm must satisfy the infrastructural requirement as laid down in para 4 to 6.

   3.2 To qualify for welded steel girders production, firm must satisfy the requirement laid down in para 7 in addition to requirement of other para 4 to 6.
3.3 Fabricators who do not have established the workshop for fabrication but do have required facilities at site as given in para 3.1 & 3.2 above as applicable will also be considered.

4. **General and Infrastructural Requirements for Steel Girders:** Provide Detail Information on items given below and enclose necessary documents in support as applicable ONLINE:-

4.1 The fabricator must have adequate 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 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 structures capable of with-standing dynamic loads such as bridge girders, microwave towers, heavy industrial steel structures etc. is essential.

**Note:-**

(i) **Bridge Girders:** Firm should have fabricated not less than 1 span of 30m or above Open Web Girder or not less than 3 spans of Plate Girder for Railway Bridge or ROB’s (Foot Over Bridges, Pipe Line crossings etc. will not be considered for similar experience purpose).

(ii) **Towers:** Fabrication of only those Microwave Tower/Power Transmission Tower/Chimneys will be considered for which height above ground level is not less than 30 meters.

(iii) **Gantry Girders:** Fabrication of Gantry Girders and/ or columns designed to cater for EOT crane of capacity not less than 50 tone.

(iv) **Heavy Industrial Structure** is defined as the work in which firm has fabricated more than 1000 MT involving built up Section like I-girder of depth not less than 700 mm or Box section with X-sectional area of Box not less than 90000 mm².

(v) 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.

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

(vii) Performance certificate from Private individuals will not be accepted
except those which are reputed Pvt. Ltd. firm whose turnover is more than 100 crores per annum and the applicant has to submit necessary certificate from CA and Audit Reports of CA or Income Tax returns to prove his point.

(viii) Necessary documents in support of above to be enclosed. If above conditions are not satisfied, it will be deemed that firm is not having the desired experience, which in turn is essential & his application will be closed as per procedure mentioned in Guidelines for Registration/Renewal of Vendors in Bridge & Structure Directorate.

4.4 A proper procedure for maintenance 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 distribution agencies and adequate backup shall be available through captive generation. (Necessary documents in support to be enclosed).

4.6 Covered bay area served by EOT cranes or by mechanically operated machines should be provided to handle day today fabrication of girder components. (Necessary documents in support to be enclosed).

4.7 Enough area to store raw material, sub assemblies and finished product should be available. The area provided should be enough to store raw material to execute the work order for requirement of steel. Suitable material handling facilities in form of EOT/mobile cranes should be available.

4.8 A separate line for inspection and testing of girders should be provided for final inspection and testing of bridge girders by railway's inspecting engineers.

4.9 Covered shed area protected from rain, dust etc. should be provided for surface preparation/painting/metalizing of steel girders. As no part of the work shall be painted unless it has been finally passed and cleared by inspecting officer, 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 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.

**Note:** For para 4.6 to 4.10 Applicant has to submit ONLINE neat copy of plan of works premises & show detail of items given below:-

(a) Covered bay area with proper handling facilities available to handle day-to-day fabrication of Steel Bridge Girder.

(b) Area for storing raw material, sub-assemblies & finished products etc.
(c) Area for separate line for inspection and testing of Girder.
(d) Covered shed area protected from rain, dust etc, available for surface preparation/painting/metalizing.
(e) Availability of Template floor.

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 facility shall be available and same should be marked clearly in the factory plan to be submitted.

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).

4.13 Digital Signatures:

It is mandatory for all the vendors to obtain Digital Signature Certificate & get registered with IREPS at http://www.ireps.gov.in.

4.14 It should be mandatory to inform the RDSO through FAX (followed by confirmation copy through courier/speed post) as soon as any machinery is removed from the firm's premise (even for repair etc.). RDSO should be informed again, when brought back and made operational.

4.15 Firm should be required to give an undertaking at the time of seeking approval that if at any time after approval is accorded, some machinery is found deficient without intimation to RDSO, then it will be presumed that machinery was not there since beginning and firm's approval will be withdrawn immediately.

4.16 Firm should submit the detail of Equipments/Machinery i.e. covering Quantity, Make, Model Number, Capacity, Year of manufacture/commissioning, Machine number etc. preferably in a chart form for the machineries and plants as mentioned under para-5 and 7.1 to 7.2 given below (Machinery owned by sister concern will not be accepted).

5. **Machinery & Plants:**

Following machinery and plants shall be available with the fabricator:

5.1 EOT/Portal/mobile crane of min. 10t capacity or suitable material handling facility to serve the handling of material for fabrication of girders, unloading of raw material and loading of finished product.

5.2 Compressors of adequate capacity suitable for riveting and for other simultaneous applications.

5.3 Oxy-Acetylene gas cutting equipment

   a) Profile cutting equipment of adequate size.
b) Self propelled straight cutting equipment preferably consisting of multiple torches.

5.4 Radial drilling machines of adequate capacity to drill holes of 12 to 50 mm diameter.

5.5 End milling machine.

5.6 Plate & structural sections straightening machine.

5.7 Pneumatic/hydraulic yoke riveting machine.

5.8 Adequate number of portable pneumatic tools such as grinders, drilling machines, chipping machines, wrenches etc.

5.9 Dumpy level or theodolite instrument for recording of camber/deflection of trial erected girder.

5.10 Facilities for surface preparation/painting/metalizing as per IRS B-1 specification.

5.11 A) To test the raw material and girders to conform it for relevant specification, testing facilities for the following must be provided:-
   (a) Elcometer for measuring thickness of paint.
   (b) Steel measuring tape duly calibrated

   B) Following facilities for testing of material can be In house or may be arranged from external agencies:

   a) Equipments required for testing of mechanical properties, chemical composition and microstructure etc.

   **Note:** If facility is in house provide details of Equipment like, Make, Model Number, Capacity, Year of manufacture/commissioning and copy of test certificates issued earlier. If outsourced, submit copy of MOU with NABL Lab and copy of some previous Test Certificate issued by NABL Lab. The MOU should have validity of minimum 30 months.

   b) Ultrasonic flaw detection testing facilities for checking internal flaws and thickness of section.

   **Note:** If facility is in house provide details of Equipment like, Make, Model Number, Year of manufactured/commissioning, Proficiency Certificate of minimum level-II of personal conducting UT Test and copy of some test certificates issued earlier. If outsourced, submit copy of MOU with NABL Lab/approved agency, Proficiency Certificate of minimum level-II of personal conducting UT Test and copy of some previous Test Certificate issued by NABL Lab/approved agency. The MOU should have validity of minimum 30 months.

5.12 System of periodical maintenance of M&P must be in vogue and proper records
maintained.

6. **Quality Infrastructure:**

6.1 Fabricator shall have proper quality infrastructure to ensure the quality product as required under latest issue of IRS B1 Specification and IRS Welded Bridge Code as applicable. ISO certified firms would be preferred.

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 feedback to the source of defects and for rectification should be in vogue. Necessary performas followed to be enclosed.

6.3 The fabricator should have adequate infrastructure and facilities like checking gauges, templates etc. during fabrication required from time to time so as to ensure that the finished product is as per requirement of IRS: B1 and Welded Bridge Code.

6.4 Following specifications/codes commonly referred in connection with fabrication of riveted steel girders must be available with fabricator.

The latest version of BIS Code/Specifications referred herein including their amendments issued from time to time are to be followed.

6.5 All equipments must meet the requirements of corresponding BIS or other international Specifications.

7. **Additional general and infrastructural requirements for fabrication of welded girders.**

7.1 The following facilities should be available for fabrication of welded girders.

a) Welding transformers/rectifier for Manual Metal Arc Welding (MMAW)

b) Inert gas (Carbon Dioxide) welding equipment sets.

c) Automatic submerged arc welding equipment.

d) Suitable welding manipulators.

e) Macroetching /Dye Penetrant or Magnetic Particle testing facilities.

f) Arrangement for radiographic test either in house or from external agency.

**Note:** If facility is in house provide details of Equipment like, Make, Model Number and Year of manufacture/commissioning and provide copy of proficiency Certificate of minimum level-II of personal conducting RT Test and copy of Test Certificates issued earlier. If outsourced, submit copy of MOU with approved Agency by BARC/Atomic Energy Regulatory Board and copy of Proficiency Certificate (preferable which should be minimum level-II) of person trained for Radiography Testing and copy of previous Test Certificates issued earlier by approved agency. The MOU should have validity of
A minimum of 30 months.

- Tongue tester for measuring current and voltage.
- Gauges for checking weld size, throat thickness and edge preparation etc.

7.2 Machine for edge preparation before welding.

7.3 Fabricators must ensure that welding and gas cutting equipment/accessories meet BIS or other international standard requirements. It will be fabricators' responsibility to satisfy the inspecting engineer that all the welding equipment/accessories conform to the BIS standard or any other standard in the absence of proper marking on such equipment/accessories.

7.4 Only trained and qualified Welders shall be deployed for welding. The welders must be trained in accordance with the provisions 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 requirements of IS: 7310 and proper records maintained. Applicant to submit copy of some welding procedures and Welders Qualification followed at their works.

7.5 All welding shall be carried out under the overall supervision of a qualified welding supervisor who has been trained in Welding Technology from any recognized welding institute. Submit details of staff & their Qualification and experience.

7.6 Welding instructions shall be prominently displayed on the shop floor. Requirement of the job in hand must be clearly explained to the welder before he is permitted to work.

7.7 Following specifications/codes commonly referred in connection with fabrication of welded steel girders must be available with fabricator.

The latest version of BIS Code/Specifications referred herein including their amendments issued from time to time are to be followed. Wherever to the standards mentioned above appears in the specification it shall be taken as a reference to the latest version of the standard.

7.8 Quality Audit of the Registered Vendors will be done every three years for which following are the requirements:

(a) The firm should continue to maintain the facilities as required at the time of initial approval.

(b) The firm should have participated in at least one of the tender of Railway Bridge Girder Fabrication.

OR

The firm should have carried out any one work satisfying criteria 4.3 of this STR during the last five financial years & upto validity of current financial year at the time of Quality Audit.
(c) The firm should not have any adverse report from any of the Railways.

7.8.1 For Quality Audit, firm will be inspected for facilities provided under para 5 to 7 of this STR, which in turn will be verified after inspection by the RDSO team. Regarding para 4 of STR, the firm should give undertaking that organizational and infrastructural requirement mentioned in para 4 of STR have been maintained as existing at the time of initial approval.

7.8.2 If the firm does not satisfy either of the criteria given in para 7.8(b), its name will be removed from list and firm shall have to apply afresh.

8.0 RESPONSIBILITY AND AUTHORITY:

The following table indicates responsibility related to this document:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Responsible</th>
<th>Approver</th>
<th>Supporting</th>
<th>Consulted</th>
<th>Informed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation, maintenance of this document</td>
<td>DBS/T&amp;I</td>
<td>ED/B&amp;S</td>
<td>DD Insp., AE/Insp. and Staff of DD/Insp.</td>
<td>-</td>
<td>Through intranet/soft copy.</td>
</tr>
<tr>
<td>Compliance of Directive contained in this document</td>
<td>DD/B&amp;S/Insp.</td>
<td>DBS/T&amp;I</td>
<td>Directorate staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.0 ABBREVIATION:

ED     = Executive Director/B&S
DBS    = Director/Joint Director (B&S)/Insp.
DD/Insp. = Deputy Director/Inspection
AE     = Assistant Engineer/Insp.
SE     = Section Engineer/Inspection
RESEARCH DESIGNS AND STANDARD ORGANISATION
MANAK NAGAR, LUCKNOW-226011

Document No. : BS-S-4.2.3 – 2 Version 4.2

Document Title : SCHEDULE OF TECHNICAL REQUIREMENTS FOR FABRICATION OF STEEL GIRDERS (w.e.f. 01.12.2019).

AMENDMENT HISTORY:

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

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

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

4 General and Infrastructural Requirements: - Detailed 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 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 structures such as bridge girders, heavy industrial steel structures etc. as under:

(a) Firm should have fabricated minimum 1 Span of Open Web Girder of Railway Bridges of not less than 30.5m

OR

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

OR

(c) Firm should have fabricated minimum 3 Spans of Composite Girders of ROB not less than 9.15m

OR

(d) 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 mm$^2$.

OR

(e) Firm should have fabricated minimum 1000 MT Railway Foot Over bridges, Plate form shelters and Bridge Girders pathways etc.

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

ii) For items (a) to (e), 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 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.

iv) In case of (b) & (c) only one time approval for two years may be given to firms which have fabricated not less 300MT Plate Girders or Composite Girders or both during last three financial years subject to fulfilling other requirements. Therefore, regular approval will only be given after completion of fabrication of minimum one Open Web Girder for Railway Bridge of not less than 30.5m span & passing by RDSO during above period. In case firm is not able to get any order for Open Web Girder for Railway Bridge during this period, regular approval will only be given after completion of fabrication of minimum one Open Web
Girder for Railway Bridge of not less than 30.5m span & passing by RDSO at its own cost.

v) In case of (d) & (e), the approval will only be given after fabrication of one Open Web Girder for Railway Bridge of not less than 30.5m span. By the firm at its own cost which is to be passed by RDSO.

4.4 A proper procedure for maintaining 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 be available through captive generation. (Necessary documents in support to be enclosed).

4.6 Covered bay/shed area duly protected from rains/wind and dust for fabrication should be available. (Necessary documents in support to be enclosed).

4.7 Enough area to store raw materials, sub-assemblies and finished products 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 facility shall be available and same should be marked clearly on 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. **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


5.5 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 other applications.

5.7 Radial drilling machines of adequate capacity to drill holes up to 50 mm diameter.

5.8 End milling machine.

5.9 Plate & structural sections straightening machines.

5.10 Minimum three number of portable pneumatic tools such as grinders, drilling machines, chipping machines, wrenches, elcometers, calibrated steel measuring tapes etc.

5.11 Minimum one number Dumpy level/Theodolite/Total Station for recording of camber/deflection of trial assembled girder etc.

5.12 Facilities for surface preparation/painting/metalizing as per IRS B-1 specification.

5.13 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 equipment like, make, model number, 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.

5.14 Testing facilities for ultrasonic flaw detection which can be in-house or may be arranged from outside.
Note:- If facility is in house, details of equipments like, make, model number, 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 agencies 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.

5.15 System of periodical maintenance of M&P must be in vogue and proper records shall be maintained.

5.16 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.
   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 and 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. 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.

5.17 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.
5.18 Only trained and qualified Welders shall be deployed for welding. The welders must be trained in accordance with the provisions 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 requirements 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 institutes. Fabricators to submit copy of welding procedures and Welders Qualification followed at their works.

5.19 All welding shall be carried out under the overall supervision of qualified welding supervisors who have been trained in welding technology from any government approved welding institutes. Details of staff, their qualification and experience should be submitted by Fabricators.

5.20 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 form the requirement, the firm's registration will be withdrawn.

6. 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 products and sub-assemblies. A dynamic arrangement for a feed back to the source of defects and for rectification should be in vogue. Perform being followed should be enclosed.

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

<table>
<thead>
<tr>
<th>IRS : B1</th>
<th>Specification for fabrication and erection of steel Girder Bridges and locomotive Turn Tables.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRS</td>
<td>Steel Bridge Code</td>
</tr>
<tr>
<td>IS: 1148</td>
<td>Steel rivet bars (medium &amp; high tensile) for structural purposes.</td>
</tr>
<tr>
<td>IS: 1149</td>
<td>Specification for High tensile steel rivet bars for structural purpose.</td>
</tr>
<tr>
<td>IS : 1852</td>
<td>Specification for Rolling and cutting tolerances for Hot Rolled Steel Products</td>
</tr>
<tr>
<td>IS : 2062</td>
<td>Hot rolled medium and high tensile structural steel-Specification.</td>
</tr>
<tr>
<td>IRS:</td>
<td>Welding Bridge Code</td>
</tr>
<tr>
<td>------</td>
<td>---------------------</td>
</tr>
<tr>
<td>IS : 817</td>
<td>Code of practice for training and testing of metal arc welders</td>
</tr>
<tr>
<td>IS : 818</td>
<td>Code of Practice for Safety and health requirements in electric and gas welding and cutting operations</td>
</tr>
<tr>
<td>IS : 822</td>
<td>Code of Procedure for inspection of welds</td>
</tr>
<tr>
<td>IS : 4353</td>
<td>Submerged arc welding of mild steel and low alloy steels recommendations</td>
</tr>
<tr>
<td>IS : 7307 (Pt-1)</td>
<td>Approval tests for welding procedures – fusion welding of steel</td>
</tr>
<tr>
<td>IS : 7310 (Pt-1)</td>
<td>Approval tests for welders working to approved welding procedures – fusion welding of steel</td>
</tr>
<tr>
<td>IS : 9595</td>
<td>Metal-arc welding of carbon and carbon manganese steels recommendation.</td>
</tr>
<tr>
<td>IS : 3935</td>
<td>Code of practice for composite construction</td>
</tr>
<tr>
<td>BS : 5400-6</td>
<td>Steel, concrete and composite bridges, Specification for materials and workmanship, steel</td>
</tr>
<tr>
<td>ISO : 8692</td>
<td>Code of mechanical properties of Stud Shear Connector</td>
</tr>
<tr>
<td>BS EN ISO 13918</td>
<td>Welding- Studs and ceramic ferrules for arc stud welding</td>
</tr>
<tr>
<td>IS : 3757</td>
<td>Specification for high strength structural bolts</td>
</tr>
<tr>
<td>IS : 4000</td>
<td>Code of practice for high strength bolts in steel structures</td>
</tr>
<tr>
<td>IS : 6623</td>
<td>High Strength Structural Nuts- Specifications</td>
</tr>
<tr>
<td>IS : 6649</td>
<td>Hardened and Tempered Washers for High Strength Structural Bolts and Nuts</td>
</tr>
<tr>
<td>BS-111</td>
<td>RDSO guidelines for use of High Strength Friction Grip (HSFG) bolts on bridges on Indian Railways.</td>
</tr>
</tbody>
</table>

7. **Quality Audit**

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

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.

7.3 For Quality Audit, firm will be inspected for facilities provided under 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.
SCHEDULE OF TECHNICAL REQUIREMENTS (STR) FOR FABRICATION OF COMPOSITE AND OTHER STEEL PLATE GIRDERS (PART-B) VALID FROM 01-12-2019

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. 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. 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. 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 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 & up to 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).

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. **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.


5.5 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 Plate & structural sections straightening machines

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/metralizing 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.

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.
   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 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 form the requirement, the firm’s registration will be withdrawn.

6. **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 the 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 |
| 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.

#### 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.