

Information for users

The attached standard:

RT/CE/S/001

Issue 3

has essential supplementary information

Instructions for use

It is essential that you first read and understand the supplement pertaining to the standard before proceeding to the standard. You must then apply the requirements of the supplement to the standard.

Proceed to supplement ►

**I have read & understand the supplement.
Proceed to standard ►**

.....

Ref	NR/SP/TRK/III
Issue	3
Date	August 2003

Flash-welded rails: depot-welded strings (formerly RT/CE/S/001)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

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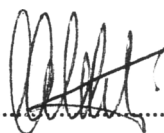
Network Rail

Company Product Specification

Flash-weld rails: depot-welded strings

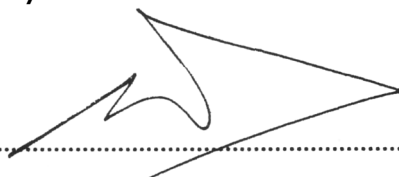
Endorsement & Authorisation

Endorsed by:



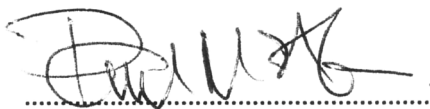
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Issue record

Issue	Date	Comments
1	Mar 1995	Superseded BR I 223
2	Dec 1998	Amended to incorporate mobile welding and revised fatigue testing
3	Aug 2003	Scope restricted to depot-welding of new rail (site welding - in-track or out-of-track- using mobile equipment transferred to new RT/CE/S/I 30)

Implementation

This product specification shall be implemented from the date of issue.

Compliance

This product specification is mandatory upon persons supplying flash-welded strings of rail, using fixed plant in a depot, to Network Rail, and shall be complied with from the date of issue.

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1 PURPOSE

To ensure the serviceability of flash welded strings installed in Network Rail's permanent way.

2 SCOPE

This specification covers long welded strings manufactured by the flash welding of new rails at fixed plant. The following rail profiles and grades are covered. Only joints between rails of the same grade are covered.

Rail profiles	Rail specification	Grades
60EI	RT/CE/S/061	220, 260 and 350HT
56EI	RT/CE/S/061	220, 260 and 350HT
95RBH	RT/CE/S/061	220
Conductor rail No. 75FB	BS 7865:1997	BS 7865:1997

See RT/CE/S/130 for on-site flash-welding of rails (new or existing), and RT/CE/S/131 for the flash-welding of leg-ends on cast crossings and for the flash-welding of switch rails and transition rails.

3 DEFINITIONS

As-welded The condition of a weld which has been trimmed, heat treated if appropriate, and cooled to ambient temperature.

Contractor A company contracted to undertake the flash welding of rails in, or to be installed in, Network Rail's permanent way.

Flat spot An area in a flash weld, revealed by breaking the joint, that has a dull, flat and relatively smooth appearance, with a fine texture differing from that of the remainder of the fracture face.

Finished weld A weld which has been trimmed, pressed if necessary and profile finished.

Fixed plant A production line for the manufacture of long welded strings remote from the site at which the strings will be installed in track. For the purposes of this specification fixed plant includes mobile plant which is used in a depot situation.

Long welded string A long rail produced by welding together a number of rails.

Nominal area The product of the length and height of a flat spot

Operator The person operating a welding machine.

Upset Those parts of the parent rail, adjacent to the weld line, that stand proud of the rest of the rail as a result of deformation associated with the welding process.

Welding process Any part of the sequence from the selection of the rail prior to welding through to the certification by the contractor that the product conforms with this specification and any other special requirements.

4 QUALITY MANAGEMENT SYSTEMS

The contractor shall maintain an independently approved and audited quality management system complying with the requirements of EN ISO 9001:2000.

The contractor shall ensure that machine operators can be identified, are competent, and that there is documentary evidence of an operator's competence.

5 SELECTION OF RAILS FOR WELDING

5.1 New running rail

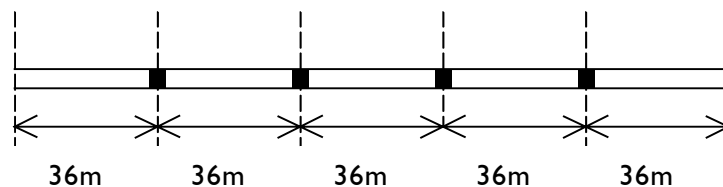
Rails shall comply with RT/CE/S/061.

Note. New rails, when supplied by Network Rail, may be assumed to comply with RT/CE/S/061.

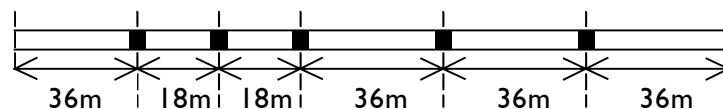
Long welded strings shall be manufactured from rails with a minimum length of 18m. Except where a site-specific derogation has been given by Network Rail, the number of welds in any one string shall not exceed by more than one the number required to produce the string from 36.5m rails.

Note: examples are given below:-

String length (m)	Maximum number of welds
91	3
182	5
216	6



(a) 182m string; preferred weld arrangement



(b) 182m string; permitted weld arrangement

Note. Lengths in this figure are given to the nearest metre

Fig.1 Examples of preferred and permitted weld arrangements in a 182m string

5.2 Conductor rail

Rails shall comply with BS 7865:1997. The rail profile shall be No. 75 FB. The minimum length of rail to be used shall be 8m.

6 WELD PRODUCTION

6.1 General

Only procedures approved and endorsed by Network Rail shall be used; these shall not be modified without Network Rail's written agreement. This includes the procedures for the handling of rails and strings, for the preparation of rails for welding, for weld heat treatment, where appropriate, and for the weld finishing and inspection operations as well as those for the making of the weld itself.

The endorsed procedures shall be available at all reasonable times for inspection by Network Rail's representatives.

Note 1 Network Rail's requirements for procedural approval are given in Appendix A. Approval will be withdrawn if the endorsed procedures are not available.

Note 2 Nothing in this clause should be construed as contradicting the requirement of ISO 9001:2000 for the continual improvement of the contractor's quality management system. However, as stated above, Network Rail's approval shall be sought before process changes are introduced.

6.2 Equipment

All welds shall be manufactured on a machine with an automatic, programmed welding sequence or sequences such that once a programme has been selected, the current and force applied to the rails, and the rail travel cannot be varied by the operator.

6.3 Welding Parameter Records

The following shall be recorded automatically as a function of elapsed time in such a way that the records can be referenced to the appropriate weld:

- Welding current
- Upset force or upset cylinder pressure
- Displacement

For each weld, the maximum forging force or upset cylinder pressure and the forging displacement shall be within the range approved by Network Rail (see Appendix A).

The welding programme identity, machine setting details and date of welding shall also be recorded. The contractor shall maintain a system whereby the above records for a given weld can be identified and accessed for a minimum of 5 years after welding. The weld itself shall be identified in such a way that its associated records can be traced. Recording the hot-stamp marking of the rails forming the joint along with the above records will be deemed to satisfy this requirement.

6.4 Profiling

The profile of the weld in the region of the rail head, excluding the fishing surfaces, shall be blended with that of the parent rails. The operation shall be carried out over a length not exceeding 450 mm from the weld on either rail.

7 INSPECTION AND TESTING

7.1 General

All long welded strings shall be inspected before shipment in accordance with the Contractor's documented procedures.

The eyesight of all staff involved in the inspection of strings shall be checked and, if necessary, corrected annually. Natural light shall be augmented if necessary so that the light level during inspection is not less than 350lx.

7.2 Visual Inspection

There shall be no loss of rail section due to localized melting near the rail ends nor shall linear defects, transverse to the rail, be present in the stripped upset. There shall be no evidence of cracking or hot tears, excessive spatter, die burn or excessive heating. If such defects are present, the cause shall be identified and corrective action taken before production continues.

Note. Some of these weld features are described in BS 6944: 1988 Appendix C.

The appearance of the stripped upset shall be compared with that of the welds on which initial process approval was based. Gouging in the stripped upset shall appear to be neither deeper nor more extensive than that in the welds on which initial process approval was based.

7.3 Height of stripped upset

The height of the remaining upset shall not exceed the following values relative to the larger rail welded:

	Running rail	Conductor
On all surfaces of the foot	1 mm	2 mm
On the web and underside of the head	2 mm	2 mm

7.4 Steps across the joint

In the 'as welded' condition, any step between the rails across the weld shall not exceed the following (discounting any effect of the remaining upset):

	Running rail	Conductor
Vertically, on the running surface	0.5 mm	1.0 mm
Horizontally, on the either side of the head	0.5 mm	1.0 mm
Horizontally, on the foot	2.0 mm	3.0 mm

7.5 Deviation from straight

The deviation from a straight edge of finished welds shall be measured, with the rail at ambient temperature, at the weld line and at points on the rail 500 mm on either side of the weld. The vertical deviations shall be measured on the running surface centreline. The horizontal head deviation shall be measured on both sides of the rail. After pressing, if necessary, and profiling, $[(D1 + D3) / 2] - D2$, shall not exceed the following limits (see Figure 2):

	Running rail (mm)	Conductor rail (mm)
Vertical hog at the head	- 0.0 to + 0.4	± 0.5
Horizontal at head	± 0.4	± 0.5
Horizontal at foot tips	± 1.5	± 2.0

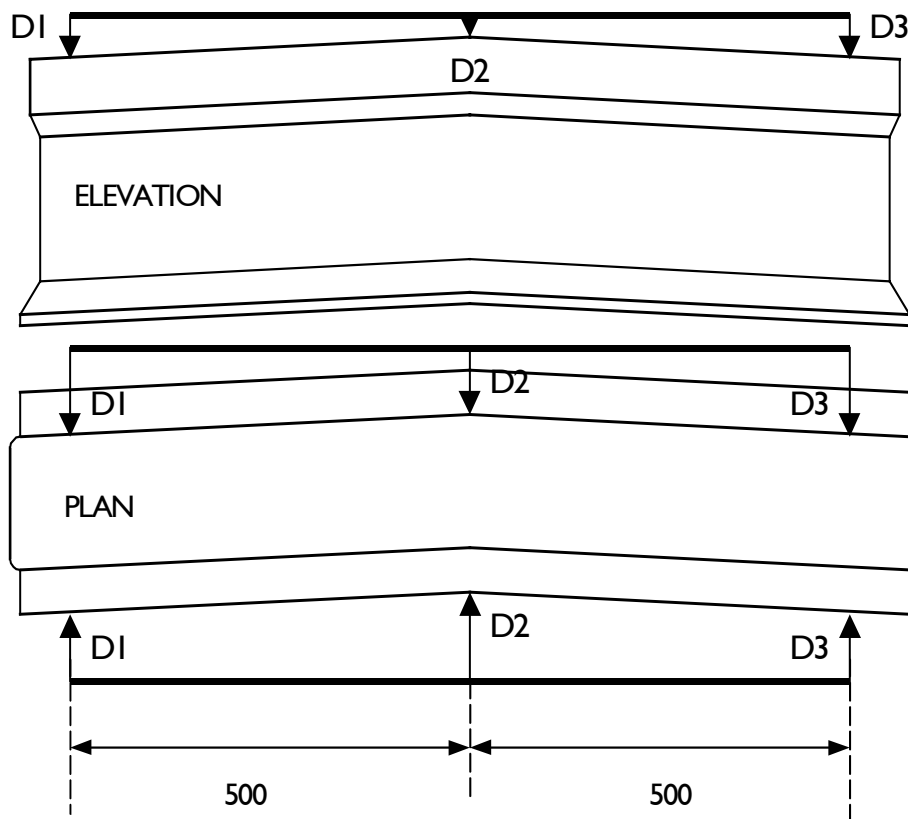


Figure 2 : Tolerances for weld straightness

7.6 Flatness of the joint

Surface flatness across finished welds shall be measured using a 200 mm straight edge. The maximum gap between the straight edge and the profiled rail surface shall not exceed the values given below.

	Running surface (mm)	Side of head (mm)
New running rail	0.2	0.2
Conductor rail	0.4	0.4