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Railway applications - Track - Switches and crossings - Part 7: Crossings with moveable parts

Bahnanwendungen - Oberbau - Weichen und Kreuzungen - Teil 7: Herzstücke mit beweglichen Bauteilen

Applications ferroviaires - Voie - Appareils de voie - Partie 7: Coeurs a parties mobiles

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Railway applications - Track - Switches and crossings - Part 7: Crossings with moveable parts

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Foreword

This European Standard (EN 13232-7:2006) 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of an identical text or by endorsement, at the latest by September 2006, and conflicting national standards shall be withdrawn at the latest by September 2006.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to support Essential Requirements of EU Directive 96/48/EC of 23 July 1996 on the interoperability of the trans-European high-speed rail system amended by the Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this European Standard.

This series of standards “Railway applications – Track – Switches and crossings” covers the design and quality of switches and crossings in flat bottom rails. The list of parts is as follows:

— *Part 1* : *Definitions*

— *Part 2 : Requirements for geometric design*

— *Part 3 : Requirements for wheel/rail interaction*

— *Part 4 : Actuation, locking and detection*

— *Part 5 : Switches*

— *Part 6 : Fixed common and obtuse crossings*

— *Part 7 : Crossings with moveable parts*

— *Part 8 : Expansion devices*

— *Part 9 : Layouts*

Part 1 contains terminology used throughout all parts of the standard.

Parts 2 to 4 contain basic design guides and are applicable to all switch and crossing assemblies.

Parts 5 to 8 deal with particular types of equipment, including their tolerances. These use parts 1 to 4 as a basis.

Part 9 defines the functional and geometrical dimensions and tolerances for layout assembly.

The following terms are used within to define the parties involved in using the EN as the technical basis for a transaction:

CUSTOMER The operator or user of the equipment, or the purchaser of the equipment on the user's behalf.

SUPPLIER The body responsible for the use of the EN in response to the customer's requirements.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 United Kingdom.

Introduction

The requirements of crossings with moveable parts are that they are capable of performing their intended purpose, which is to allow a vehicle to pass the area where the two rails cross with a continuous running edge.

That means the wheels of the vehicle are fully supported and guided in the whole crossing area, either in the facing or trailing direction.

The main criteria for the selection of crossings with moveable parts are:

— improvement of ride comfort;

— reduction of noise and vibration;

— reduction of maintenance;

— mixed traffic conditions (e.g. train/tram);

— security against derailment.

This last point is particularly important (critical) in diamond crossings. Effectively, as the wheel diameter and the obtuse crossing angle decrease, the distance without guidance (EN 13232-3:2003, 4.2.5) increases.

Therefore, to assure the safety of running of the wheel set over the diamond crossing, it is sometimes necessary to design the obtuse crossing as moveable.

Rules and recommendations for security against derailment in diamond crossings are set down in part 9 of this standard.

The crossings with moveable parts shall be designed to withstand all external forces from rolling stock, thermal influences etc.

The customer shall specify the maximum strains or stresses due to external thermal forces that the crossing with moveable parts has to withstand.

Operating, signalling systems, heater systems, load bearing supports, maintainability and safety are all major factors which should be taken into account during the design.

The performance criteria shall be based on information given by the customer.

The design and selection of types of crossings with moveable parts will be influenced by axle loads, frequency of traffic and speed.

1 Scope

The scope of this part is:

— to establish a working terminology for crossings with moveable parts, which means crossings with moveable parts to close the gap of the running edge, and their constituent parts, and identify the main types;

— to list the minimum informative requirements for the manufacture of crossings with moveable parts and/or their constituent parts;

— to formulate codes of practice for inspection and tolerances for crossings with moveable parts and/or their constituent parts;

— to establish the limits and extent of supply;

— to list the method by which crossings with moveable parts and their constructional parts should be identified and traced;

— to list the different and varying ways by which crossings with moveable parts can be described, using the following parameters:

  — geometry of crossings;

  — types of construction;

  — performance requirements;

  — design criteria;

  — tolerances and inspection.

2 Normative references

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

EN 13145, *Railway applications — Track — Wood sleepers and bearers*

EN 13146 (all parts), *Railway applications — Track — Test methods for fastening systems*

EN 13230 (all parts), *Railway applications — Track — Concrete sleepers and bearers*

EN 13232-1, *Railway applications — Track — Switches and crossings — Part 1: Definitions*

EN 13232-2, *Railway applications — Track — Switches and crossings — Part 2: Requirements for geometric design*

EN 13232-4, *Railway applications — Track — Switches and crossings — Part 4: Actuation, locking and detection*

prEN 13232-9, *Railway applications — Track — Switches and crossings — Part 9: Layouts*

EN 13481 (all parts), *Railway applications — Track — Performance requirements for fastening systems*

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*

prEN 13674-3, *Railway applications — Track — Rail — Part 3: Check rails*

EN 13674-4, *Railway applications — Track — Rail — Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/m*

UIC 866, *Technical specification for the supply of cast manganese steel crossings for switch and crossing work*

3 Types of crossing with moveable parts

3.1 Common crossings with moveable parts

There are two major types of common crossing with moveable parts. These are crossing with moveable point (see Figure 1) and crossing with moveable wing rails (see Figure 2).

In both cases:

The wings and vee support can be:

— saddle (cast, welded, machined);

— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

The vee can be:

— monobloc (cast, welded, machined);

— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

Rail profiles shall be according to EN 13674-1 and EN 13674-2.

In the case of a crossing with moveable point:

— point may or may not contain a longitudinal sliding area;

— vee of point and splice rail may be coupled by bolting, welding or fabricated out of a monobloc and welded to their respective adjacent legs.

For example see Figures 3, 4 and 5.

In the case of a crossing with moveable wing rails a longitudinal sliding area is not required.

Other types of construction and their requirements shall be agreed between customer and supplier.

3.2 Obtuse crossings with moveable parts

The main type of obtuse crossing with moveable parts is the switch diamond crossing (see Figure 6).

The wing and switches rails support can be:

— saddle (cast, welded, machined);

— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

The wing rail can be:

— monobloc (cast, welded, machined);

— assembled (made of different rail profiles, e.g. standard rail, asymmetric low section, symmetric thick web section etc.).

Switch diamond crossings can be used in obtuse crossings with or without single or double slips.

Rail profiles shall be according to EN 13674-1 and EN 13674-2.

3.3 Materials

The materials used shall be defined at least by their respective EN or by their mechanical and chemical characteristics in the non-existence of an EN.

The grade and specification of rails to be used shall be specified by the customer and shall comply with EN 13674-1, EN 13674-2, prEN 13674-3 and EN 13674-4. All bolts and other fixing devices shall be minimum grade 5.6. All other blocks and fittings shall be manufactured to minimum grade 200. The use of other materials shall be agreed between customer and supplier.

3.4 Geometry

The geometry of the crossing at the running edges (straight or curved) shall be in accordance with the general layout according to EN 13232-2 and prEN 13232-9.

3.5 Inclination of the running table

The running table of the crossing may or may not be inclined.

Inclination of any running table in the crossing and location and length of any twist (change of inclination) shall be defined.

3.6 Construction

If a transition from special rail profile to standard rail profile is required, the transition can either be located in the fixed part or in the moveable part. In case of a weld, in the moveable part, the weld shall be secured by fishplating.

3.7 Relationship with the adjacent track

The crossing can be joined to the adjacent track:

— by fishplates;

— by glued fishplates;

— by welding.

4 Terms and definitions

For the purpose of this European Standard the terms and definitions given in EN 13232-1:2003 and the following apply.

4.1 Common crossing with moveable point (Figure 7)

4.1.1
swing nose (or moveable vee)
part of the crossing which forms the vee. It is moved to form a continuous running edge for either the main or branch lines

4.1.2
saddle (or wing rail)
gives support to the swing nose and also forms the housings when the swing nose is thrown. The saddle (or wing rail) is also used to support the wheel when transferring from the wing rail to the vee

4.1.3
relief ramp (if required)
ramp for false flange on worn wheels

4.1.4
distance blocks (if required)
mechanical device to give strength and support to the crossing. Depending on the design concept, the distance blocks should transfer track forces

4.1.5
left hand wing front rail
rail connected to left hand wing front

4.1.6
right hand wing front rail
rail connected to right hand wing front

4.1.7
spacer blocks (or studs)
blocks to give lateral support to the swing nose

4.1.8
foot relief (if required)
reduction of section of point rail foot at the swing nose heel to facilitate flexing

4.1.9
longitudinal sliding area (if required)
system to permit free movement of the swing nose, it allows for the changes in rail length as the swing nose is operated. The longitudinal sliding area is normally situated on the branch line of the crossing

4.1.10
left hand wing rail
wing rail to the left of the vee when viewed from the vee (swing nose)

4.1.11
right hand wing rail
wing rail to the right of the vee when viewed from the vee (swing nose)

4.1.12
left hand vee rail (monobloc vee)
rail connected to the left hand vee leg between the swing nose and the longitudinal sliding area (as shown for a left hand crossing)

4.1.13
left hand extended vee rail (monoblock vee) (if required)
rail between the longitudinal sliding area and the heel of the crossing (as shown for a left hand crossing)

4.1.14
right hand vee rail (monoblock vee)
rail connected to the right hand vee leg of swing nose (as shown for a left hand crossing)

4.1.15
flangeway blocks
blocks used to maintain the correct flangeway gap between the vee rails and wing rails. Depending on the design concept, the distance blocks should transfer track forces

4.1.16
left hand splice rail (assembled vee)
rail spliced to point rail

— forming the vee and permitting longitudinal movement between point rail and splice rail (see Figure 3),

— forming the vee between the point rail and the extended splice rail and permitting longitudinal movement between splice rail and extended splice rail (see Figure 4) and

— forming the vee and without longitudinal movement between point rail and splice rail

4.1.17
left hand extended splice rail (assembled vee) (if required)
rail between the longitudinal sliding area and the heel of the crossing (as shown for a left hand crossing)

4.1.18
right hand point rail (assembled vee)
rail forming the swing nose situated in the main line from the swing nose to the heel joint (as shown for a left hand crossing in Figures 3 and 4)

4.1.19
point rail toe (PRT)
front physical end of the point rail that contacts the saddle or the wing rail to form a continuous running edge in the closed position (see Figure 10 a))

4.1.20
splice rail toe (SRT) (assembled vee)
front physical end of the splice rail that contacts the point rail (see Figure 10 a))

4.2 Common crossing with moveable wing rails (Figure 8)

4.2.1
left hand vee rail
rail forming the vee situated to the left of the vee when viewed from the nose

4.2.2
right hand vee rail
rail forming the vee situated to the right of the vee when viewed from the nose

4.2.3
relief ramp (if required)
ramp for false flange on worn wheels

4.2.4
vee
part of the crossing forming the shape of a letter '*v*'. The vee is fixed

4.2.5
supporting bar
in the closed position of the wing rail this bar gives lateral support to the wing rail via the wing rail stops

4.2.6
wing rail stops
stops fixed on the wing rails to transfer the lateral forces from the wing rail to the supporting bar (in the closed position of the wing rail)

4.2.7
foot relief
reduction of section of wing rail foot at the wing front to facilitate flexing

4.2.8
left hand moveable wing rail
wing rail to the left of the vee when viewed from the nose. It is moved to form a continuous running edge for the right line as shown in Figure 8

4.2.9
right hand moveable wing rail
wing rail to the right of the vee when viewed from the nose. It is moved to form a continuous running edge for the left line

4.2.10
nose
point at which the vee commences at the level of the gauge reference plane

4.3 Obtuse crossing with moveable parts (Figure 9)

4.3.1
right hand switch rail
rail to the right hand side of the switch diamond when viewed from outside the gauge. This rail flexes to either form a continuous running edge for the wheel to pass over when the switch is closed, or flange way clearance for the wheel to pass through when the switch is open

4.3.2
left hand switch rail
as right hand switch rail but opposite hand

4.3.3
right hand back rail (if required)
rail to the right hand side of the switch diamond when viewed from outside the gauge. This rail gives support to the switch rail and also forms the fixed flexing portion at the heel of the switch rail

4.3.4
left hand back rail (if required)
as right hand back rail but opposite hand

4.3.5
heel blocks (if required)
blocks used to form the fixed heel block assembly between the switch rail and respective back rail to limit the moveable length. Depending on the design concept, the distance blocks should transfer track forces

4.3.6
wing rail
part of the crossing with horizontal set forming the running rail support at the switch rail ends

4.3.7
distance blocks (if required)
mechanical device to give strength and support to the crossing assembly. Depending on the design concept, the distance blocks should transfer track forces

4.3.8
knuckle
theoretical intersection of the running edges

4.3.9
spacer blocks (or studs)
blocks to give lateral support to the switch rail

4.3.10
switch toe
physical end of the switch rail that contacts the wing rail to form a continuous running edge in the closed position

4.3.11
moveable length
part of the switch rail which moves in front of the first fixed position when the switch diamond is operated

4.3.12
foot relief
reduction of section of switch rail foot at the switch heel to facilitate flexing

5 Design requirements

5.1 Geometrical data

The following data shall be agreed between the customer and the supplier:

— geometry of the two intersecting running edges (straight, circular, clothoid etc.);

— tangent at the theoretical intersection point;

— bearer layout at the crossing;

— position of the gauge plate/strut (if required);

— height of the crossing;

— rail profiles;

— rail inclination;

— track gauge;