सत्यमेव जयते

भारत सरकार – रेल मंत्रालय

Government of India- Ministry of Railways

केवल कार्यालय उपयोग के लिए
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TECHNICAL PROCEDURE/GUIDELINES FOR GENERAL INSPECTION DURING ROH/POH, REPAIR OF CRITICAL WELD JOINTS, REPAIR OF CENTRE SILL, CENTRE GIRDER & SOLE BAR CRACKS & STRENGTHENING OF UNDERFRAME OF BLC/BLCM/BLCS (A-CAR & B-CAR) WAGONS

TECHNICAL PAMPHLET No. **G -118**
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ISSUED BY-

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RESEARCH DESIGNS AND STANDARDS ORGANISATION
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Contents

Section – A

General

1. Background:

Broad Gauge Bogie Low Platform Container Flat wagons type BLC/BLCM (A-Car and B-Car) and BLCS (A-Car and B-Car) has been design for transportation of 20'/40' ISO Series-1 containers having maximum height 2896/2591 mm (9'6"/8'6"), width 2438 mm (8') and length 20'40' along with Non-ISO domestic containers (like Dwarf Contaiers, 12' heigh containers etc.) over routes of Indian Railways and routes of DFCCIL.

Superstructure of BLC/BLCM (A-Car and B-Car) and BLCS (A-Car and B-Car) wagon is all welded construction with Copper bearings quality steel to specification IS:2062 E450/250 Quality A/BR with Cu. The BLC (A-Car & B-Car) wagon fitted with LCCF 20C bogie and is designed to carry 20.32 t axle load. The BLCM (A-Car & B-Car) wagon is fitted with modified LCCF 20C bogie and designed to carry 22.0 t axle loads. The BLCS (A-Car & B-Car) wagon is fitted with LWLH (Light Weight and Low Height) bogie and designed to carry 25.0 t axle loads.

In recent past, there has been a high incidence of weld joint failures between sub-assemblies like joint between Centre Sill (End) - Bolster subassemblies, weld joint between Solebar and Bolster, weld joint between Centre Sill/Girder (Middle)-Bolster. Similarly there is a rise in cases of cracking of Solebar, Centre Sill (Middle) i.e. Centre Girder reported by Workshops, ROH depots & CTO's (including M/s CONCOR). Therefore these comprehensive guidelines are being issued to facilitate Workshops/Depots to undertake repair of underframe on BLC/BLCM and BLCS wagons with ease & in line with RDSO guidelines. Experience gained while examining damages in Container Flat wagons has shown that predominantly the noticed damages are on account of wrong loading/ unloading practices, some inappropriate repair methodologies adopted in field & hence greatly differ from wagon-to-wagon. This also underlines the fact that no single document detailing all kinds of possible damages/ repair of those damages can be compiled. This document, hence, aims to define broadly the requirements/ expectations from repair practices on BLC/BLCM and BLCS wagons covering all aspects to the extent possible.

Electrodes used for repair procedure should be as specified in G-72 (Latest Revision) or extent guidelines issued by RDSO. Wherever preheating is desired for low hydrogen electrodes (as per manufacturer guidelines) should be strictly followed. Suitable heat boxes should be arranged for maintaining the electrodes at desired temperature during welding as specified by manufacturer of electrodes. Recommendations for GMAW/Metal Arc welding of Carbon steel as per specification IS:9595(latest) should be referred for understanding details.

The scope of this procedure is given below:

i. To highlight the nature and location of frequent failures in wagon.
ii. Comprehensive inspection of all wagons arriving for ROH/POH at depots/workshops.
iii. For undertaking repair of general weld failures and underframe cracks as reported. Workshops/maintenance depots shall undertake repair & strengthening of BLC/BLCM and BLCS wagons arriving/detected with such type of failures as per the guidelines for of the procedure.
iv. However, for any major failure (not covered under this procedure) should be reported to RDSO for study/analysis and advising suitable specific procedure.
v. Although efforts have been made to cover recommendations for structural repair in all major assemblies, it is expected that workshops/Depots based on experience gained while

undertaking repair of BLC/BLCM and BLCS wagons, would suitably add/ enrich this document.

2. General instructions:

The guidelines/procedure is for general guidance and the repair shall be carried out in observance of following:

1. Key drawings of BLC/BLCM (A-Car) wagon as per Index drawing no CONTR-9405-S-01 and drawing of BLC/BLCM (B-Car wagon) as per Index drawing no CONTR-9406-S-01.
2. Key drawings of BLCS (A-Car) wagon as per Index drawing no WD-15011-S-01 and drawings of BLCS (B-Car) wagon as per Index drawing no WD-15012-S-01.
3. 'Welding Diagram' drawing of BLC/BLCM (A-car & B-Car) wagon i.e. CONTR-9405-S-08.
4. 'Welding Diagram' drawing of BLCS (A-car & B-Car) wagon i.e. WD-15011-S-09.
5. This document must be read with relevant & latest revision of drawings of BLC/BLCM, BLCS wagons & other RDSO guidelines/standards/specifications such as G-72, G-93, G-81. Consumables such as welding electrodes/ paints as specified in relevant specifications /standards/drawings shall be used during repair. This document does not over-rule/replace any maintenance instructions in Wagon Maintenance Manual/ Railway Board's circulars/RDSO's instructions/ Maintenance standards but only supplements the same. Workshops/Depots are advised to refer Wagon Directorate, RDSO, in case of any conflicting instructions/guidelines concerning repair of subject BLC/BLCM, BLCS wagons (with this procedure) is noticed.
6. Before undertaking the wagon repair, the wagons should be extensively examined for assessment of the extent of crack at all the welded joints by gouging/chipping of welds removing of ribs/strengthening/patch plates on failed/cracked location and adjoining members.
7. After attending all the repairs, strengthening has to be carried out as per Section-D. The dimensions of Stiffening plates, Strengthening Rib assembly is based on key dimensions of wagon. However, the dimensions of strengthening pieces can be adjusted (to suit) based on actual measurement of sub-assemblies.
8. After attending all the repairs, the position of locks (ATLs) along longitudinal and lateral direction shall be checked and ensured as per relevant drawings.
9. As mentioned above (point no. 1 and 2) these guidelines are for carrying out general repair of said wagon. However in addition to the failures mentioned in this procedure, if any other damage/failure of welding joint /sub-assemblies is observed, that shall be bring to knowledge of RDSO, Lucknow. Annexure-B showing the format of reporting such damages, not covered under this procedure is attached with the document.
10. This Guideline/procedure describes both MMAW and GMAW process for the repair/strengthening of the wagons. **However it is recommended to use MIG/MAG welding conforming to Class III of ISRM-46 (latest issue) to the maximum possible extant for the repair/strengthening of wagons**. Filler wire diameter for MIG/MAG welding mentioned in this procedure is suggestive. Repairer may suitably choose MIG/MAG welding filler wire dia./size as per the weld joint details or any other extent guidelines/standards.
11. Repair and strengthening procedure for BLL (A-Car & B-Car) Wagons as documented procedure No G -103 (Rev-2) has already been issued by RDSO.

3. Nature and details of Failures:

Recently the damages/failures reported in BG Container Flat wagons are pertaining to mainly weld joint failures between sub-assemblies like joint between Centre Sill (End) - Bolster sub-assemblies, weld joint between Solebar and Bolster, weld joint between Centre Sill (Middle)-Bolster & cases of cracking of Solebar, Centre Sill (Middle) i.e. Centre Girder. The details of damages reported frequently are as given below, for easy and quick reference:

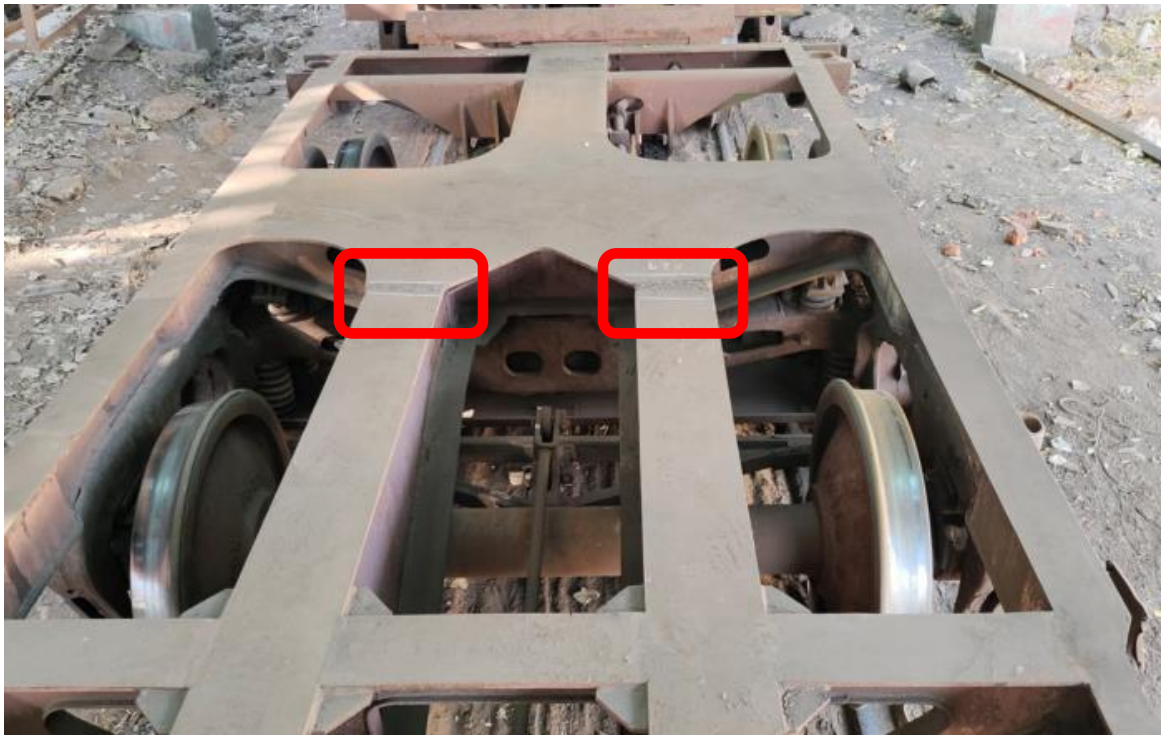
- **Weld crack/failure at Joint between Solebar and Bolster assembly:**
  Joint between Solebar and Bolster sub-assemblies at both raised and lower end of A-car/B-Car wagons are shown below:

Weld crack/failure at joint between top plates of Solebar & Bolster sub-assemblies

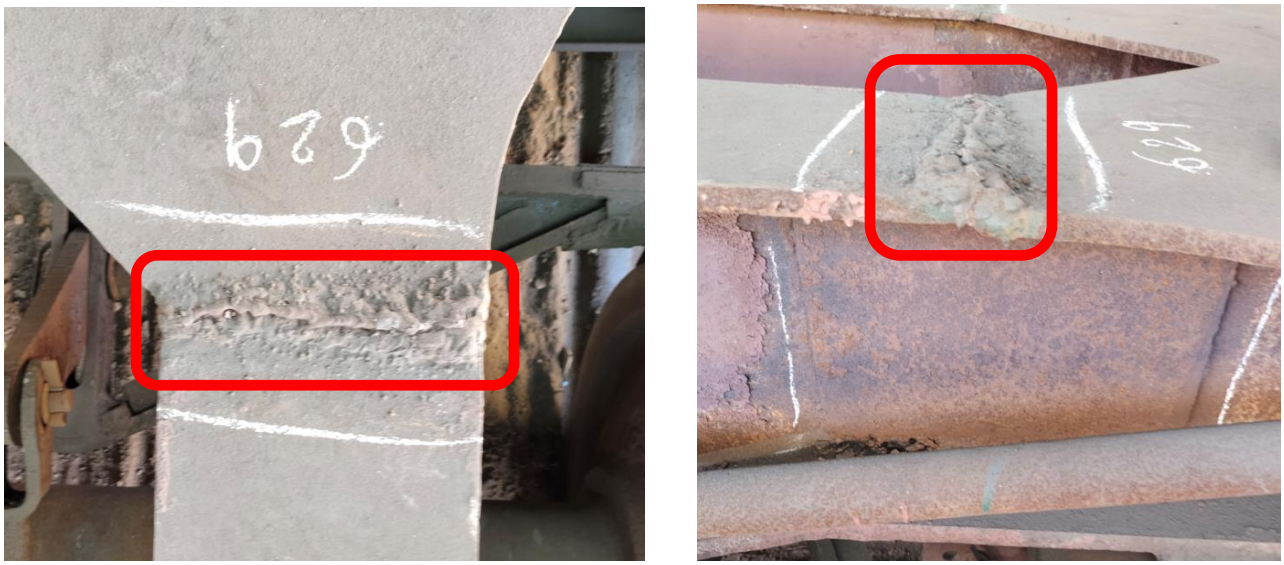
Weld crack/failure at joint between web plate of Solebar & Bolster sub-assemblies

Similar type of butt joints is being carried out between top/bottom flanges of Solebar and top/bottom flanges of Body Bolster.

- **Weld crack/failure at Joint between top plates of Centre Sill (Middle) and Bolster sub-assembly :**



Weld crack/ failure at joint failure between top plates of Centre Girder (Centre Sill-Middle) & Bolster

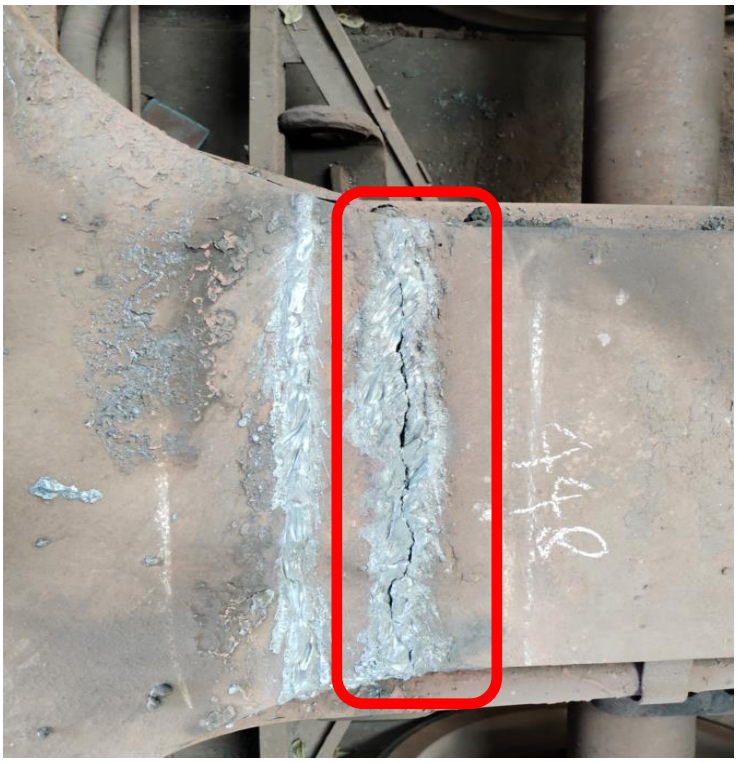


Centre Girder (Centre Sill-Middle) Top plate - Bolster Top plate weld joint failure

- **Crack in web plate of Centre Girder below the weld joint of top plates of Bolster assembly and Centre Girder:** Along with weld joint failure in top flanges (top plates of Centre Girder (Centre Sill-Middle & Body Bolster), crack in web plate of Centre Sill-Middle also observed (below these joints) as shown in image, below:

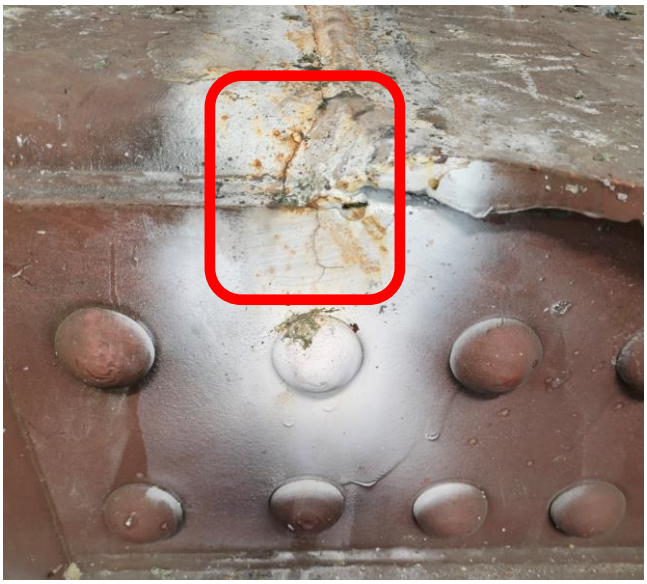
Crack in web plate of Centre Sill-Middle at joint between Centre Sill top plate and Bolster top plate

- **Weld joint crack between top plate of Centre Sill (towards Headstock) and top plate of Bolster assembly:**



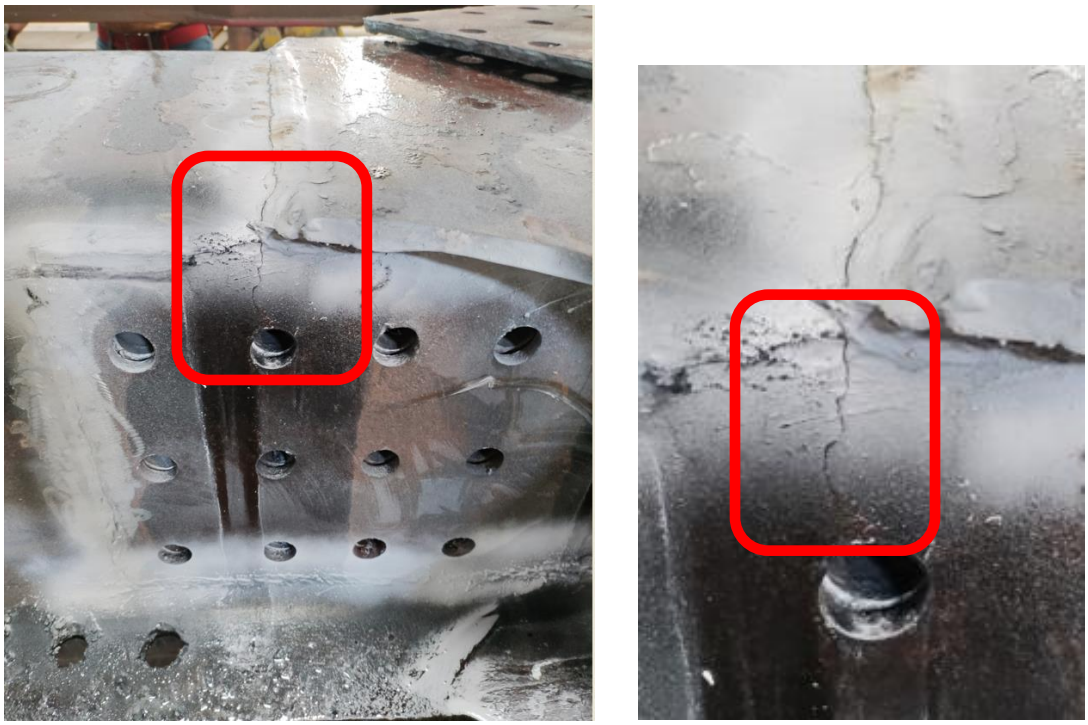
Centre Sill (towards Headstock) - Bolster top plate weld joint failure

- **Crack on Knee plate assembly of Centre Sill (below Centre Sill-Bolster assembly joint):**



Crack/failure of weld joint between Centre Sill top & Bolster top plate, crack also initiate & propagate in Knee plate.

- **Crack on Centre Sill web below Centre Sill - Bolster assembly top plate joint:**



Crack in web of Centre Sill below Centre Sill - Bolster top plate joint.

Section – B

Guidelines for general inspection and analysis of cracks of all BLC/BLCM/BLCS wagons arriving for ROH/POH

1. Comprehensive examination and Inspection of all BG Low Platform Container wagon received for ROH/POH/NPOH:

This procedure given under this section shall be applicable for all BG Low Platform Container wagons arriving for ROH/POH/NPOH. Before start of repair/maintenance of wagons, it is advised to carry out general visual inspection as well DP/MPT of wagon. This may involve removing certain component or assemblies, depending upon the severity of damages in the wagon:

a. Run out the Bogies and place the wagon so that it lies on level plane. It is better to place under frame on trusses or suitable fixtures to provide proper support and prevent any deflection.

b. Examine the wagon for any deformation or sagging at centre of wagon and at the head stock ends.

c. Carry out the DP test (or Magnetic Particle Testing) at all critical weld joints in the wagon. The details of 'Critical joints' are given in the drawing no. CONTR-9405-S-08 for BLC/BLCM (A-Car and B-car) wagon and drawing no. WD-15011-S-09 for BLCS (A-Car and B-car) wagon.

d. If needed, remove the Air Brake pipes and its components (near the failure/crack location) for proper inspection and also to prevent them from getting damage during inspection or repair.

e. Carry out a visual inspection (at failed joint/cracked location) from outside as well as inside/underside of Centre Sill/Bolster/Solebar/Centre Girder to find out any crack/failure on

   a) Centre Sill (CRF/HR section) web, fillet portion (vertical joint with Body Bolster)
   b) Centre Sill - Bolster weld joint (top and bottom flanges)
   c) Bolster-Centre Girder (Centre Sill Middle) joint
   d) Bolster - Solebar joint location.
   e) Gusset Plate joints (all round)

   If required, carry out the Dye Penetrant (D.P.) test or Magnetic Particle Test on Centre Sill section (at joints provided between Body Bolster and other sub-assemblies) to assess the crack.

f. In case of detection of a failed/cracked weld joint between Centre Sill (End) - Body Bolster top flanges joint crack-

   a) Cut out the Back Stop rivets and remove the back stop from Centre Sill assembly.

   b) Remove the Knee assembly from wagon at damaged/cracked Centre Sill location form the wagon (Item 30 of drawing no CONTR-9405-S/06A, latest for for BLC/BLCM (A-Car and B-car) wagon and Item 30 of drawing no. WD-15021-S-07 for BLCS (A-Car and B-car) wagon).

   c) Carry out weld joint repair for said section as per guidelines given under **Section-C.**

   d) Again carry out a visual inspection from outside and inside of Centre Sill (at failed joint /cracked location) to find out any crack/failure on Centre Sill (CRF/HR section) web. If required, carry out the Dye Penetrant (D.P.)/Magnetic Particle Test on Centre Sill

section web (near joints provided between Body Bolster and Centre Sill) to assess the crack.

g. Moreover, carry out weld joint examination and quality of weld (like size, lack of weld fusion, under-fill welds joints etc.) at the following locations:

   a) Weld joint of the top plate (underside) of Bolster top flange with Centres Sill-web.

   b) Examine the Back strip and its welding details provided at underside of Centre Sill - Bolster weld joint (from inside of Centre Sill).

   c) Weld joint between Centre Sill web and Bolster web plate (from outside and inside of Centre Sill).

   d) Welding and fitment of Knee assembly between Bolster-web and Centre Sill web.

   e) Welding and fitment of Gusset Plate (Bottom) Centre Sill Middle with Bolster-bottom plate, Centre Sill (Middle) bottom flange.

   f) Welding and fitment of Gusset plate (Lower end/Raised end) with Bolster-bottom plate, Centre Sill (End) bottom flange.

h. If any deficiency or improper welding is found than it has to be corrected as per details given in Section-C of this document else key drawings of respective wagon/IS:9595.

i. Any other way of inspection, not covered by this procedure that Depots/Workshops, based on their previous experience, gained while undertaking repair of BLC/BLCM and BLCS wagons may also be explored.

Section – C

Procedure for general repair of welding joint failures and cracked sub-assemblies

The repair of subject BLC/BLCM/BLCS (A-Car& B-Car) wagon shall be carried out as per below:

1. Inspection and analysis of crack

a. Before start of repair of wagon it is advised to carry out final inspection of wagon after removing certain component or assemblies.

b. Run out the Bogies and place the wagon so that it lies on level plane. It is better to place under frame on trusses or suitable fixtures to provide proper support and prevent any deflection.

c. Remove the Air Brake pipes and its components (respective end) to prevent them from getting damage during repair.

d. Carry out a visual inspection from outside and inside of Centre Sill (at failed joint /cracked location) to find out any crack/failure on (i) Centre Sill (CRF/HR section) web , fillet portion (ii) Centre Sill - Bolster joint (iii) Bolster Centre Girder Joint and Bolster - Solebar joint location. If required carry out the Dye Penetrant (D.P.) or Magnetic Particle test on centre sill section (at joints provided between Body Bolster and Centre Sill) to assess the crack.

e. Deformation (if any) observed in subassembly/assemblies shall be first corrected by Thermal or Mechanical methods.

f. Annexure-1 contains generic details of welding of butt joints with edge preparation, sealing run and shall be followed for all such joints. Mechanical method of edge preparation needs to be followed.

2. Procedure for repair of Welding joint Cracks between top plates of Centre sill (CRF/HR section) and Body Bolster:

The joint between Body Bolster and Centre sill (Headstock side) is a Critical joints and therefore care should be needed while repairing. Before start of repair it is better to ensure securement of under frame on suitable fixtures to provide proper support and prevent any movement and deflection.

2.1. First remove the 3.15mm thick Backing Strip, if previously provided, below the weld joint (from inner side of Centre Sill).

2.2. Gouge out and remove the (earlier) weld metal between Centre Sill top flange and Body Bolster top plate. Prepare V-Groove as per RDSO drg. no. CONTR-9405-S/08 or WD-15011-S-09, as applicable, depending upon the location of joint in wagon.

2.3. Ensure that the surrounding surface to be welded (at least 12mm both side) should be free of scale, dirt, grease, paint, rust etc.

2.4. Deformation (if any) observed in subassembly/assemblies shall be first corrected by Thermal or Mechanical methods. Ensure the critical dimensional parameters as per drg. CONTR-9405-S/04 (for BLC/BLCM A-Car), CONTR-9406-S/04 (for BLC/BLCM B-Car), WD-15011-S/04 (for BLCS A-Car) and WD-15012-S/04 (for BLCS B-Car).

2.5. Prepare a new Backing Strip and weld as per details of Joint F1-F1 of above mentioned drg. (CONTR-9405-S/08 or WD-15011-S-09, as applicable).

2.6. Give root run in the groove using basic coated Low Hydrogen type electrode of 3.15 mm diameter, Class C1 as per IRS: M 28-02 (or latest). Welding current should be kept between 90-120 Amps or as per recommendations of electrodes manufacturer.

2.7. Clean the weld deposit using pencil grinder and carry out DP test/ Magnetic Particle test to ensure for crack free weld deposit in root run.

2.8. Weld the V-groove using basic coated low hydrogen type electrode of diameter 4.0 mm, class C1 as per IRS: M 28-02 (or latest). Welding current should be kept between 90-120 Amps or as recommended by electrode manufacturer.

2.9. Grind the welded surface even. It should be strictly ensured that the weld is properly grinded and in no condition the weld beads/deposition should project above under frame level (under frame members making platform/bed uneven for resting of containers).

2.10. Carry out the Dye Penetrant (D.P.)/Magnetic Particle test at all weld joints (joints provided between Body Bolster and other subassemblies) after completion of welding

2.11. If welding with DC, electrode must be connected with positive terminal of welding equipment.

2.12. If welding with AC, the OCV of welding equipment shall be min 70 Volts or as per recommendation of electrode manufacturer.

2.13. The electrode must be preheated to about 250°C for two hours before use or as recommendations by manufacturer.

2.14. MIG/MAG welding filler wires of diameter 1.2mm approved under Class III as per IRS M-46-03 (or latest) may preferably be used in place of electrodes as above. Welding current should be as per recommendations of electrodes manufacturer.

Any short or intermittent welding observed around the Body Bolster assembly - Centre Sill assembly joint shall be cleaned and re-applied as per relevant drawings of the wagon. All weld joints on top of underframe (wagon floor) should be ground to ensure it does not project above the floor level.

3. Procedure for repair of crack in Web of Centre Sill (Headstock side):

Before start of repair it shall be ensured that under frame is secured properly on trussels or suitable fixtures to provide proper support and prevent any movement and deflection during repair.

3.1. Cut out the Back Stop rivets and remove the Back Stop from Centre Sill assembly.

3.2. Carry out a visual inspection from outside and inside of Centre Sill (at failed joint /cracked location) to find out any crack/failure on (i) Centre Sill (CRF/HR section) web , fillet portion (ii) Centre Sill - Bolster joint. If required carry out the Dye Penetrant (D.P.)/ Magnetic Particle test on Centre Sill section (at joints provided between Body Bolster and other Centre Sill) to assess the crack.

3.3. For weld joint between Centre Sill – Bolster, first grind and remove the previous cracked weld between Centre Sill top and Body Bolster top plate.

3.4. First remove carefully Knee Assembly (Item 30 of drawing no. CONTR-9405-S/06A, latest for for BLC/BLCM (A-Car and B-car) wagon and Item 30 of drawing no. WD-15021-S-07, latest for BLCS (A-Car and B-car) wagon (at cracked Centre Sill-Body Bolster location form the wagon without damaging the body) provided on both sides of Centre Sill.

3.5. Grind the earlier welds beads/deposition (at Knee Assembly, around crack location) to make surface even.

3.6. Carry out visual inspection of cracked Centre Sill web. If required carry out the Dye Penetrant (D.P.) /Magnetic Particle test on cracked area of the Centre Sill web (below joint of Body Bolster top and Centre Sill) to access the extant of crack in Centre Sill Web.

3.7. Drill arrestor hole of 10mm dia., about 10mm from the tip of the crack (at one/both ends depending upon crack location), in the direction of propagation of crack (up to C/s plate depth)

3.8. Gouge V-groove on the crack up to the arrestor hole such that included angle for 'V' groove should be 60-70 degree (for sections other than welded).

3.9. Ensure that the surrounding surface to be welded should be free of scale, dirt, grease.

3.10. Give root run in the groove using low heat input, pre-heated, low hydrogen type electrode of 3.15mm dia to IRS: M 28 – 02: C1.

3.11. Build up weld with electrode of 4.0mm dia. to same specification.

3.12. Grind the welded surface even.

3.13. The Underframe now should be inverted (bottom side up). From inner side of the Centre Sill, the back of the root run carried from outside should be gouged out and sealing run should be provided. (See Details in Annexure-A). This is essential to ensure complete penetration and to ensure clean and a sound metal deposition.

3.14. Grind the welded surface even.

3.15. Carry out the Dye Penetrant (D.P.)/ Magnetic Particle test on the welded joint, from both outside and inside (if possible) of the Centre Sill.

3.16. If welding with DC, electrode must be connected with positive terminal of welding equipment.

3.17. If welding with AC, the OCV of welding equipment shall be min 70 Volts or as per recommendation of electrode manufacturer.

3.18. The electrode must be preheated to about 250°C for two hours before use or as recommendations by manufacturer.

3.19. MIG/MAG welding filler wires of diameter 1.2mm approved under Class III as per IRS M-46-03 (or latest) may preferably be used in place of electrodes as above.

4. Repair procedure for weld joint failures of Solebar with Body Bolster top and bottom flanges and Body Bolster top flange with Centre Girder (Centre Sill assembly middle) top flange:

The joints between Body Bolster and Solebar or between Body Bolster and Centre Girder (Centre Sill-Middle) are Critical joints as per 'Welding Details' drawing no. CONTR-9405-S/08 or WD-15011-S-09. Following procedure is proposed for repair of cracked/failed weld joint (with no crack/failures in underframe member i.e. Solebar web and Centre Girder Web etc. in the vicinity of Body Bolster) for BG Low Platform Container Flat wagons. Before start of repair it is better to ensure securement of under frame on suitable fixtures to provide proper support and prevent any movement and deflection.

4.1. Before start of repair of cracks the nature/extent of cracks (top of bottom side weld) should be carefully examined. It should be ensured that there is no major deformation or sagging in Sole bar/Centre Girder.

4.2. Position the wagon in top or bottom up based on observance of crack. In case cracks are observed on both top and bottom joint then the procedure can be started with top up first and followed by bottom joint or vice –verse.

4.3. Gouge out and remove the weld metal. Prepare V-Groove as per RDSO drawing (Welding Details) number CONTR.-9405-S/8 or WD-15011-S-09, as applicable, depending upon location of joint in wagon.

4.4. Resulting V-groove to be welded, while ensuring that surrounding surface, for a distance of at least 12 mm both sides, should be free from scale, dirt, grease, paint, rust etc.

4.5. Give root run in the groove using basic coated low Hydrogen type electrode of 3.15 mm diameter, Class C1 as per IRS: M 28-02 (or latest). Welding current should be kept between 90-120 Amps or as per recommendations of electrodes manufacturer.

4.6. Clean the weld deposit using pencil grinder and carry out DP test/Magnetic Particle test to ensure for crack free weld deposit in root run.

4.7. Weld the V-groove using basic coated low Hydrogen type electrode of diameter 4.0 mm, Class C1 as per IRS: M 28-02 (or latest). Welding current should be kept between 90-120 Amps or as recommended by electrode manufacturer.

4.8. Grind the welded surface even. It should be strictly ensured that the weld is properly grinded and in no condition the weld beads/deposition should project above under frame level (under frame members making platform/bed for resting of containers).

4.9. Carry out the Dye Penetrant (D.P.)/Magnetic Particle (MPI) test at all critical weld joints (joints provided between Body Bolster and other subassemblies) after completion of welding.

4.10. The underframe should be inverted (bottom/top side up) so that weld on other side can be gouged out and sealing run should be provided (see Details in Annexure-A). This is essential to ensure complete penetration and to ensure clean and a sound metal deposition.

4.11. Place the underframe on bogies ensuring the critical dimensional parameters as per drg. CONTR-9405-S/04 (for BLC/BLCM A-Car wagon) and CONTR-9406-S/04 (for BLC/BLCM B-Car), WD-15011-S/04 (for BLCS A-Car) and WD-15012-S/04 (for BLCS B-Car).

4.12. If welding with DC, electrode must be connected with positive terminal of welding equipment.

4.13. If welding with AC, the OCV of welding equipment shall be minimum 70 volts.

4.14. The electrode must be preheated to about 250°C for two hours before use or as recommendations by manufacturer.

4.15. MIG/MAG welding filler wires of diameter 1.2mm approved under Class III as per IRS M-46-03 (or latest) may preferably be used in place of electrodes as above. Welding current should be as per recommendations of electrodes manufacturer.

Any short or intermittent welding observed around the Body Bolster assembly - Centre Sill assembly joint shall be cleaned and re-applied as per relevant drawings of the wagon. All weld joints on top of underframe (wagon floor) should be ground to ensure it does not project above the floor level.

5. Procedure for repair of full welding crack at web of Sole Bar of Container wagon:

Before start of repair, it is better to ensure securement of under-frame on suitable fixture in bottom side up position to provide proper support and removal of sub-assemblies (Air Brake pipes etc.) as required. The extent of cracks should be carefully examined. It should be ensured that there is no major deformation or sagging is observed in sole bar.

5.1. The under frame should be inverted, so that welding crack at web, bottom plate etc. of Sole Bar web can be easily accessed.

5.2. Carefully access the extent of crack by Dye Penetration (D.P.)/ Magnetic Particle (MPI) test in the vicinity of crack.

5.3. If the crack is not through (on complete web length) then drill an arrester hole of 10mm dia., about 10mm from the tip of the crack (at one/both ends depending upon crack location), in the direction of propagation of crack.

5.4. Gouge out and prepare V-Groove as per RDSO drawing number CONTR.-9405-S-08/WD-15011-S-09 (as applicable) or IS:9595 depending upon location of joint in wagon.

5.5. Resulting V-groove to be welded, ensure that surrounding surface, for a distance of at least 12 mm both sides, should be free from scale, dirt, grease, paint, rust etc.

5.6. Give root run in the groove using basic coated Low Hydrogen type electrode of 3.15 mm diameter, Class C1 as per IRS: M 28-02(or latest). Welding current should be kept between 90-120 Amps or as per recommendations of electrodes manufacturer.

5.7. Build up weld with electrode of 4.0mm dia. to same specification.

5.8. Clean the weld deposit using pencil grinder and carry out DP/Magnetic Particle (MPI) test to ensure for crack free weld deposit in root run.

5.9. Weld the V-groove using basic coated Low Hydrogen type electrode of diameter 4.0 mm, Class C1 as per IRS: M 28-02(or latest). Welding current should be kept between 90-120 Amps or as recommended by electrode manufacturer.

5.10. Carry out the Dye Penetrate (D. P.)/ Magnetic Particle test on the new welded joint.

5.11. Prepare a patch plate (12 mm thick) of at least 200 mm length as per item no. 2 of sketch no. 'BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-1' to strengthen Solebar. The plate should be provided from the outer side of Solebar web (at all locations having cracked) in wagon (up to area easily assessable). Weld the patch plate from all around.

5.12. If welding with DC, electrode must be connected with positive terminal of welding equipment.

5.13. If welding with AC, the OCV of welding equipment shall be minimum 70 volts.

5.14. The electrode must be preheated to about 250°C for two hours before use or as recommendations by manufacturer.

5.15. MIG/MAG welding filler wires of diameter 1.2mm approved under Class III as per IRS M-46-03 (or latest) may preferably be used in place of electrodes as above. Welding current should be as per recommendations of electrodes manufacturer.

In case of cracked 'stiffener' in Solebar, same shall be replaced with new components as given in relevant drawings (as shown Item 1.14 for BLC/BLCM/BLCS A-Car (of drg. no. CONTR-9405-S/6 or WD-15011-S-06) and Item 1.9 for BLC/BLCM/BLCS B-Car (of drg. no. CONTR-9406-S/5 or WD-15012-S-05).

6. Procedure for repair of cracks of Centre Girder- Web (near weld joint with Body Bolster flanges):

6.1. Before start of repair of cracks the nature/extent of cracks should be carefully examined. It should be ensured that there is no major deformation or sagging is observed in Centre Girder/wagon body.

6.2. Before start of repair it is better to ensure placement of under frame on trusses or suitable fixtures to provide proper support and prevent any movement and deflection.

6.3. Deformation (if any) observed in subassembly/assemblies shall be first corrected by Thermal or Mechanical methods.

6.4. Carefully access the extent of crack by visual or Dye Penetration (D.P.) /Magnetic Particle test.

6.5. Drill arrestor hole of 10mm dia., about 10mm from the tip of the crack (at one/both ends depending upon crack location), in the direction of propagation of crack.

6.6. Gouge V-groove on the crack up to the arrestor hole such that included angle for 'V' groove should be 60-70 degree (for sections other than welded).

6.7. Ensure that the surrounding surface to be welded should be free of scale, dirt, grease, paint rust etc.

6.8. Give root run in the groove using low heat input, pre-heated, Low Hydrogen type electrode of 3.15mm dia to IRS: M 28 – 02: C1.

6.9. Build up weld with electrode of 4.0mm dia. to same specification.

6.10. From other side of the Centre girder, the back of the root run carried from inner side should be gouged out and sealing run should be provided. (See Details in Annexure-A). This is essential to ensure complete penetration and to ensure clean and a sound metal deposition.

6.11. Carry out the Dye Penetration (D.P.) /Magnetic Particle test on the welded joint.

6.12. Grind the welded surface even.

6.13. Prepare strengthening plate as per Item -1 of sketch no. 'BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-1'. The plate should be welded all around on outer side of Centre Girder (face towards Solebar) on both ends (total 4 nos.) at the joint (Body Bolster to Centre Girder). Proper clamping of plate with web should be ensured before start of welding. The above procedure is for cracks on Centre Girder web below weld joint between Centre Girder top flange and Body Bolster top plate.

6.14. If welding with DC, electrode must be connected with positive terminal of welding equipment.

6.15. If welding with AC, the OCV of welding equipment shall be min 70 Volts.

6.16. The electrode must be preheated to about 250°C for two hours before use or as recommendations by manufacturer.

6.17. MIG/MAG welding filler wires of diameter 1.2mm approved under Class III as per IRS M-46-03 (or latest) may preferably be used in place of electrodes as above. Place the underframe on bogies ensuring the critical dimensional parameters as per relevant drawings after carrying out repair given above.

6.18. It should be ensured that the weld joint/surface on top of the underframe floor (bed for container) should be ground even/flush with the underframe floor as the surface is bearing surface with the container loaded on top.

6.19. Apply relevant coats of primer and paint on the welded/repaired strengthened area.

7. Procedure for Fitment of new Centre Sill-Knee assembly and other components to the damaged wagons or wagons without this sub-assembly

7.1. Before fitment of Knee assembly (Item 30 of drawing no CONTR-9405-S/06A, latest for BLC/BLCM (A-Car and B-car) wagon and Item 30 of drawing no. WD-15021-S-07, latest for BLCS (A-Car and B-car) wagon, it is better to ensure securement of under frame on trusses or suitable fixtures to provide proper support and prevent any movement and deflection.

7.2. Prepare new Knee assembly (to suit) as per 'Item 30 of drawing no CONTR-9405-S/06A, latest for for BLC/BLCM (A-Car and B-car) wagon and Item 30 of drawing no. WD-15021-S-07, latest for BLCS (A-Car and B-car) wagon, as applicable. The webs & ribs of Knee assembly side should be welded in position to ensure proper welding (ensuring clearance from Air Brake pipes). Proper clamping of rib assembly should be ensured before start of welding. All around welding to be provided.

7.3. Build up weld with electrode of 4.0mm dia. to same specification.

7.4. The Knee assembly should be welded on both side of the Centre Sill as shown in drawing number CONTR-9405-S/05 (latest), item no. 19 for BLC/BLCM (A-Car &B-Car) and drawing number WD-15011-S/05 (latest), item no. 19 for BLCS (A-Car &B-Car). Maintain the welding around the Knee as per relevant drawing of wagon.

7.5. After completion of welding, all earlier removed pipes and sub-assemblies (Back Stop etc.) should be re-fitted as per relevant Air Brake drawings mentioned in Index drawing of BLC/BLCM wagon (i.e. CONTR-9405-S/01(latest) for A-Car & CONTR-9406-S/01(latest) for B-Car) and BLCS wagon (i.e. WD-15011-S/01(latest) for A-Car & WD-15012-S/01(latest) for B-Car).

(Note-It is suggested that ribs of Knee assembly (toward Air Brake pipe layout) can be tack welded first and final welding can be carried out (in-situ). fitment of pipes shall be carried out after finalisation of all repair and strengthening as per the procedure).

Section – D

Strengthening of Underframe

Strengthening of BLC/BLCM (A-Car& B-Car) and BLCS (A-Car & B-Car) wagon shall be carried out as per below:

This section presents the modification/new features to be added to BLC/BLCM (A-Car& B-Car) and BLCS (A-Car& B-Car) wagon design to strengthen the underframe (based on RDSO field experiences). These strengthening features should be incorporated in subject Container Flat wagon undergoing POH/NPOH at workshop, having failures/cracks in underframe members (observed as per Section-B & C) explained earlier.

1. Procedure for Strengthening/repair of cracks of Centre Girder- Web (near weld joint with Body Bolster flanges):

1.1. After completion of repair of above mentioned weld failure strengthening of critical joint of Centre Girder shall be undertaken at all four locations in wagon. Prepare strengthening plates as per Item -1 of sketch no. 'BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-1'. The plate should be welded all around on outer side of Centre Girder (face towards Solebar) at the joint. Proper clamping of plate with web should be ensured before start of welding. Then ribs shall be welded in situ. The above strengthening procedure is to be carried out on all damaged wagons.

1.2. The procedure of welding should be same as specified above for the repair procedure excluding steps/test not applicable.

1.3. After completion of welding all earlier removed pipes and sub-assemblies should be re-fitted as per Air Brake drawings mentioned in Index drawing of BLC/BLCM wagon (i.e. CONTR-9405-S/01(latest) for A-Car & CONTR-9406-S/01(latest) for B-Car) and BLCS wagon (i.e. WD-15011-S/01(latest) for A-Car & WD-15012-S/01(latest) for B-Car).

1.4. Apply relevant coats of primer and paint on the welded/repaired strengthened area.

2. Procedure for Strengthening cracks of Centre Sill-Bolster joint (near weld joint with Body Bolster web plate):

2.1. After completion of repair of above mentioned weld failure strengthening of critical joint between Centre Sill-Bolster subassembly shall be undertaken at Lower end of A-Car (two locations) and both end of B-Car (four locations) in wagon. Prepare strengthening plates as per Item -1 of 'BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-2' The plate should be welded all around on inner side of Centre Sill (inside face of Centre Sill) and web of Bolster, at the vertical joint. Proper clamping of plate with both web of centre sill (inside face of centre sill) and Bolster should be ensured before start of welding. Then ribs shall be welded in situ. The above strengthening procedure is to be carried out on all damaged wagons.

2.2. The procedure of welding should be same as specified above for the repair procedure excluding steps/test not applicable.

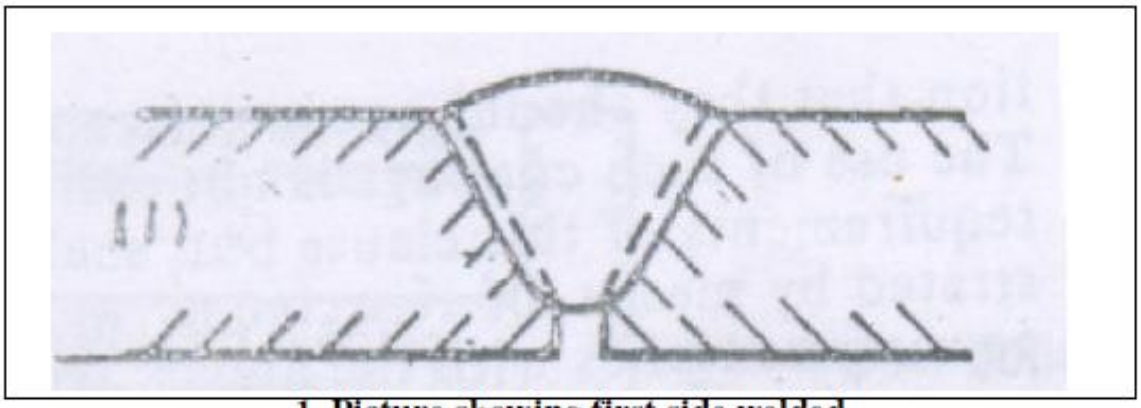
2.3. After completion of welding all earlier removed pipes and sub-assemblies etc. should be re-fitted as per Air Brake drawings mentioned in Index drawing of BLC/BLCM wagon (i.e. CONTR-9405-S/01(latest) for A-Car & CONTR-9406-S/01(latest) for B-Car) and BLCS wagon (i.e. WD-15011-S/01(latest) for A-Car & WD-15012-S/01(latest) for B-Car).

2.4. Apply relevant coats of primer and paint on the welded/repaired strengthened area.

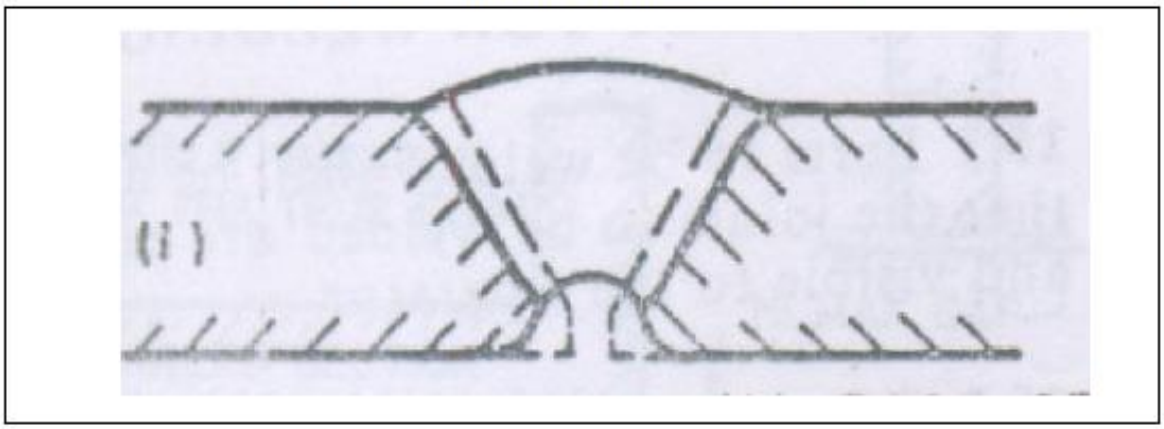
General Note:

1. Electrodes used for repair procedure should be as specified in G-72 (latest revision) or extent guidelines of RDSO. Wherever preheating is desired for Low Hydrogen electrodes (as per manufacturer guidelines) should be strictly followed. Suitable heat boxes should be arranged for maintaining the electrodes at desired temperature during welding as specified by manufacturer of electrodes. Recommendations for Metal Arc welding of carbon steel as per specification IS:9595 (latest) should be referred for details not covered in the procedure.
2. Any short or intermittent welding observed around the Body Bolster assembly - Centre Sill assembly joint shall be cleaned and re-applied as per drawing no. CONTR-9405-S/08 for BLC/BLCM (A-Car and B-car) wagon and drawing no. WD-15021-S-09 for BLCS (A-Car and B-car) wagon, depending upon the location.
3. All weld joints on top of underframe (wagon floor) should be ground to ensure it does not project above the floor level.
4. Annexure-A contains generic details of welding of butt joints with edge preparation, sealing run and shall be followed for all such joints. Mechanical method of edge preparation needs to be followed.
5. Apply relevant coats of primer and paint on the welded/repaired strengthened area.
6. Deformation (if any) observed in subassembly/assemblies shall be first corrected by Thermal or Mechanical methods.
7. Wagon repaired through this procedure shall be marked with **'SPL-R-MM-YY' (where MM stands for month and YY stands for year of repair)** in black on white back ground on both sides of Centre Sill (undergone repair) for monitoring during service
8. Repair of failures can be done as per guidelines given in procedure (as applicable). Workshop/Depots needs to thoroughly examine the wagon underframe for any failure other than mentioned in this procedure also and brought in notice of Wagon Directorate, RDSO (As given in Annexure-B).
9. The repaired wagons need to be checked/monitored after every service examination (till first POH). Any issue or failure to be immediately reported to Wagon Directorate of RDSO.
10. Quality of workmanship and repair to be ensured during the repair.
11. This procedure has been prepared for carrying repair at different location of damages in wagon based on previous reported issues. In case of multiple failures in a wagon as detailed in para 3 of Section-A, than respective paras of this procedure, as given above, shall be followed for the repair of the same.
12. Although efforts have been made to cover recommendations/suitable practices for structural repair of damaged wagons, it is expected that Workshops/Depots, based on experience gained while undertaking repair/maintenance of IR wagons, would suitably add/ enrich this document.
13. General weld joint failure not covered in this guideline can be repaired by referring key drawings of corresponding wagons. However any critical failure of sub-assembly along with weld failure not covered under this document shall be reported to RDSO as per proforma of Annexure-B.

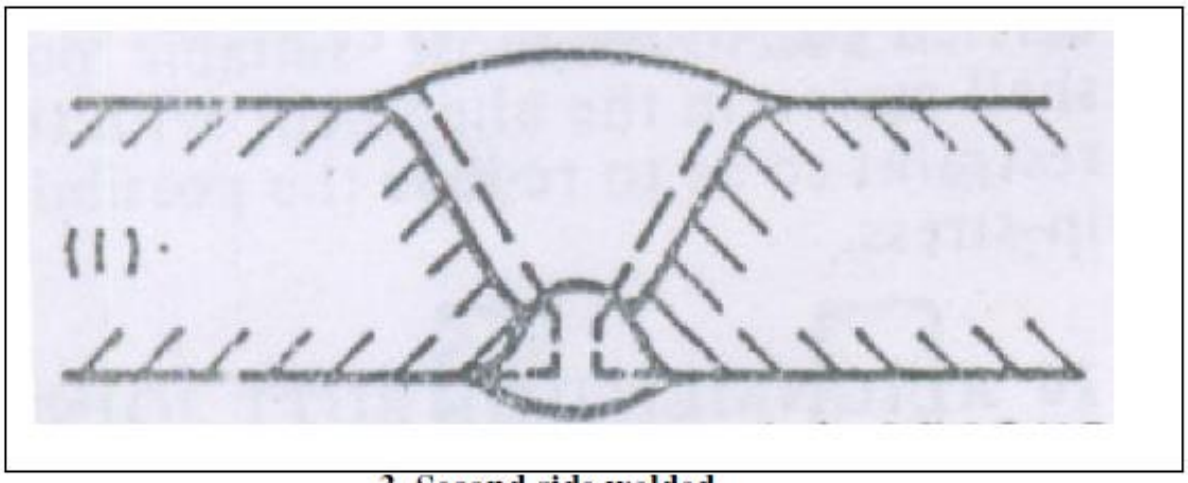
Annexure-'A'



1. Picture showing first side welded



2. Back of first run gouged out to clean metal



3. Second side welded

Procedure to provide back gouging & sealing run on cracked surfaces during repair

Annexure-'B'

Proforma of reporting major Cracks/failures in Low platform Container Flat wagons type BLC/BLCM and BLCS

In order to maintain record and analyse the failures, it is required to understand the trend of failure in these wagons. It is advised that Workshop's/Zonal Railways(ZR) before forwarding a major failure (other than that specified in this guideline) shall carry out analysis of failure of wagons and summit the following details/information for scrutiny of failure in subject wagon, and to analyses the operational conditions etc.

A. General Details

Wagon No	Built date	Owner	Received from (ZR)/CTO

B. Details of failure(weld/crack) observed

S.No	Description	Observation of Workshop/ZR	Remarks (i.e. special observation/photo enclosed/mapping sketch enclosed etc.)
1.	In case of cracks/failures having been noted on the section of Center Sill, Center Girder, Body Bolster & Solebar etc., clear and sufficient (sides, top/bottom) pictures of each of the case may be sent to this office.		
2.	Mapping of the failures/cracks (as per sketches enclosed with the letter) shall be done on sketch/drg. of wagon showing crack locations w.r.t. Headstock/Body Bolster including the dimensional details for subject wagon.		
3.	If failure has been reported by Zonal Railways in that case preliminary observations and investigations report submitted (if any)shall be sent		
4.	In case the investigation carried out does not include the following, the same may be appended to the report and sent to this office:		
4.1	Detail of wagon with make and built year, base depot particulars etc.		
4.2	Complete previous maintenance particulars (if any) of the wagon.		
4.3	Whether any other distress marks are noticeable in the wagons?(evidence of loose shunting, broken Striker Casting/Back Stop		

	rivets, hitting/dent on locks/lock brackets)		
4.4	Condition of the Draft Gear noted in each of the wagons and result of subsequent testing (as per standard RDSO guidelines) carried out, if any?		
4.5	Any sign of twist/sagging in the wagon under frame.		
4.6	Condition of the Wagon floor, Automatic Twist locks & lock brackets. Any weld failure or breakage of lock or its bracket shall be indicated in report. Any signs of damage to ATL and Brackets may also be indicated with pictures.		
4.7	Condition of bogies including any sign of damage on members, any variation in wheel size or wheel damage, condition of springs etc.		
4.8	Welding parameters noted in weld cracks as also in vicinity: i. Whether welding was continuous. ii. Measurements of the fillet radii at the cracked locations and/or in vicinity against the standard provisions as per drawings. iii. Were the weld joints at floor level grounded properly? iv. Any other defect related to welding, noticed by workshop/Depot		
4.9	Whether quality of fabrication was observed to be satisfactory of the wagon.		
5.	If any unusual spillage of material, corrosion of components, sub-assemblies is observed same to be reported in analysis report.		

Note:

i. It is requested the basic preliminary investigation along with the pictures and mapping of failure areas for every individual (as applicable) should invariably be sent to this office for better appreciation of such cases.

ii. ‘Sketch-BLC/BLCM/BLCS-(A-Car)-01’ & ‘Sketch-BLC/BLCM/BLCS-(B-Car)-02’ is enclosed for reference and mapping. Workshop can develop sketches in this line (for A & B-car) to cover any specific area.

SKETCH FOR MAPPING OF CRACKS ON BLC/BLCM/BLCS (A-CAR) WAGONS BY WORKSHOPS/ZONAL RAILWAYS

WAGON NO.-

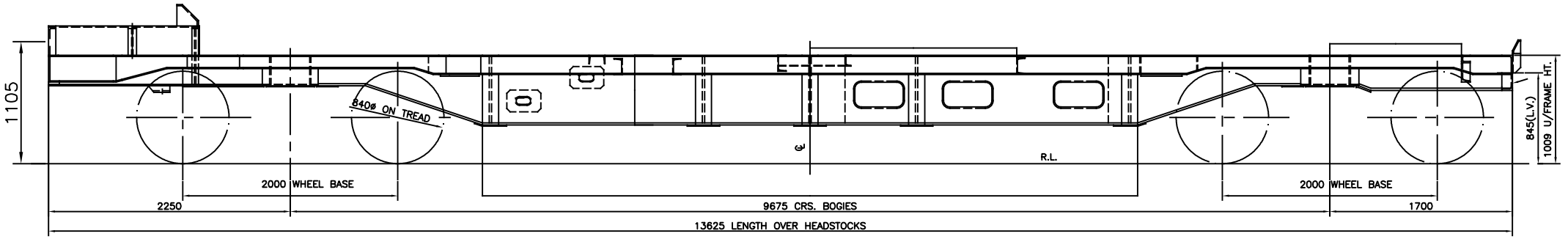
COMMISSIONED DATE.-

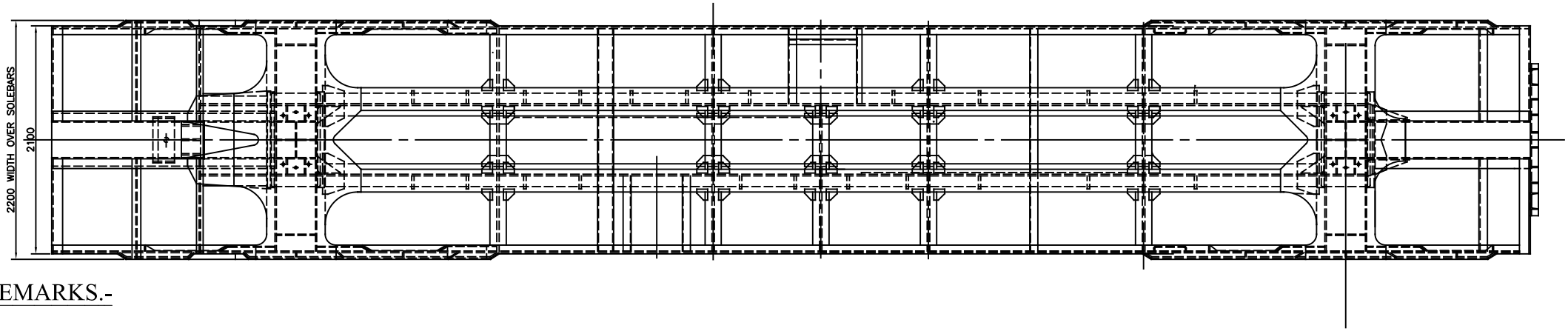
ROH/POH DETAILS.-

BUILT DATE.-

BUILT BY.-

BASE DEPOT.-





REMARKS.-

SKETCH-BLC/BLCM/BLCS-(A-CAR)-01

SKETCH FOR MAPPING OF CRACKS ON BLC/BLCM/BLCS (B-CAR) WAGONS BY WORKSHOPS/ZONAL RAILWAYS

WAGON NO.-

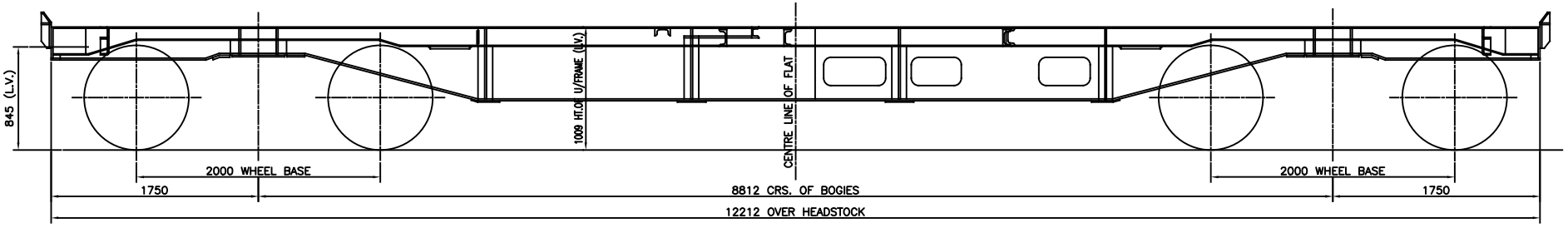
COMMISSIONED DATE.-

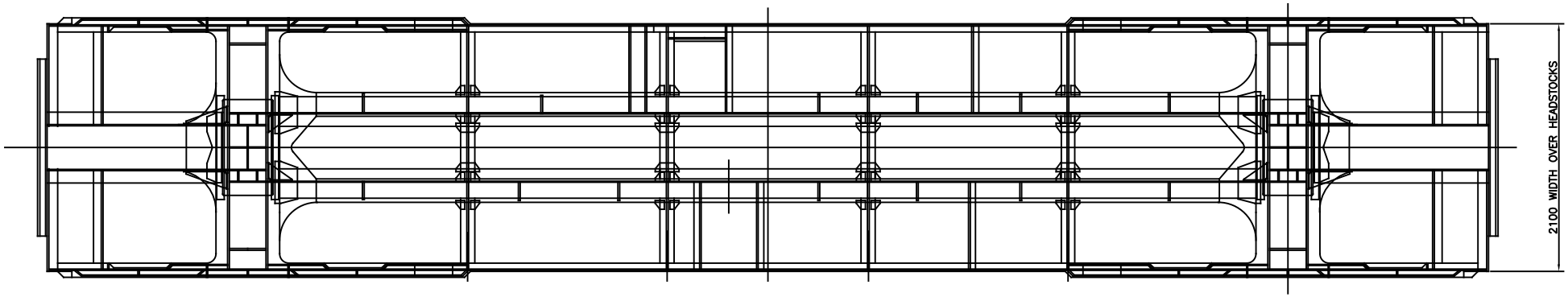
ROH/POH DETAILS.-

BUILT DATE.-

BUILT BY.-

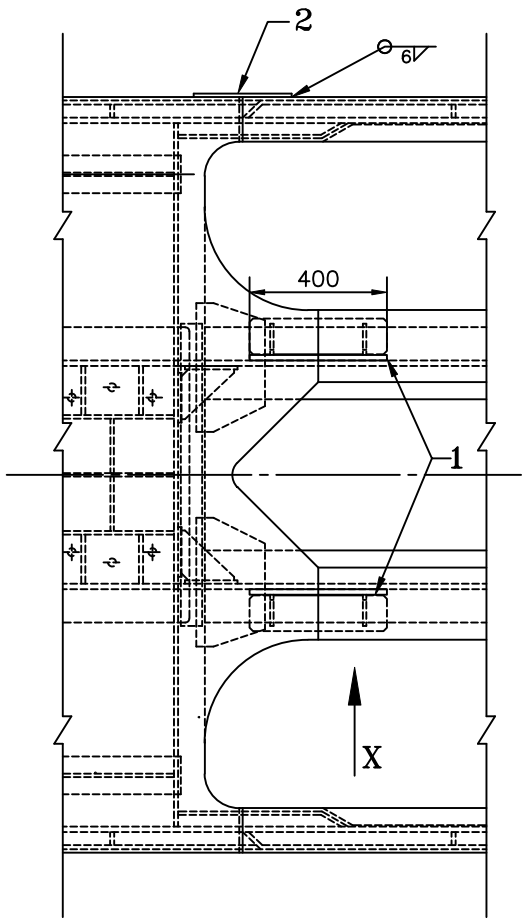
BASE DEPOT.-



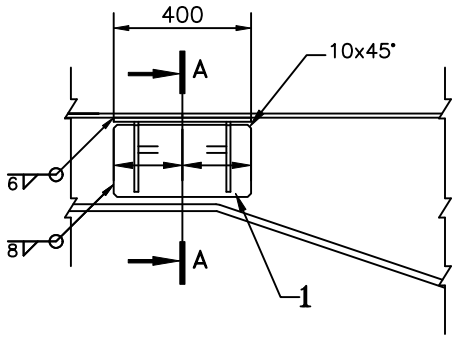


REMARKS.-

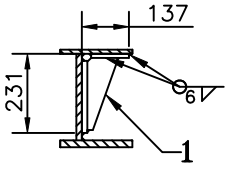
SKETCH-BLC/BLCM/BLCS-(B-CAR)-02



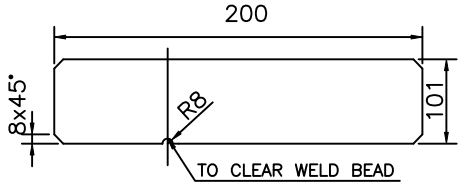
BODY BOLSTER AND CENTRE SILL (MIDDLE)



VIEW AT 'X'

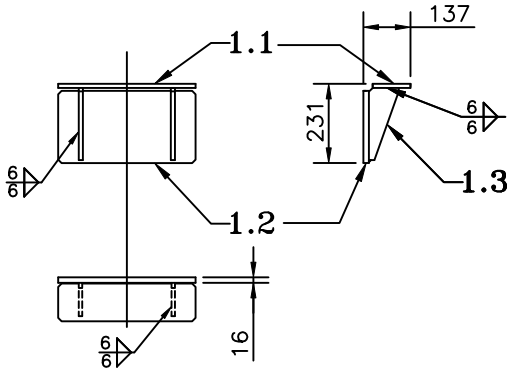


SECTION–AA

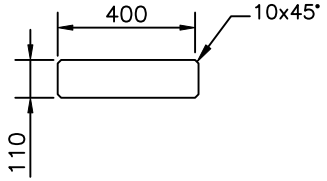


ITEM-2
(10 THICK)

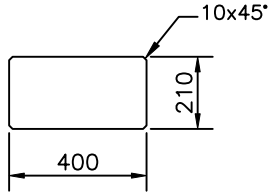
SOLE BAR STIFFNER.
(AT ALL LOCATIONS OF SOLE BAR WITH CRACKS)



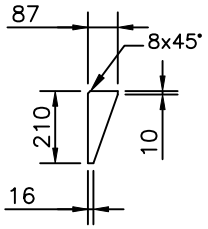
1
CENTRE GIRDER STIFFENER.



1.1
(12mm thick)



1.2
(16mm thick)

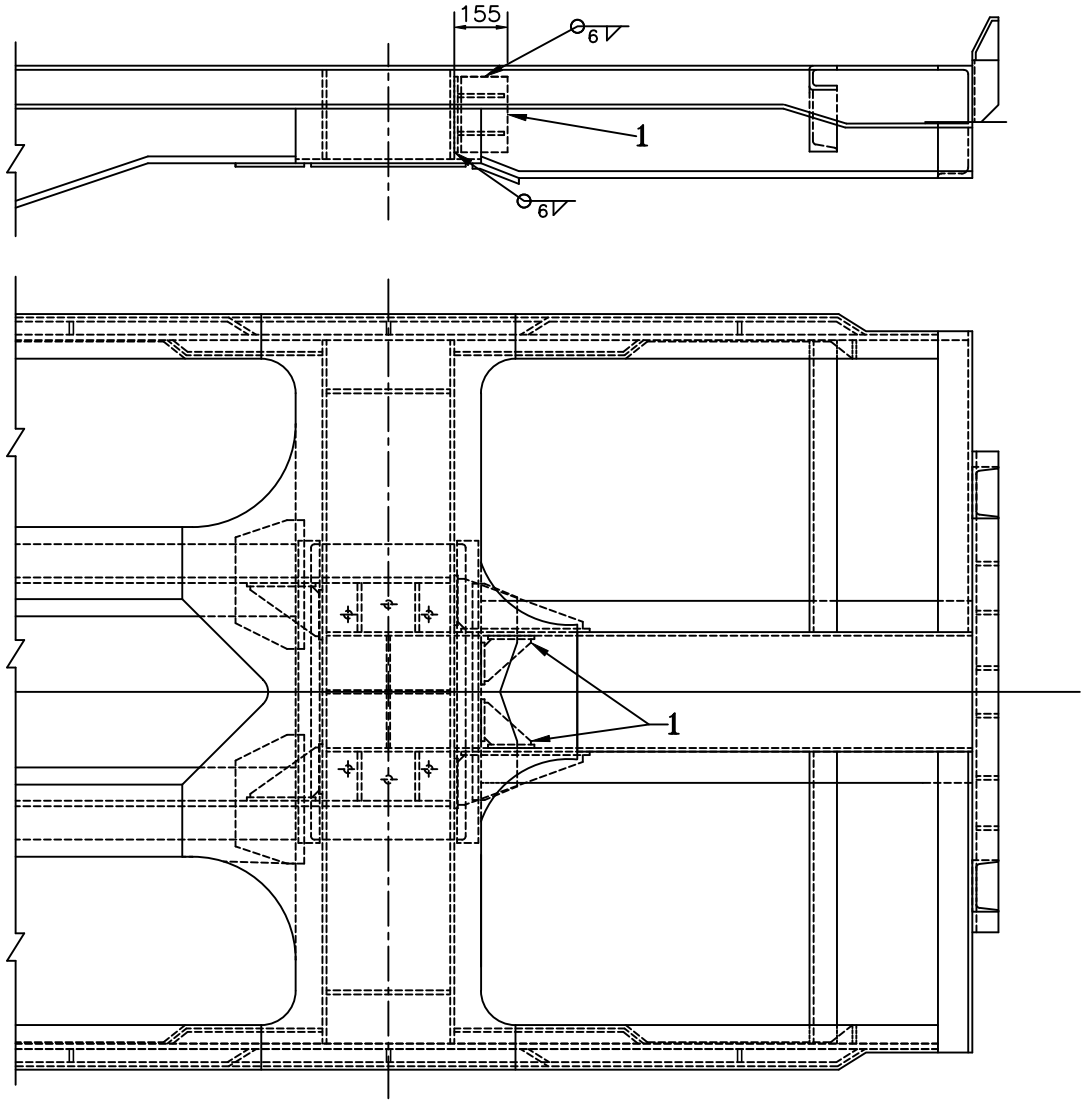


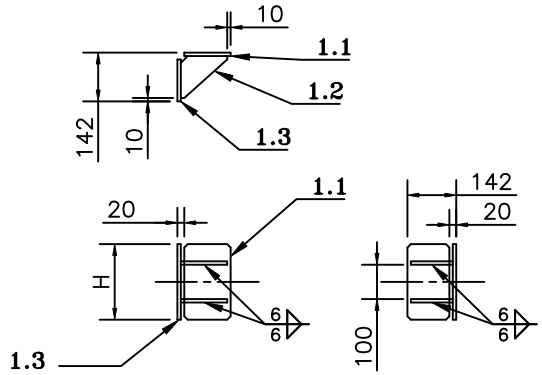
1.3
(12mm thick)

NOTE:–

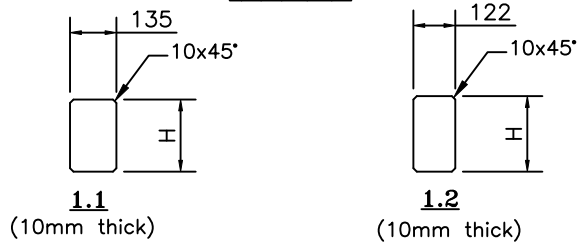
- MATERIAL OF ITEM 1 & 2 – IS:2062 450 BR WITH CU.
- THE DIM OF STRENGTHENING PLATES CAN BE REVISED IN–SITU TO SUIT THE ENVELOPE OF CRACK PORTION AND CLEAR EARLIER WELD BEAD.
- ITEM–1 SHALL BE PROVIDED AT ALL 4 LOCATIONS(I.E. BOTH SIDES).
- THIS SKETCH SHALL BE READ ALONG WITH SPECIFICATION NO. G–118

BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-1



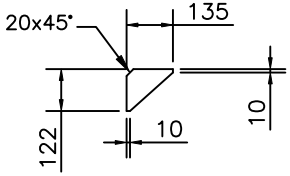


ITEM–1



1.1 (10mm thick)

1.2 (10mm thick)



1.3 (10mm thick)

HEIGHT 'H' OF THE STIFFENING PLATES SHOULD AS BELOW:

TYPE OF CENTRE SILL	HEIGHT (H)
CRF CENTRE SILL	220 MM
Z–SECTION HR CENTRE SILL	200 MM

NOTE:–

- MATERIAL OF ITEM 1 – IS:2062 450 BR WITH CU.
- THE DIMENSION OF STRENGTHENING PLATES CAN BE REVISED IN–SITU TO SUIT/CLEAR EARLIER WELD BEAD.
- ITEM–1 SHALL BE PROVIDED AT LOWER END OF A–CAR WHILE BOTH END OF B–CAR WAGON
- THIS SKETCH SHALL BE READ ALONG WITH SPECIFICATION NO. G–118

BLC/BLCM/BLCS-GENERIC-REPAIR-SKETCH-2