

Justification:
Instruction
(Maintenance)

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Title

**Vertical Transom
Plate Fractures in
Fabricated Y25
Bogie Frames**

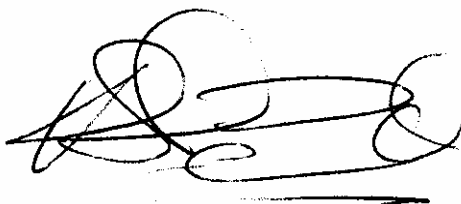
ENDORSEMENT & AUTHORISATION

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1. **INTRODUCTION**

Cracks have been found in the vertical transom plates of fabricated Y25 bogie frames (see NIR 1953). Generally, cracks in the outer vertical transom plates have been found to propagate from where the fillet weld (between the vertical and horizontal plates) ends to give clearance to the side bearer spring locator nuts. On the centre vertical transom plate, cracks propagate from the edges of the cut out, where the weld terminates without rounding the plate edge.

This document describes the inspection regime for the presence of cracks in the vertical transom plates of all fabricated Y25 bogie frames (see **Figure 1**).

It also details the requirements to be met when producing weld repair procedures and recommends extending the repair welds to remove any poor end geometry to reduce the propensity to initiate cracks.

2. **SCOPE**

The weld repair procedure is applicable to single cracks found in the vertical transom plates of fabricated Y25 bogie frames used on PWRA wagons.

3. **INSPECTION**

The vertical transom plates of fabricated Y25 bogie frames shall be visually inspected at VIBT and PPM for the presence of cracks. When a crack is found, its size shall be determined by Magnetic Particle inspection (MPI).

The wagon may continue in service where:

- a). The total length of the crack is less than 60mm.
- b). The crack has not turned at both ends.
- c). The crack does not extend into a horizontal transom plate.
- d). No other transom plates on that side of the bogie frame are found cracked.
- e). The crack length is monitored every two weeks.

4. **REPAIR CRITERIA**

It shall be permissible to weld repair cracks in the vertical transom plates where they do not extend either the full vertical depth or have not propagated into a horizontal plate. If cracks that extend the full vertical depth or run into a horizontal plate are found, then the bogie frame shall be deemed to be beyond repair by means of this instruction.

5. GENERAL REQUIREMENTS

5.1 NDT Personnel Certification

All personnel carrying out non-destructive testing in accordance with this procedure shall hold either a current PCN Level 1/2 certificate or ASNT Level 2 certificate of competence in magnetic particle inspection of general or wrought products.

Personnel holding PCN level 1 certification shall have access to a level 2 certificate holder who will provide technical supervision. Note that the PCN level 1 and PCN level 2 certificate holders do not have to be at the same site.

5.2 Welding Standards

Steel components shall be welded in accordance with the requirements of BS EN 1011 and TL/TS0528.

5.3 Welding Procedure Specifications (WPS)

Welding shall be carried out in accordance with a joint specific WPS approved in accordance with BS EN 15614 -1 in order to comply with the requirements of TL/TS0528. Evidence of approval shall be demonstrated to the satisfaction of the PWRA Management Group before any weld repairs (or trial repairs) are carried out.

5.4 Welder Approval

All welding operators shall have relevant BS EN 287 approval.

5.5 Consumables

Consumables shall comply with the requirements of the appropriate BS EN standard and be of a type shown in the relevant WPS. They shall be stored, handled and used in accordance with the manufacturer's recommendations.

6. SAFETY

When working to this specification, it is the responsibility of the contractor to ensure that all relevant local and mandatory safety instructions are strictly followed. This shall include, where applicable, adherence to COSHH assessments and Railway Group Standards.

Aerosol propelled white contrast paint and magnetic ink create an airborne residue, a protective breathing mask, and non-vented eye shields shall be used when using these products.

Magnetic particle inks may constitute a health hazard to the skin; liquid resistant gloves shall be worn whilst using such inks.

Aerosol propelled products can concentrate at floor level, and can be highly flammable. Thus, while these products are in use a strict NO SMOKING rule shall be enforced.

When not in use, all aerosols shall be stored in a fireproof cabinet away from heat.

For the purpose of welding reclamation, attention is also drawn to the following Health & Safety Executive document:

HS(G) 118 'Electrical safety in arc welding'

This can be obtained from: HSE Books
 PO Box 1999
 Sudbury
 Suffolk
 CO10 6FS

7. PREPARATION FOR WELDING

Remove all paint, grease, rust, scale etc. adjacent to the cracked area(s) using a hand held or rotary wire brush and carry out MPI to determine the full extent of the crack.

Excavate the crack over its entire length using a suitable sized grinding disc and/or rotary burring tool. Continue the excavation to a distance of 25mm at each end of the visible crack length and carry out further MPI to verify complete removal of the crack. If the crack is still evident, further grinding and crack detection shall be carried out until the area is proven defect free.

At each end of the excavation further grind to produce a 1 in 4 taper to minimise the risk of stop/start defects during the welding operation. Use a rotary or hand held wire brush and suitable sized sanding disc, to remove all traces of dirt, grease, scale and paintwork within 25mm of all grinding.

8. WELDING REPAIR PROCEDURE

Preheat the excavation and surrounding area to a temperature of 20°C in preparation for welding. This temperature shall be maintained and checked throughout the welding operation by use of a suitable temperature indicating device (i.e. temperature indicating crayon or digital thermometer).

Note: All arc welding equipment shall be in a calibrated condition and only consumables of the type specified in the WPS shall be used. Only electrodes from sealed vacuum packs shall be used and the time and date of opening on each pack shall be recorded. At the end of each repair or end of the shift, whichever comes first, all unused electrodes from opened packs shall be scrapped.

Depending on the depth of excavation, deposit weld metal in accordance with WPS to fill the prepared excavation, ensuring enough weld metal is deposited to allow the weld deposit to be dressed flush and smooth with the surrounding surface and that welds also wrap around the edge of plate cut outs so as to eliminate poor end weld geometry.

Ensure that the weld repair extends the fillet welds across the existing gap left to give clearance to the side bearer spring locator nuts. Following welding, the area required for the nut to seat should either be ground back (ensuring even tapering out to full weld either side) or a suitably profiled spacer washer to be used to provide correct seating for the nuts.

Allow the repaired area to cool slowly in still air. Then carefully remove any excess weld metal from the surface of the reclaimed area by grinding flush with the parent material. Remove any spatter adjacent to the repaired area and visually inspect the weld repair to ensure there are no surface irregularities.

Where surface irregularities are evident, these shall be dressed out carefully to ensure there is no significant reduction in the thickness of the parent material.

9. **NON DESTRUCTIVE TESTING USING MPI**

On completion of the welding/grinding operations, the repaired area(s) shall be subject to MPI to ensure freedom from defects.

Note: Due to the risk of delayed cracking, the completed weld repair shall be left for a minimum period of 16 hours before non-destructive testing.

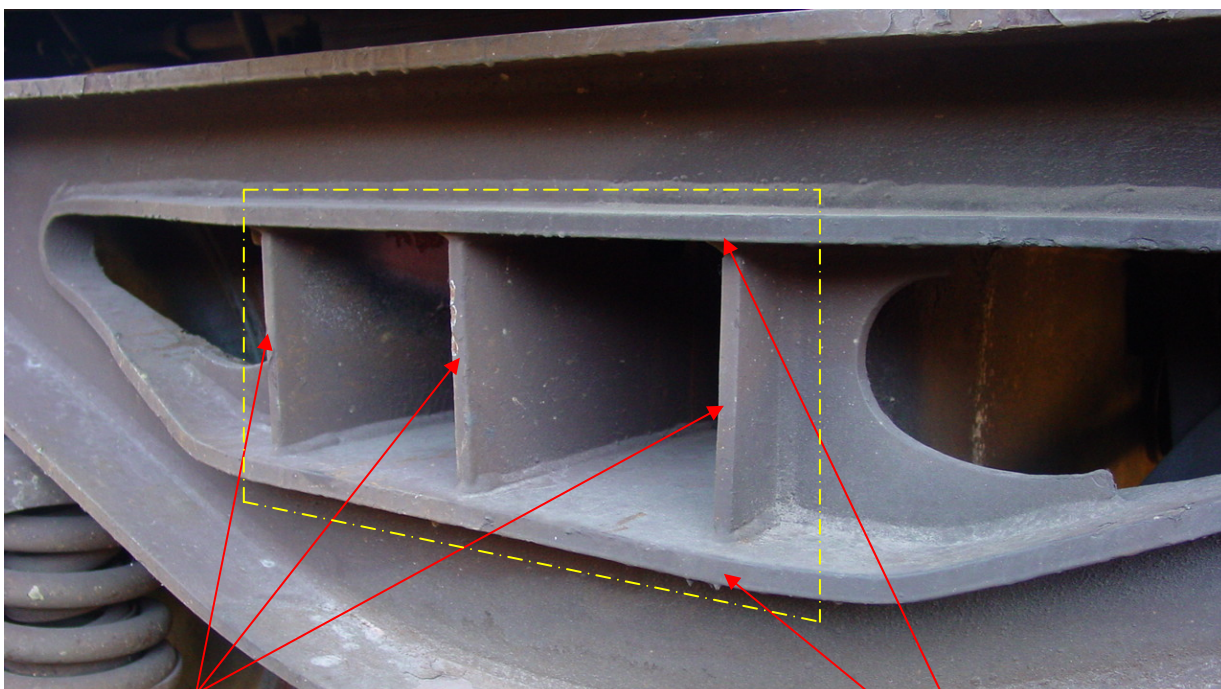
Where defects are found these shall be repaired and re-inspected until proven defect free. Should any further welding be required, this shall be carried out using the parameters in the WPS.

Upon satisfactory completion of MPI the surface in the area of the repair shall be made good using the appropriate, approved paint system.

10. **REFERENCES**

BS EN 970	Non-Destructive Examination of Fusion Welds - Visual Examination
BS EN 1290	Non-Destructive Examination of Welds: Magnetic Particle Examination of Welds

- BS EN 1291 Non-Destructive Examination of Welds: Magnetic Particle Examination of Welds – Acceptance Levels
- GM/RT/2005 Certification Processes for NDT Operatives, Equipment and Facilities used for inspecting T&RS.
- TL/TS0528 Arc welding of carbon-manganese steels for railway applications by contractors
- BS EN 1011 Welding – Recommendations for welding of metallic materials
- Part 1: General Guidance for Arc Welding
Part 2: Arc welding of ferritic steels.
- BS EN 15614 Specification and approval of welding procedures for metallic materials
- Part 1: Welding procedure test - for the arc and gas welding of steels and arc welding of nickel and nickel alloys.
- BS EN 287 Approval testing of welders for fusion welding.
- BS EN ISO 2560 Welding consumables. Covered electrodes for manual metal arc welding of non-alloy and fine grain steels. Classification.
- Health and Safety Guidance Note EH40 – Occupational Exposure Limits.
- The Health and Safety at Work Act, etc. – 1974.



Vertical transom plates

Horizontal plates

Figure 1 Area to inspect for cracks on fabricated Y25 bogie frame