

Letter of instruction

Information for users

The following document:

RT/CE/S/130 Issue 1

has had changes made to it, most recently, with effect from **01 October 2010**.

Instructions for use

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

NR/BS/LI/163	Issue 2	01 October 2010	Proceed to letter ►
RT/CE/S/130	Issue 1	02 August 2003	Proceed to standard ►

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Information for users

The attached standard:

RT/CE/S/I30

Issue 1

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 ►**

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Ref	NR/SP/TRK/I30
Issue	I
Date	August 2003

Flash-welded rails – site-welded strings (formerly RT/CE/S/I30)

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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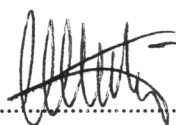
Network Rail

Company Product Specification

Flash-welded rails - site-welded strings

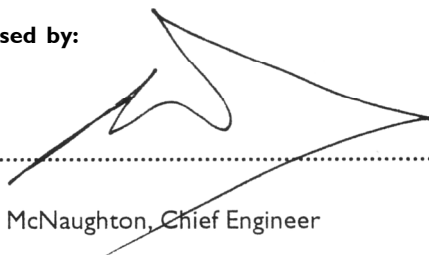
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Endorsed by:



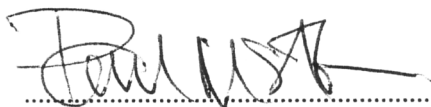
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Issue record

Issue	Date	Comments
I	August 2003	Replaces and amends parts of RT/CE/S/001 Issue 2

Implementation

This specification shall be implemented from the date of issue.

Compliance

This specification is mandatory upon persons using mobile plant to create welded strings of rail, whether in-track or out-of track (but near the site of eventual rail installation), 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 flash welding at, or adjacent to, their site of installation. The following 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
113A	RT/CE/S/002	Normal grade and grade A
110A and 109FB	RT/CE/S/002	Normal grade
95RBH	RT/CE/S/002	Normal grade

This standard does not cover the requirements for rail vehicle acceptance as applicable to mobile flash welding machines.

See RT/CE/S/001 for the flash-welding of new rails by fixed plant, 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.

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

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.

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

Operator The person operating a welding machine.

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

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 are competent, hold a certificate of competence and carry suitable identification.

5 SELECTION AND PREPARATION OF RAILS

5.1 New rail

5.1.1 Rail specification

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

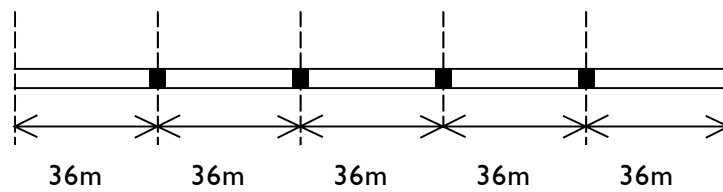
Note. New rails, when supplied by Network Rail, may be assumed to comply with RT/CE/S/061

5.1.2 Rail lengths

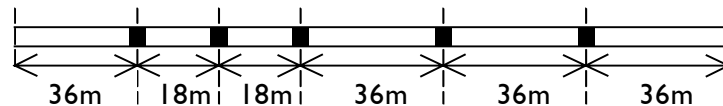
Long welded strings shall be manufactured from rails with a minimum length of 18m. Except where a site-specific derogation has been given by Network Rail, the number of welds in any one string shall not exceed by more than one the number required to produce the string from 36.5m rails.

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 Serviceable running rail

5.2.1 Rail specification

Rails shall comply with RT/CE/S/002.

5.2.2 Rail length

The minimum length of a rail to be included in a string shall be 4.6 metres prior to welding with no more than one rail of less than 9 metres in any string.

Note. The adoption of a minimum rail length of 4.6m prior to welding is to ensure that, after welding, Network Rail's requirement that welds are at least 4.5m apart is complied with.

5.2.3 Rail inspection

Rails with rolling contact fatigue cracks shall not be used. Rails shall be inspected ultrasonically in accordance with the requirements of RT/CE/S/I03.

5.2.4 Rail preparation

All squats and isolated wheelburns shall be either removed or repaired prior to flash welding. The rails shall be free from any other defects that would result in their removal from track within 13 weeks according to the 'Minimum Action Criteria' set out in RT/CE/S/I03.

Note. It is the responsibility of the Welding Contractor to ensure that 5.2.3 and 5.2.4 are complied with prior to welding.

All serviceable rail shall have the ends cropped prior to welding to remove any dipped or battered ends, fishbolt holes, rail bonds and flame-cut holes. The minimum distances of permitted features from the rail end, when prepared for welding, shall be as follows:

Feature	Minimum distance from cropped rail end
Drilled holes up to 8 mm diameter	300 mm
Drilled holes up to 30 mm diameter	600 mm
Existing welds	4.6 metres (see Note, 5.2.2)
Underfoot gall	Not at end nor within the rail travel distance nor in the contact area of underfoot welding electrodes

5.2.5 Matching of serviceable rails

Profiles I13A and I10A may be welded to each other but I09FB and 95RBH rails may be welded only to themselves.

The maximum difference in rail depth of adjacent rails (excluding gall) shall be 2.0 mm, measured down the vertical axis. Except where welds are made in track, the maximum variation of rail depth within a long welded string shall be 3.0 mm.

Except where welding is to be undertaken in track, sideworn rails shall be welded with the good or less worn gauge face aligned for the new running edge.

Where rails are to be welded in track, the existing gauge face may be retained.

Note. When matching sideworn rails consideration should be given to the need, after welding, to 'blend in' the sidewear of the rails on the gauge face over a distance of 1.5m.

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.

No other work shall be permitted on the rails being welded during the welding process.

The contractor shall ensure that welds, including existing welds in a string manufactured from serviceable rail, shall not be positioned so that they fall over a chair or baseplate or the rail seat area of a sleeper.

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 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.

A record of the location in track where a weld was installed shall be maintained by the contractor for a minimum of 5 years.

6.4 Straightening

Welds may be straightened by pressing within 1 month of welding. If the weld is not pressed at the time of welding and profiling, and is subsequently pressed, it shall be re-profiled after straightening.

6.5 Profiling

All welds shall be profiled once vertical movement has ceased and prior to the passage of traffic. The rails shall be clipped down prior to profiling.

Note. The vertical contraction of the weld as a function of time needs to be established beforehand to ensure that profiling is not commenced before vertical movement has ceased.

If required as a condition of process acceptance, welds shall have the trimmed upset ground from the foot tip through to the neutral axis of the rail. The trimmed upset shall be blended into the rail and the sharp "notch" between the rail and upset completely removed without damage to the rail.

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

Where rails with differential sidewear on the intended gauge face are welded together, the step in the running edge shall be blended in by grinding as follows:

- blended length to be 1.5m from the weld on the less worn rail
- the sidewear angle of the more worn rail shall be retained throughout the blended length
- the gauge corner shall be rounded throughout the blended length; sharp or square edges are not permitted.

7 INSPECTION AND TESTING

7.1 General

Welds shall be inspected in accordance with the Contractor's documented procedures. Strings, other than strings created by welding together rails in track, shall be inspected before installation in track. Where strings are created in track, welds shall be inspected directly after profiling.

The eyesight of all staff involved in the inspection of long welded 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.

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

In the event that any of the above defects are present, the weld shall be removed, or clamped pending its removal, before the string is trafficked. In the case of die- burn, the clamps shall be centred, so far as possible, over the die-burnt area. The cause of the defect shall be identified and corrective action taken before production continues.

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 on the finished weld shall not exceed the following values relative to the larger rail welded:

	New	Serviceable
On the underside of the foot, and the foot tips	1 mm	1 mm
All other surfaces	2 mm	2.5 mm