SLOVENSKI STANDARD
SIST EN 16725:2017

01-januar-2017

Železniške naprave - Zgornji ustroj proge - Obnova in popravilo kretniških src iz mangana

Railway applications - Track - Restoration and repair of manganese crossings

Bahnanwendungen - Oberbau - Instandsetzung und Reparatur von Herzstücken aus Manganhartstahlguss

Applications ferroviaires - Voie - Réparation des cœurs en acier au manganèse

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45.080	Tračnice in železniški deli	Rails and railway components
93.100	Gradnja železnic	Construction of railways

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Railway applications - Track - Restoration and repair of manganese crossings

Applications ferroviaires - Voie - Réparation des cœurs en acier au manganèse

Bahnanwendungen - Oberbau - Instandsetzung und Reparatur von Herzstücken aus Manganhartstahlguss

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 16725:2016) 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of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by May 2017.

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Introduction

Restoration of cast manganese crossings 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. 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 need to 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 need to be clearly defined.

1 Scope

This European Standard specifies restoration of cast austenitic manganese steel for fixed crossings and cradles for crossings with movable parts, designed to be flash butt welded or bolted to adjoining rails manufactured according to EN 15689. The standard also applies to flash welded leg ends of austenitic manganese steel crossings and the associated tri-metal zone.

The standard specifies the approval systems for consumables and procedures used in manual metal arc and flux cored metal deposit repair welding. The standard includes the quality-related tasks and responsibilities and qualifications of personnel involved in the electric arc repair welding of cast crossings.

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

This standard may be applied for procedures *in situ*, at line side or at out of track locations.

The purpose of this standard is to unify restoration of cast manganese crossings by electric arc welding across Europe. The standard provides control systems for the approval and qualification of welding processes, WPS, welding consumables, contractors and welders for the successful delivery of welds on crossings in service.

2 Normative references

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

EN 1371-1, *Founding - Liquid penetrant testing- Part 1: Sand, gravity die and low pressure die castings*

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

EN 15689, *Railway applications - Track - Switches and crossings - Crossing components made of cast austenitic manganese steel*

EN ISO 544, *Welding consumables - Technical delivery conditions for filler materials and fluxes - Type of product, dimensions, tolerances and markings (ISO 544)*

EN ISO 2560, *Welding consumables — Covered electrodes for manual metal arc welding of non-alloy and fine grain steels — Classification (ISO 2560)*

EN ISO 3452-1, *Non-destructive testing - Penetrant testing - Part 1: General principles (ISO 3452-1)*

EN ISO 4063, *Welding and allied processes - Nomenclature of processes and reference numbers (ISO 4063)*

EN ISO 5817, *Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817)*

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

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1)*

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

EN ISO 17632, *Welding consumables - Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels - Classification (ISO 17632)*

3 Terms and definitions

For the purposes of this document, 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 cast manganese track components by electric arc welding on that particular infrastructure

Note 1 to entry: 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 consumable manufacturer, but which has not been approved by the RA

Note 1 to entry: 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
welding 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

3.6
manual metal-arc welding
MMA
manually operated metal-arc welding using a covered electrode

3.7
flux-cored arc welding
FCAW
semi-automatic or automatic arc welding process

Note 1 to entry: FCAW requires a continuously fed consumable tubular electrode containing a flux and a constant-voltage or a constant-current welding power supply.

3.8
certification body
body for the purpose of witnessing and reporting the welding and testing of test pieces

3.9
AMS
austenitic manganese steel, in accordance with EN 15689

3.10
penetrant testing
PT
method of crack detection employing capillary action. A low surface tension liquid is applied to a test area, after a given soak time a powder developer is applied, the developer draws the liquid from any cracks present giving a clear indication of any surface breaking defect

3.11
tri-metal zone
flash butt welded area of the casting containing AMS, rail steel and the stainless steel insert

3.12
million gross tonnes (MGT)
Equivalent Million Gross Tonnes Per Annum (EMGTPA)
annual traffic load (metric for assigning track category)

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

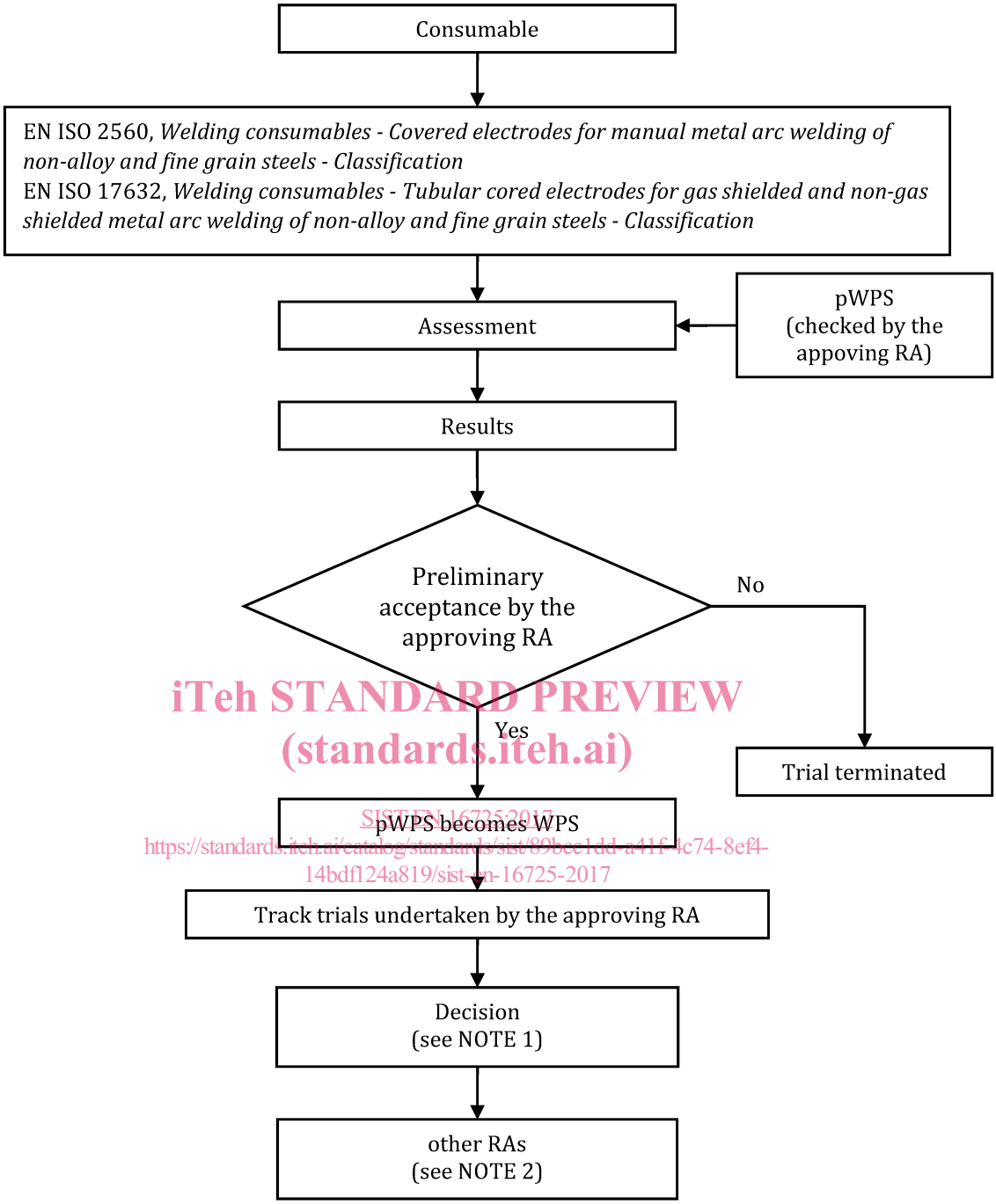
4.1 General

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 steel grades, the approval process shall follow this standard.

4.2 Consumable and WPS approval model

4.2.1 Flow chart

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 The approving RA has to issue an approval certificate upon successful outcome of track trial.

NOTE 2 Other RAs may require further tests to verify suitability for special service/operational conditions or deposition techniques.

Figure 1 — WPS approval

4.2.2 Minimum information to be included in the pWPS

The pWPS shall contain as a minimum the following:

— Parent material;

— Consumable classification type and size;

— Welding process;

— Methods of preparation and cleaning;

— Current (A);

— Arc Voltage (V);

— Type of Current (AC/DC);

— Polarity;

— Travel Speed (mm/min);

— Deposition sequence – direction of welding;

— Heat input (kJ/mm);

— Welding position;

— Excavation details (sketch);

— Temperature measurement points (sketch);

— Maximum or minimum temperature values at measurement points;

— Interpass temperature at measurement points;

— Peening details.

4.3 Information supplied by the manufacturer of the welding consumable to the certifying body

— Toxicity threshold levels;

— Applicable steel grades in accordance with EN 15689 and/or EN 13674-1;

— Electrode classification in accordance with EN ISO 2560 for MMA and EN ISO 17632 for FCAW;

— Chemical analysis and batch analysis;

— Storage requirements with manufacturer's recommendations;

— Current range/voltage range/polarity;

— Open Circuit Voltage (OCV) requirements;

— Availability of vacuum sealed MMA electrodes;

— Dimensions, length and diameter;

— FCAW spool size/weight/winding pattern availability;

— Drying requirements;