



SLOVENSKI STANDARD SIST EN 15594:2009

01-junij-2009

Železniške aplikacije - Proga - Obnova tirnic s pomočjo električnega loka

Railway applications - Track - Restoration of rails by electric arc welding

Bahnanwendungen - Oberbau - Aufarbeitung von Schienen durch elektrisches Lichtbogenauftragsschweißen

PREVIEW STANDARD

Applications ferroviaires - Voie - Réparation des rails par soudure à l'arc électrique

Ta slovenski standard je istoveten z: **EN 15594:2009**

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ICS:

25.160.01	Varjenje, trdo in mehko spajkanje na splošno	Welding, brazing and soldering in general
45.080	Vozni kolosaji in železniški sestavni deli	Rails and railway components

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EUROPEAN STANDARD

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Railway applications - Track - Restoration of rails by electric arc welding

Applications ferroviaires - Voie - Réparation des rails par soudure à l'arc électrique

Bahnwendungen - Oberbau - Aufarbeiten von Schienen durch elektrisches Lichtbogenauftragschweißen

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 15594:2009) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2009, and conflicting national standards shall be withdrawn at the latest by October 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

The purpose of this standard is to unify the restoration of rail electric arc welding across Europe. The standard provides control systems for the approval and qualification of welding processes, welding procedures, welding consumables, contractors and welders for the successful delivery of welds into track.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the EU Directive 2008/57/EC.

For relationship with the EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document.

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According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

Restoration of rails by electric arc welding is a special process requiring the co-ordination of welding and grinding activities to establish confidence and reliability of the weld deposit and safety of the line. Controls must be in place from the design phase through to inspection. Incorrect selection of materials, consumables or procedure may result in serious track welding failure. The correct application of the approved processes and the types of repairs permitted to be carried out on various rail components will be strictly adhered to. Only consumables approved by the method described in this standard are to be used. The tasks and responsibilities of personnel involved in restoration e.g. planning, executing, supervising and inspection will be clearly defined.

1 Scope

This European Standard specifies restoration by electric arc welding and is limited to the head of the rails only.

This European Standard describes the approval systems for consumables and procedures used in manual metal arc and flux cored metal deposit rail repair welding. The standard includes the quality-related tasks and responsibilities of personnel involved in the electric arc repair welding of rails. The standard applies to plain rail and switches and crossings manufactured from new vignole railway rails R200, R220, R260, R260Mn, R260Cr and R350HT grade rails of 46 kg/m and above as contained in EN 13674-1 and EN 13674-2.

The permitted welding processes are limited to Electric Arc (EA) in accordance with EN ISO 4063 and are by description Process No 111: MMA (Manual Metal Arc) and Process No 114: FCAW (Flux Cored Arc Welding).

This European Standard may be applied in situ, at line side or at out of track locations. The flash welded leg ends of austenitic manganese steel crossings are included in this standard, except when located within 500 mm of manganese crossings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 287-1, *Qualification test of welders – Fusion welding – Part 1: Steels*

EN 571-1, *Non destructive testing – Penetrant testing – Part 1: General principles*

EN 1290, *Non-destructive examination of welds – Magnetic particle examination of welds*

EN 13674-1, *Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above*

EN 13674-2, *Railway applications - Track - Rail - Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above*

EN ISO 544, *Welding consumables – Technical delivery conditions for welding filler materials – Type of product, dimensions, tolerances and markings (ISO 544:2003)*

EN ISO 3580, *Welding consumables – Covered electrodes for manual metal arc welding of creep-resisting steels – Classification (ISO 3580:2004)*

EN ISO 4063, *Welding and allied processes – Nomenclature of processes and reference numbers (ISO 4063:1998)*

EN ISO 6506-1, *Metallic materials – Brinell hardness test – Part 1: Test method (ISO 6506-1:2005)*

EN ISO 6507-1, *Metallic materials – Vickers hardness test – Part 1: Test method (ISO 6507-1:2005)*

EN ISO 14341, *Welding consumables – Wire electrodes and deposits for gas shielded metal arc welding of non alloy and fine grain steels – Classification (ISO 14341:2002)*

EN ISO 15613, *Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test (ISO 15613:2004)*

UIC 714, *Classification of lines for the purpose of track maintenance*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1 Railway Authority (RA)
either the railway regulator or the owner of a railway infrastructure or the custodian with a delegated responsibility for a railway infrastructure

3.2 contractor and sub-contractor
company approved by a railway authority to carry out the restoration of rails by electric arc welding on that particular infrastructure

NOTE This may include staff from within the RA.

3.3 preliminary welding procedure specification (pWPS)
tentative welding procedure specification, which is assumed to be adequate by the manufacturer, but which has not been approved. Welding of test pieces needed for approval of a welding procedure specification has to be carried out on the basis of a preliminary welding procedure specification

3.4 weld procedure specification (WPS)
procedure approved to European standards and agreed by the RA for use on the railway infrastructure

3.5 training establishment
welder training organisation or centre approved by the railway authority or alternatively a welder training organisation or centre approved by and belonging to a railway authority

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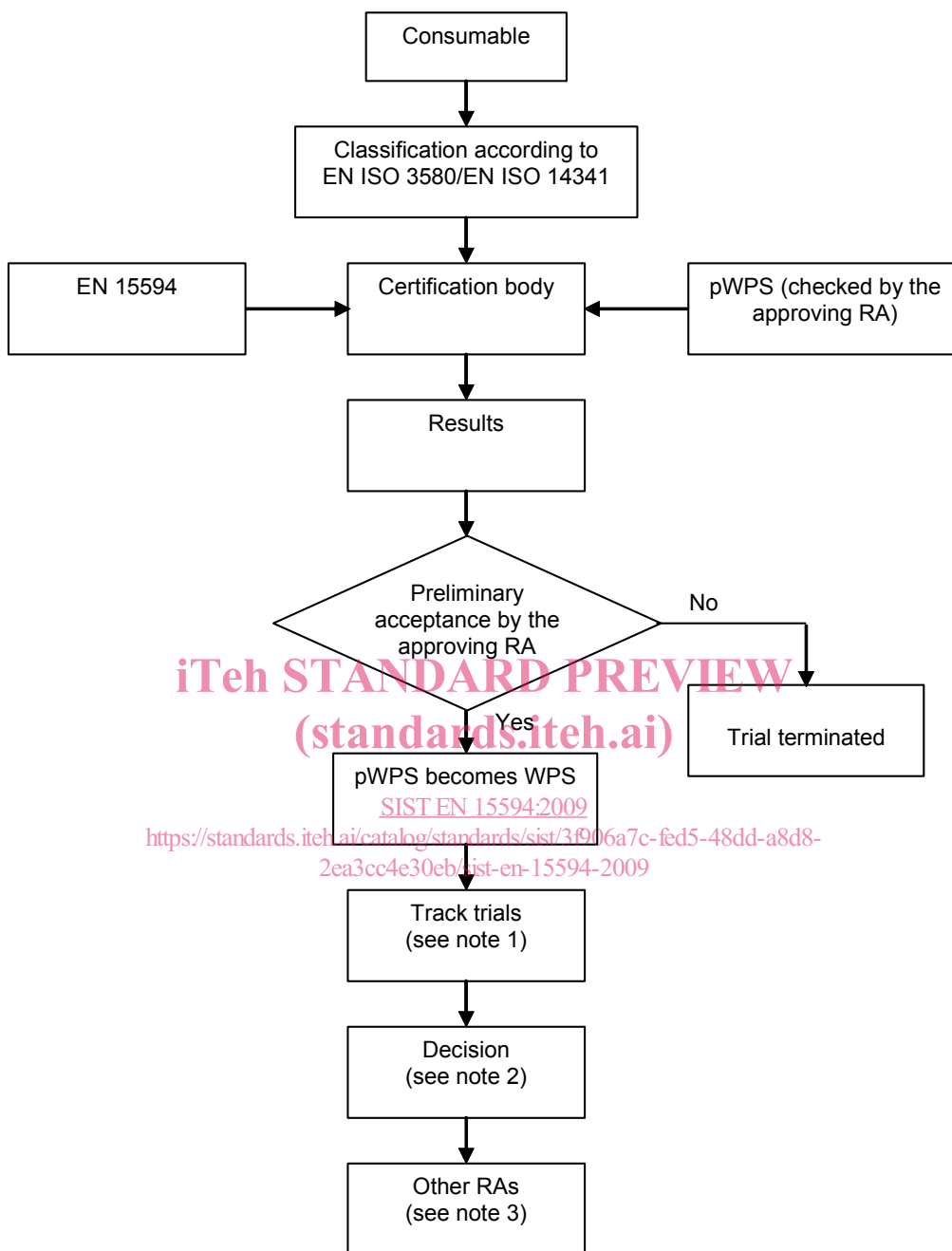
4 Consumable and WPS approval tests for MMA electrodes and FCAW wires

4.1 General

The approval of consumables and the related WPS is broadly in line with the requirements of EN ISO 15613, but owing to the special nature of the repair weld in terms of rail steel grade and use, e.g. rolling contact fatigue, the approval process shall follow this standard.

4.2 Consumable and WPS approval model

The following flow chart describes how a consumable and its related WPS shall be approved. WPS approval shall follow the principle of EN ISO 15613 approval by a pre-production test.



NOTE 1 These track trials are undertaken by the approving RA.

NOTE 2 The approving RA shall issue an approval certificate upon successful outcome of track trial.

NOTE 3 Other RAs may require further tests to verify suitability for special service/operational conditions or deposition techniques.

4.3 Information supplied by the manufacturer to the certifying body

— Toxicity threshold levels;

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- Rail steel grades in accordance with EN 13674-1;
- MMA electrode classification in accordance with EN ISO 3580;
- Wire electrodes classification in accordance with EN ISO 14341;
- Chemical analysis and batch analysis;
- Storage requirements with manufacturers recommendations;
- Current range/voltage range/polarity;
- Availability of vacuum sealed MMA electrodes;
- Dimensions, length and diameter;
- FCAW spool size/weight availability;
- Drying requirements;
- Description of marking system;
- Optimum deposition technique.

4.4 Batch testing by the manufacturer

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The batch testing criteria are:

- concentricity and dimensions; [SIST EN 15594:2009
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- chemical composition;
- consumable performance e.g. wire behaviour.

4.5 Test requirements of this standard under the supervision of certifying body**4.5.1 List of tests**

The following tests shall be supervised by the certifying body:

- Mechanical tests;
- Chemical analysis of undiluted weld metal with batch verification;
- Hardness;
- Weld integrity (lab conditions);
- Crack free;
- Defect level;
- Porosity;
- Craters;

- Open Circuit Voltage (OCV) requirements;
- Welding parameters.

4.5.2 Information to be confirmed by the certifying body

The certifying body shall confirm the following:

- marking/branding before and after drying;
- compliance with this standard;
- complete results of laboratory tests.

4.5.3 Statement on the general weldability

The certifying body shall issue a statement on the general weldability as follows:

- bead shape;
- cratering;
- spatter;
- slag characteristics;
- strike and re-strike capability;
- other relevant information.

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These checks are carried out on one bead, one layer and five layers.

The one bead test checks for cracking after grinding.

The single layer test checks the behaviour of weld deposit on rail steel.

The five-layer test checks the behaviour of weld metal on weld metal.

In single and five-layer deposits macro, micro and hardness HV tests are employed.

The five-layer test is finish ground and ultrasonic testing applied.

4.6 Laboratory tests

4.6.1 Purpose

The purpose of the laboratory tests is to prove the suitability of the consumable to successfully repair appropriate grades of rail steel.

4.6.2 General requirements for laboratory tests

The following deposits are required for laboratory tests.

- single bead on rail: one sample required;
- single layer on rail: one sample required;

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— multi-layers on rail: one sample required

Deposits shall be subjected to magnetic particle inspection (MT) in accordance with EN 1290 or dye penetrant inspection (PT) in accordance with EN 571-1.

4.6.3 Description of the sample for laboratory test

Figures 1 and 2 describe the requirements of sample size, excavation details and preheat measurement positions.

Pre-heat point A shall be 75 mm from the end of the excavation on the running surface.

Pre-heat point B shall be at the full railhead flange height.

Length of the sample C shall be 600 mm minimum.

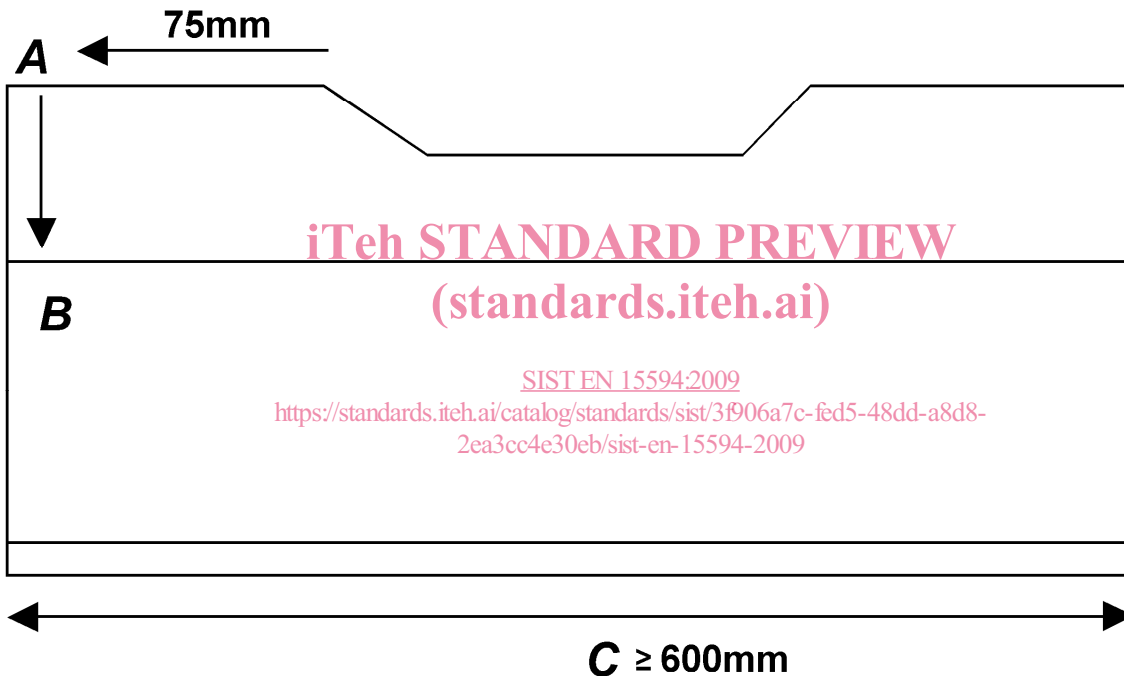


Figure 1 — Position of preheat measurement and sample size

The transverse excavation for trials shall be 100 % of the railhead width.