GUIDELINES ON FABRICATION OF STEEL GIRDERS FOR CONSTRUCTION/FIELD ENGINEERS

BS –110 (R)

March, 2016
(With Addendum & Corrigendum of July, 2017)

ISSUED BY

B&S DIRECTORATE
RESEARCH DESIGNS AND STANDARDS ORGANISATION
LUCKNOW-226011
FABRICATION OF STEEL GIRDERS

The fabrication of steel girder bridges is being done by various Railway Workshops as well as through trade. The fabrication is governed by the provisions of:

i) Indian Railway Standard specification for fabrication and erection of steel girder bridges and locomotive turn-tables. (B1-2001).


The officials associated with fabrication work should have thorough understanding of both the codes i & ii. However, these guidelines have been prepared for helping the field engineers associated with execution of the fabrication work through trade. It has been tried to cover various aspects which require close attention of the field engineers for ensuring quality of the fabrication work. These guidelines are just to facilitate and not to supersede the two codes. All engineers associated with fabrication are advised to understand the provision of IRS B1-2001 and Welded Bridge Code and take help from these guidelines. Book published by RETS IRICEN “Steel Structure Fabrication for Railways” is also a very good guide for the Engineer incharge of fabrication. The workshop engineer or contractors should also have good understanding of various provisions of above Railway codes and other related codes.

ITEM REQUIRING ATTENTION BY FIELD/WORKSHOP ENGINEERS DURING FABRICATION OF STEEL GIRDERS

A. Approved Drawing to be used for fabrication:

Field/Workshop Engineer associated with fabrication should have all the relevant drawings, Codes & Specifications with latest Correction Slips prior to the start of work. On the basis of structural drawings, fabrication drawings should be prepared by fabricator. Plate Girder Drawings to be checked for intermediate stiffeners whether riveted or welded.

B. Quality Assurance Programme (QAP) of Steel Girder Fabrication:

- To ensure the proper quality of fabrication, Quality Assurance Plan (QAP) is prepared. QAP must indicate stage-wise manufacturing process covering various steps, tests, checks & their frequency, sampling plan, authority for grant of clearance etc. for all activities from inspection and testing of raw material to trial assembly and erection. The QAP must cover following aspects.
• Brief Details of project
• Contract Agreement No.
• Loading Standard
• Governing Specification
• Drawing references
• Roles and responsibilities of various agencies involved in fabrication, erection & inspection.

A sample QAP for 30.5m welded open web girder is given at Annexure-I.

QAP is to be scrutinized and approved by the inspection agency. In case of welded girder it is to be done by RDSO, as per prevailing orders.(QAP should be signed by Fabricator and Railway Officials [Minimum JAG Level] before submission to RDSO)

Field Engineer should ensure that work is carried out strictly as per the approved QAP and no deviation takes place from QAP. All the stages should be studied in detail, prior to start of work.

C. Scrutiny & Approval of Welding Procedure Spec. Sheet (WPSS) (final approval to be done by RDSO):

WPSS is process sheet indicating plate/section used, welding process, type of joint, welding consumables quality, welding parameters, acceptance standard, tests applicable etc. Field Engineer should ensure that welding is carried out as per approved WPSS. Performa for WPSS is given in Appendix-V of IRS B1-2001. WPSS should be signed by fabricator and Railway Officials before sending for approval of RDSO (Annexure-II).It is to be ensured that welding consumables to be used are from approved source and a proper record of their consumption is maintained. A sample Performa for record keeping of consumables is enclosed as Annexure–III.

D. Welding Procedure Qualification Records (WPQR) (final approval to be done by RDSO):

WPQR is the document indicating approval of various welders who are to be deployed for carrying out welding work for fabrication. It contains Name of the welder with photograph, qualification, experience, qualification tests and records for each welding process and joint, welding parameter. Tests are conducted by RDSO Official from M&C Directorate before qualifying the welders and then approval is granted through WPQR. Performa for WPQR is given in Appendix-V of IRS B1-2001. WPQR should be signed by fabricator and Railway Officials before sending for approval of RDSO (Annexure-IV). Field engineer should ensure that welding is done only by approved welders and no deviation takes place.
E. Raw Material and Gauge Certification

*Inspection of Raw Materials:* Passing of raw material is done on the basis of visual inspection and lab test reports for mechanical properties, chemical composition, ultrasonic examination, Charpy Impact Test etc. Rivets and other consumables like paint etc. should also be got tested from NABL Lab as per relevant codes/specification.

All the required test should be got done through independent NABL Labs and compared with the mill test certificate results given by the supplier before passing the material for use.

Material test certificate register must bemaintained by fabricator as per Annexure available in IRS: B1-2001(appendix-I,Performa-7)and signed by railway representative as well as fabricator.

All angle/channel, rolled section to be used for open web girder fabrication shall be checked for rolling tolerance as stipulated in IS:1852.

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

Note:- Raw Material Steel has to be as per Para 8 of IRS B1:2001, recently revised vide Correction Slip No.5 dated 30-08-2013 (Annex.-V). In majority of case where service temperature does not fall below 0°C steel grade designation is E-250 Quality “B0” as per Para 8.2 of IRS B1:2001.

F. Item requiring attention before Fabrication of Girder.

F1. Inspection of Layout on template floor – Field engineer has to ensure that the Template floor is level. Nominal and camber layout are drawn with the calibrated steel tape. The certificate of calibration from a authorized agency should be kept in record. Squareness, diagonal measurement of layouts are also checked. It should be remembered that tape should not be changed during the various stages of measurement. Running measurement should be recorded with a long tested tape having minimum length suitable for half span/full span measurement as per the case. 4 lbs. pull is to be applied for stretching the tape. Suitable device should be used for this purpose.

F2. Inspection of Jigs, Fixtures and Master Plates -Master Gussets should be checked on nominal layout and transfer of all inter section line/points to be done with great care and accuracy. If gussets are symmetrical then 1/4th or half hole marking is to be done and same will be transferred to complete the gusset marking. Dimensional Inspection of Jigs, Fixtures, Master Plates used in manufacture of girder should be done very carefully to ensure accuracy.
It should be remembered that jigs of main members of the open web girders are fabricated on the camber length with the adoption of the field holes at nominal length layout through master gussets.

**F3. Layout of joints is drawn as per drawing on 1:1 scale on a level ground to check for:**

i) Any infringement of rivets, adjoining edges etc.

ii) Position of holes in master plates for jigs as per layout.

iii) The bore of bushes shall initially have tolerances of - 0mm to + 0.1mm. Fairing of bushes with holes of master plate shall conform to tolerances of – 0.13mm using a ‘GO’ gauge of 0.13mm less than hole diameter. Bushes of jigs during service should be maintained within acceptable limit (D+0.4mm) which shall be checked at regular intervals.

**F4. Certification of Jigs, Fixtures and Master Plates-Stamping of Master Plates**

by the inspection official should be ensured prior to their use.

The jigs should be checked by fabricator and field engineer from time to time for their wear and tear for maintaining accuracy during work.

**G. Item requiring attention during fabrication of girder:**

Field/Workshop engineer should keep a watch and maintain proper record for-

(i) Ensuring Use of Approved Raw Material – Only raw material cleared originally to be used during fabrication.

(ii) Ensuring use of Approved Welding Consumables-Type of consumables, source, quality, approval status, grade, suitability for fabrication as per WPSS etc. to be frequently checked and recorded.

(iii) Ensuring use of Approved Welders-Checking of welders certificate, records, skill and procedure adopted for welding as per WPSS

(iv) Ensuring use of Approved WPSS & Welding Parameters-Checking welding parameters and equipment used for correctness of joint preparation etc.

**Important Checks for Tack Welding:**

i) Check that top & bottom flange plate are perfectly perpendicular with reference to web throughout the length of I Section.

ii) Check the squareness i.e. 90° angle between flange & web of top and bottom flange plate to avoid out of squares flanges.

iii) Check with filler gauge throughout the length of top & bottom flange connection for uniform contact throughout the web plate.

**Points requiring attention during full welding:**

i) Thorough cleaning of tack welded member should be done with appropriate tool like wire brush, before shifting for full welding. Minimum width of 75mm
throughout the length shall be cleaned to ensure that the surface is free from
dust, mill scale, grease, oil and paint to ensure sound quality of weld.

ii) Full welding shall be carried out in flat position with SAW process as per
sequence mentioned in WPSS/ WPQR using manipulator/special welding
fixture.

iii) The sequence of welding shall be shown in WPSS/ WPQR marked as 1, 2, 3
& 4 in the order of welding.

iv) The welding should be done in proper sequence.

v) Minor welds/ Inaccessible location welds shall be made by CO₂ welding or
other type of welding as per approved WPSS.

**Good Working practice for prevention of distortion in welded girders:**

i) By pre-bending of flange plate of welded girder using appropriate fixture.

ii) By clamping the flange plate to fixture.

(Fixture developed by MMR Workshop is given at Annexure VI)

**Radiographic Exam.of Butt Weld Joints**- Any butt welding provided as per
approved WPSS should be subjected to radiographic testing by authorized
agency only. The film should be preserved for examination, sensitivity, defect
interpretation and acceptance decision based on prescribed criteria.

**Ensuring use of Approved set of Jigs & Fixtures**- To permit the
interchangeability of the components and ensure pre-stressing in open web
girders and to avoid distortion, it should be ensured that only approved Jigs &
fixture are used and proper clamping arrangement are provided in jigs/fixtures.

**H. Item requiring attention after fabrication of girder:** Stacking of
component should be proper and shipping mark is properly stenciled on
component for identification.

**Field/Workshop engineer should ensure that:-**

While cutting the plates or other section the heat/cast mark should be transferred
to all cut members while using these members for fabrication. Proper record of
heat mark should be maintained/ correlating it with the components of girder.

Visual Exam of Welds- Quality of weld, uniformity of weld bead, size of the weld,
weld defects e.g. under cut, blow hole, porosity, spatter, crack etc. should
satisfy para 31 and Appendix C of welded bridge code.

Metallographic and NDT Exam of Fillet Welds- Macro etching on girder, run-on,
run-off tabs for ensuring proper weld quality, Dye penetrant examination
etc. should be arranged by fabricator, for independent inspection.
Structural and dimensional inspection-Dimensional check should be carried out by field engineer to ensure conformance to drawing dimensions including diagonal checks for squareness etc. before offering girders for final inspection.

I. Trial Assembly: for open web girder.

First span is always trial assembled to check whether fabrication process is proper or require any correction in jigs, workmanship or procedures to ensure regular quality output. Following important parameters are checked during trial assembly:

(i) Camber:

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

(ii) Dimensional check:

i) Overall length
ii) Bearing centers
iii) Height
iv) Truss center
v) Center to center distance of rail bearers
vi) Center to center distance of panel points
vii) Squareness
viii) Alignment of the girder
ix) Fairing of holes
x) Verticality
xi) Infringement, if any
xii) Butting of compression flange.

J. Component Inspection of first span-Detailed inspection of dismantled components of trial erected span is carried out to see the integrity of components. There should not be any elongation of holes, tearing of edges or other defects after dismantling of trial assembly.

K. Component inspection of 2nd span onwards:- Once fabrication process is found satisfactory i.e. all steps from A to J are proved during trial assembly and its component inspection, then only components of 2nd span and onwards should be fabricated with the approved sets of jigs and fixture, the tested WPSS and
WPQR as laid out in steps earlier. Field engineer should do the components inspection and ensure all record are available before giving final inspection call inspecting authority.

**Plate girder check.**

i) Overall length  
ii) Bearing centers  
iii) Height  
iv) Girder center  
v) Squareness  
vi) Fairing of holes  
vii) Verticality  
viii) Infringement, if any  
ix) Butting of compression flange.

L. **Anti Corrosive Treatment**-Surface preparation, metalizing and or painting as per applicable painting schedule should be done as per provision given in para39 of IRS:B1-2001.

M. **Stages of Inspection in Fabrication of Bridge Girders:**

The important stages in a tabulated form showing various stages and corresponding Inspection/Approval agency for Rail & Rail-cum-Road Bridge are as shown in Annexure-VII. For ROB’s, Inspection/Approval agency for all stages will be concerned Railways.

N. **Certificates to be furnished by Railway:**

During fabrication, internal inspection to be done by Railways to ensure that only RDSO approved welders carryout welding as per approved WPSS, work is as per dimensional tolerances and other quality aspects and should satisfy itself before sending inspection call to RDSO for Trial Assembly or Component Inspection. Railway has to give following four certificates as mentioned in RDSO letter No. CBS/Insp./WBG Dated 10-04-2015 (Annex.VIII) at time of sending Inspection Call.

(i) **Steel used for welded Bridge Girders components is of weldable quality is IS: 2062 Gr.BO fully killed and fully normalized, which has been inspected & approved by the Railways.**

(ii) **Fabrication has been done with the help of approved Jigs.**

(iii) **Entire welding was done by approved welders using approved welding procedures (WPSS) and welding consumables.**
(iv) Fabrication work has been inspected by our internal quality control/inspection organization including the welding and riveting. All significant defects have been rectified and final dimensions are within tolerances.

O. Fabrication Agency:-

Railway Board vide letter No. 2014/CE-III/BR/Bridge Workshops Policy dated 24-02-2014 has allotted Railway Bridge Workshops as Primary Source and Secondary Sources to all Zonal Railways. The same has been reiterated vide RDSO Letter No. CBS/Insp./WBG dated 28-02-2014 (Annex.-IX).

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Railway</th>
<th>Primary Source</th>
<th>Secondary Source</th>
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<tbody>
<tr>
<td>1.</td>
<td>CR, WCR &amp; SECR</td>
<td>Manmad</td>
<td>Sabarmati</td>
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<td>2.</td>
<td>ER, ECoR&amp; ECR</td>
<td>Mughalsarai</td>
<td>Lucknow</td>
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<tr>
<td>3.</td>
<td>NCR &amp; NR</td>
<td>Jallandhar&amp; Lucknow</td>
<td>Mughalsarai</td>
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<tr>
<td>4.</td>
<td>SWR &amp; SR</td>
<td>Arakkonam</td>
<td>Manmad</td>
</tr>
<tr>
<td>5.</td>
<td>NWR &amp; SR</td>
<td>Sabarmati</td>
<td>Manmad</td>
</tr>
<tr>
<td>6.</td>
<td>SCR</td>
<td>Lallaguda</td>
<td>Manmad</td>
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<tr>
<td>7.</td>
<td>NFR</td>
<td>Bogaingaon</td>
<td>Mughalsarai</td>
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<td>8.</td>
<td>NER</td>
<td>Gorakhpur</td>
<td>Lucknow</td>
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<td>9.</td>
<td>SER</td>
<td>Sini</td>
<td>Mughalsarai</td>
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</tbody>
</table>

Efforts should be made by the Open Line/Construction Organization of the concerned Railway to get the requirement of their Railway met by primary or secondary sources. While exploring this aspect, they should advise realistic target date to requirement within the planned target date, concerned CBEs should advise the requisite Railway, their ability/ inability to supply girders within the stipulated time. Only after obtaining the confirming in writing from CBEs of both the primary and secondary sources that they are not able to meet the request of the Zonal Railway, the concerned Railways may go to the trade for fabrication/ supply of girders. In such cases, Zonal Railway will have to ensure that the trade supplies the material within the target date given originally by Railway to the CBE of primary and secondary source.

RDSO will take up the inspection of the girders supplied by trade only after the certificate of the primary and secondary source i.e. CBE of primary and secondary source regarding their inability to complete the requirement within the target date is produced by the requisite Railways.

P. Check List:- Check List for fabrication of Steel Bridge Girders for three stages (i) Prefabrication stage (ii) During fabrication and (iii) After fabrication are enclosed as performa-I, II & III in Annex.-X for guidance of Field Engineers.

Q. Standard QAP for Elastomeric Bearings, POT-PTFE Bearings & Expansion Joints are enclosed as Annexure-XI, XII & XIII for guidance of Field Engineers.
R. Some important DOs & DON’TS are given here for guidance:-

**DOs-**

- Use proper fixtures and clamps to hold the members firmly at desired location while welding. The clamps and fixtures must be strong enough to prevent any distortion of the member while cooling of the welding joint. The clamps and fixtures are only to be removed when the joint is cooled to ambient temperature.

- Do the welding work in a warm and dry place so that rain water or other atmospheric elements may not come in contact while welding is in progress.

- While welding in very cold weather pre-heat the material before welding and apply post heating to prevent the weld joint from rapid cooling and develop stress raiser due to sudden contraction.

- Cross level of bearing plates in the welded plate girders should be checked properly for proper sitting over bed plate.

- To co-relate use of steel and welders in different members proper records should be maintained.

- Drilling of holes through approved set of jig particularly long members should be ensured. No fabrication should be done with unapproved jig.

- Drain hole in the portal girders at proper locations should be ensured.

- Fairing of holes and removal of drill burrs through initial assembly should be ensured.

- Proper edge finishing with grinding/ special attention in top chord compression members butting by end milling should be carried out.

- At site during the erection of girders particularly open web girders due and adequate care should be taken to achieve the required camber values.

- Camber Jacks should be provided at all the nodal points during trial assembly.

- Butting of compression members, X-levels of stringers and alignment of stringers to be checked properly in the trial erection.

- Application of paint on permanent contact surface should be ensured after proper surface preparation visual inspection is very important tool.

- The plates should be perfectly horizontal while drilling the holes to ensure horizontal verticality of holes.

- Steel with proper test certificate/ reports should be used. Commercially available steel in the market should not be used.

- Steel received from the rolling mills has generally punch heat mark numbers. These numbers should be legibly marked again with paint for easy
identification. Heat mark numbers should be transferred to cut members with paints.

- Members of the open web girders should be fabricated on the camber length with the adoption of the field holes of nominal length.
- Consistency of weld quality is higher in Submerged Arc Welding Process and chances of human errors are also eliminated. Therefore, welding of the girders should be done by SAW process. Whenever not possible then only CO2 welding or MMAW may be adopted if provided in approved WPSS.
- Stage inspection during fabrication should be properly ensured to avoid rejection at later stage.
- Skilled and qualified welders, drillers, fitter should be deployed for welding drilling and marking works. The welder should be individually approved by authorized agency i.e. M&C Directorate of RDSO.
- Selection of Angles in fabrication of cross girders and stringers of open web girders requires special attention, drooping in angles either acute or obtuse should not be permitted. It will cause improper sitting of sleepers on the stringers.

**DON’T’s**-

- Use of pitted/corroded material should not be done because it gives rise to concentration of stresses and results in poor fatigue strength.
- Tack welds in fabrication of riveted open web girders should be avoided.
- Do not hammer the distorted joints for rectification. It may lead to the development of cracks and failure of the joints.
- Do not do the welding in chilled weather, as due to sudden cooling of welded joints they are liable to be brittle and develop cracks. The joints may also suddenly fail under dynamic loading without any prior warning.
- Do not weld with un-controlled welding parameters, these will affect the quality of welding and make the joints weak and may yield in dynamic loading on the structure.
- Do not weld the joint haphazardly without following the proper welding sequence. This will lead to uncontrolled and irreparable distortion, of the proper geometry of the joint.
- Sharp notches in the member should be avoided.
SAMPLE QUALITY ASSURANCE PLAN

30.5m Welded Open Web Girder (25T Loading-2008) as per RDSO’s Drg. No. RDSO/B-11678

Name of project …………………………………………………………………………………………………………………………………………………………………………………………………………………

Manufactured by ……………………………………………………………………………………………………………………………………………………………………………………………………………………………

Workshop Address ……………………………………………………………………………………………………………………………………………………………………………………………………………………………

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<tr>
<th>SN</th>
<th>Component/Operations</th>
<th>Characteristic Check</th>
<th>Frequency &amp; type of check</th>
<th>Reference Document</th>
<th>Fabricators Quality Control</th>
<th>Inspection details</th>
<th>Type of Record</th>
<th>Acceptance criteria</th>
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<tr>
<td>1</td>
<td>1.0 Raw Material</td>
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<td>1.1</td>
<td>Steel Plates, Structural Section</td>
<td>Identification and correlation with Mill Test Certificate from Supplier e.g., SAIL, TISCO, IISCO etc.</td>
<td>As per Mill T.C. and tests required by RDSO from Govt./NABL approved lab</td>
<td>Challan, Mill T.C.</td>
<td>Verification of reference document</td>
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<td>Plates: IS 2062-2006, Gr. E 250 B0, 12mm &amp; above thick. Plates are fully killed &amp; normalized or control cooled. Sections IS 2062-2006, Gr. E 250 B0/A</td>
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<td>Physical condition i.e., Pitting, rusting, straightness, rolling defect, etc.</td>
<td>Visual</td>
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<td>Complete visual inspection</td>
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<td>100% Fabricator’s Record</td>
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Signature of Fabricating Agency
Signature of Railway Representative
Approval of RDSO
<table>
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<tr>
<td><strong>Mechanical Test</strong> as per IS 2062-2006 UTS, YS, % El, Bend test,</td>
<td>Lab Test at appvd. Laboratory</td>
<td>-</td>
<td>Lab Test Report</td>
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<td>-</td>
<td>IS 2062-2006 Gr. E 250 B fully killed &amp; normalized or control cooled</td>
<td>Raw matl. Clearance shall be by Zonal Railway</td>
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<td><strong>Charpy test</strong> at 0°C for plates of thks. 12mm and above</td>
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<td>Heat/Cast no. section wise as per IS 2062-2006</td>
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<td>Lab Test Report</td>
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<td>IS 4225 or ASTM SA 435/435M</td>
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<td><strong>Dimensions</strong></td>
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<td>Fabricator’s Record &amp; Zonal Railway Records</td>
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<td><strong>1.2 Rivets, Bolts &amp; Nuts</strong></td>
<td>Visual/ Measurement</td>
<td>Challan</td>
<td>Verification of Reference Document</td>
<td>.......... Railway</td>
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<td>b) As per specs. <strong>Mechanical &amp; Chemical</strong></td>
<td>Signature of Fabricating Agency</td>
<td>Signature of Railway Representative</td>
<td>Approval of RDSO</td>
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<td>Paints</td>
<td>Verification of Manufacturer's Test Certificate, Inspection Certificate, Challan</td>
<td>Visual</td>
<td>Challan., Manufacturer's Test Certificate</td>
<td>Verification of Reference Document</td>
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<td>Railway</td>
<td>Each Batch</td>
<td>Manufacturer's Test Certificate</td>
<td>IS 102, Contract agreement</td>
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<td>Tests as per Specification</td>
<td>Lab test at Govt. Appvd. Lab</td>
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<td>Verification of Reference Document</td>
<td>..........</td>
<td>Railway</td>
<td>Random</td>
<td>Lab. Test Report</td>
<td>IS 102 Contract agreement</td>
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<td>1.4</td>
<td>Welding Consumables</td>
<td>As per specification and as approved by RDSO</td>
<td>Any test as required</td>
<td>Challan., Manufacturer's Test Certificate</td>
<td>Verification of Reference Document</td>
<td>..........</td>
<td>Railway</td>
<td>As per requirement</td>
<td>Fabricator's Record</td>
<td>-</td>
</tr>
<tr>
<td>2.0</td>
<td>Manufacturing Process</td>
<td></td>
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<tr>
<td>2.1</td>
<td>Lay out of Components &amp; Joints</td>
<td>Dimension</td>
<td>Measurement with calibrated steel tape &amp; gauges</td>
<td>Approved Drawing</td>
<td>Measurement of Dimension</td>
<td>RDSO</td>
<td>100%</td>
<td>Inspection Report of Inspection Official</td>
<td>Relevant IS/IRS Codes &amp; Approved Drawings</td>
<td>Clearance by RDSO</td>
</tr>
<tr>
<td></td>
<td>a) Normal</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>b) Jigs &amp; Templates</td>
<td>Dimension, Intersection lines, pitch, gauge, dia. Of Holes &amp; No. of holes</td>
<td>Measurement with calibrated steel tape &amp; gauges</td>
<td>Approved Drawing</td>
<td>Measurement of Dimension</td>
<td>RDSO</td>
<td>100%</td>
<td>Record of Jigs &amp; fixtures as per proforma issued by RDSO</td>
<td>IRS B1-2001</td>
<td>Clearance by RDSO</td>
</tr>
<tr>
<td>3.0</td>
<td>Welding:</td>
<td></td>
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Signature of Fabricating Agency
Signature of Railway Representative
Approval of RDSO

13
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<tbody>
<tr>
<td>b) WPQR</td>
<td>Witnessing of established WPSS</td>
<td>Visual, DT &amp; NDT at approved lab</td>
<td>As per code requirement</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep.</td>
<td>IS 7310(I)-74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Baking of Electrode, Flux</td>
<td>To have moisture free Electrode &amp; Flux</td>
<td>Visual Check of Electrodes &amp; beating</td>
<td>As per Manufacture’s recommendations</td>
<td>Verification of Reference Document</td>
<td>............ Railway</td>
<td>100%</td>
<td>Inspection Report of Inspection Official &amp; Fabricator’s Record</td>
<td>IRS B1-2001</td>
<td></td>
<td></td>
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<tr>
<td>e) Selection of correct Electrodes &amp; Flux</td>
<td>Reference to WPSS, IRS Class, etc.</td>
<td>Visual</td>
<td>As per approved WPSS</td>
<td>Verification of Reference Document</td>
<td>............ Railway</td>
<td>100%</td>
<td>Inspection Report of inspection official &amp; Fabricator’s Record</td>
<td>As per list of vendors approved by RDSO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g) Sequence of Welding</td>
<td>To control distortion</td>
<td>Visual</td>
<td>As per approved WPSS</td>
<td>Verification of Reference Document</td>
<td>............ Railway</td>
<td>Random</td>
<td>Inspection Report of Inspection Official &amp; Fabricator’s Record</td>
<td>IRS B1-2001</td>
<td></td>
<td></td>
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<tr>
<td>h) Provision of Run-on &amp; Run off Plates</td>
<td>To avoid crater defects</td>
<td>Visual</td>
<td>As per IRS B1-2001</td>
<td>Verification of Reference Document</td>
<td>............ Railway</td>
<td>100%</td>
<td>Inspection Report of Inspection Official &amp; Fabricator’s Record</td>
<td></td>
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</tr>
</tbody>
</table>

Signature of Fabricating Agency
Signature of Railway Representative
Approval of RDSO
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<tbody>
<tr>
<td>4.0</td>
<td>Inspection of Welding</td>
<td>a) For Fillet Welds: Visual, D.P.Test Fillet Size, Penetration, Leg Length, Throat thickness, etc. b) For butt Welds RT/UT tests, as applicable</td>
<td>Visual, Gauge &amp; Macro Etching.</td>
<td>Approved Drg. &amp; WPSS</td>
<td>Visual Inspection &amp; Verification of dimension by gauges</td>
<td>RDSO</td>
<td>100%</td>
<td>Fabricator's Record</td>
<td>Relevant IS/IRS Code, Approved Drg. &amp; WBC-2001</td>
<td>Clearance by RDSO</td>
</tr>
<tr>
<td>5.0</td>
<td>Trial Assembly</td>
<td>a) Camber on Jack b) Dead Load deflection c) Dimension d) Fairness of holes e) Temporary fasteners f) Infringement g) Butting of compression edges</td>
<td>Visual &amp; Dimensional</td>
<td>Approved. Drg.</td>
<td>Complete dimensional check of Control Assembly</td>
<td>RDSO</td>
<td>One complete span</td>
<td>Inspection Report of Inspection Official &amp; Fabricator’s Record</td>
<td>IRS B1-2001</td>
<td>Clearance by RDSO</td>
</tr>
<tr>
<td>6.0</td>
<td>Final Clearance</td>
<td>Component completeness of 1st span after dismantling &amp; 2nd span onwards</td>
<td>Visual Dimensional &amp; Structural</td>
<td>Stage clearance Record</td>
<td>Verification of Stage clearance Record</td>
<td>Day to day inspection by Railways and final inspection by RDSO</td>
<td>Girder fabrication with approved Jigs-100%</td>
<td>Inspection Report of Inspection Official &amp; Fabricator’s Record</td>
<td>IRS B1-2001</td>
<td>Initial inspection by Railways and final Clearance by RDSO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface finish after Metalizing</td>
<td>Visual checking</td>
<td>-Do-</td>
<td>-Do-</td>
<td>.......... Railway</td>
<td>-Do-</td>
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<td></td>
<td>DFT checking</td>
<td>Measurement</td>
<td>-Do-</td>
<td>-Do-</td>
<td>.......... Railway</td>
<td>Minimum one reading per M²</td>
<td>Measurement Record</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>8.0 Cleaning &amp; Painting</td>
<td>Surface condition before painting</td>
<td>Visual checking</td>
<td>Approved Fabrication Drawing &amp; IRS B1-2001</td>
<td>Verification of stage clearance records</td>
<td>........... Railway</td>
<td>100% by fabricator &amp; Random by Railway</td>
<td>Fabricators record</td>
<td>IRS B1-2001 IS:104, IS:51, IS:2339, IS:5666</td>
<td>Clearance shall be given by Zonal Railway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Surface finish after painting</td>
<td>Visual checking</td>
<td>-Do-</td>
<td>-Do-</td>
<td>........... Railway</td>
<td>-Do-</td>
<td>-Do-</td>
<td>-Do-</td>
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</tr>
<tr>
<td></td>
<td>DFT checking</td>
<td>Measurement</td>
<td>-Do-</td>
<td>-Do-</td>
<td>........... Railway</td>
<td>Minimum one reading per M²</td>
<td>Measurement Record</td>
<td></td>
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</tbody>
</table>

Note:
1. During fabrication, internal inspection to be done by Railways to ensure that only RDSO approved welders carry out welding as per approved WPSS, work is as per dimensional tolerances and other quality aspects and should satisfy itself before sending Inspection call to RDSO for Trial Assembly or components Inspection.
2. For ROB’s Inspection/Approval Agency for all stages will be concerned Railways.

Signature of Fabricating Agency
Signature of Railway Representative
Approval of RDSO
PROFORMA FOR WELDING PROCEDURE SPECIFICATION SHEET

Name and address of Fabricator:

Welding procedure specification No

1. Weld joint description:
2. Base Metal :
3. Welding Process :
4. Welding position :
5. Welding consumables :
   5.1 Electrode/wire Class :
       Dia :
       Drying method:
   5.2 Flux Class :
       Type:
       Drying method:
   5.3.1 Shielding gas:
6.0 Base Metal preparation:
6.1 Joint design details:
   (Give sketch showing arrangement
   of parts, welding groove details,
   weld passes & their sequence etc.)
6.2 Joint preparation:
7. Welding current: Type:
                   Polarity:
8. Welder qualification:
9. Welding parameters and technique:
9.1 Welding Parameters:
9.2 Welding sequence and technique:
   (Give sketch showing sequence and direction of welding).

10. Provision of run in and run-off tabs:

11. Cleaning of weld bead before laying next weld bead:

12. Root preparation before welding other side of groove weld:

13. Preheating and inter pass temperature:

14. Peening

15. Post weld treatment:

16. Rectification of weld defects:

17. Inspection of weld.

18. Any other relevant details

Prepared by

Signature_____________________________

Designation__________________________

Date______________________________

(for & on behalf of Fabricator).
Annexure-III

Performa for maintaining Register for consumable:

<table>
<thead>
<tr>
<th>Date</th>
<th>Detail of Item with manufacturer name</th>
<th>Weather item is approved by RDSO (Yes/No)</th>
<th>Manufacturer test certificate detail.</th>
<th>Quantity received</th>
<th>Quantity consumed</th>
<th>Quantity balance</th>
<th>Sign of site supervisor</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
Annexure-IV

Proforma for Welding Procedure Qualification Record

NAME AND ADDRESS OF FABRICATOR

1. Description of weld joint:
2. Welding procedure specification no.:
3. Name of welder:
4. Date of preparation of test piece:
5. Dimensions of test piece:
6. Base Metal:
7. Welding Process:
8. Welding position:
9. Welding Current: Type:
   Polarity:
10. Weld joint design details:
11. Welding consumables:
   11.1 Electrode/wire Class:
       Dia:
       Brand:
   11.2 Flux Class:
       Type:
       Brand:
   11.3 Shielding gas:
12. Welding parameters:

<table>
<thead>
<tr>
<th>Weld pass No.</th>
<th>Electrode wire dia (mm)</th>
<th>Current (amp)</th>
<th>Arc voltage (volt)</th>
<th>Wire feed speed (m/min.)</th>
<th>Travel speed (m/min.)</th>
<th>Electrical stick out (mm)</th>
<th>Shielding gas flow rate (lit/min.)</th>
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<tbody>
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</table>

13. Preheating and interpass temperature:
14. **Results of Qualification Tests:**

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<tr>
<th>Test</th>
<th>Specimen No.</th>
<th>Result.</th>
</tr>
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<tbody>
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<table>
<thead>
<tr>
<th>Non-destructive tests:</th>
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<tbody>
<tr>
<td>i) Visual examination:</td>
<td></td>
</tr>
<tr>
<td>ii) Dye penetrant test:</td>
<td></td>
</tr>
<tr>
<td>iii) Magnetic particle test:</td>
<td></td>
</tr>
<tr>
<td>iv) Radiographic/Ultrasonic test:</td>
<td></td>
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</tbody>
</table>

<table>
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<tr>
<th>Destructive tests:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>i) Macro-examination:</td>
<td></td>
</tr>
<tr>
<td>ii) Hardness survey:</td>
<td></td>
</tr>
<tr>
<td>iii) Fillet weld fracture test:</td>
<td></td>
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<tr>
<td>iv) Transverse tensile test:</td>
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<tr>
<td>Tensile strength</td>
<td></td>
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<tr>
<td>Yield Stress</td>
<td></td>
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<tr>
<td>Location of fracture</td>
<td></td>
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<tr>
<td>v) All-weld tensile test:</td>
<td></td>
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<tr>
<td>Tensile strength</td>
<td></td>
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<tr>
<td>Yield Stress</td>
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<tr>
<td>Elongation %</td>
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<tr>
<td>vi) Guided bend test:</td>
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<tr>
<td>Root bend test</td>
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<td>Face bend test</td>
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<tr>
<td>Side bend test</td>
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<td>vii) Any other tests:</td>
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Signature _______________________
Designation ___________________
Date _________________________
(for & on behalf of Fabricator).
Annexure-V

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(Railway Board)

INDIAN RAILWAY STANDARD
SPECIFICATION FOR FABRICATION AND ERECTION OF STEEL GIRDER BRIDGES AND LOCOMOTIVE TURN-TABLES

Fabrication Specification (IRS:B1-2001)

ADOPTED – 1934
REVISED – 2001

ADDENDUM & CORRIGENDUM SLIP NO. 5 DATED 30-08-2013

(i) Existing Para 0.3.3 is to be replaced as under:

Para 0.3.3

RDSO’s Specifications:

(ii) Existing Para’s 8.1, 8.2, 8.3 and 8.4 are to be replaced as under:

8.1 IS:2062, Quality “A” Grade Designation E250 as rolled semi-killed or killed shall be used for foot-over bridges and other structures subjected to non-critical loading.

8.2 IS:2062, Quality “B0” Grade Designation E250 fully killed and with normalizing/normalizing rolling/controlled rolling where service temperature does not fall below 0°C, shall be used for welded/riveted girders subjected to Railway loading. Plates less than 12mm thick need not be with normalizing/normalizing rolling/controlled rolling.

8.3 IS:2062, Quality “C” Grade Designation E250 fully killed and with normalizing/normalizing rolling/controlled rolling ensuring impact properties at (-) 20°C shall be used for sub-zero temperature areas for welded/riveted girders subjected to Railway loading. Plates less than 12mm thick need not be with normalizing/normalizing rolling/controlled rolling.
NOTE: 1. In case Rolled Steel Section confirming to IS:2062 Quality “B0” or “C” are not available in market, CAO(C)/CBE may permit use of steel confirming to IS:2062 Quality “BR” on case to case basis by satisfying himself about non availability of quality “B0” or “C”.

2. In case Rolled Steel Section confirming to IS:2062 Quality “BR” is also not available in market, CAO(C)/CBE may permit use of steel confirming to IS:2062 Quality “A” on case to case basis, by satisfying himself about non availability of quality “BR”.

8.4 High tensile steel shall comply in all respects with the requirement of IS:2062 Grade Designation E 410 Quality B0 or C (copper bearing quality) for the welded work.

(iii) Existing Para 39.2.3.(b) is to be replaced as under:

Para 39.2.3(b)

Finishing Coat

Two finishing coats of red oxide paint to IS:13607 with colour/shade to be specified by Zonal Railway or of any other approved paint shall be applied over the primer coats. One coat shall be applied before the fabricated steel work leaves the shop. After the steel work is erected at site the second finishing coat shall be applied after touching up the primer and the finishing coat if damaged in transit.

Note: (i) The colour/shade of finishing coat should be generally matching with the Smoke Grey colour/shade No. ISC 692 mentioned in IS:5-2004.

(ii) The colour/shade can be changed by CBE as per the local requirements.

BY ORDER

[Signature]

(A.K. Dadarya)
Executive Director (B&S)

LUCKNOW

Dated: 30-08-2013
10mmx50mm STRIP WELDED ON 40MM THICK PLATE TO PROVIDE PREBENDING TO FLANGE

PLAN

40mm THICK PLATE CLAMPED WITH FLANGE

CLAMP

GAP REDUCED BY CLAMPS

10mmx50mm STRIP WELDED ON 40mm THICK PLATE TO PROVIDE PREBENDING TO FLANGE

SIDE VIEW

IMPROVED DESIGN OF FIXTURE
Annexure-VII

Stages of inspection of Steel Bridge Girders
(For Rail and Rail-cum-Road Bridges)

<table>
<thead>
<tr>
<th>(I)</th>
<th>Prefabrication stage :</th>
<th>Inspection/Approval</th>
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<tbody>
<tr>
<td>(1)</td>
<td>Approval of Quality Assurance Plan (QAP)</td>
<td>RDSO</td>
</tr>
<tr>
<td>(2)</td>
<td>Scrutiny of Welding Procedure Specifications Sheets (WPSS)</td>
<td>RDSO</td>
</tr>
<tr>
<td>(3)</td>
<td>Welders Qualification Test i.e. Welding Procedure Qualification Records (WPQR)</td>
<td>RDSO</td>
</tr>
<tr>
<td>(4)</td>
<td>Inspection and clearance of raw material</td>
<td>Railways</td>
</tr>
<tr>
<td>(5)</td>
<td>Inspection of layout on template floor (Nominal Camber)</td>
<td>RDSO</td>
</tr>
<tr>
<td>(6)</td>
<td>Inspection of jigs and fixtures with master plates</td>
<td>RDSO</td>
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<thead>
<tr>
<th>(II)</th>
<th>During Fabrication :</th>
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<tbody>
<tr>
<td>(1)</td>
<td>Use of approved raw material</td>
<td>Railways</td>
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<tr>
<td>(2)</td>
<td>Use of approved welding consumables</td>
<td>Railways</td>
</tr>
<tr>
<td>(3)</td>
<td>Use of approved welders</td>
<td>Railways</td>
</tr>
<tr>
<td>(4)</td>
<td>Use of approved welding procedures and parameters (WPDS) Welding Procedure Data Sheet to be maintained for all welds.</td>
<td>Railways</td>
</tr>
<tr>
<td>(5)</td>
<td>Fabrication with approved set of jigs</td>
<td>Railways</td>
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<tr>
<th>(III)</th>
<th>After Fabrication :</th>
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<tbody>
<tr>
<td>(1)</td>
<td>Inspection of welds</td>
<td>RDSO</td>
</tr>
<tr>
<td>(2)</td>
<td>Structural and dimensional inspection</td>
<td>RDSO</td>
</tr>
<tr>
<td>(3)</td>
<td>Trial assembly (First Girder)- Camber Values, Dimensions, Fairness of Holes by Go-No-Go Gauge, Butting of Flange in Top Chord.</td>
<td>RDSO</td>
</tr>
<tr>
<td>(5)</td>
<td>Inspection of Dismantled Components of 1st Trial Assembly – Check for elongation of Holes/Abnormal stress marks/cuts etc. &amp; Removal of shortcomings noted during Trial Assembly.</td>
<td>RDSO</td>
</tr>
<tr>
<td>(7)</td>
<td>Inspect of only components for further spans- welding inspection &amp; Dimensional checks.</td>
<td>RDSO</td>
</tr>
<tr>
<td>(9)</td>
<td>Metalizing/ Painting</td>
<td>Railways</td>
</tr>
</tbody>
</table>

Note: 1. During fabrication, internal inspection to be done by Railways to ensure that only RDSO approved welders carry out welding as per approved WPSS, work is as per dimensional tolerances and other quality aspects and should satisfy itself before sending Inspection call to RDSO for Trial Assembly or components Inspection.

2. For ROB’s Inspection/Approval Agency for all stages will be concerned Railways.
No. CBS/INSP/WBG

Chief Bridge Engineer:
1. Central Railway, Mumbai CST-400 001.
2. Eastern Railway, Fairlie Place, Kolkata-700 001.
4. East-Coast Railway, Bhubaneswar-751 016.
5. Northern Railway, Baroda House, New Delhi-110 001.
6. North-Central Railway, Allahabad-211 001.
10. Southern Railway, Park Town, Chennai-600 003.
11. South Central Railway, Rail Nilayam, Secunderabad-500 371.
12. South East Central Railway, Bilsapur-495 004.
13. South Eastern Railway, Garden Reach, Kolkata-700 043.
15. Western Railway, Mumbai-400 020.
16. West-Central Railway, Jabalpur-482 001.

Sub: Fabrication – Inspection of Steel Bridge Girders.

Ref: 1. This Office letter of even number dated 12-09-2013.

RDSO has been entrusted to undertake the inspection of Steel Bridge Girders as per Para 27 of IRS: Welded Bridge Code.

In order to ensure proper Quality of the fabrication work of the Steel Bridge Girders, Quality Assurance Plan (QAP) is finalized among the user Zonal Railways, Fabricating Agency and RDSO, accordingly the responsibility to ensure different quality checks from pre-fabrication to post fabrication stages are stage wise indicated clearly.

Some cases have come to notice, where Railways are not diligently following the inspection on their part as per approved QAP during fabrication of Steel Bridge Girders.

In order to ensure the Quality of Steel Bridge Girders while offering the girder to RDSO for final inspection it is desired that an undertaking by Railway Officer should be submitted:

- Undertaking by Railway Officer (minimum JAG Officer):- It is certified that:-
  (i) Steel used for welded Bridge Girders components is of weldable quality is IS: 2062 Gr.B0 fully killed and fully normalized, which has been inspected & approved by the Railways.
  (ii) Fabrication has been done with the help of approved Jigs.
  (iii) Entire welding was done by approved welders using approved welding procedures (WPSS) and welding consumables.
(iv) Fabrication work has been inspected by our internal quality control/inspection organization including the welding and riveting. All significant defects have been rectified and final dimensions are within tolerances.

Kindly convey to all concerned officials that inspection call without above undertakings will not be considered.

(A.K. Dadarya)
Executive Director (B&S)
For Director General

Copy to –

I. Chief Administrative Officer (Constrn.):
   1. Central Railway, ChhatrapatiShivaji Terminus, Mumbai –400 001.
   2. Eastern Railway, Fairlie Place, Kolkata-700 001.
   3. East Central Railway, MahendruGhat, Patna-800 004.
   4. East-Coast Railway, Bhubaneswar-755 001.
   5. Northern Railway, Kashmere Gate, Delhi- 110 006.
   6. North-Central Railway, Allahabad-211 001.
   10. Southern Railway, 183, EVR Periyar, High Road Egmore, Chennai -600 008.
   11. South Central Railway, Rail Nilayam, Secunderabad-500 371.
   12. South East Central Railway, Bilaspur-495 004.
   13. South-Eastern Railway, Garden Reach Kolkata-700 043.
   14. South-Western Railway, 18, Basaveshwara (Millers) Road, Bangalore-560 046.
   15. Western Railway, Churchgate, Mumbai-400 020.
   16. West-Central Railway, Jabalpur-482 001.

II. Chief Workshop Manager/Dy. Chief Engineer/Executive Engineer (Bridge Engineering Workshops):
   1. Central Railway, Manmad.
   3. Northern Railway, Jalandhar.
   4. Northern Railway, Charbagh, Lucknow.
   5. N.E. Railway, Gorakhpur Cantt.
   7. Southern Railway, Arakkonam.
   8. South Central Railway, Lalaguda.
   10. Western Railway, Sabarmati.

III. Managing Director, Rail Vikas Nigam Ltd., Plot No. 25 1st Floor, B-Blok, August Kranti Bhawan, Bhikaji Cama Place, New Delhi-110066.

IV. Managing Director, Dedicated Freight Corridor Corporation of India Ltd., 5th Floor, Pragati Maidan, Metro Station Building Complex, New Delhi – 110001.

(A.K. Dadarya)
Executive Director (B&S)
For Director General
No. CBS/INS/P/WBG

Chief Administrative Officers (Construction)
Chief Bridge Engineers

1. Central Railway, Mumbai CST-400 001.
2. Eastern Railway, Fairlie Place, Kolkata-700 001.
3. East Central Railway, Hazipur.
4. East-Coast Railway, Bhubaneswar.
5. Northern Railway, Baroda House, New Delhi-110 001.
8. North-Western Railway, Jaipur.
10. Southern Railway, Park Town, Chennai-600 003.
11. South Central Railway, Rail Nilayam, Secunderabad-500 371.
12. South East Central Railway, Bilaspur.
13. South Eastern Railway, Garden Reach, Kolkata-700 043
15. Western Railway, Mumbai-400 020.
16. West-Central Railway, Jabalpur.

Sub: Nomination of Bridge Workshops-Secondary source.

*****

Railway Board vide their letter under reference have conveyed that with the approval of Board (ME), it has been decided that primary source as well secondary source of different Zonal Railways would be as under:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Railway</th>
<th>Primary source</th>
<th>Secondary Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CR, WCR &amp; SECR</td>
<td>Manmad</td>
<td>Sabarmati</td>
</tr>
<tr>
<td>2</td>
<td>ER, ECOR &amp; ECR</td>
<td>Mughalsarai</td>
<td>Lucknow</td>
</tr>
<tr>
<td>3</td>
<td>NCR, NR</td>
<td>Jallandhar &amp; Lucknow</td>
<td>Mughalsarai</td>
</tr>
<tr>
<td>4</td>
<td>SWR, SR</td>
<td>Arakkonam</td>
<td>Manmad</td>
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<tr>
<td>5</td>
<td>NWWR, WR</td>
<td>Sabarmati</td>
<td>Manmad</td>
</tr>
<tr>
<td>6</td>
<td>SCR</td>
<td>Lallaguda</td>
<td>Manmad</td>
</tr>
<tr>
<td>7</td>
<td>N.F. Rly</td>
<td>Bogaingaon</td>
<td>Mughalsarai</td>
</tr>
<tr>
<td>8</td>
<td>N.E. Rly</td>
<td>Gorakhpur</td>
<td>Lucknow</td>
</tr>
<tr>
<td>9</td>
<td>SER</td>
<td>Sini</td>
<td>Mughalsarai</td>
</tr>
</tbody>
</table>
2.0 Further Railway Board has also ordered that RDSO will take up the inspection of the girders supplied by trade only after the certificate of the primary and secondary source, i.e. CBE of primary and secondary source regarding their inability to complete the requirement within the target date is produced by the requisite railways. The above arrangement will be effective from 01.04.2014.

3.0 Zonal Railways are advised to take suitable action in order to comply with the Railway Board's order.

4.0 Copy of Railway Board's letter under reference in enclosed for necessary action by Zonal Railways.

DA: As above

(A.K. Dadarya)
Executive Director/B&S

Copy to:

I. The General Manager (Con.), Northeast Frontier Railway, Maligaon, Guwahati-781 061.

II. Director, Indian Railways Institute of Civil Engineering, Pune-410 001.

III. Executive Director, Civil Engg./B&S, Railway Board, Rail Bhavan, New Delhi-110 001.

IV. Chief Work Shop Managers/ Dy.Chief Enginner/Executive Engineers-Bridge / Engg. Work Shop

1. Central Railway, Manmad
2. E.C.Railway, Plant Depot, Mughalsarai
3. N.Railway, Jalandhar Cantt.
4. N.Railway, Charbagh, Lucknow
5. N.E.Railway, Gorakhpur Cantt.
7. S.Railway, Arakkonam
8. S.C.Railway, Lalaguda
9. S.E.Railway, Sini
10. W.Railway, Sabarmati

DA: As above.

(A.K. Dadarya)
Executive Director/B&S
Annexure-X

PROFORMA -I

Check List for Fabrication-Inspection of Steel Girders

1. Fabrication Code: IRS Welded Bridge Code
3. Fabrication Guideline: RDSO Report No. BS:110
4. HSFG Bolt Guideline: RDSO Report No. BS:111
5. Approved drawing No. ---------
6. Components of QAP (For Model QAP Refer BS-110)
   (i) Raw Materials
   (ii) Rivet/nut/bolt
   (iii) Welding consumables
   (iv) HSFG Bolts (Bolts, Nuts, Washers and ferrules)
   (v) Paint
   (vi) Manufacturing process (Refer BS-110)
   (vii) Nominal/ Camber layout on template floor
   (viii) Jigs/fixtures (layout and jigs not required fabrication is to be done by CNC system)
   (ix) Welding activities and inspection (WPSS,WPQR and WPDS)
   (x) Welding by approved welders
   (xi) Trial Assembly (First Girder)
   (xii) Detailed component inspection and clearance thereof.
7. Raw material
   (i) Steel to IS: 2062 quality BO fully killed and normalized.
   (ii) Heat mark on plates and name manufactures
   (iii) Mill Test Certificate available or not/Properties satisfactory or otherwise
   (iv) Test report from NABL if any
   (v) Visual inspection
   (vi) Rolling and cutting tolerance as per IS:1852
   (vii) Any dispensations from competent authority i.e. CAO(C)/CBE for change of quality of steel or in drawing.
8. HSFG Bolt
   (i) Material Specification
Annexure-X (Contd....)

(i) (a) Bolt : IS:3757
     (b) Nut: IS: 6649 and
     (C) Washer: IS: 6623
(ii) Test report (Manufacture)
(iii) Test report, NABL, if any

9. Stud shear connector
   (i) Material BS: EN ISO:13918
   (ii) Ferrule broken or not

10. Approval of Template Floor Layout (not applicable if CNC machine is used)
    (a) Nominal Layout
    (b) Camber Layout
    (c) Approval of master plates
        (i) Gusset Plates on nominal layout
        (ii) Members on camber length
        (iii) Distance over intersection points
        (iv) Transference of intersection linins
        (v) Symmetry and inter changeability
        (vi) Pitches/Gauge lines w.r.t intersection points.
        (vii) Dia of holes and No. of holes.
PROFORMA -II

Check List for Fabrication-Inspection of Steel Girders

Proforma-I completed or not (further inspection to be done after completing activities mentioned in proforma-II)

1. Use of approved raw material
2. Fabrication with approved of jigs or CNC
3. Welding
   (i) Scrutiny of WPSSs (Done or Not)
   (ii) Approval of WPQRs (Yes or No)
   (iii) Welding Parameters during welding (WPDS) maintained or not
   (iv) Welding done by Approved welders (Yes or No)
   (v) Use of approved welding consumable (Yes or No)
      Electrode: IRS: M/28
      Wire & Flux: IRS: M/39
      Co₂wire: IRS: M/46
   (vi) Internal checks of welding
      (a) Visual, weld size, throat thickness, weld profile
      (b) DPT/MPT and Macro Etching
      (c) Ultrasonic/Radiography Testing
PROFORMA -III

Check List for Fabrication-Inspection of Steel Girders

Proforma-II completed or not (further inspection to be done after completing activities mentioned in proforma-II)

Fabrication Process as per BS: 110 report

1. Finished Product
   I. Welding inspection (done or due)
      (a) Visual, weld size, throat thickness, weld profile
      (b) DPT/MPT and Macro Etching
      (c) Ultrasonic/Radiography Testing
   II. Use of approved set of jigs/CNC system

2. Structural and Dimensional Inspection (as per drawing)
   I. Trial Assembly (1st girder)
      (a) Parameters to be checked
         (i) Camber on Jack
         (ii) Dead Load Camber
         (iii) Dimension
         (iv) Fairness of holes
         (v) Temporary fasteners
         (vi) Infringement, if any
         (vii) Butting of compression edges
      (b) Camber (on jack and residual) to be recorded in case of open web girders
         Measurements as per drawing of components.

3. Surface Preparation (IS:9954)

4. Metalizing/Painting of girder as per para 39 of IRS:B1 (Sa 2½ to IS:9954)
# STANDARD QUALITY ASSURANCE PLAN FOR ELASTOMERIC BEARINGS

1. Name of Manufacture: ..............................................
2. Drg. No.: .............................................................
3. Name of Project/Railway: .........................................
4. Authority (CA No./LOA No./Order No.):.....................

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabricator's quality control</th>
<th>Inspection details</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>RAW MATERIAL Elastomer (Only virgin Polychloroprene (CR) is permitted &amp; preferable grades are Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V)</td>
<td>Physical Test With values of characteristics specified</td>
<td>As per manufacturer test certificate &amp; test required by Authorized inspector of zonal Railway from Govt./NABL approved lab</td>
<td>Manufacturer test certificate &amp; Challan</td>
<td>Verification of reference document.</td>
<td>Authorized Inspector appointed by Zonal Railway</td>
<td>From batches at Random and at discretion of Inspector</td>
<td>Fabricators record.</td>
<td>IRC:83 (Part-II) &amp; IS:3400 (as per relevant test procedure)</td>
</tr>
<tr>
<td>1.1</td>
<td></td>
<td>a) Hardness IRHD (60±5)</td>
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<td></td>
<td>Examination of Test Certificates is required Test Certificate shall be furnished by manufacturers for following tests. (i) Composition (ii) Hardness (iii) Tensile strength (iv) Elongation at Break (v) Compression set (vi) Accelerated Ageing test (vii) Adhesion Strength IMPORTANT: Properties of Elastomer should be as per Table 1 of IRC:83 Part-II Polychloroprene Content&lt; 60 % Ash content &gt; 5% Note: (i) No reclaimed rubber, vulcanized wastes or natural rubber shall be used. (ii) EPDM (Ethyle propylene Dimonomer), IIR (Isobutane Isoprene Copolymer), CIIR (Chloro-Isoprene Copolymer) are not permitted for manufacture of bearings. Adhesion strength test to be conducted as per IS: 3400 Part XIV.</td>
</tr>
</tbody>
</table>

**Note:** Large lot means if number of bearings are ≥ 24 & tests for Acceptance level 1 to be conducted. Small lot means if numbers of bearings are < 24 where Acceptance level 2 tests are done. Lot size to be approved by the engineer. In large lot 2 extra bearings to be made which are consumed in destructive testing.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabriacr's quality control</th>
<th>Inspecting Agency</th>
<th>Extent of Inspection</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Elastomer</td>
<td>Chemical Test</td>
<td></td>
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<td></td>
<td>IRC:83 (Part-II) Ash content as per IS:3400 part XXII and Polychloroprene content as per ASTM-D297 Identification of polymer as per ASTM D 3677 (as per relevant test procedure)</td>
<td>Examination of Test Certificates is required. Test Certificate shall be furnished by manufacturers for following tests. (i) Polymer Identification (ii) Polymer content (iii) Ash content (iv) Specific gravity (V) Ozone resistance Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent to NABL LAB for evaluation. Note: For acceptance testing level I, (a) Ash content on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is ± 0.5% (b) Specific gravity on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is ± 0.2% (c) For other test max. and min. limits to be adhered. (d) Ozone resistance can be waived by test engineer as per note 2 of Para 918.4.1.2 of IRC83 Part II.</td>
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<td>1</td>
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<td>Cont.</td>
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<td>IRC:83</td>
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<tr>
<td>1.1</td>
<td>Elastomer</td>
<td>Chemical Test</td>
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</tr>
</tbody>
</table>

- **Elastomer**
- **Chemical Test**
- i) Determination / Identification of polymer
  - As per manufacturer certificate & test required by Authorized inspector of zonal Railway from Govt./NABL approved lab
  - Manufacturer test certificate & Challan
  - Verification of reference document.
- ii) Polymer content
  - min 60%
- iii) Ash content
  - Max 5%
- (iv) Specific gravity
- (V) Ozone resistance

- **Inspecting Agency**
- Authorized Inspector appointed by Zonal Railway
- From batches at Random

- **Extent of Inspection**
- -do- -do-

- **Type of Records**
- Fabricator's record.

- **Acceptance criteria**
- IRC:83

- **Remarks**
- Examination of Test Certificates is required. Test Certificate shall be furnished by manufacturers for following tests. (i) Polymer Identification (ii) Polymer content (iii) Ash content (iv) Specific gravity (V) Ozone resistance Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent to NABL LAB for evaluation. Note: For acceptance testing level I, (a) Ash content on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is ± 0.5% (b) Specific gravity on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is ± 0.2% (c) For other test max. and min. limits to be adhered. (d) Ozone resistance can be waived by test engineer as per note 2 of Para 918.4.1.2 of IRC83 Part II.
<table>
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<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
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<th>Fabricator’s quality control</th>
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<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>Mild Steel</td>
<td>Mechanical Test UTS, Yield Stress, Elongation%, Impact test at 0 degree centigrade or -20 degree for sub-zero zone</td>
<td>As per Mill TC &amp; test required by Authorized inspecting official of Zonal Railway from Govt. Lab / NABL approved lab.</td>
<td>Mill TC and Challan</td>
<td>1. Verification of reference document. 2. Complete visual inspection.</td>
<td>Authorized Inspecting official of Zonal Railway</td>
<td>Fabricators record correlated with Mill TC &amp; test report.</td>
<td>IS: 2062-11, E250 Quality BO is generally used. However Quality C shall be used for sub zero condition. (As specified in approved Drg.).</td>
<td>Manufacturer’s test certificate shall be furnished. UST shall be conducted for 12mm &amp; above thick plates per provision of relevant specification before processing the material for manufacturing.</td>
</tr>
<tr>
<td>2.0</td>
<td>Manufacturing Process</td>
<td>Dimensional inspection Specified tolerances -0.6mm</td>
<td>Visual &amp; Measurement As per approved drawing</td>
<td>Measuremant of dimension</td>
<td>Manufacturer inspecting agency</td>
<td>At Discretion</td>
<td>Fabricators record.</td>
<td>IRC 83 Part II &amp; as per drawing</td>
<td>Internal report will be furnished which will be verified by Zonal Railway Inspector. However random check may be done by Zonal Railway inspector during Manufacturing. Note: During manufacturing test pieces will also be moulded with identical compound and under identical vulcanizing conditions and suitably marked for identification at the time of tests. This process shall be open to inspection by Railway inspecting official.</td>
</tr>
<tr>
<td>S. No.</td>
<td>Component</td>
<td>Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
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<td>e)</td>
<td></td>
<td>Thickness of laminate</td>
<td>±10 %</td>
<td>1 in 100</td>
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<td></td>
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<tr>
<td>f)</td>
<td></td>
<td>Parallelism of laminate with respect to bearing base as datum</td>
<td>IRHD 60±5</td>
<td>Visual &amp; Measurement</td>
<td>As per approved drawing</td>
<td>Measuremnt of dimension</td>
<td>Manufacture inspecting agency</td>
<td>At Discretion</td>
<td>Fabricator's record</td>
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<td>g)</td>
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<td>Hardness during manufacturing</td>
<td>-0,-5%</td>
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<td>IRC 83 Part-II &amp; as per drawing</td>
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<td>h)</td>
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<td>Over all Thickness</td>
<td>-0,-5%</td>
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<tr>
<td>3.0</td>
<td></td>
<td>Final inspection</td>
<td>Visual examination and dimensional check</td>
<td>Dimensions of bearing as per specified tolerances as under :</td>
<td>Visual and measurement</td>
<td>As per relevant drg. &amp; specification</td>
<td>Measuremnt of dimension</td>
<td>Authorized Inspector appointed by Zonal Railway</td>
<td>100%</td>
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<tr>
<td>3.1</td>
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<td></td>
<td>a) Over all plan dimension (length &amp; Breadth)</td>
<td>-0.56mm</td>
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<td>As per table 2 of IRC 83 Part-II</td>
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<td>b) Over all Thickness</td>
<td>-0,-5%</td>
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<td>c) Parallelism of top surface of bearing with respect to the bottom surface as datum</td>
<td>1 in 200</td>
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<td>d) Parallelism of one side surface with respect to the other as datum</td>
<td>1 in 100</td>
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<td>3.2</td>
<td></td>
<td>Chemical &amp; Physical</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
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<td>Fabriactor’s quality control</td>
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<td>Inspecting Agency</td>
<td>Extent of Inspection</td>
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<tr>
<td>1</td>
<td>Test</td>
<td>Chemical Test</td>
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<td></td>
<td>Authorized Inspector appointed by Zonal Railway</td>
<td>From batches at Random</td>
<td>Fabricators record.</td>
<td></td>
</tr>
<tr>
<td>3.2.1</td>
<td></td>
<td>i) Determination/Identification of polymer.</td>
<td></td>
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<td></td>
<td>IRC:83 (Part-II) Ash content as per IS:3400 part XXII and Polychloroprene content as per ASTM-D297 Identification of polymer as per ASTM D 3677 (as per relevant test procedure)</td>
<td></td>
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<td></td>
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<td>ii) Polymer content</td>
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<td>Test certificate shall be furnished by manufacturers. For level I acceptance sample from randomly selected bearing of each lot of Elastomer bearing as prescribed in procedure in IS3400 and IRC83 (Part-II) shall be drawn by authorize inspector and tested in house lab. or in Govt./NABL approved laboratory for all the 5 tests. These test are in addition to tests conducted on specially moulded test pieces prepared at the time of manufacture of bearing. For Level II acceptance tests on specially moulded test pieces to be done. Tests to be done for (i) Polymer Identification (ii) Polymer content (iii) Ash content (iv) Specific gravity (v) Ozone resistance Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent to Govt./NABL LAB for evaluation. For Level-I Acceptance additional test will be, (a) Ash content on specimen from test bearing shall be compared with these for specially moulded test pieces and Max variation permitted is ± 0.5% (b)Specific gravity on specimen from test bearing shall be compared</td>
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<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabriactor’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
<td>Remarks</td>
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<td>Inspecting Agency</td>
<td>Extent of Inspection</td>
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</table>

3.2.2 Elastomer (Only virgin Polychloroprene (CR) is permitted & preferable grades are Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V)

- Physical Test: With values of characteristics specified
  - a) Hardness
  - b) Min. Tensile strength
  - c) Min. Elong. at break
  - d) Max. Compression set

- Manufacturer test certificate & Challan
- As per manufacturer certificate & test required by Authorized inspector from Govt. / NABL approved lab
- IRHD (60 ± 5) 17 MPa 400% 35%
- Verification of reference document
- Authorized Inspector appointed by Zonal Railway
- From batches at Random
- Fabricator’s record
- IRC:83 (Part-II) & IS:3400 (as per relevant test procedure)

Test certificate shall be furnished by manufacturers. (For level I acceptance sample from each lot of Elastomer as prescribed in specification shall be drawn by authorize inspector and tested in either In-house Lab. or in NABL/ Govt. Approved laboratory. For level 2 acceptance, tests on specially molded test pieces to be done.

Tests to be done are
- (i) Composition
- (ii) Hardness
- (iii) Tensile strength
- (iv) Elongation at Break
- (v) Compression set

Note: (i) No reclaimed rubber, vulcanized wastes or natural rubber shall be used.

(ii) EPDM (Ethyle propylene Dimonomer), IIR (Isobutane Isoprene Copolymer), CIIR (Chloro-Isoprene Copolymer) are not permitted for manufacture of bearings.

With these for specially molded test pieces and Max variation permitted is ± 0.2%

(c) For other test max. and min. limits to be adhered.

(d) Ozone resistance can be waived by test engineer as per note 2 of Para 918.4.1.2 of IRC83 Part II.

Polychloroprene Content < 60%

Ash content >5%
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabriactor’s quality control</th>
<th>Inspection details</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3</td>
<td>Load Test on complete bearings</td>
<td>a) Axial load test</td>
<td>Upto 15MPa</td>
<td>All bearing of the lot shall be tested.</td>
<td>As per relevant drg. and specification</td>
<td>Fabricators record.</td>
<td>Authorized Inspector appointed by Zonal Railway</td>
<td>100%</td>
<td>Fabricators record.</td>
</tr>
<tr>
<td>3.3 Cont.</td>
<td>b) Elastic Modulus test</td>
<td>Test to be conducted as per Annexure 2 of IRC: 83 (Part-II)</td>
<td>Test to be conducted as per Annexure 2 of IRC: 83 (Part-II)</td>
<td>Load testing on Two test bearings.</td>
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<td>In case of large lot</td>
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<tr>
<td>3.3 Cont.</td>
<td>c) Shear Modulus test</td>
<td>Test to be conducted as per Annexure 2 of IRC: 83 (Part-II)</td>
<td>Load testing on Two test bearings.</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
<td>Frequency &amp; Type of check</td>
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<tr>
<td>1</td>
<td>(d) Stripping strength test / Adhesive strength test</td>
<td>value of G for acceptance from 0.8MPa to 1.2 MPa</td>
<td>Load testing on Two test bearings.</td>
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<td>Test to be conducted as per Annexure 2 of IRC: 83 (Part-II) examination for evidence of cracking/peeling both in strained (Strain value 2.0) and unstrained state.</td>
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<td>2</td>
<td>(e) Ultimate compressive strength test</td>
<td>&lt;=60MPa</td>
<td>Load testing on Two test bearings for Destructive Test.</td>
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Note:- Large lot means if number of bearings are ≥ 24 & tests for Acceptance level 1 to be conducted. Small lot means if numbers of bearings are < 24 where Acceptance level 2 tests are done. Lot size to be approved by the engineer. In large lot 2 extra bearings to be made which are consumed in destructive testing.

Signature of Fabricating Agency

Signature of Railway Representative
# MODEL QUALITY ASSURANCE PLAN FOR POT-PTFE BEARINGS

1. Name of Manufacture: .................................................................
2. Drg. No.: ....................................................................................
3. Name of Project/Railway: .........................................................
4. Authority (CA No./LOA No./Order No.) .............................

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checked</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabricator's quality control</th>
<th>Inspection details</th>
<th>Extent of Inspection</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>RAW MATERIAL: Cast Steel (CS)</td>
<td>Physical Test</td>
<td>As per Mill TC &amp; test</td>
<td>Mill TC and</td>
<td>RDSO/Authorized inspecting</td>
<td>One integral Test</td>
<td>100%</td>
<td>Fabricator's record</td>
<td>IS:1030</td>
<td>Manufacturer's test certificate shall be furnished. UST shall be conducted as per provision of relevant specification before processing the material for manufacturing. UST after load test shall also be carried out.</td>
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<tr>
<td>1.1</td>
<td></td>
<td>UTS, Yield Stress</td>
<td>required by RDSO/Authorized inspecting official of Zonal Railway from Govt. Lab./NABL approved lab</td>
<td>Challan</td>
<td>Inspecting official of Zonal Railway</td>
<td>Test piece per heat</td>
<td>Co-related with Mill TC &amp; test report.</td>
<td>IS:9565 Level-III</td>
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<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabriactor's quality control</td>
<td>Inspection details</td>
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<td>1.2</td>
<td>Mild Steel</td>
<td>Mechanical Test UTS, Yield Stress, Elongation%, Bend test , Impact test at 0 degree centigrade or -20 degree for sub-zero zone Chemical Test C, Mn, Si, P, S, CE. Physical condition i.e. Pitting, rusting, rolling defect, etc. Ultrasonic Testing of plates (100%)</td>
<td>As per Mill TC &amp; test required by RDSO/Authorized inspecting official of Zonal Railway from Govt. Lab./NABL approved lab.</td>
<td>Mill TC and Challan</td>
<td>1. Verification of reference document. 2. Complete visual inspection.</td>
<td>RDSO/Authorized inspecting official of Zonal Railway</td>
<td>One test piece per thickness per heat. Fabricator's record Co-related with Mill TC &amp; test report.</td>
<td>IS: 2062-11, E250, Quality BO is generally used. However Quality C shall be used for sub-zero condition. (As specified in approved Drg.).</td>
<td>Manufacturer's test certificate shall be furnished. UST shall be conducted as per provision of relevant specification before processing the material for manufacturing. UST after load test shall also be carried out.</td>
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</tr>
<tr>
<td>1.3</td>
<td>Stainless Steel (S.S.)</td>
<td>Physical Test UTS, Yield Stress, Elongation %, Hardness Chemical Test C, Mn, Ni, Cr, P, S, Si, Mo</td>
<td>As per Mill TC &amp; test required by RDSO/Authorized inspecting official of Zonal Railway from Govt. Lab./NABL approved lab.</td>
<td>Mill TC and Challan</td>
<td>1. Verification of reference document. 2. Complete visual inspection.</td>
<td>RDSO/Authorized inspecting official of Zonal Railway</td>
<td>One test pc. Per heat Fabricator records.</td>
<td>IS:4225 or ASTM A435</td>
<td>Stain less steel shall conform to AISI 316L/02Cr17Ni12Mo2 of IS:6911 Or (Grade/class As per relevant approved Drg.). Manufacturer's test certificate shall be furnished. Sample from each lot of S.S shall be drawn by authorize inspecting official and tested in Govt./NABL approved laboratory.</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
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<tr>
<td>1.4</td>
<td>PTFE (confined &amp; dimpled)</td>
<td>a) Tensile strength</td>
<td>As per manufacturer test certificate &amp; Challan</td>
<td>1. Verification of reference document.</td>
<td>RDSO/Authorized Inspecting official of Zonal Railway</td>
<td>One test pc for Full Lot of supply</td>
<td>Fabricator’s record.</td>
<td>Grade A of BS:3784 or equivalent (Grade/class as per relevant specification / approved Drg.).</td>
<td>Manufacturer’s test certificate shall be furnished. Sample from each lot of PTFE shall be drawn by authorize inspector and tested in Govt./NABL approved laboratory.</td>
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<tr>
<td>1.5</td>
<td>Elastomer (Neoprene WRT/ Bayprene 110 or equivalent/Denka)</td>
<td>Physical properties</td>
<td>As per Mill TC &amp; tests required by RDSO/Authorized Zonal Railway inspection official from Govt./NABL approved lab</td>
<td>Manufacturer test certificate &amp; Challan</td>
<td>Verification of reference document.</td>
<td>RDSO/Authorized Inspecting official of Zonal Railway</td>
<td>From each batch at Random</td>
<td>Fabricator’s record.</td>
<td>IRC:83 (Part-III) &amp; (Part-II) and IS:3400 (as per relevant test procedure).</td>
<td>Test certificate shall be furnished by manufacturer. Sample from each lot of Elastomer as prescribed in specification shall be drawn by authorize inspecting official of RDSO /Zonal Railway and tested in Govt./NABL approved laboratory.</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator's quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
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<tr>
<td>1.6</td>
<td>Brass sealing Ring</td>
<td>Physical properties</td>
<td>As per Mill TC &amp; tests required by RDSO/Auth orized Zonal Railway inspecting official from Govt./lab/ NABL approved lab</td>
<td>Manufacturer test certificate &amp; Challan</td>
<td>Verification of reference document.</td>
<td>RDSO/Auth orized Inspecting official of Zonal Railway</td>
<td>From each batch at Random</td>
<td>Fabricators record.</td>
<td>Test certificate shall be furnished by manufacturer. One sample for full lot of sealing ring supply shall be drawn by RDSO/Authorized Zonal Railway inspecting official and tested in Govt./NABL approved laboratory.</td>
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<td>(20mm wide x 2mm Thick)</td>
<td>(i) Tensile strength (N/mm2), (ii) Elongation % (iii) Bend test (iv) Vickers Hardness</td>
<td>Chemical Test Cu , Pb, Fe and total Cu+Pb+Fe&amp; Remainder Zn</td>
<td>As per Mill TC &amp; tests required by RDSO/Auth orized Zonal Railway inspecting official from Govt./lab/ NABL approved lab</td>
<td>Manufacturer test certificate &amp; Challan</td>
<td>Verification of reference document.</td>
<td>RDSO/Auth orized Inspector appointed by Zonal Railway</td>
<td>One test pc for full lot of supply</td>
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<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
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<td>1.7</td>
<td>Bolts &amp; Nuts</td>
<td>Physical properties</td>
<td>As per Mill TC &amp; test required by RDSO/Auth orized inspecting official from Govt./NABL approved lab</td>
<td>Visual &amp; Measureme nt</td>
<td>Manufacturer test certificate &amp;Challan</td>
<td>Verification of reference document.</td>
<td>Authorized Inspector appointed by Zonal Railway</td>
<td>As per relevant specificatio n</td>
<td>Test certificate shall be furnished by manufacturer. One sample for each lot of Bolts &amp; Nuts supply shall be drawn by authorize inspecting official of Zonal Railway and tested in Govt./NABL approved laboratory.</td>
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<td>1.8</td>
<td>Adhesive for bonding PTFE</td>
<td>Peel of strength</td>
<td>As per Mill TC &amp; test required by Zonal Railway inspection official from Govt./NABL approved lab</td>
<td>Manufacturer test certificate &amp;Challan</td>
<td>Verification of reference document.</td>
<td>Zonal Railway.</td>
<td>One sample per lot.</td>
<td>Fabricato rs record.</td>
<td>Test report shall be furnished to inspecting official.</td>
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<tr>
<td>1.9</td>
<td>Paint</td>
<td>Verification of Manufacturer’s Test Certificate, Inspection Certificate, Chalan</td>
<td>Visual</td>
<td>Manufacturer test certificate &amp;Challan</td>
<td>Verification of reference document.</td>
<td>Zonal Railway.</td>
<td>Each Batch</td>
<td>Fabricato rs record.</td>
<td>Paint should be as per IRS: B1</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator's quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
<td>Remarks</td>
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<tr>
<td>2.0</td>
<td>Manufacturing Process</td>
<td>Dimensional inspection</td>
<td>Visual &amp; Measurement</td>
<td>As per approved drawing</td>
<td>Measurement of dimension</td>
<td>Manufactur er's inspecting official</td>
<td>100 %</td>
<td>Fabricato rs record.</td>
<td>IRC 83 Part-III &amp; as per drawing</td>
<td>Internal report shall be furnished, However random check may be done in presence of Zonal Railway inspecting official.</td>
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<tr>
<td>2.1</td>
<td>a) plan dimension b) individual height of the component c) Thickness of elastomer ic pad</td>
<td>Dimensional inspection</td>
<td>Visual &amp; Measurement</td>
<td>As per approved drawing</td>
<td>Measurement of dimension</td>
<td>Manufactur er's inspecting official</td>
<td>100 %</td>
<td>Fabricato rs record.</td>
<td>IRC 83 Part-III, IS: 822 &amp; IS:3658</td>
<td>Internal report shall be furnished, However, random check may be done in presence of Zonal Railway inspecting official.</td>
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<tr>
<td>2.2</td>
<td>Check after attachment of stainless steel plate a) Flatness b) Surface Finish</td>
<td>Dimensional inspection</td>
<td>Visual &amp; Measurement</td>
<td>As per approved drawing</td>
<td>Measurement of dimension</td>
<td>Manufactur er's inspecting official</td>
<td>100 %</td>
<td>Fabricato rs record.</td>
<td>IRC 83 Part-III, IS:822 &amp; IS:3658</td>
<td>Internal report shall be furnished, However, random check may be done in presence of Zonal Railway inspecting official.</td>
</tr>
<tr>
<td>2.3</td>
<td>NDT test DP test on welding of the top plate and bearings after load test</td>
<td>DP Test, weld Size , visual</td>
<td>DP Test of weld, visual &amp; gauge</td>
<td>As per approved WPSS &amp;Drg.</td>
<td>Visual inspection &amp; verification of dimension by gauge.</td>
<td>Manufactur er's inspecting official/ Zonal Railway/RD SO</td>
<td>100%</td>
<td>Fabricato rs record.</td>
<td>IS:3658 -1981</td>
<td>Internal report will be furnished by the manufacture and final clearance will be given by RDSO.</td>
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<tr>
<td>2.4</td>
<td>Hardness a) On major steel components b) On the hard facing zone</td>
<td>Hardness tester measurement</td>
<td>As per drg. and relevant specification</td>
<td>Fabricators record &amp; check.</td>
<td>Manufactur er inspecting official/ Zonal Railway</td>
<td>100%</td>
<td>Fabricato rs record.</td>
<td>IRC 83 Part-III</td>
<td>Internal report will be furnished, however, random check will be done in presence of Railway representative inspecting authority. Firm should keep the records of hard facing and submit the same to inspection official at the time of inspection</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checked</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabricator's quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
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<td>2.5</td>
<td>Corrosion Protection</td>
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<td>Inspecting Agency</td>
<td>Extent of Inspection</td>
<td>Fabricators record &amp; check.</td>
<td>IRC 83 Part-III</td>
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<tr>
<td></td>
<td>a) Grit Blasting</td>
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<td>Manufacturer inspecting official/ Zonal Railway</td>
<td>100%</td>
<td>Fabricators record</td>
<td>Internal report shall be furnished. However, total DFT shall be checked randomly from the finished store in presence of inspecting authority of Zonal Railway.</td>
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<td>b) Zn metalizing</td>
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<td>c) Painting</td>
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<td>2.6</td>
<td>Assembly</td>
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<td>Inspecting Agency</td>
<td>Extent of Inspection</td>
<td>Fabricators record</td>
<td>IRC 83 Part-III</td>
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<td>a) Parallelism</td>
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<td>Manufacturer inspecting official/ Zonal Railway</td>
<td>100%</td>
<td>Fabricators record</td>
<td>During assembly all the bearing components should be checked for proper cleanliness and greasing of PTFE &amp; Stainless steel surfaces. Random check shall be done in presence of Zonal Railway's inspecting authority.</td>
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<td>b) Overall Height</td>
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<td>2.7</td>
<td>Marking</td>
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<td>IRC 83 Part-III</td>
<td>Fabricators record.</td>
<td>Manufacturer's inspecting official/ Zonal Railway</td>
<td>100%</td>
<td>Fabricators record</td>
<td>IRC 83 Part-III</td>
<td>During internal final inspection the same component shall have to be fixed on each bearing.</td>
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<td>2.8</td>
<td>Tolerance of fit between different component of bearing</td>
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<td></td>
<td>a) Piston Cylinder</td>
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<td>b) Elastomeri c pad &amp; Cylinder</td>
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<td></td>
<td>c) Guide &amp; Adjacent component</td>
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<td>d) Pin &amp; Cylinder</td>
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</table>

Signature of Fabricating Agency

Signature of Railway Representative

48
# STANDARD QUALITY ASSURANCE PLAN FOR EXPANSION JOINTS

1. **Name of Manufacture**: …………………………………………
2. **Drg. No.**; ……………………………………………………
3. **Name of Project/Railway**: …………………………………………
4. **Authority (CA No./LOA No./Order No.)**: …………………………………………

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabricator's quality control</th>
<th>Inspection details</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>1.0</td>
<td>RAW MATERIAL</td>
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<tr>
<td>1.1</td>
<td>Mild Steel For Steel Plates, Angles, Splice Plates, Anchor Loops, Studs etc</td>
<td><strong>Mechanical Test</strong> UTS, Yield Stress, Elongation%, Bend test, Impact test at 0 degree centigrade or -20 degree for sub-zero zone</td>
<td>As per Mill TC &amp; test required by Authorized inspecting official of Zonal Railway from Govt. Lab./ NABL approved lab.</td>
<td>Mill TC and Challan</td>
<td>Authorized Inspecting official of Zonal Railway</td>
<td>One test piece per thickness per heat.</td>
<td>Fabricator's record Co-related with Mill TC &amp; test report.</td>
<td>IS: 2062-11, E250, Quality BO is generally used. However Quality C shall be used for sub zero condition. (As specified in approved Drg.).</td>
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<td></td>
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<td><strong>Chemical Test</strong> C, Mn, Si, P, S, CE</td>
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<td>IS:4225 or ASTM A435</td>
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<td><strong>Physical condition</strong> i.e. Pitting, rusting, rolling defect, etc.</td>
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<td><strong>Dimensional Check</strong> Length Width Thickness Dia</td>
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<td></td>
<td></td>
<td><strong>Ultrasonic Testing of plates</strong> (100% for 12mm &amp; above thick plates)</td>
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<tr>
<td>1.2</td>
<td>Strip Seal and other Elastomer Components (Only virgin Polychloroprene (CR) is permitted &amp; preferable)</td>
<td><strong>Physical Test</strong> With values of characteristics specified</td>
<td>As per manufacturer certificate &amp; test required by Authorized inspector of zonal Railway</td>
<td>Manufacuturer test certificate &amp; Challan</td>
<td>Authorized Inspecting official appointed by Zonal Railway</td>
<td>From batches at Random and at discretion of Inspector</td>
<td>Fabricator's record.</td>
<td>IRC:83 (Part-III) &amp; IS:3400 (as per relevant test procedure)</td>
<td>Examination of Test Certificates is required. Test Certificate shall be furnished by manufacturers for following tests. (i) Composition (ii) Hardness</td>
</tr>
</tbody>
</table>

Manufacturer’s test certificate shall be furnished. UST shall be conducted for 12mm & above thick plates as per provision of relevant specification before processing the material for manufacturing.

Raw Material to be cleared by nominated inspecting official of Zonal Railway:
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
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<th>Fabricator's quality control</th>
<th>Inspection details</th>
<th>Type of Records</th>
<th>Acceptance criteria</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>grades are-Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V)</td>
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<td>from Govt./NABL approved lab</td>
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<td>(iii) Tensile strength</td>
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<td>h) Hardness</td>
<td>IRHD (60 ±5)</td>
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<td>(iv) Elongation at Break</td>
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<td></td>
<td>o) Min. Tensile strength</td>
<td>17 MPa</td>
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<td>(v) Compression set</td>
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<td>p) Min. Elong. at break</td>
<td>400%</td>
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<td>(vi) Accelerated Ageing test</td>
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<td>q) Max. Compression set</td>
<td>35%</td>
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<td>(vii) Adhesion Strength</td>
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<td></td>
<td>r) Accelerated ageing test</td>
<td>100 ±1°C for 70 Hours</td>
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<td>IMPORTANT:</td>
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<td></td>
<td>IV) Max. Change in Hardness</td>
<td>+15% w.r.t. value of (a)</td>
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<td>Properties of Elastomer should be as per Table 1 of IRC:83</td>
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<tr>
<td></td>
<td>V) Max. Change in Tensile strength</td>
<td>-15% w.r.t. value of (b)</td>
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<td>Part-II Polychloroprene</td>
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<td>VI) Max. Change in Elongation.</td>
<td>-30% w.r.t. value of (c)</td>
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<td>Content &lt; 60%</td>
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<td></td>
<td>(f) Adhesion strength of Elastomer to Steel Plates</td>
<td>Min. 7 KN/m</td>
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<td>Ash content &gt; 5%</td>
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<td>Chemical Test</td>
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<td>Note: (i) No reclaimed rubber, vulcanized wastes or natural rubber shall be used.</td>
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<tr>
<td></td>
<td>vii) Determination/ Identification of polymer</td>
<td>As per manufacturer certificate &amp; test required by Authorized inspector of zonal Railway from Govt./NABL approved lab</td>
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<td>(ii) EPDM (Ethyle propylene Dimonomer), IIR (Isobutane Isoprene Copolymer), CIIR (Chloro-Isoprene Copolymer) are not permitted for manufacture of bearings.</td>
</tr>
<tr>
<td></td>
<td>viii) Polymer content</td>
<td>min 60%</td>
<td>Manufacterer test certificate &amp; Channel</td>
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<td>Adhesion strength test to be conducted as per IS: 3400 Part XIV.</td>
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<td>ix) Ash content</td>
<td>Max 5%</td>
<td>Verification of reference document.</td>
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<td>Examination of Test Certificates is required Test Certificate shall be furnished by manufacturers for following tests.</td>
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<td>Authorized Inspecting official appointed by Zonal Railway</td>
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<td>(i) Polymer Identification</td>
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<td>From batches at Random</td>
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<td>(ii) Polymer content</td>
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<td>Fabricators record.</td>
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<td>(iii) Ash content</td>
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<td>IRC:83 (Part-II) Ash content as per IS:3400 part XXII and Polychloroprene content as per ASTM-D297 Identification of polymer as per ASTM D 3677 (as per (iv) Specific gravity (V) Ozone resistance</td>
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<td>Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
<td>Frequency &amp; Type of check</td>
<td>Reference Document</td>
<td>Fabriactor’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
<td>Acceptance criteria</td>
<td>Remarks</td>
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<td>Inspecting Agency</td>
<td>Extent of Inspection</td>
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<td>2.0</td>
<td>Welding:</td>
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<tr>
<td></td>
<td>a) Submission of WPSS</td>
<td>Review of WPSS</td>
<td>Verification</td>
<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
<td>Fabriactor’s Record</td>
<td>RDSO</td>
<td>100%</td>
<td>Fabricator’s Record</td>
<td>to NABL LAB for evaluation.</td>
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<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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<tr>
<td></td>
<td>b) WPQR</td>
<td>Witnessing of established WPSS Witnessing of Welder Qualification test</td>
<td>Visual, DT &amp; NDT at approved lab</td>
<td>As per code requirement</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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<td></td>
<td>c) Preheating</td>
<td>Measurement of Temperature</td>
<td>Visual with thermal Chalk</td>
<td>As per approved WPSS</td>
<td>Verification of Reference Document</td>
<td>Random</td>
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<td>Inspection Report of Inspecting Official &amp; Fabricator’s Record</td>
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<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
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<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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<td>d) Baking of Electrode, Flux</td>
<td>To have moisture free Electrode &amp; Flux</td>
<td>Visual Check of Electrodes &amp; beating</td>
<td>As per Manufacturer’s recommendations</td>
<td>Verification of Reference Document</td>
<td>Random</td>
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<td>Inspection Report of Inspecting Official &amp; Fabricator’s Record</td>
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<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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<td></td>
<td>e) Selection of correct Electrodes &amp; Flux</td>
<td>Reference to WPSS, IRS Class, etc.</td>
<td>Visual</td>
<td>As per approved WPSS</td>
<td>Verification of Reference Document</td>
<td>Authorized Inspecting official appointed by Zonal Railway</td>
<td>Random</td>
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<td>Inspection Report of Inspecting Official &amp; Fabricator’s Record</td>
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<td>IRS B1-2001 IS 9595-96 WBC-2001</td>
<td>Verification of Reference Document</td>
<td>RDSO</td>
<td>100%</td>
<td>WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74</td>
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</table>

2.0 Welding:

a) Submission of WPSS

- Review of WPSS
- Verification: IRS B1-2001 IS 9595-96 WBC-2001
- Verification of Reference Document
- Fabriactor’s Record: RDSO
- Acceptance criteria: 100%
- Remarks: Only RDSO certified welders to be engaged in the job.

b) WPQR

- Witnessing of established WPSS
- Witnessing of Welder Qualification test
- Visual, DT & NDT at approved lab
- As per code requirement
- Verification of Reference Document
- Fabriactor’s Record: RDSO
- Acceptance criteria: 100%
- Remarks: WPQR Sheet to be recorded in presence of RDSO Rep. IS 7310(I)-74

c) Preheating

- Measurement of Temperature
- Visual with thermal Chalk
- As per approved WPSS
- Verification of Reference Document
- Authorized Inspecting official appointed by Zonal Railway
- Acceptance criteria: Random
- Remarks: Inspection Report of Inspecting Official & Fabricator’s Record

d) Baking of Electrode, Flux

- To have moisture free Electrode & Flux
- Visual Check of Electrodes & beating
- As per Manufacturer’s recommendations
- Verification of Reference Document
- Authorized Inspecting official appointed by Zonal Railway
- Acceptance criteria: Random
- Remarks: Inspection Report of Inspecting Official & Fabricator’s Record

e) Selection of correct Electrodes & Flux

- Reference to WPSS, IRS Class, etc.
- Visual
- As per approved WPSS
- Verification of Reference Document
- Authorized Inspecting official appointed by Zonal Railway
- Acceptance criteria: 100%
- Remarks: As per list of vendors approved by RDSO
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Component Operation</th>
<th>Characteristic Checks &amp; Tolerances</th>
<th>Frequency &amp; Type of check</th>
<th>Reference Document</th>
<th>Fabricator's quality control</th>
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<tr>
<td>1</td>
<td>f) Current Condition</td>
<td>Measurement of Amp. &amp; Voltage</td>
<td>Visual with Ammeter &amp; Voltmeter</td>
<td>As per approved WPSS</td>
<td>Verification of Reference Document</td>
<td>Authorized Inspecting official appointed by Zonal Railway</td>
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<td>IRS B1-2001</td>
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<tr>
<td>3</td>
<td>IN Process Inspection</td>
<td>(a) Angle Profile</td>
<td>Size, thickness Dia, profile</td>
<td>Concer specification &amp; drawings</td>
<td>Visual &amp; dimensional verification w.r.t. concern specification &amp; drawings</td>
<td>Firm &amp; Authorized Inspecting Official nominated by Zonal Rly</td>
<td>100% by Firm &amp; random by Zonal Rly</td>
<td>Fabrication record maintained by Firm</td>
<td>In Random check Rly supervisor will record their observations on records maintained by Firm</td>
</tr>
<tr>
<td>4</td>
<td>Finished expansion joint inspection</td>
<td>(a) Dimensional check</td>
<td>Length, width, thickness As per drawing</td>
<td>Visual &amp; dimensional verification w.r.t. concern specification &amp; drawings</td>
<td>Authorized Inspecting Official of Zonal Rly/RDSO</td>
<td>100% by Zonal Rly/RDSO</td>
<td>Minimum 20% by Zonal Rly</td>
<td>Quality check list(like sample Annexure-A) as per approved drawing to be maintained by Firm &amp; same to be checked &amp;verified by concern Rly official/RDSO.</td>
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<tr>
<td>S. No.</td>
<td>Component Operation</td>
<td>Characteristic Checks &amp; Tolerances</td>
<td>Frequency &amp; Type of check</td>
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<td>Fabricator’s quality control</td>
<td>Inspection details</td>
<td>Type of Records</td>
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<td>Remarks</td>
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<td>Zonal Rly/RDSO</td>
<td>Rly/RDSO</td>
<td></td>
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</tr>
<tr>
<td>5</td>
<td>Painting Process</td>
<td>Verification of Manufacturer's Test Certificate, Challan</td>
<td>Visual</td>
<td>Verification of Manufacturer's Test Certificate, Challan</td>
<td>Authorized Inspecting Official of Zonal Railway</td>
<td>Each Batch</td>
<td>Fabricator's record</td>
<td>As per relevant Specification</td>
<td>Paint should be as per IRS: B1:2001 or as per contract conditions as applicable</td>
</tr>
<tr>
<td>6</td>
<td>Packing &amp; Dispatch</td>
<td>(a) Marking of expansion joints</td>
<td>Verification of reference document</td>
<td>Zonal Railway</td>
<td>Each Batch</td>
<td>Fabricator's record</td>
<td>As per relevant Specification</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>(b) Clamping of joints</td>
<td></td>
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<td></td>
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<td>(c) packing of expansion joint</td>
<td></td>
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</tbody>
</table>

**Note:-** 1. If there are any studs in the approved drawing, perform as per BS-115 issued by RDSO may be referred for suitable changes.
2. If there are Bolts & Nuts in the approved drawing, then add Para 1.3 in this QAP as given for Bolts & Nuts in Para 1.7 of QAP of POT-PTFE Bearings (Anex.-XII)

Signature of Fabricating Agency

Signature of Railway Representative
## QUALITY CHECK LIST OF EXPANSION JOINT (SAMPLE)

Date: _____________________

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Required</th>
<th>Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Size of the Edge Beam Length (+3, -0) mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Anchor Studs Should be properly bend</td>
<td></td>
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<tr>
<td>3.</td>
<td>Straightness Throughout the Length of the Beam (no bending)</td>
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<tr>
<td>4.</td>
<td>Proper Attachment of Splicing Plates at the end.</td>
<td></td>
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<tr>
<td>5.</td>
<td>Proper Welding Size of Anchor Studs. (e.g. 8mm, 45°)</td>
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<tr>
<td>6.</td>
<td>Seal Gap (6mm+0,-1)</td>
<td></td>
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<tr>
<td>7.</td>
<td>Edge Beam corner should be properly round like Fillet not Chamfer</td>
<td></td>
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<tr>
<td>8.</td>
<td>Angle Joint Straight with proper “V” Shape</td>
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<tr>
<td>9.</td>
<td>No Splatter, Primer &amp; Final Paint Application</td>
<td></td>
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</tr>
<tr>
<td>10.</td>
<td>Hammer Test</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Signature of 
Fabricating Agency

Signature of 
Railway Representative
No. CBS/PBEJ/Reg:Dated: 07-07-2017

I. The General Manager (Constrn.), Northeast Frontier Railways, Maligaon, Guwahati-780001.

II. Chief Administrative Officer (Constrn.):
   1. Central Railway, Chhatrapati Shivaji Terminus, Mumbai -400 001.
   2. Eastern Railway, Fairlie Place, Kolkata-700 001.
   3. East Central Railway, Mahendru Ghat, Patna-800 004.
   4. East-Coast Railway, Bhubaneswar-755 001.
   5. Northern Railway, Kashmere Gate, Delhi-110 006.
   6. North-Central Railway, Allahabad-211 001.
   10. Southern Railway, 183, EVR Periyar, High Road Egmore, Chennai-600 008.
   11. South Central Railway, Rail Nilayam, Secunderabad-500 371.
   12. South East Central Railway, Bilaspur-495 004.
   13. South-Eastern Railway, Garden Reach Kolkata-700 043.
   14. South-Western Railway, 18, Basaveshwara (Millers) Road, Bangalore-560 046.
   15. Western Railway, Churchgate, Mumbai-400 020.
   16. West-Central Railway, Jabalpur-482 001.

Sub:- Addendum & Corrigendum of Guidelines on Fabrication of Steel Girders for Construction/Field Engineers-BS-110 (R).

Ref:- 1. BS Report No.-110 (R) issued in March, 2016.
      2. Sr. ED/VDG Note No Comp/1.55.07.01 dated 04.06.2017.

*******

NABL is not the sole accreditation body for Testing & Calibration of laboratories as has been confirmed by Department of Science & Technology.

There is other accreditation agency NABC also. Therefore, decision has been taken with the approval of DG that NABL accredited should be replaced by NABL/NABC accredited in work instructions/specifications issued by RDSO.

Accordingly, henceforth, by this addendum & corrigendum, at all places in BS-110 (R), NABL Lab should be read as NABL/NABC Accredited Lab.

(A.K.Dadarya)
Executive Director(B&S)
For Director General

Copy to: (I) The General Manager (Engg./Works), - For information and necessary action with respect to Bridge Workshops & other fabrication work supervised by Open Line:-
   1. Central Railway, Mumbai CST-400 001.
   2. Eastern Railway, Fairlie Place, Kolkata-700 001.
   4. East-Coast Railway, Bhubaneswar-751 016.
5. Northern Railway, Baroda House, New Delhi-110 001.
6. North-Central Railway, Allahabad-211 001.
10. Southern Railway, Park Town, Chennai-600 003.
11. South Central Railway, Rail Nilayam, Secunderabad-500 371.
12. South East Central Railway, Bilaspur-495 004.
13. South Eastern Railway, Garden Reach, Kolkata-700 043.
15. Western Railway, Mumbai-400 020.
16. West-Central Railway, Jabalpur-482 001.

II. Executive Director/Civil Engineering (B&S), Railway Board, Rail Bhawan, New Delhi-110001.

III. Addl. Executive Director/M&C, RDSO, Lucknow.

(A.K.Dadarya)
Executive Director(B&S)
For Director General