

Railway applications — Track — Switches and crossings —

Part 7: Crossings with moveable parts

ICS 45.080

National foreword

This British Standard is the UK implementation of EN 13232-7:2006+A1:2011. It supersedes BS EN 13232-7:2005, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee RAE/2 Railway Applications - Track.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This document is a preview of the final version of the standard.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 28 April 2006

© BSI 2011

ISBN 978 0 580 70119 1

Amendments/corrigenda issued since publication

Date	Comments
30 November 2011	Implementation of CEN amendment A1:2011

English Version

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

Applications ferroviaires - Voie - Appareils de voie - Partie
7: Cœurs à parties mobiles

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

This European Standard was approved by CEN on 9 January 2006 and includes Amendment 1 approved by CEN on 13 September 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, 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.



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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	4
Introduction	6
1 Scope	7
2 Normative references	7
3 Types of crossing with moveable parts	8
3.1 Common crossings with moveable parts	8
3.2 Obtuse crossings with moveable parts	8
3.3 Materials	9
3.4 Geometry	9
3.5 Inclination of the running table	9
3.6 Construction.....	9
3.7 Relationship with the adjacent track	9
4 Terms and definitions	10
4.1 Common crossing with moveable point (Figure 7)	10
4.2 Common crossing with moveable wing rails (Figure 8)	11
4.3 Obtuse crossing with moveable parts (Figure 9)	12
5 Design requirements	13
5.1 Geometrical data.....	13
5.2 Rolling stock data	14
5.2.1 Maximum axle load	14
5.2.2 Maximum speed	14
5.2.3 Wheel profile, diameter, back to back and wheel set dimensions	14
5.2.4 Note	14
5.3 Supports and fastenings.....	14
5.4 Interface between crossing with moveable parts and operating system	15
5.5 Transfer of longitudinal track forces	15
5.6 Other requirements.....	15
5.7 Drawings	15
6 Tolerances and inspection	15
6.1 General.....	15
6.2 Tools and instruments	16
6.3 Critical dimensions.....	16
6.3.1 General.....	16
6.3.2 Critical dimensions for common crossings with moveable point.....	16
6.3.3 Critical dimensions for common crossings with moveable wing rails	16
6.3.4 Critical dimensions for obtuse crossings with moveable parts	16
6.4 Certification	16
6.5 Methods of examination for structural defects	17
6.5.1 Visual	17
6.5.2 Dye penetrant and/or magnetic particle	17
6.5.3 Ultrasound	17
6.5.4 Radiography.....	17
7 Limits and extent of supply	17
8 Identification marks	17

Annex ZA (informative)  Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC 	64
Bibliography	67

Foreword

This document (EN 13232-7:2006+A1:2011) 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 April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

A1 This document has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2008/57/EC.

For relationship with EU Directive 2008/57/EC, see informative Annex ZA, which is an integral part of this document. **A1**

This document includes Amendment 1, approved by CEN on 2011-09-13.

This document supersedes EN 13232-7:2006.

The start and finish of text introduced or altered by amendment is indicated in the text by tags **A1** **A1**.

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.

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, Bulgaria, Croatia, 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 (monobloc 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 (monobloc 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;

- check gauge (if non-active check rail is requested by the customer);
- machining profile of nose and wing-rail (see Figures 10 to 12);
- minimum flange way width;
- minimum opening between the wing rails (throat opening);
- opening at the drive position.

And any other interfaces with the turnout deemed to be necessary for the design of the crossing.

Check rail profiles shall be according to prEN 13674-3.

5.2 Rolling stock data

5.2.1 Maximum axle load

The customer shall provide the value of the maximum axle load for the line where the crossing is to be installed.

5.2.2 Maximum speed

The customer shall provide the value of the maximum speed for the mainline where the crossing is to be installed.

5.2.3 Wheel profile, diameter, back to back and wheel set dimensions

The customer shall provide the supplier with the wheel profile/profiles, diameter, back to back and wheel set dimensions. The wheel profile/profiles to be used in the design of the crossing may be new ones, with an average wear or maximum wear values. The customer shall indicate which profile/profiles are to be used in the design. Also if special circumstances are to be taken into account, e.g. false flanges in the wheels etc.

Wheel profile and wheel set geometry determine the geometry of the rolling table of the crossing, the flange way width and the check gauge if non-active checkrails are requested.

5.2.4 Note

For detail requirements, see EN 13232-2 and EN 13232-3.

5.3 Supports and fastenings

The relationship of the crossing to the adjacent track and the closure panel, the fastening and supporting systems shall be agreed between supplier and customer. EN 13145, EN 13146, EN 13230 and EN 13481 shall be taken into account.

It shall be specified if the crossing is to be welded to the track or joined by fishplates. In the latter case, the type and details of the fishplates to be used shall be specified by the customer, i.e. section details, length, size and number of holes, bolt centre line height above base of rail and material of fishplates.

The customer shall specify the details of fastenings to be used, direct or indirect.

5.4 Interface between crossing with moveable parts and operating system

Requirements to permit the interface between the crossing with moveable parts and the actuation, locking and detection systems shall be as defined in EN 13232-4. The type of operating system shall be specified by the customer.

The throwing force shall be agreed between customer and supplier and checked at inspection of prototypes only.

5.5 Transfer of longitudinal track forces

When the crossing is integrated in a continuous welded track, the maximum longitudinal forces to be considered for the design are the maximum thermal forces.

The supplier shall prove the capability of the product to support track forces on customer request.

The customer shall define the method (calculation and/or practical test) to be used.

5.6 Other requirements

The customer shall specify all other requirements that may have an influence on the design of the crossing, and provide all necessary data for them.

Examples are heaters, environmental conditions, electrical insulation, continuously welded rail, insulated and/or glued joints, applied cant, special maintenance requirements.

5.7 Drawings

Individual components shall be illustrated on detailed drawings. These detailed drawings shall contain the following information:

- machining profiles;
- sets;
- bending details;
- position of the running edges and machining reference plane;
- drillings;
- pertinent tolerances and surface finishes.

To assure the safety of running of the wheel set over crossing with moveable parts, the machining profiles of switch rail, point rail, splice rail and wing rail shall respect the prescription given in prEN 13232-9.

See also EN 13232-3.

6 Tolerances and inspection

6.1 General

The following section describes tolerances of the critical dimensions, which shall be verified. These tolerances are based on workshop temperatures or a predefined temperature specified by the customer.

Any dimensions and tolerances relating to special requirements (e.g. operating systems, welds, insulated joints) shall be verified.

If the customer imposes restrictions on the tolerances given in the following, they shall be stated in the tender documents.

6.2 Tools and instruments

The customer may request drawings/details of tools/measuring instruments and measuring conditions for verification. Drawings/details shall be submitted on request for approval. All tools/instruments shall be made available by the supplier on request.

For inspection of the components, adequate measuring instruments shall be used, depending on the geometry of the component and on the required accuracy. The appropriate measuring instruments shall be agreed between customer and manufacturer.

It is the manufacturer's responsibility to guarantee dimensional accuracy and to ensure that the inspection is carried out with the appropriate measuring instruments.

6.3 Critical dimensions

6.3.1 General

The following dimensions shall be verified as part of the inspection process and a record shall be kept for inspection by the customer on request. Any sharp edges shall be de-burred.

6.3.2 Critical dimensions for common crossings with moveable point

Refer to Tables 1 to 4 and Figures 13 to 32.

6.3.3 Critical dimensions for common crossings with moveable wing rails

Refer to Tables 5 to 8 and Figures 33 to 46.

6.3.4 Critical dimensions for obtuse crossings with moveable parts

Refer to Tables 9 to 12 and Figures 47 to 61.

6.4 Certification

All materials shall conform to the latest relevant European Standards.

The manganese castings shall be of an austenitic manganese steel generally in accordance with European Standards, if they exist; if not, in accordance with UIC 866.

Materials used for the wheel transfer areas or in some cases only the crossing nose, shall be discussed between customer and supplier. These materials shall only be used with the prior consent of the customer.

The methods of examination required by the customer shall be clearly defined. Any certification required from such examination shall be stated by the customer.

6.5 Methods of examination for structural defects

6.5.1 Visual

This method of examination may be used on all types of crossings. In the event of a defect being suspected this may be followed by one or more of the other methods of examination.

6.5.2 Dye penetrant and/or magnetic particle

Dye penetrant can be used on all types of crossings. Magnetic particle can only be used on magnetic materials and is therefore not suitable for manganese crossings/components.

6.5.3 Ultrasound

Ultrasound may be used on all types of crossings. There are specific conditions for use on manganese material.

6.5.4 Radiography

Radiography can be used on all types of crossings and is particularly useful to examine the internal soundness of cast metallic materials.

7 Limits and extent of supply

Limits and extent of supply shall include all components and special plates equipped with fastenings required, for the basic manufacture of crossings with moveable parts, from the wing front joint to the vee joint. Any requirement for additional items, such as fishplates, fishplate drilling, base plates and clips shall be specified by the customer.

8 Identification marks

Each crossing with moveable parts shall have an identification marking fixed on the crossing. The design of marking shall be agreed between customer and supplier.

The following information shall be marked:

- manufacturer's mark;
- last two digits of year of manufacture;
- crossing type (radius of crossing, main line radius, rail profile and hand of turnout);
- unique identification number.

Other markings shall be specified by the customer.

The identification marks concerning dispatch shall be agreed between customer and supplier.

Table 1 — Critical dimensions for common crossings with moveable point – Completed crossing

Dimensions in millimetres		
Dimension	Description	Tolerance
<i>L1</i>	Point rail length (Figure 13)	± 3
<i>L2</i>	Point rail toe to wing rail front (Figure 13)	± 2
<i>L3</i>	Point rail toe to wing rail end (Figure 13)	± 3
<i>L4</i>	Point rail toe to splice rail end (Figure 13)	± 3
<i>L5</i>	Point rail toe to splice rail toe (Figure 13)	± 2
<i>L6</i>	Overall length wing rail front to point rail / splice rail end (Figure 13)	± 5
<i>b1</i>	Opening running edge measured at the crossing front (Figure 13)	$\pm 1^a$ $\pm 2^b$
<i>b2</i>	Opening running edge measured at the crossing end (Figure 13)	$\pm 1^c$ $\pm 2^b$
<i>b3</i>	Throat opening (Figure 13)	± 2
<i>b4</i>	Flange way width at various positions (measured in the gauge reference plane) (Figure 13)	+ 2 - 1
<i>b5</i>	Distance between running edge to running edge at various positions (measured in the gauge reference plane) (Figure 13)	$\pm 1^a$ $\pm 2^b$
<i>b6</i>	Crossing foot width at bearers positions (for indirect fastening) (Figure 27) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening	+ 1 - 2
<i>b7</i>	Relative position foot edge / running edge at bearers positions (for indirect fastening) (Figure 27) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening and the running edge	± 1
<i>CH</i>	Contact point rail / splice rail to saddle or wing rail (Figure 21)	max. 1
<i>CH1</i>	Contact point rail to splice rail (to be checked when the crossing is set in diverging track) (Figure 23)	max. 1
<i>CH2</i>	Contact splice rail to extended splice rail (to be checked when the crossing is set in diverging track) (Figure 24)	max. 1
<i>CS</i>	Contact point rail to studs (Figure 19)	max. 1
<i>CS</i>	Contact splice rail to studs (Figure 20)	max. 1
<i>SR</i>	Alignment of running edge (straight track) (Figure 28)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 29)	± 1
<i>SR1</i>	Local alignment of running edge (Straight track) (Figure 30)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (Curved track) (Figure 30)	0,5/1 500
<i>CP</i>	Flatness/max allowance between point rail/splice rail and base plates (Figure 22)	1
<i>HM1</i>	Relative position between the top of base plates and the machining reference plane (in case of a saddle) (Figure 17)	$\pm 0,5$
<i>HM2</i>	Relative position between the top of baseplates and the running plane (in case of a saddle) (Figure 17)	$\pm 0,5$
<i>TF</i>	Thickness of the crossing foot (for indirect fastening) (Figure 27)	± 1
<i>h1</i>	Running table flatness (Figure 25)	1
<i>h2</i>	Intermediate running table flatness (Figure 25)	0,2/1 000
<i>h3</i>	Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 26)	1
<i>h4</i>	Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 27)	1
^a Monoblock crossings only. ^b Other than monoblock crossings. ^c Cast vee		

Table 2 — Critical dimensions for common crossings with moveable point – Point rail/splice rail

Dimensions in millimetres

Dimension	Description	Tolerance
<i>L1</i>	Point rail length (Figure 13)	± 3
Not shown	Splice rail length	± 3
<i>I11</i>	Hole position relative to end of rail (Figure 31)	± 1,5 (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 28)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 29)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 30)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 30)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 14 to Figure 16)	± 0,5 (+ tolerance of height of rail)
<i>TM</i>	Thickness at machined area (Figure 14 and Figure 16)	± 0,5
<i>IM</i>	Inclination of machined area (Figure 14 to Figure 16)	± 0,5°
<i>d1</i>	Diameter of fish bolt holes (Figure 31)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 25)	1
<i>h2</i>	Intermediate running table flatness (Figure 25)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 31)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in µm		

Table 3 — Critical dimensions for common crossings with moveable point – Saddle or wing rail

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Overall length of wing rail	± 5
Not shown	Wing rail knuckle to end	± 3
<i>l11</i>	Hole position relative to end of rail (Figure 31)	$\pm 1,5$ (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 28)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 29)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 30)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 30)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 18)	$\pm 0,5$ (+ tolerance of height of rail)
<i>HM1</i>	Relative position between the top of baseplates and the machining reference plane (in case of a saddle) (Figure 17)	$\pm 0,5$
<i>HM2</i>	Relative position between the top of baseplates and the running plane (in case of a saddle) (Figure 17)	$\pm 0,5$
<i>IM</i>	Inclination of machined area (Figure 17 and Figure 18)	$\pm 0,5^\circ$
<i>d1</i>	Diameter of fish bolt holes (Figure 31)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 25)	1
<i>h2</i>	Intermediate running table flatness (Figure 25)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 31)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in μm		

**Table 4 — Critical dimensions for common crossings with moveable point – Forging (transition) area
(when applicable)**

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Running table	0,3/1 500
Not shown	Running edge alignment	0,5/1 500
Not shown	End profile	Tolerance according to the rolled rail section
<i>HC</i>	Head profile (Figure 32)	An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm
<i>HF</i>	Height difference from one rail foot to the other rail foot (Figure 32)	± 1
<i>LT</i>	Transition length (Figure 32)	$\pm 10 \%$

Table 5 — Critical dimensions for common crossings with moveable wing rails – Completed crossing

Dimensions in millimetres

Dimension	Description	Tolerance
<i>L1</i>	Vee length (nose to heel) (Figure 33)	± 3
<i>L2</i>	Nose to wing rail front (Figure 33)	± 2
<i>L3</i>	Overall length wing rail front to vee rail end (Figure 33)	± 5
Not shown	Overall length of wing rail	± 5
<i>b1</i>	Opening running edge measured at the crossing front (Figure 33)	± 2
<i>b2</i>	Opening running edge measured at the crossing end (Figure 33)	$\pm 1^a$ $\pm 2^b$
<i>b3</i>	Throat opening (Figure 33)	+ 3 - 4
<i>b4</i>	Flange way width at drive positions (measured in the gauge reference plane) (Figure 33)	+ 3 - 4
<i>b5</i>	Distance between running edge to running edge at various positions (measured in the gauge reference plane) (Figure 33)	$\pm 1^a$ $\pm 2^b$
<i>b6</i>	Crossing foot width at bearers positions (for indirect fastening) (Figure 41) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening	+ 1 - 2
<i>b7</i>	Relative position foot edge / running edge at bearers positions (for indirect fastening) (Figure 41). For direct fastening this dimension is to be checked between the centreline of the hole for the fastening and the running edge. This dimension is to be checked in closed position	± 1
<i>CH</i>	Contact wing rail to vee rail (Figure 36)	max. 1
<i>CS</i>	Contact wing rail stops to supporting bar (Figure 38)	max. 1
<i>SR</i>	Alignment of running edge (straight track) (Figure 42)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 43)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 44)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 44)	0,5/1 500
<i>CP</i>	Flatness/max allowance between wing rail and base plates (Figure 37)	1
<i>TF</i>	Thickness of the crossing foot (for indirect fastening) (Figure 41)	± 1
<i>h1</i>	Running table flatness (Figure 39)	1
<i>h2</i>	Intermediate running table flatness (Figure 39)	0,2/1 000
<i>h3</i>	Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 40)	1
<i>h4</i>	Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 41)	1
^a Cast vee only.		
^b Other than cast vee.		

Table 6 — Critical dimensions for common crossings with moveable wing rails – Vee

Dimensions in millimetres		
Dimension	Description	Tolerance
<i>L1</i>	Vee length (nose to heel) (Figure 33)	± 3
<i>l11</i>	Hole position relative to end of rail (Figure 45)	± 1,5 (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 42)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 43)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 44)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 44)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 34)	± 0,5 (+ tolerance of height of rail)
<i>TM</i>	Thickness at machined area (Figure 34)	± 0,5
<i>IM</i>	Inclination of machined area (Figure 34)	± 0,5°
<i>d1</i>	Diameter of fish bolt holes (Figure 45)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 39)	1
<i>h2</i>	Intermediate running table flatness (Figure 39)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 45)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in µm		

Table 7 — Critical dimensions for common crossings with moveable wing rails – Wing rail

Dimensions in millimetres		
Dimension	Description	Tolerance
Not shown	Overall length of wing rail	± 5
Not shown	Wing rail knuckle to end	± 3
<i>l11</i>	Hole position relative to end of rail (Figure 45)	± 1,5 (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 42)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 43)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 44)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 44)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 35)	± 0,5 (+ tolerance of height of rail)
<i>IM</i>	Inclination of machined area (Figure 35)	± 0,5°
<i>d1</i>	Diameter of fish bolt holes (Figure 45)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 39)	1
<i>h2</i>	Intermediate running table flatness (Figure 39)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 45)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in µm		

Table 8 — Critical dimensions for common crossings with moveable wing rails – Forging (transition) area (when applicable)

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Running table	0,3/1 500
Not shown	Running edge alignment	0,5/1 500
Not shown	End profile	Tolerance according to the rolled rail section
<i>HC</i>	Head profile (Figure 46)	An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm
<i>HF</i>	Height difference from one rail foot to the other rail foot (Figure 46)	± 1
<i>LT</i>	Transition length (Figure 46)	$\pm 10 \%$

Table 9 — Critical dimensions for obtuse crossings with moveable parts – Completed crossing

Dimensions in millimetres

Dimension	Description	Tolerance
<i>L1</i>	Wing rail knuckle to end (Figure 47)	± 2
<i>L2</i>	Wing rail knuckle to switch rail end (Figure 47)	± 3
<i>L3</i>	Overall length wing rail end to switch rail end (Figure 47)	± 5
<i>L4</i>	Wing rail knuckle to switch rail toe (measured with the switch rail in closed position) (Figure 50)	± 5
<i>b1</i>	Opening running edge L H side (measured at shortest rail) (Figure 47)	± 2
<i>b2</i>	Opening running edge R H side (measured at shortest rail) (Figure 47)	± 2
<i>b3</i>	Distance between running edge to running edge at various positions (measured in the gauge reference plane with the switch rail in closed position) (Figure 47)	± 2
<i>b6</i>	Crossing foot width at bearers positions (for indirect fastening) (Figure 56) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening	+ 1 - 2
<i>b7</i>	Relative position foot edge/running edge at bearers positions (for indirect fastening) (Figure 56) For direct fastening this dimension is to be checked between the centreline of the hole for the fastening and the running edge	± 1
<i>CH</i>	Contact switch rail to wing rail (Figure 51)	max. 1
<i>CS</i>	Contact switch rail to studs (Figure 53)	max. 1
<i>SR</i>	Alignment of running edge (straight track) (Figure 57)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 58)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 59)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 59)	0,5/1 500
<i>CP</i>	Flatness/max allowance between switch rail and base plates (Figure 52)	1
<i>TF</i>	Thickness of the crossing foot (for indirect fastening) (Figure 56)	± 1
<i>h1</i>	Running table flatness (Figure 54)	1
<i>h2</i>	Intermediate running table flatness (Figure 54)	0,2/1 000
<i>h3</i>	Underside flatness at bearer positions, every support shall not deviate more than 1 mm from the reference plane formed between the two end bearer positions (Figure 55)	1
<i>h4</i>	Underside transverse flatness at bearer positions. Reference plane is formed between the two outer positions of the bearing surface (Figure 56)	1
Open Switch Rail Flange way: The physical dimensions with the switch rail in the open position shall be greater than or equal to the dimensions stated on the drawing.		

Table 10 — Critical dimensions for obtuse crossings with moveable parts – Switch rail

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Switch rail length	± 3
<i>l11</i>	Hole position relative to end of rail (Figure 60)	$\pm 1,5$ (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 57)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 58)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 59)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 59)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 49)	$\pm 0,5$ (+ tolerance of height of rail)
<i>TM</i>	Thickness at machined area (Figure 49)	$\pm 0,5$
<i>IM</i>	Inclination of machined area (Figure 49)	$\pm 0,5^\circ$
<i>d1</i>	Diameter of fish bolt holes (Figure 60)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 54)	1
<i>h2</i>	Intermediate running table flatness (Figure 54)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 60)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in μm		

Table 11 — Critical dimensions for obtuse crossings with moveable parts – Wing rail

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Overall length of wing rail	± 5
<i>L1</i>	Wing rail knuckle to end (Figure 47)	± 2
<i>l11</i>	Hole position relative to end of rail (Figure 60)	$\pm 1,5$ (for temporary fishplating ± 3)
<i>SR</i>	Alignment of running edge (straight track) (Figure 57)	± 1
<i>SR</i>	Alignment of running edge (curved track) (Figure 58)	± 1
<i>SR1</i>	Local alignment of running edge (straight track) (Figure 59)	0,5/1 500
<i>SR1</i>	Local alignment of running edge (curved track) (Figure 59)	0,5/1 500
<i>HM</i>	Height at machined area (Figure 48)	$\pm 0,5$ (+ tolerance of height of rail)
<i>IM</i>	Inclination of machined area (Figure 48)	$\pm 0,5^\circ$
<i>d1</i>	Diameter of fish bolt holes (Figure 60)	+ 1 - 0,5
Not shown	Chamfer of holes	minimum 0,5
<i>h1</i>	Running table flatness (Figure 54)	1
<i>h2</i>	Intermediate running table flatness (Figure 54)	0,2/1 000
<i>h5</i>	Hole position relative to rail foot (Figure 60)	± 1
Not shown	Roughness of machined running surface areas	<i>Ra</i> 6.3 ^a
^a value 6.3 given in μm		

**Table 12 — Critical dimensions for obtuse crossings with moveable parts – Forging (transition) area
(when applicable)**

Dimensions in millimetres

Dimension	Description	Tolerance
Not shown	Running table	0,3/1 500
Not shown	Running edge alignment	0,5/1 500
Not shown	End profile	Tolerance according to the rolled rail section
<i>HC</i>	Head profile (Figure 61)	An area of concavity may exist only on the opposite of the running edge. This shall not exceed 2 mm
<i>HF</i>	Height difference from one rail foot to the other rail foot (Figure 61)	± 1
<i>LT</i>	Transition length (Figure 61)	$\pm 10 \%$

25

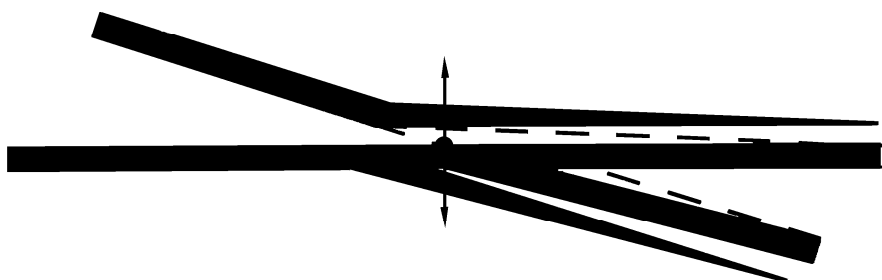


Figure 1 — Moveable point

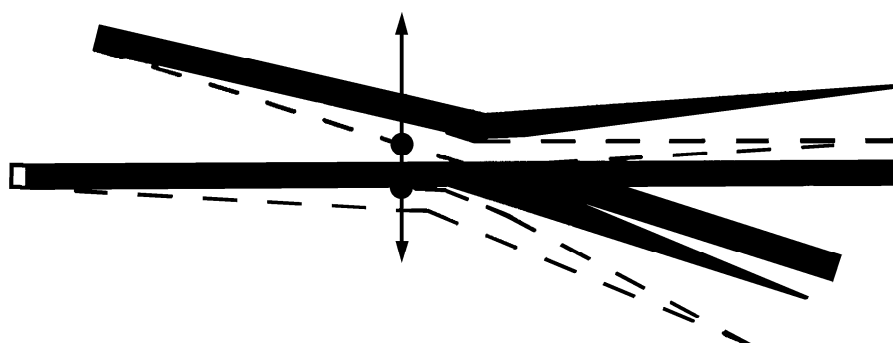
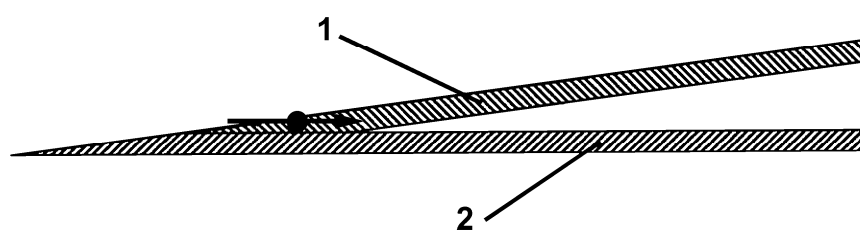


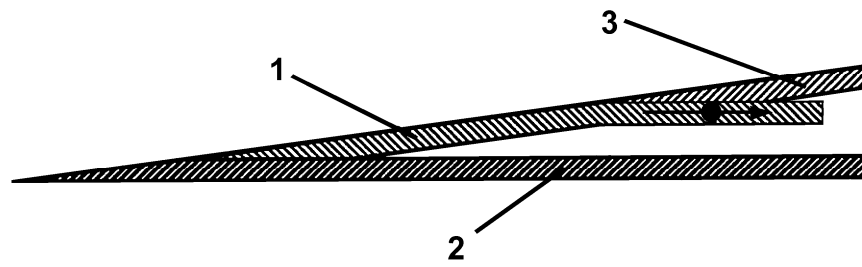
Figure 2 — Moveable wing rails



Key

- 1 splice rail
- 2 point rail

Figure 3 — Splice rail sliding along the point rail



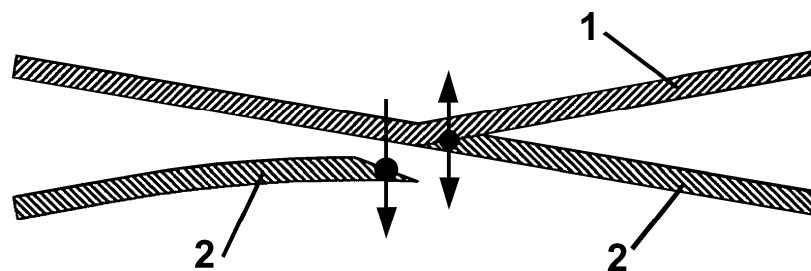
Key

- 1 splice rail
- 2 point rail
- 3 extended splice rail

Figure 4 — Splice joint in the diverging track



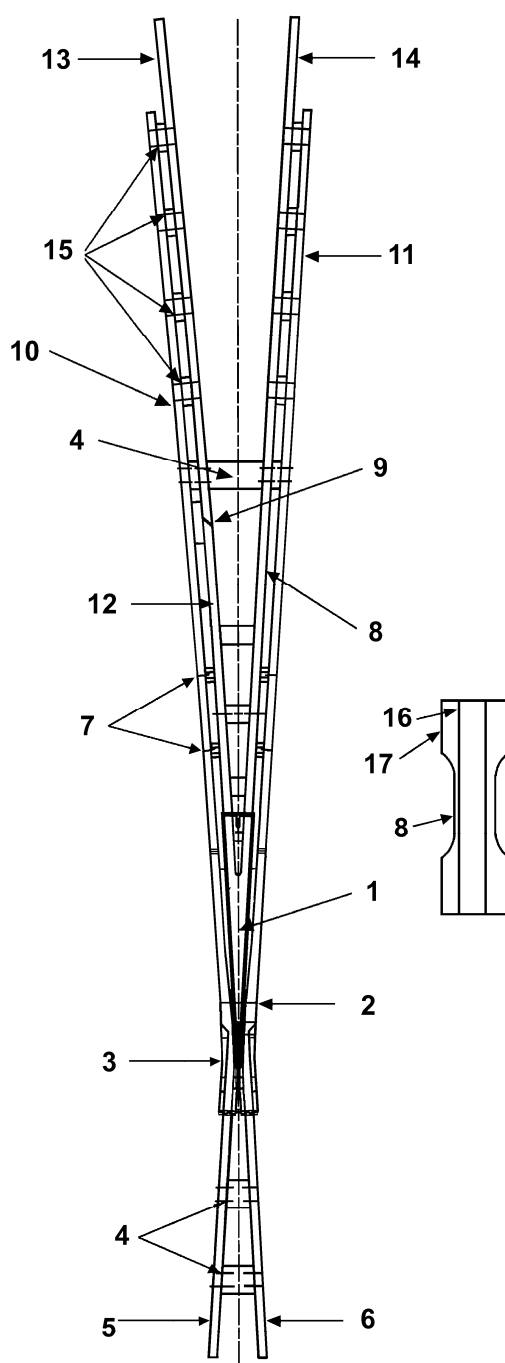
Figure 5 — Moveable point without longitudinal sliding area



Key

- 1 wing rail
- 2 switch rail

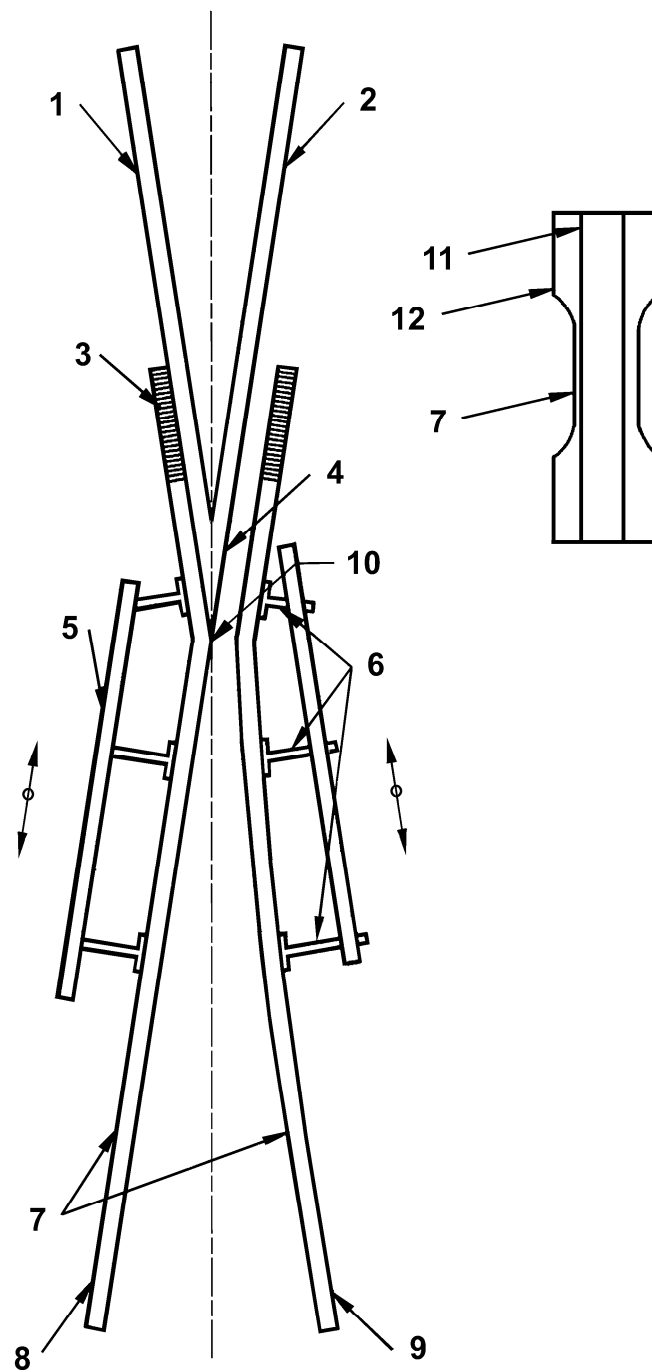
Figure 6 — Switch diamond crossing



Key

1 swing nose (moveable vee)	7 spacer blocks (studs)	13 L H extended vee rail
2 saddle (wing rail)	8 foot relief	14 R H vee rail
3 relief ramp	9 longitudinal sliding area	15 flange way blocks
4 distance block	10 L H wing rail	16 rail head
5 L H front wing rail	11 R H wing rail	17 rail foot
6 R H front wing rail	12 L H vee rail	

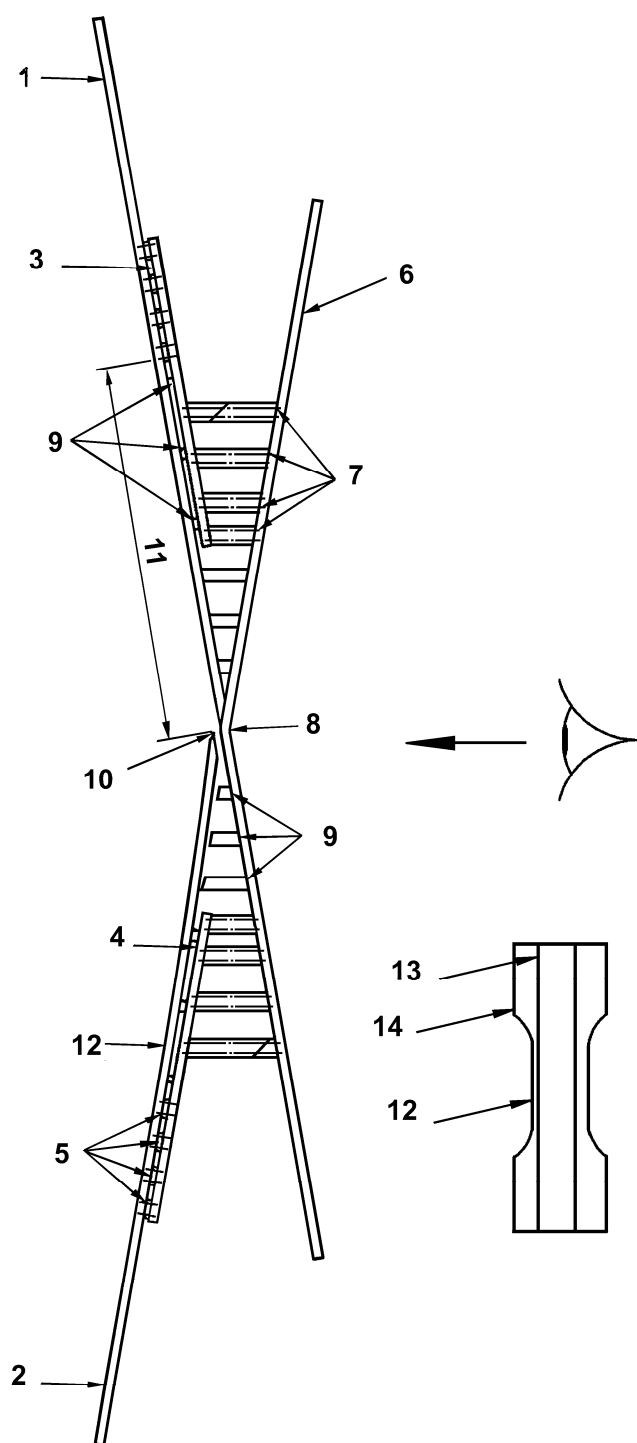
Figure 7 — Common crossing with moveable point



Key

- | | | | | | |
|---|--------------|---|-----------------|----|---------------|
| 1 | L H vee rail | 5 | supporting bar | 9 | R H wing rail |
| 2 | R H vee rail | 6 | wing rail stops | 10 | nose |
| 3 | relief ramp | 7 | foot relief | 11 | rail head |
| 4 | vee | 8 | L H wing rail | 12 | rail foot |

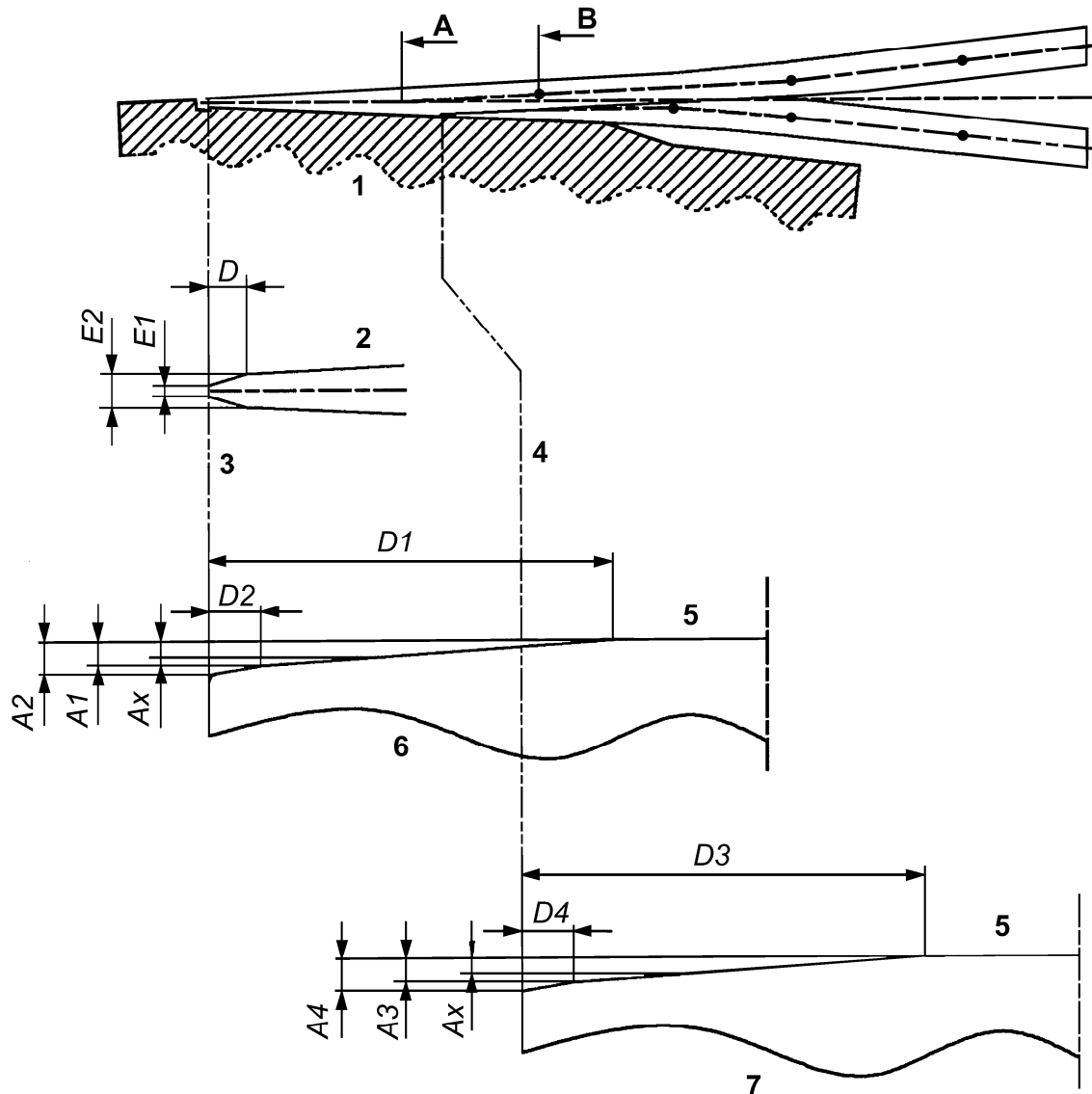
Figure 8 — Common crossing with moveable wing rails



Key

- | | | |
|-------------------|-------------------------|--------------------|
| 1 R H switch rail | 6 wing rail | 11 moveable length |
| 2 L H switch rail | 7 distance blocks | 12 foot relief |
| 3 R H back rail | 8 knuckle | 13 rail head |
| 4 L H back rail | 9 spacer blocks (studs) | 14 rail foot |
| 5 heel blocks | 10 switch toe | |

Figure 9 — Obtuse crossing with moveable parts (switch diamond crossing)

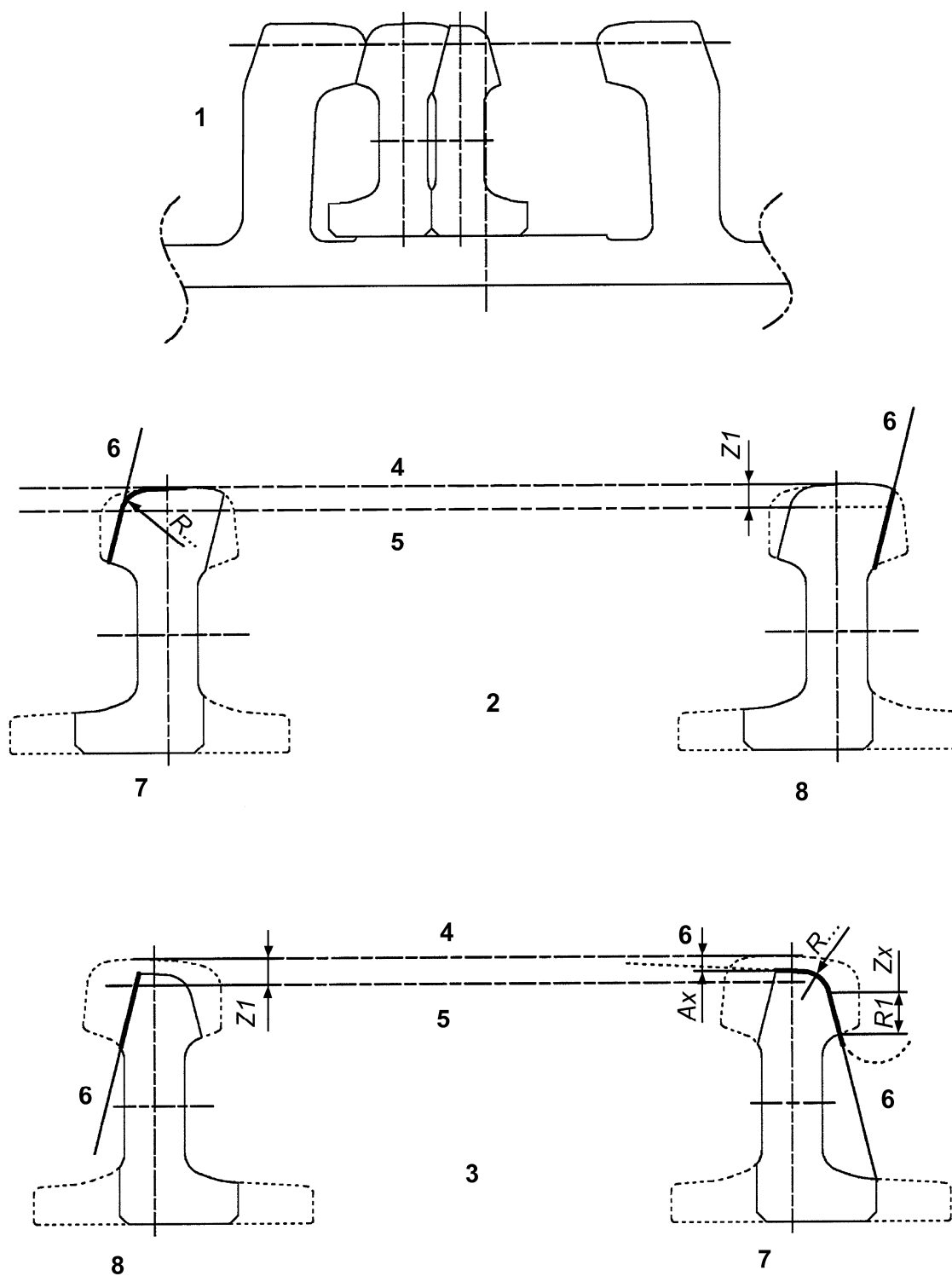


Key

- | | |
|-------------------------|---------------------------------|
| 1 saddle (wing rail) | 5 running plane |
| 2 nose | 6 point rail |
| 3 PRT (point rail tip) | 7 splice rail |
| 4 SRT (splice rail tip) | An, Dn, En various check values |

NOTE An, Dn, En are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. An is the lowering measuring from the corresponding length Dn.

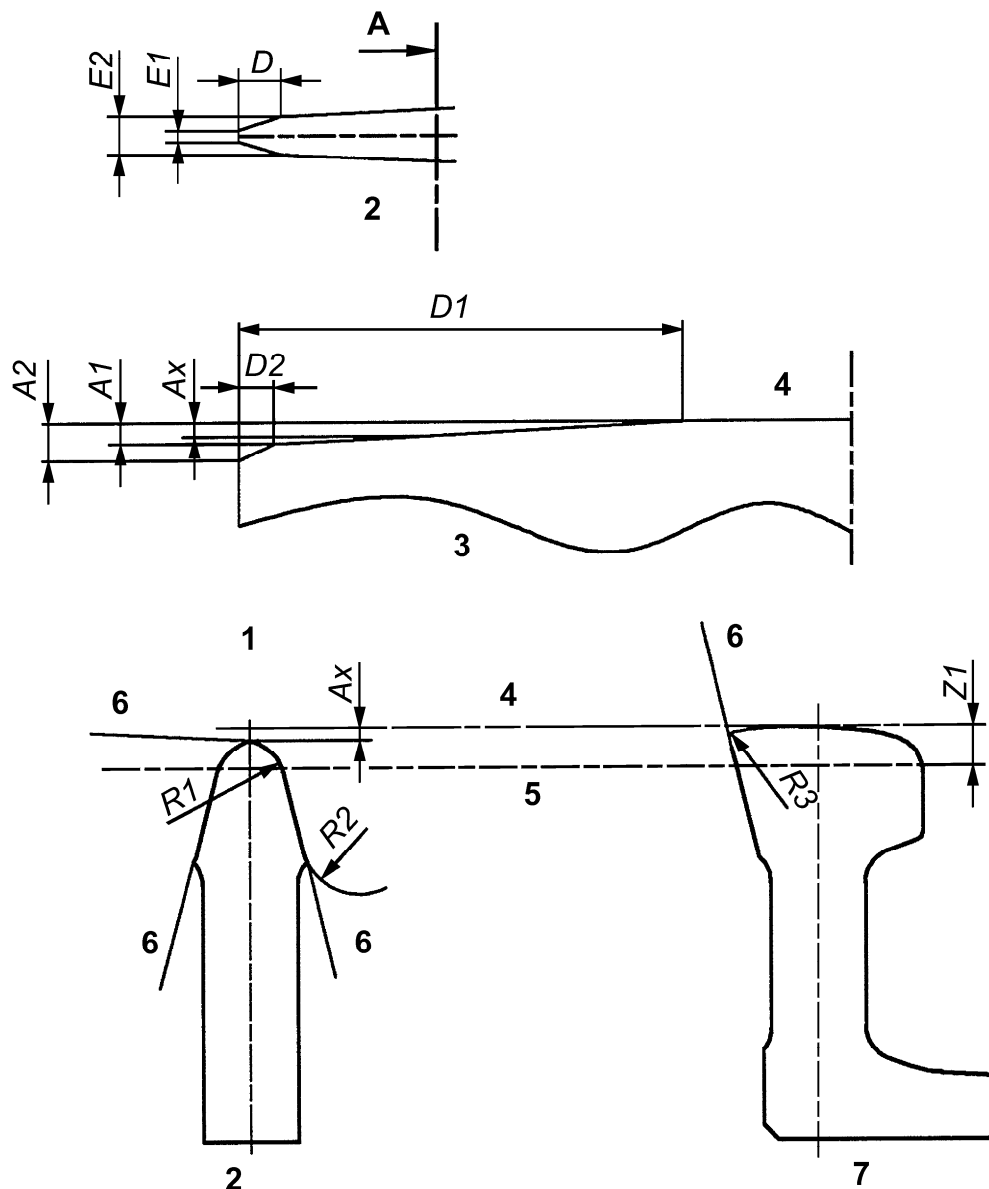
Figure 10 a) — Common crossing with moveable point: machining details



Key

- | | | | |
|---|---------------|---|---------------------------|
| 1 | section B | 5 | machining reference plane |
| 2 | point rail | 6 | slope |
| 3 | splice rail | 7 | running side |
| 4 | running plane | 8 | application side |

Figure 10 b) — Common crossing with moveable point: machining details



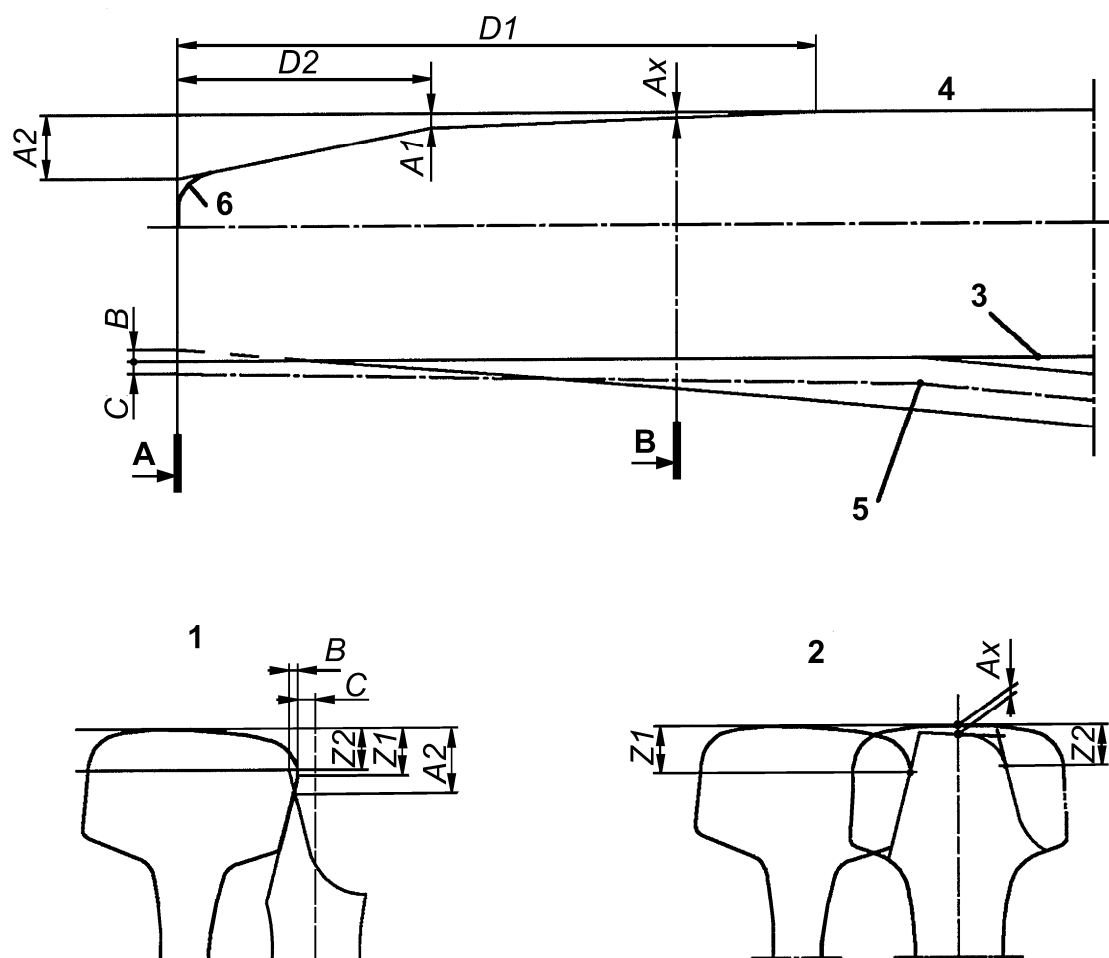
Key

- | | |
|-----------------|---------------------------------|
| 1 section A | 5 machining reference plane |
| 2 nose | 6 slope |
| 3 point rail | 7 moveable wing rail |
| 4 running plane | An, Dn, En various check values |

NOTE 1 An, Dn, En are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. An is the lowering measuring from the corresponding length Dn.

NOTE 2 radi (Rn) depending on manufacturing

Figure 11 — Common crossing with moveable wing rail: machining details



Key

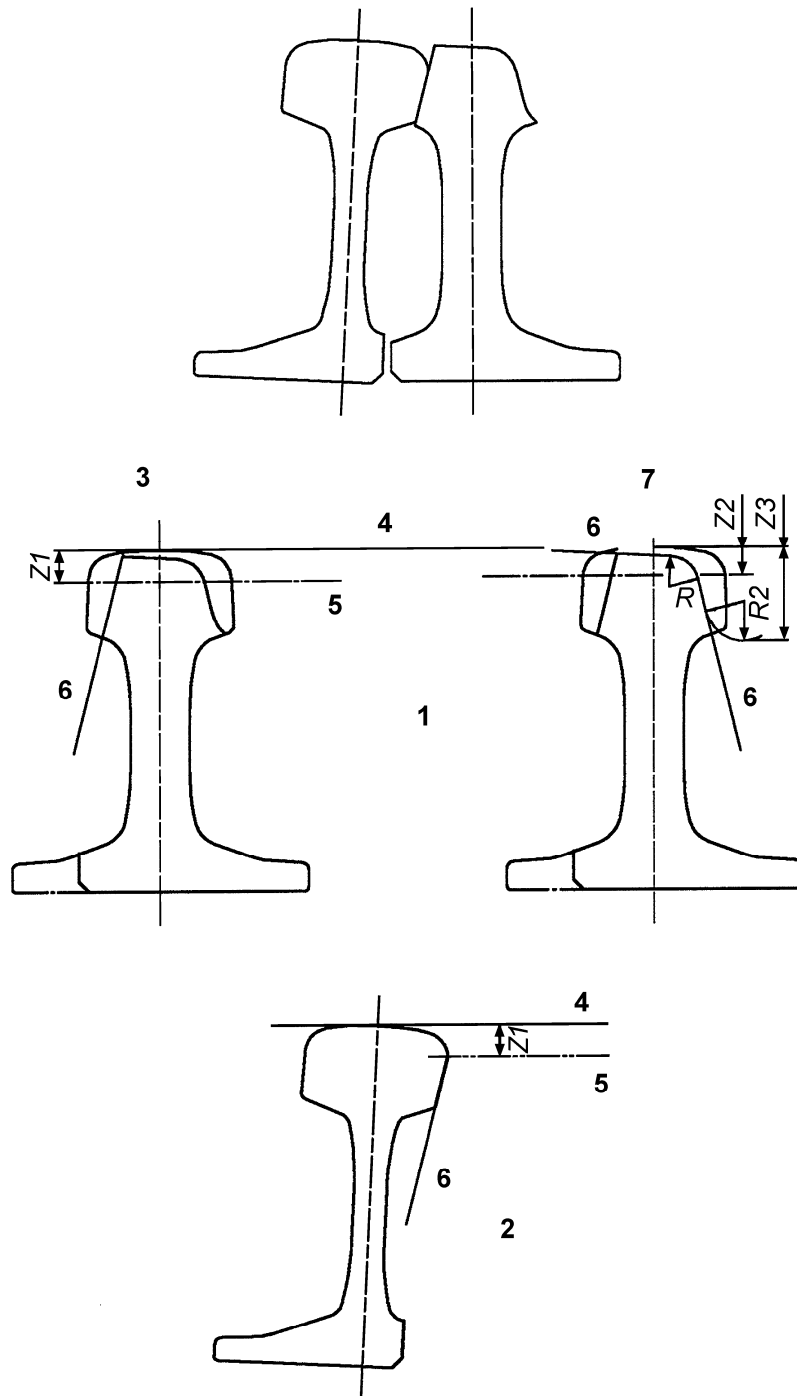
- 1 section A
- 2 section B
- 3 wing rail running edge

- 4 running plane
- 5 set of switch rail
- 6 R (if any)
- A_n, D_n various check values
- Z_n gauge reference plane

NOTE 1 $Z1 = Z2$ in the case of vertical wing rail

NOTE 2 A_n and D_n are various values to be checked in accordance with the respective crossing drawing. Dimensions are calculated according to crossing angle and wheel profile. A_n is the lowering measuring from the corresponding length D_n .

Figure 12 a) — Switch diamond crossing: machining details

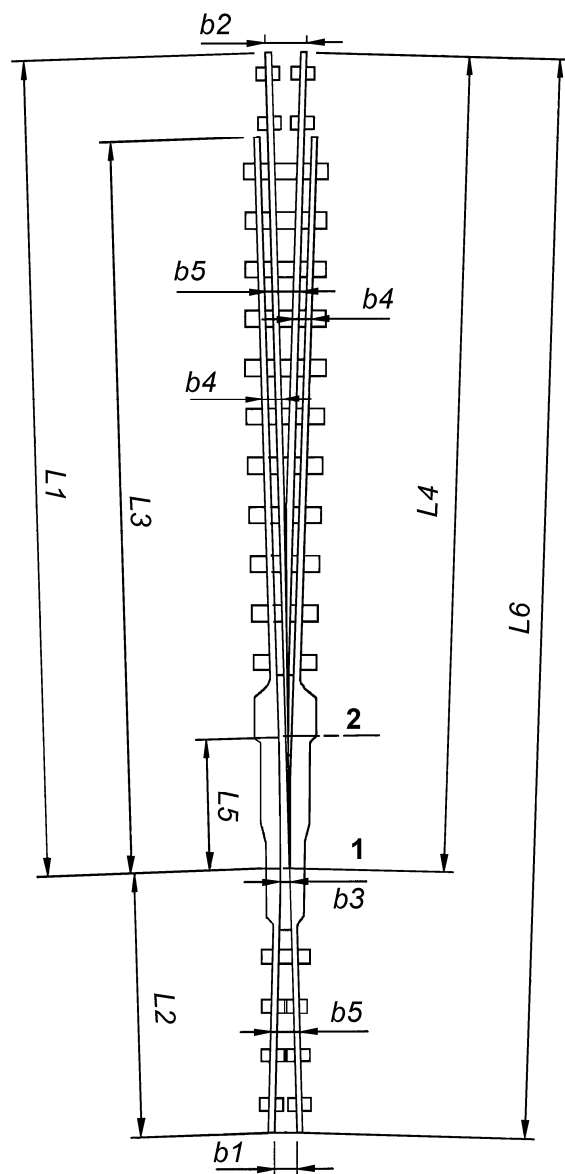


Key

- | | | | |
|---|------------------|----|----------------------------------|
| 1 | switch rail | 5 | machining reference plane |
| 2 | wing rail | 6 | slope |
| 3 | application side | 7 | running side |
| 4 | running plane | Zn | gauge reference plane |
| | | Rn | radi, depending on manufacturing |

NOTE $Z1 = Z2$ in the case of vertical wing rail

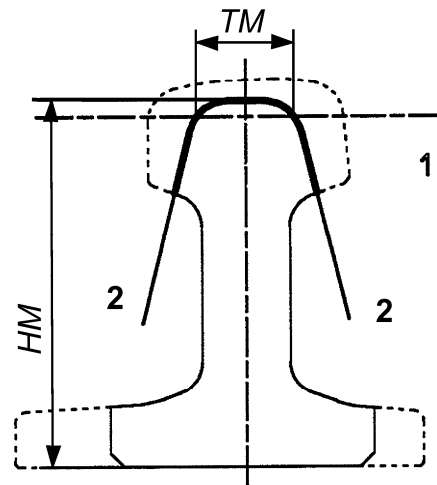
Figure 12 b) — Switch diamond crossing: machining details



Key

- 1 PRT (point rail tip)
- 2 SRT (splice rail tip)
- L1 Point rail length
- L2 Point rail toe to wing rail front
- L3 Point rail toe to wing rail end
- L4 Point rail toe to splice rail end
- L5 Point rail toe to splice rail toe
- b1 Opening running edge measured at the crossing front
- b2 Opening running edge measured at the crossing end
- b3 Throat opening
- b4 Flange way width at various positions
- b5 Distance between running edge to running edge at various positions

Figure 13 — Critical dimensions for common crossing with moveable point – openings and lengths

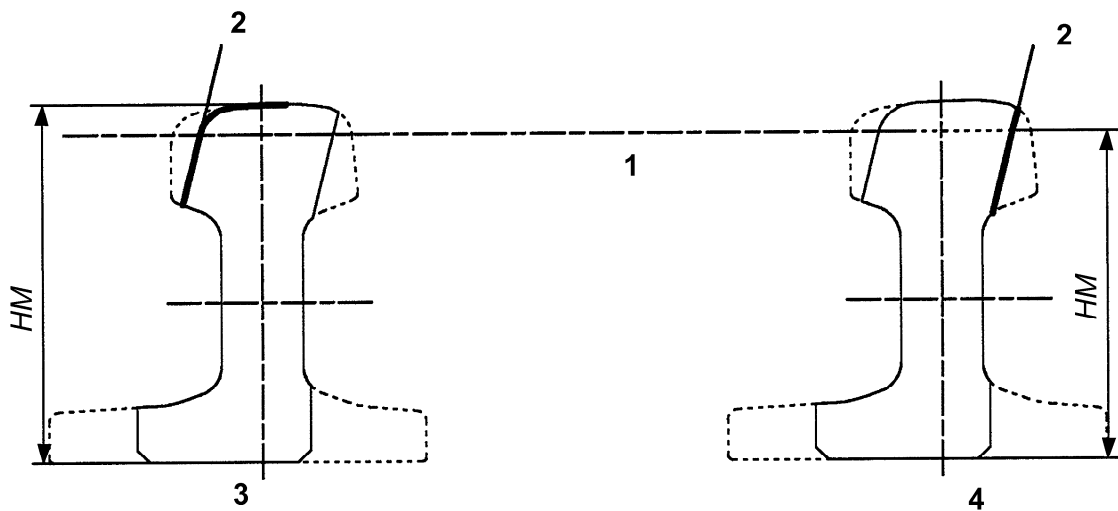


Key

- 1 machining reference plane
- 2 slope

TM thickness at machined area
HM height at machined area

Figure 14 — Critical dimensions for common crossing with moveable point – point rail

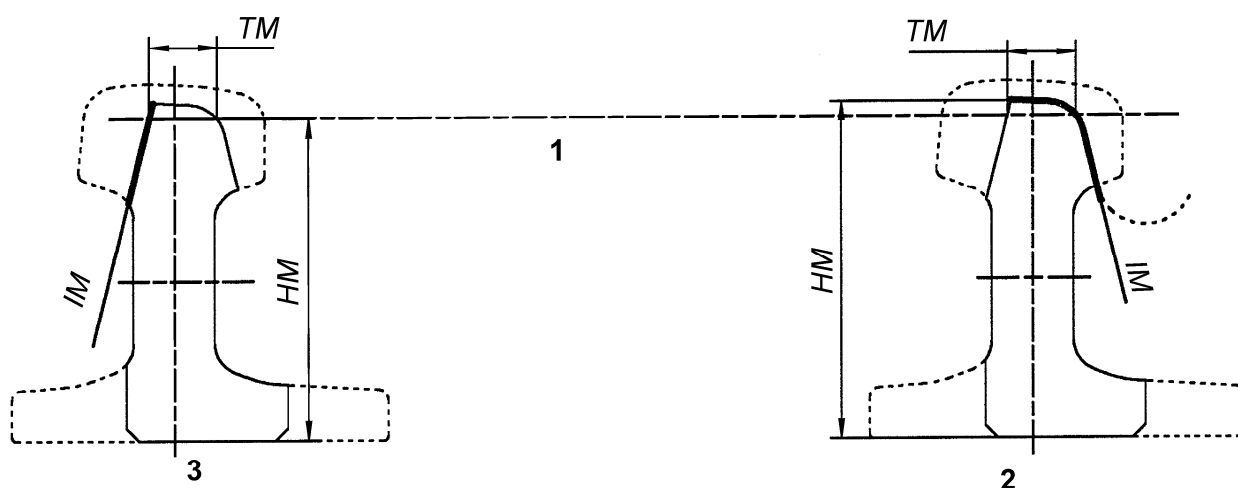


Key

- 1 machining reference plane
- 2 slope
- 3 running side

4 application side
HM height at machined area

Figure 15 — Critical dimensions for common crossing with moveable point – point rail

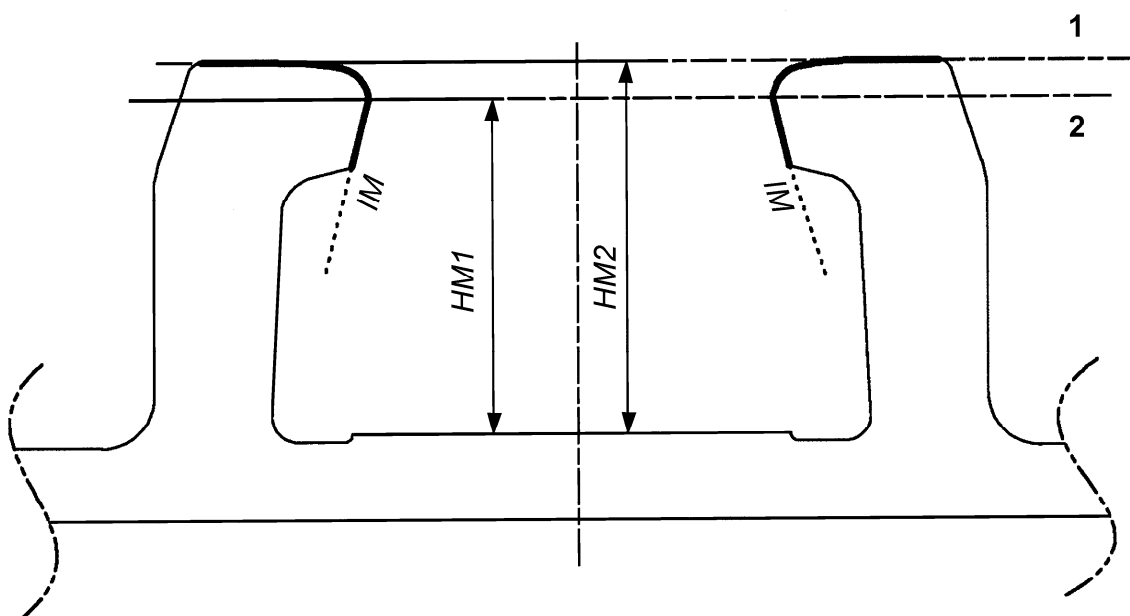


Key

- 1 machining reference plane
- 2 running side
- 3 application side

- IM* inclination of machined area
- TM* thickness at machined area
- HM* height at machined area

Figure 16 — Critical dimensions for common crossing with moveable point – splice rail

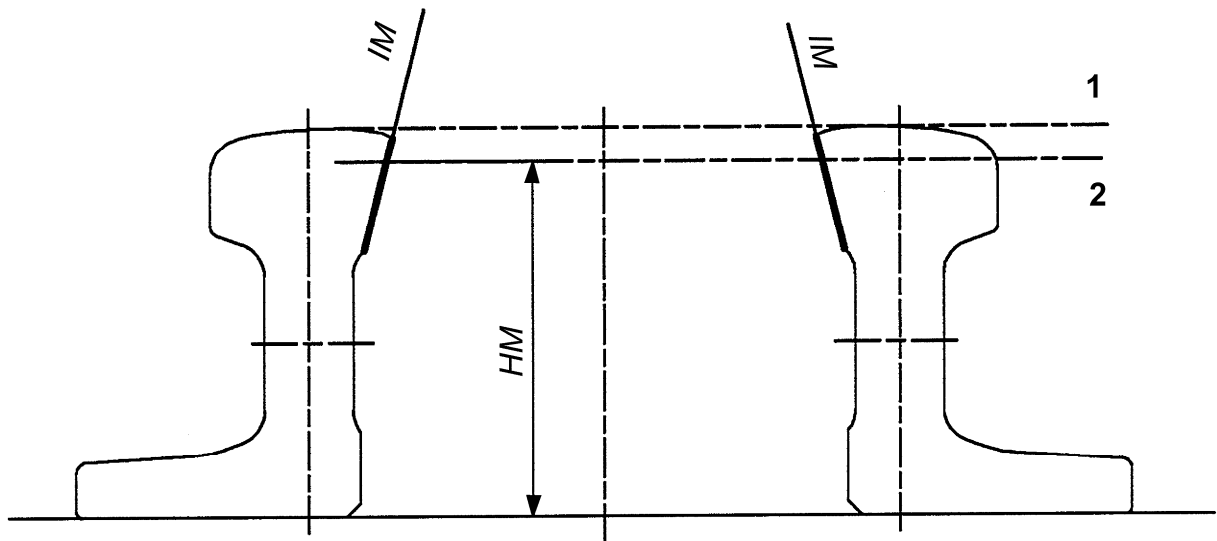


Key

- 1 running plane
- 2 machining reference plane

- IM* inclination of machined area
- HM1* top of base plate to machining reference plane
- HM2* top of base plate to running plane

Figure 17 — Critical dimensions for common crossing with moveable point – saddle



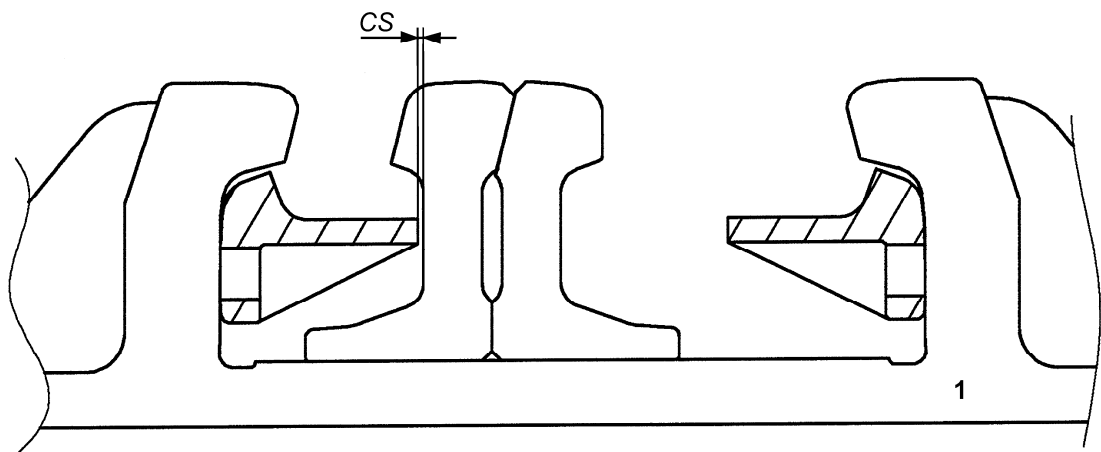
Key

- 1 running plane
- 2 machining reference plane

HM height of machining reference plane

IM inclination of machined area

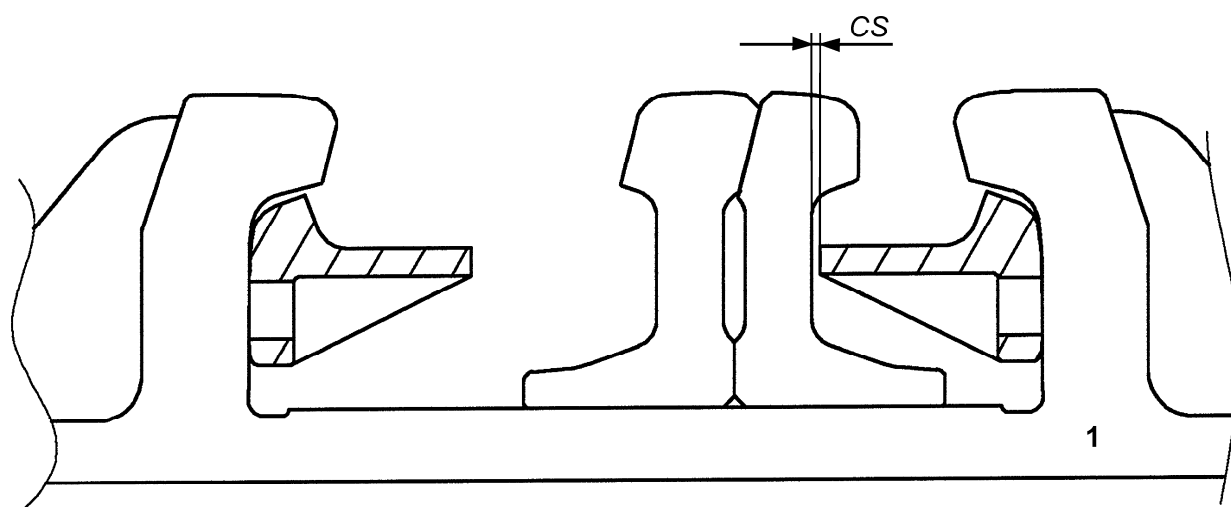
Figure 18 — Critical dimensions for common crossing with moveable point – wing rail



Key

- 1 saddle (wing rail)
- CS contact point rail to studs

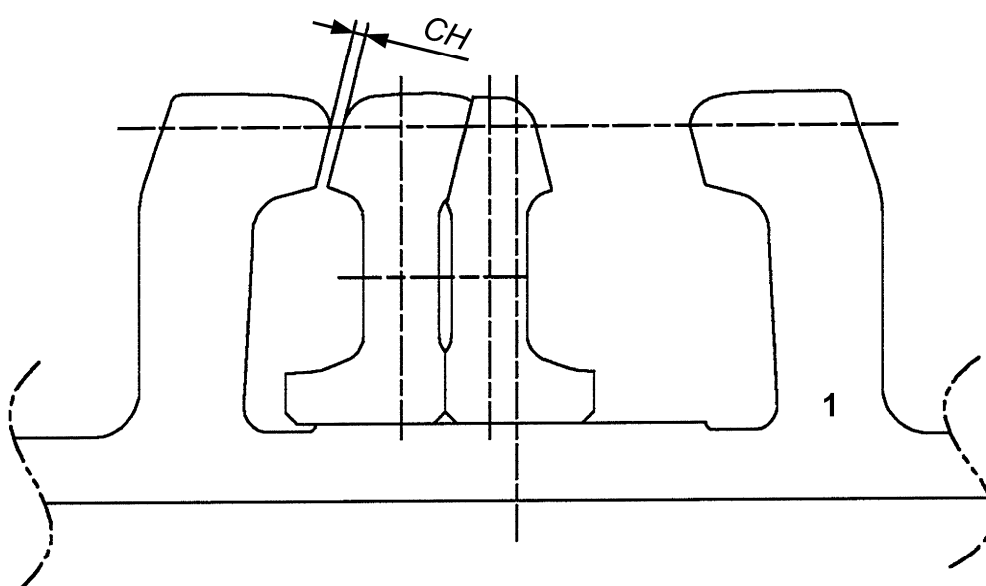
Figure 19 — Critical dimensions for common crossing with moveable point – point rail/stud contact



Key

- 1 saddle (wing rail)
- CS contact point rail to studs

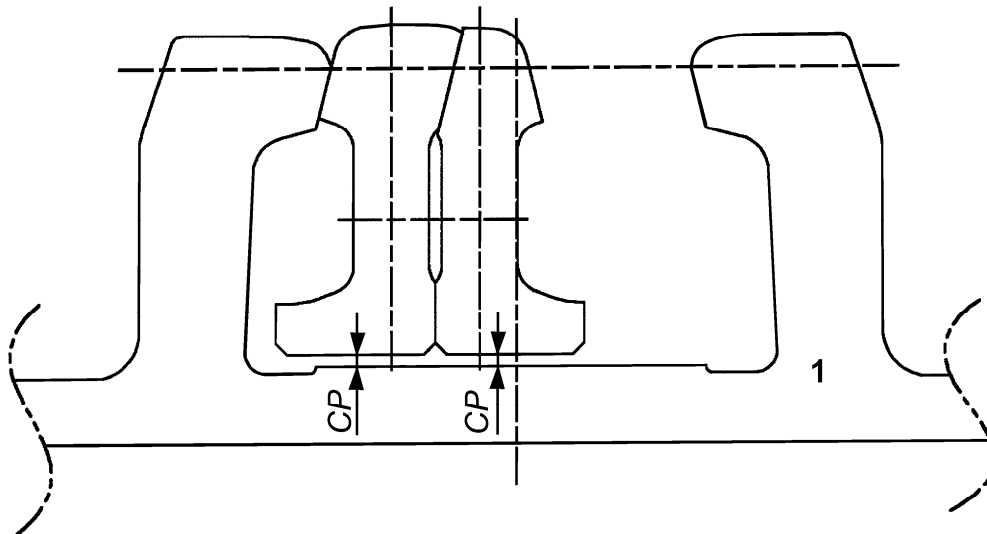
Figure 20 — Critical dimensions for common crossing with moveable point – splice rail/stud contact



Key

- 1 saddle (wing rail)
- CH contact point rail to saddle or wing rail

Figure 21 — Critical dimensions for common crossing with moveable point – point rail and splice rail/saddle or wing rail contact

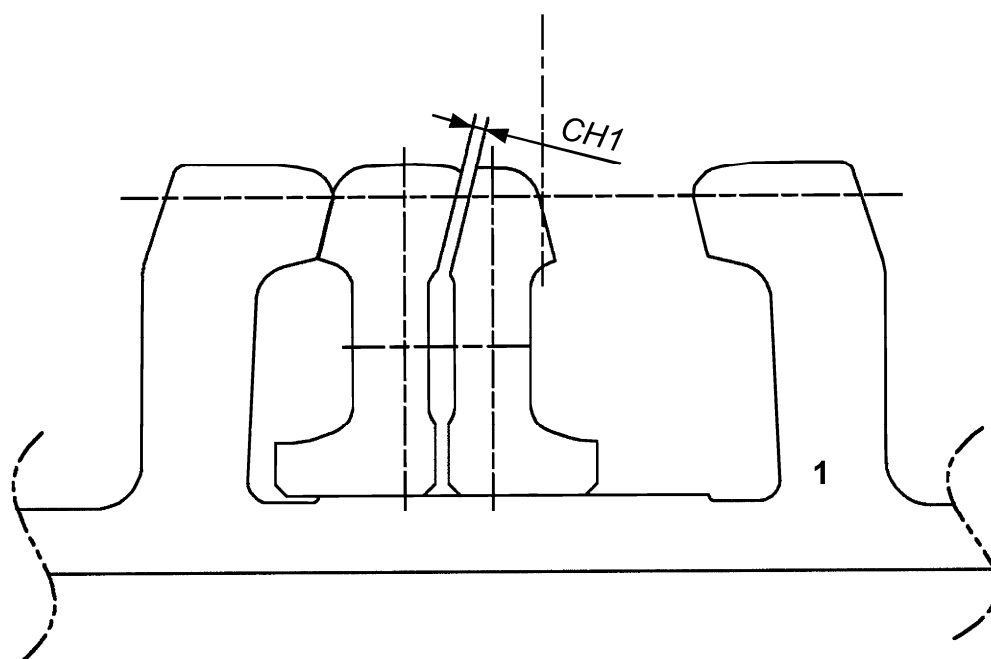


Key

1 saddle (wing rail)

CP flatness/maximum allowance between point/splice rail and baseplate

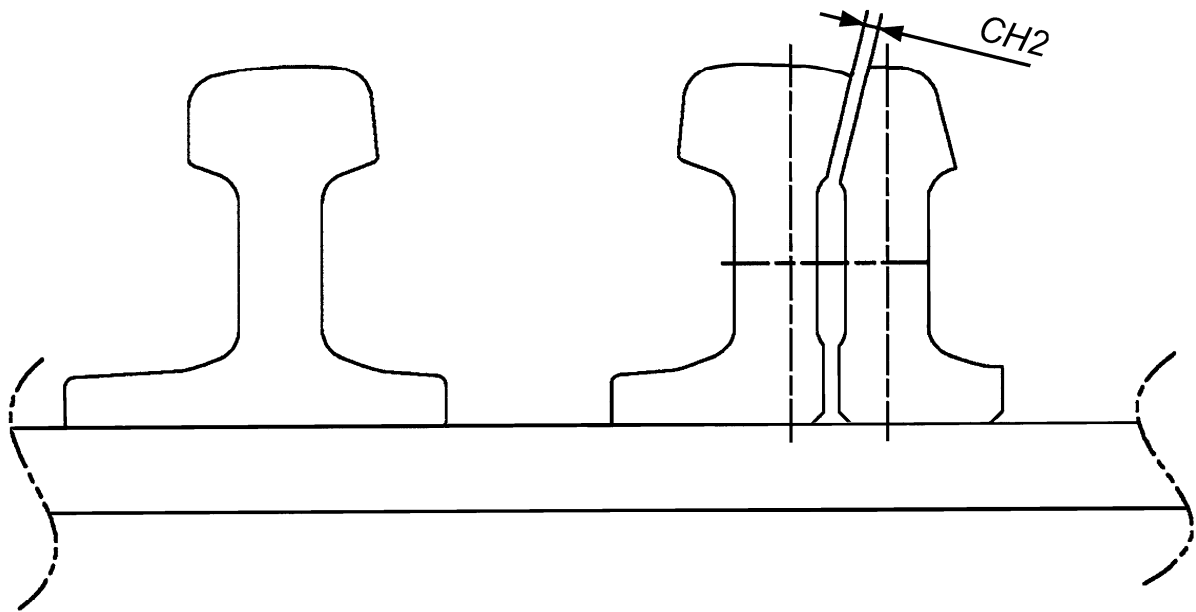
Figure 22 — Critical dimensions for common crossing with moveable point – point rail and splice rail/ baseplate contact



Key

- 1 saddle (wing rail)
CH1 contact point rail to splice rail

Figure 23 — Critical dimensions for common crossing with moveable point – point rail/splice rail contact

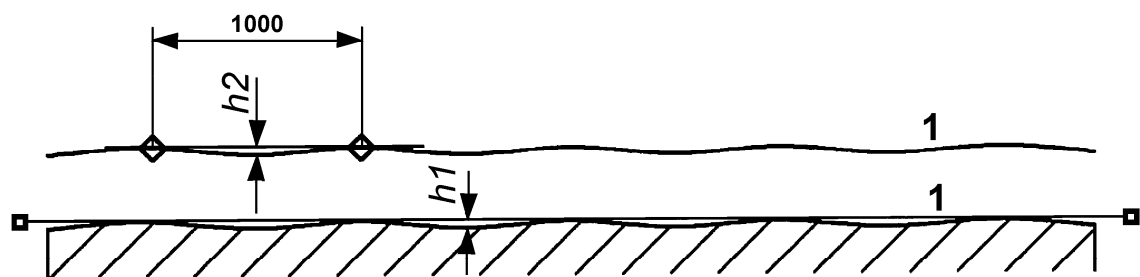


Key

CH2 contact splice rail to extended splice rail

Figure 24 — Critical dimensions for common crossing with moveable point –splice rail/extended splice rail contact

Dimensions in millimetres



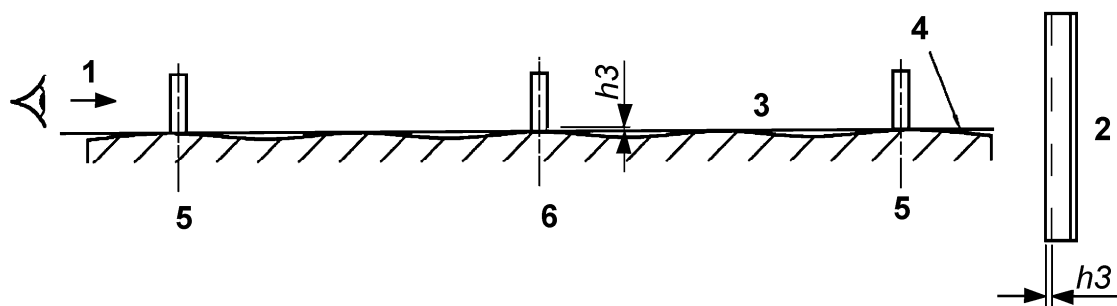
Key

1 top surface

h1 running table flatness

h2 intermediate running table flatness

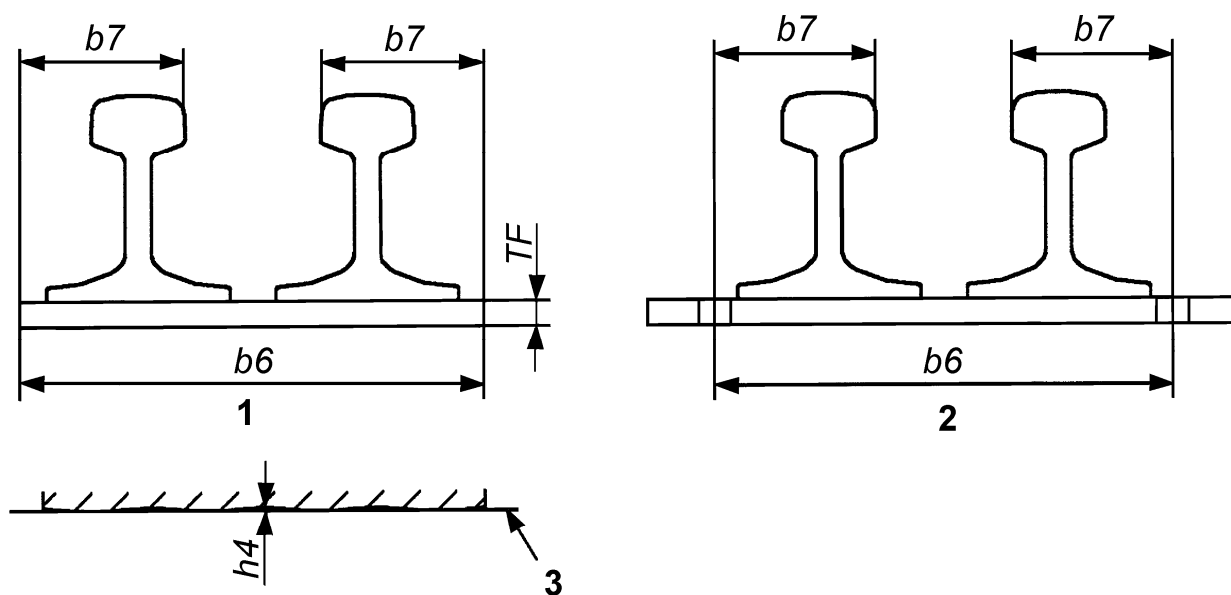
Figure 25 — Critical dimensions for common crossing with moveable point – top surface



Key

- | | | | |
|---|-----------------|------|---------------------------------------|
| 1 | arrow A | 5 | end position bearer |
| 2 | view on arrow A | 6 | intermediate bearer positions |
| 3 | bottom surface | $h3$ | underside flatness at bearer position |
| 4 | reference plane | | |

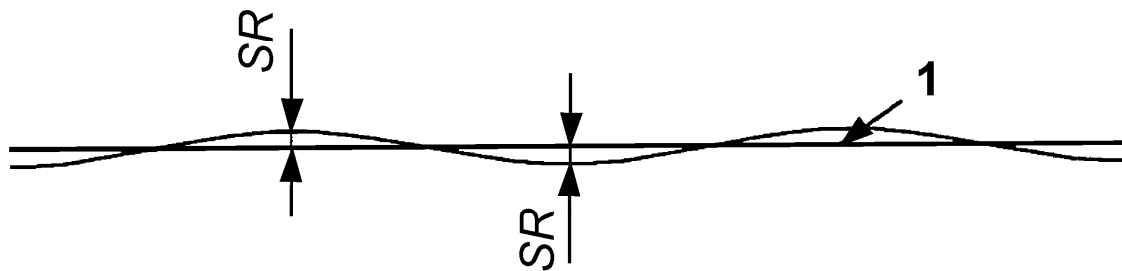
Figure 26 — Critical dimensions for common crossing with moveable point – bottom surface



Key

- | | | | |
|---|--------------------|--------|---|
| 1 | indirect fastening | $h4$ | underside transverse flatness at bearer positions |
| 2 | direct fastening | $b6$ | crossing foot width |
| 3 | reference plane | $b7$ | relative position foot edge/running edge |
| | | $b6^*$ | distance of baseplate hole at bearer position |
| | | $b7^*$ | relative position running edge from the baseplate hole at bearer position |
| | | TF | thickness of crossing foot |

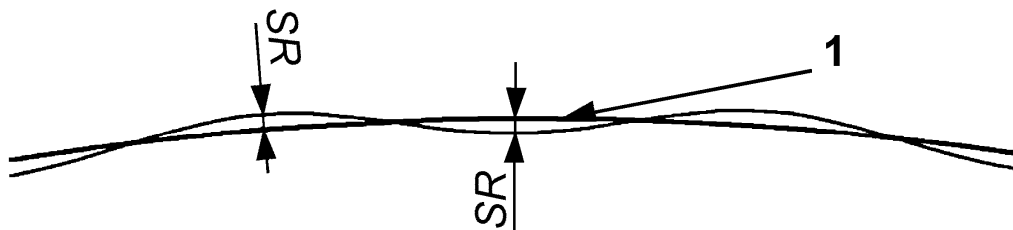
Figure 27 — Critical dimensions for common crossing with moveable point – cross-section



Key

- 1 theoretical running edge
- SR alignment of running edge

Figure 28 — Critical dimensions for common crossing with moveable point – alignment of running edge (straight)

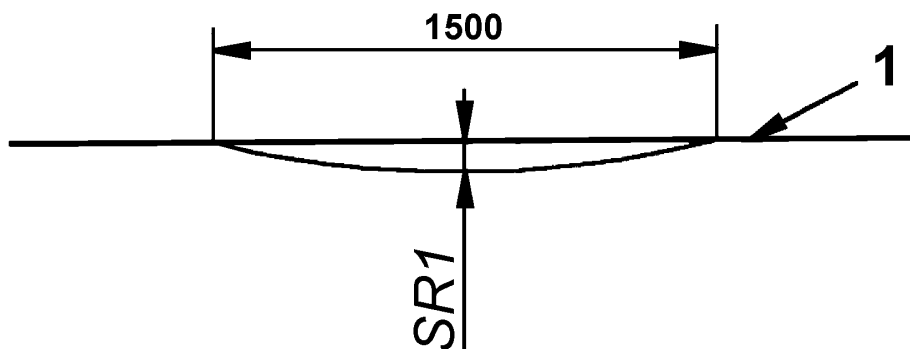


Key

- 1 theoretical running edge
- SR alignment of running edge

Figure 29 — Critical dimensions for common crossing with moveable point – alignment of running edge (curved)

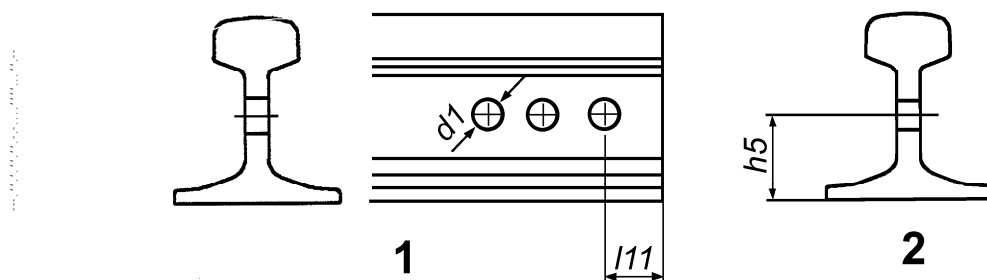
Dimensions in millimetres



Key

- 1 theoretical running edge
- SR1 local alignment of running edge

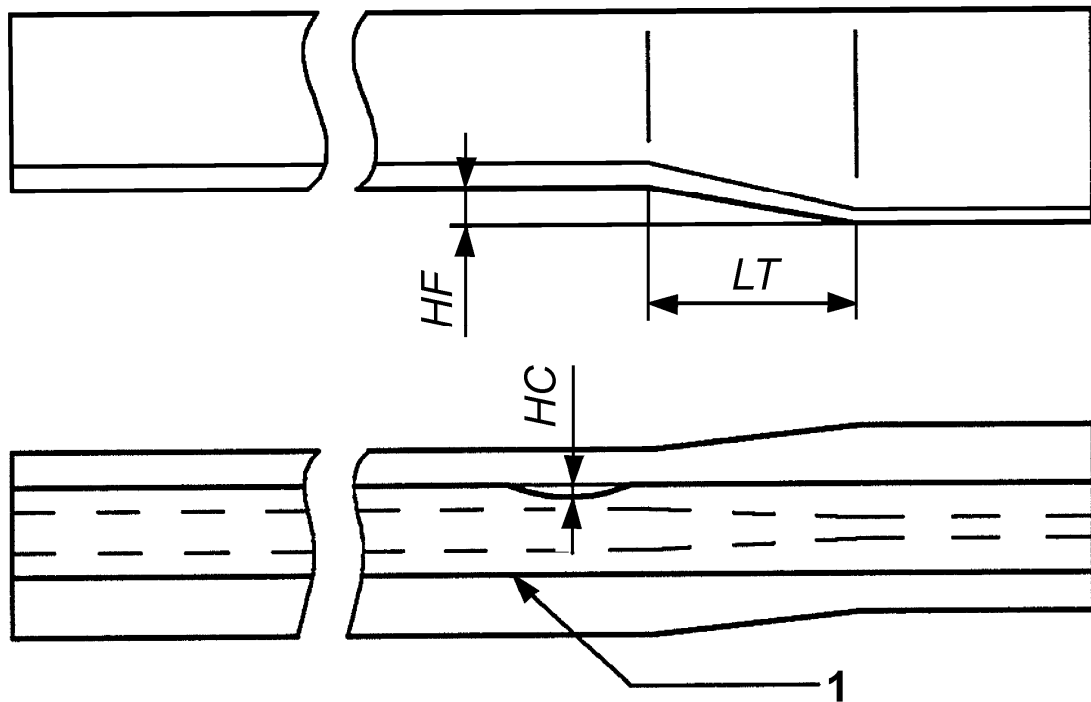
Figure 30 — Critical dimensions for common crossing with moveable point – alignment of running edge



Key

- 1 hole position relative to end of crossing
- 2 hole position relative to crossing foot
- $d1$ diameter of fishbolt holes
- $h5$ hole position relative to rail foot
- $l11$ hole position relative to end of crossing

Figure 31 — Critical dimensions for common crossing with moveable point – hole position



Key

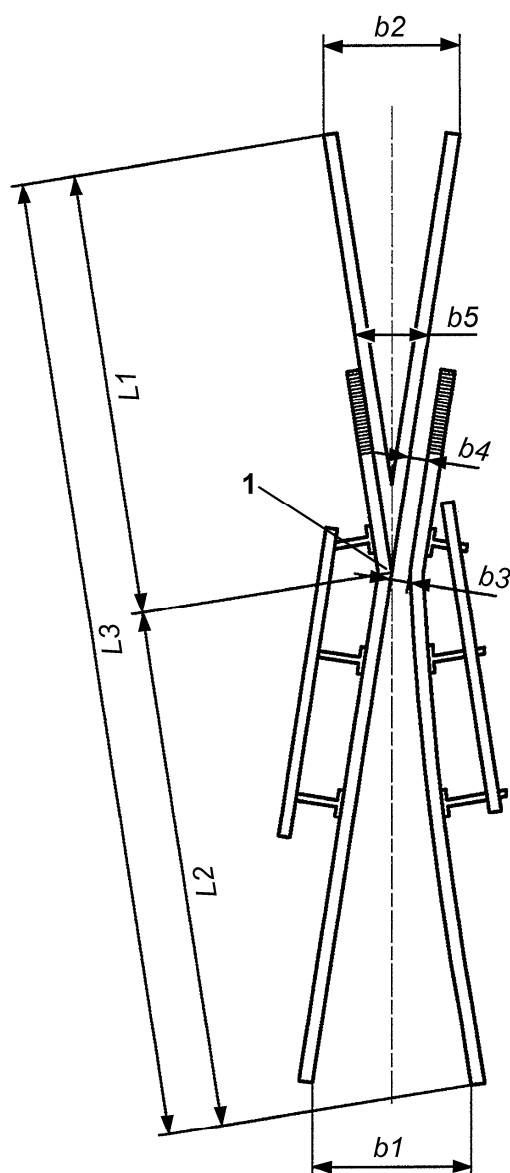
1 running edge

HF height difference from one rail foot to the other rail foot

LT transition length

HC head profile concavity

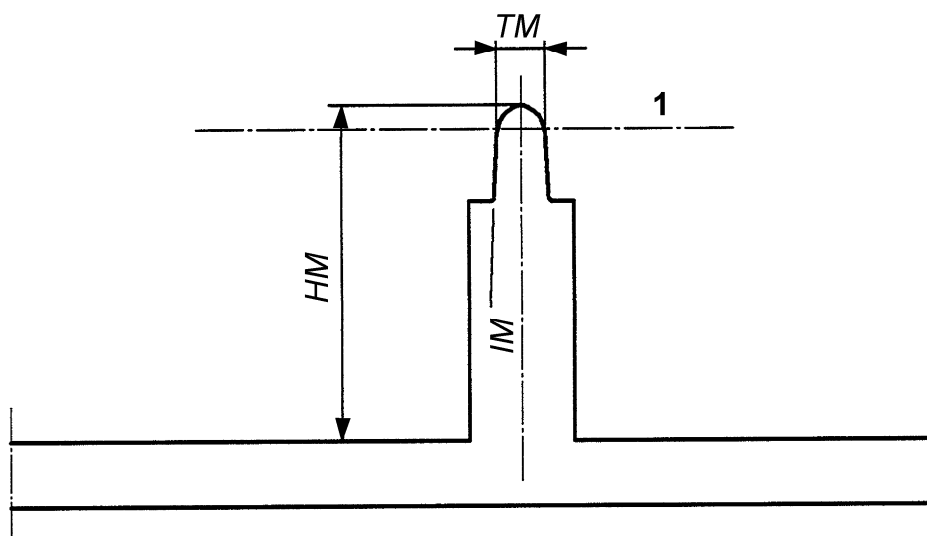
Figure 32 — Critical dimensions for common crossing with moveable point – point forging (transition) area



Key

- 1 Nose
- L1 Vee length
- L2 Nose to wing rail front
- L3 Overall length wing rail front to vee rail end
- b1 Opening running edge measured at the crossing front
- b2 Opening running edge measured at the crossing end
- b3 Throat opening
- b4 Flange way width at drive positions
- b5 Distance between running edge to running edge at various positions

Figure 33 — Critical dimensions for common crossing with moveable wing rails – openings and lengths



Key

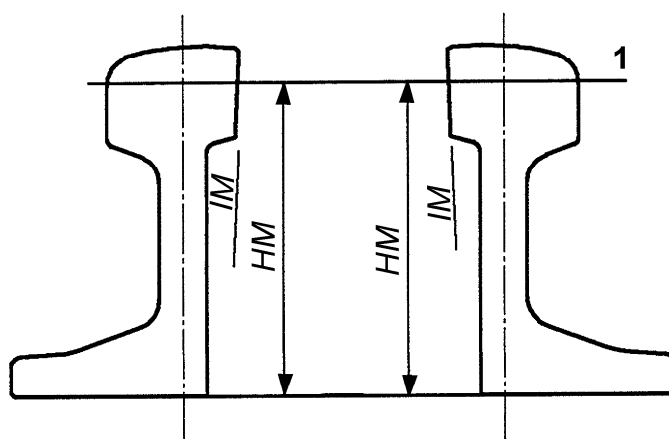
1 machining reference plane

IM inclination of machined area

TM thickness at machined area

HM height at machined area

Figure 34 — Critical dimensions for common crossing with moveable wing rails – vee



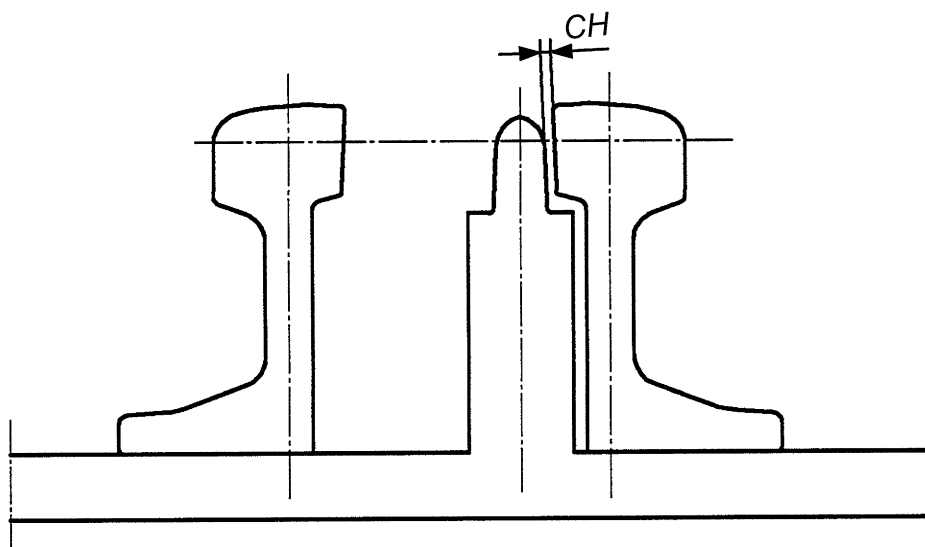
Key

1 machining reference plane

IM inclination of machined area

HM height at machined area

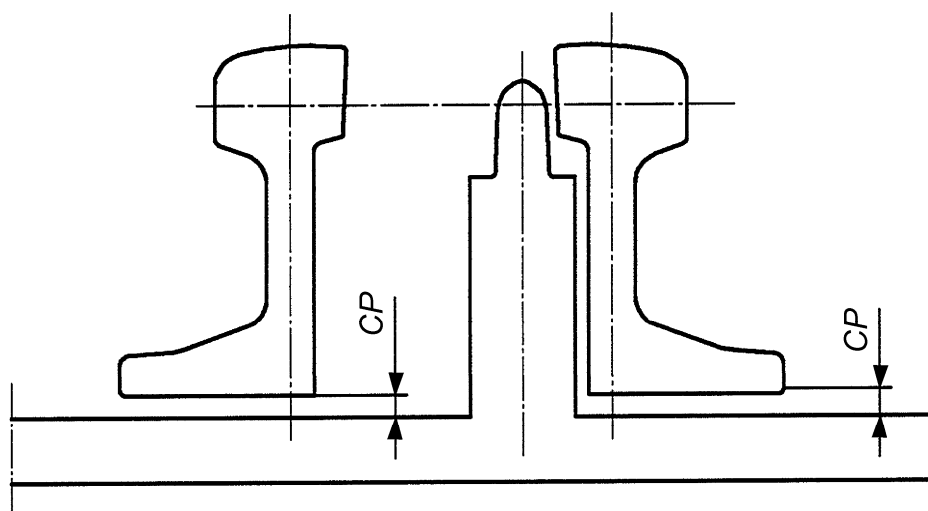
Figure 35 — Critical dimensions for common crossing with moveable wing rails – wing rails



Key

CH contact wing rail to vee rail

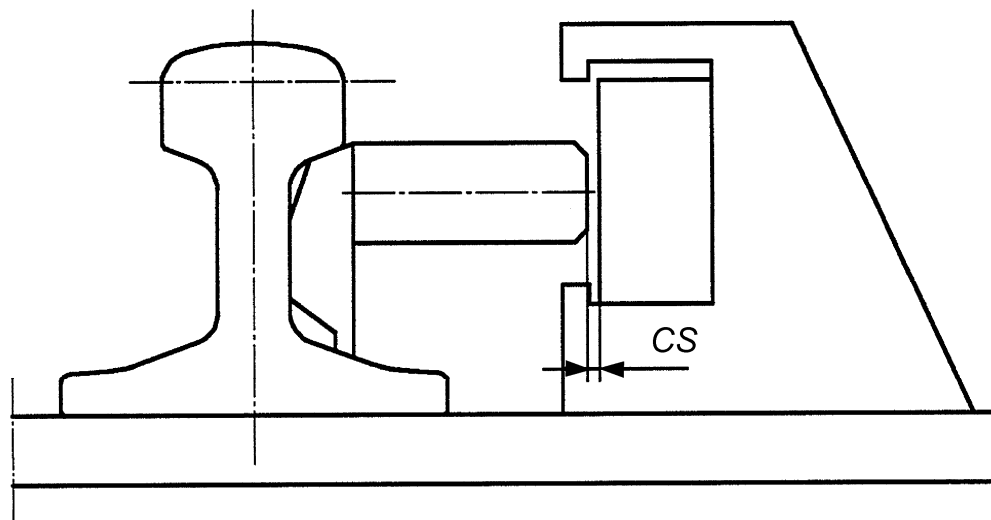
Figure 36 — Critical dimensions for common crossing with moveable wing rails – wing rails/vee rail contact



Key

CP flatness/maximum allowance between moveable rail and base plate

Figure 37 — Critical dimensions for common crossing with moveable wing rails – wing rails/base plate contact

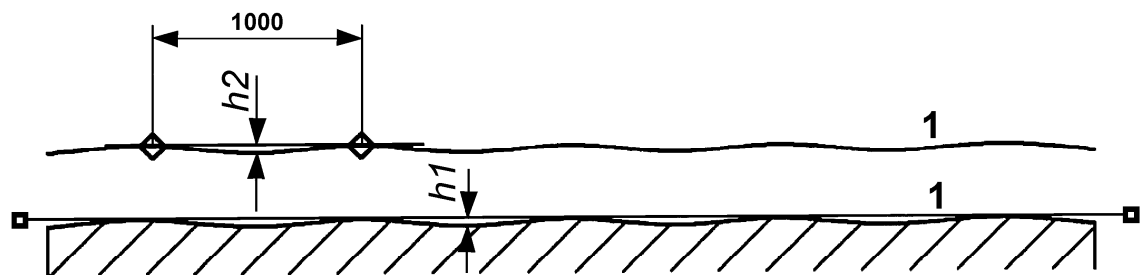


Key

CS contact between wing rail stops and supporting bar

Figure 38 — Critical dimensions for common crossing with moveable wing rails – wing rail stops/ supporting bar contact

Dimensions in millimetres



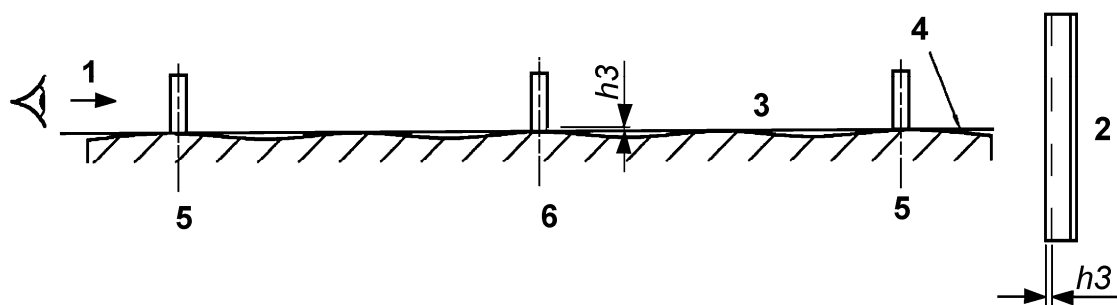
Key

1 top surface

$h1$ running table flatness

$h2$ intermediate running table flatness

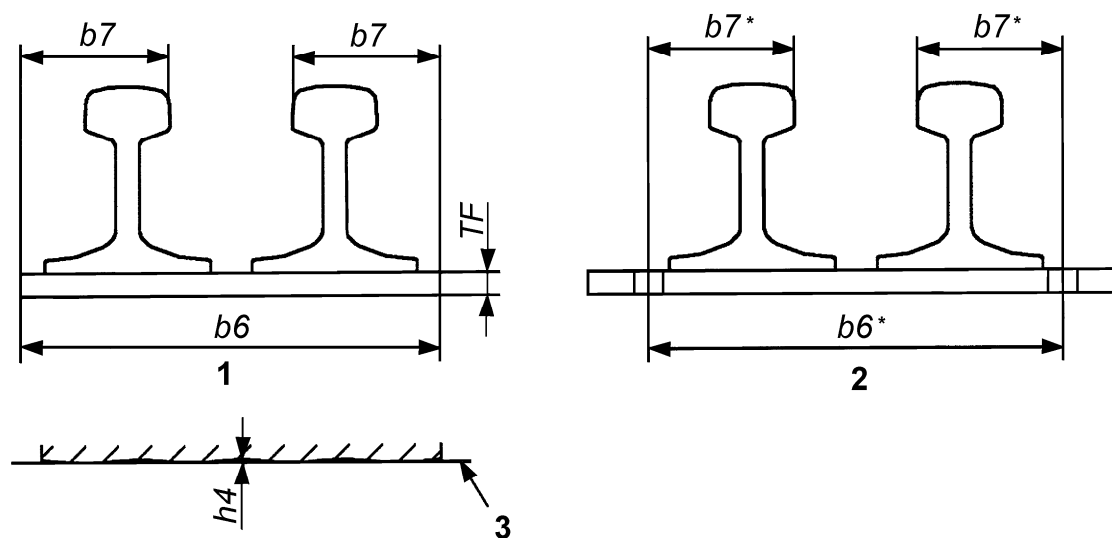
Figure 39 — Critical dimensions for common crossing with moveable wing rails – top surface



Key

- | | | | |
|---|-----------------|------|--|
| 1 | arrow A | 5 | end position bearer |
| 2 | view on arrow A | 6 | intermediate bearer positions |
| 3 | bottom surface | $h3$ | underside flatness at bearer positions |
| 4 | reference plane | | |

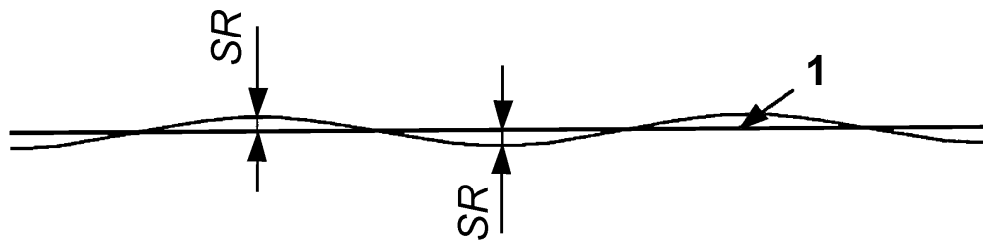
Figure 40 — Critical dimensions for common crossing with moveable wing rails – bottom surface



Key

- | | | | |
|---|--------------------|--------|---|
| 1 | indirect fastening | $h4$ | underside transverse flatness at bearer positions |
| 2 | direct fastening | $b6$ | crossing foot width |
| 3 | reference plane | $b7$ | relative position foot edge/running edge |
| | | $b6^*$ | distance of baseplate hole at bearer position |
| | | $b7^*$ | relative position running edge from the baseplate hole at bearer position |
| | | TF | thickness of crossing foot |

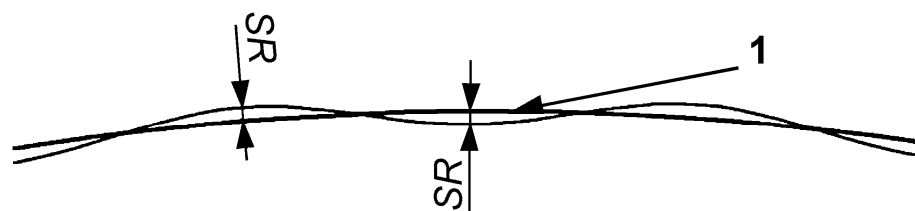
Figure 41 — Critical dimensions for common crossing with moveable wing rails – cross-section



Key

- 1 theoretical running edge
- SR alignment of running edge

Figure 42 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge (straight)

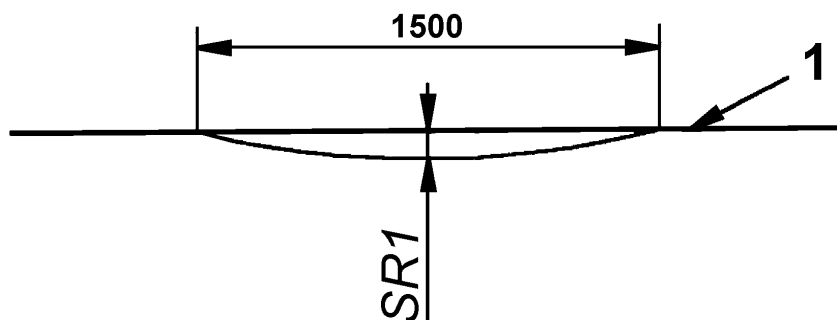


Key

- 1 theoretical running edge
- SR alignment of running edge

Figure 43 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge (curved)

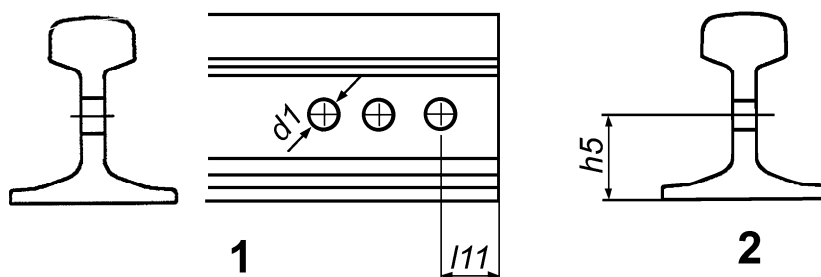
Dimensions in millimetres



Key

- 1 theoretical running edge
- SR1 local alignment of running edge

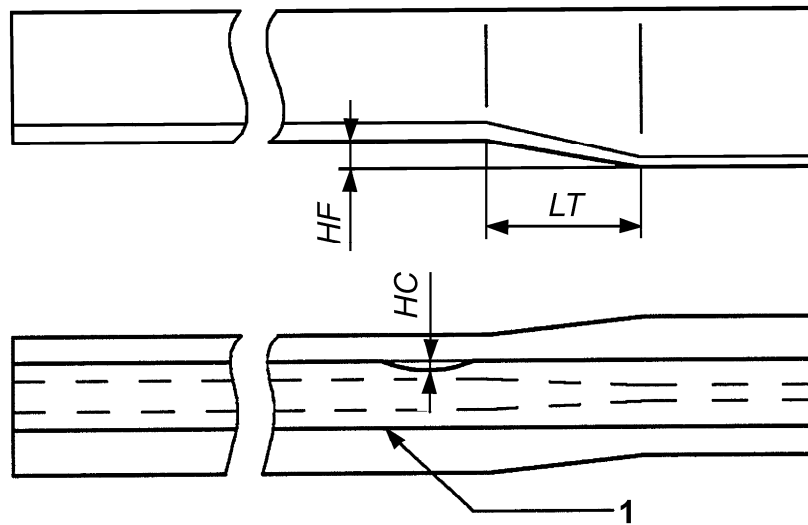
Figure 44 — Critical dimensions for common crossing with moveable wing rails – alignment of running edge



Key

- 1 hole position relative to end of crossing
- 2 hole position relative to crossing foot
- $d1$ diameter of fishbolt holes
- $h5$ hole position relative to rail foot
- $l11$ hole position relative to end of crossing

Figure 45 — Critical dimensions for common crossing with moveable wing rails – hole position



Key

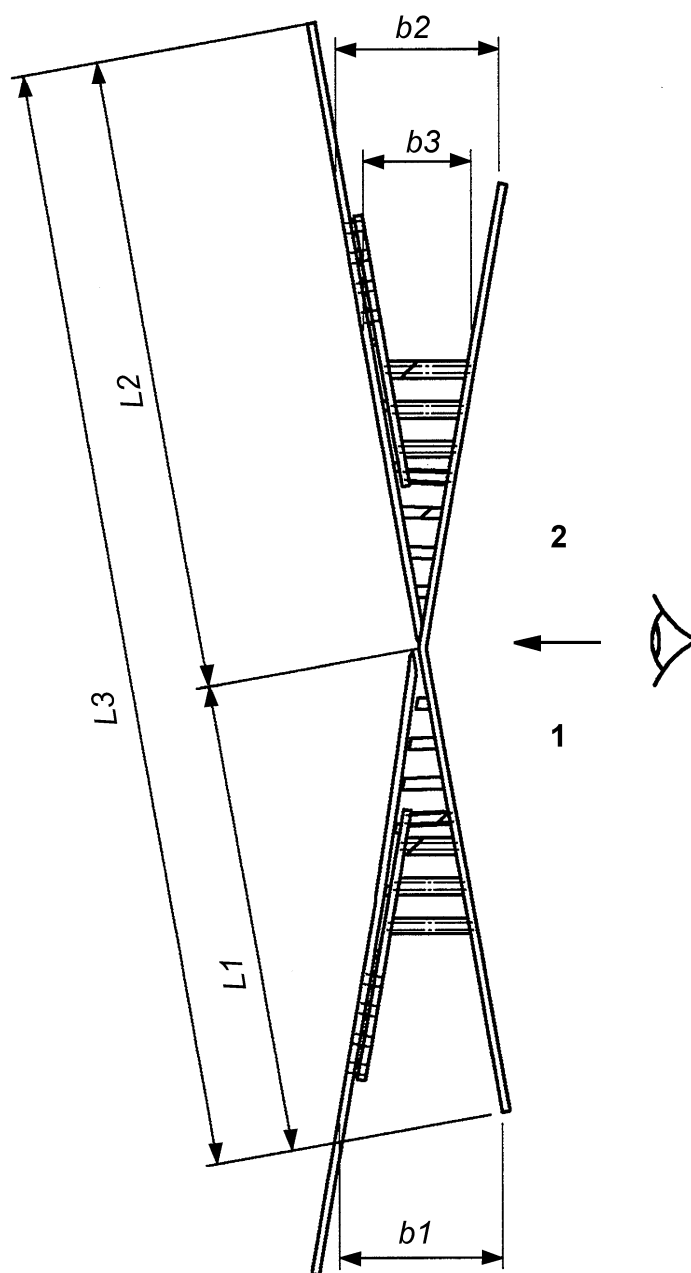
1 running edge

HF height difference from one rail foot to the other rail foot

LT transition length

HC head profile concavity

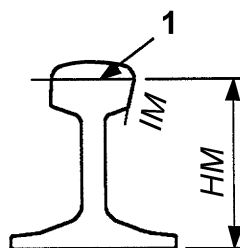
Figure 46 — Critical dimensions for common crossing with moveable wing rails – point forging (transition) area



Key

- 1 left hand
- 2 right hand
- L1 Wing rail knuckle to end
- L2 Wing rail knuckle to switch rail end
- L3 Overall length wing rail end to switch rail end
- b1 Opening running edge LH side
- b2 Opening running edge RH side
- b3 Distance between running edge to running edge at various positions

Figure 47 — Critical dimensions for obtuse crossing with moveable parts (switch diamond crossing)



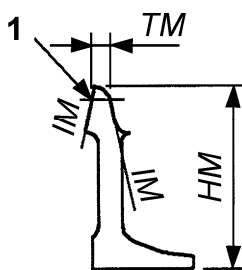
Key

1 machining reference plane

IM inclination of machined area

HM height of machined area

Figure 48 — Critical dimensions for obtuse crossing with moveable parts – wing rail



Key

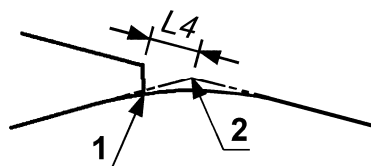
1 machining reference plane

IM inclination of machined area

TM thickness of machined area

HM height of machined area

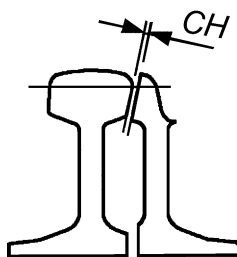
Figure 49 — Critical dimensions for obtuse crossing with moveable parts – switch rail



Key

- 1 switch rail toe
- 2 wing rail knuckle
- L4* wing rail knuckle to switch rail toe

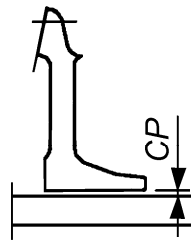
Figure 50 — Critical dimensions for obtuse crossing with moveable parts



Key

- CH* Contact switch rail to wing rail

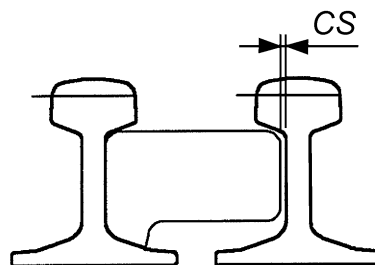
Figure 51 — Critical dimensions for obtuse crossing with moveable parts – switch rail/wing rail contact



Key

CP allowance switch rail to baseplate

Figure 52 — Critical dimensions for obtuse crossing with moveable parts – switch/baseplate contact

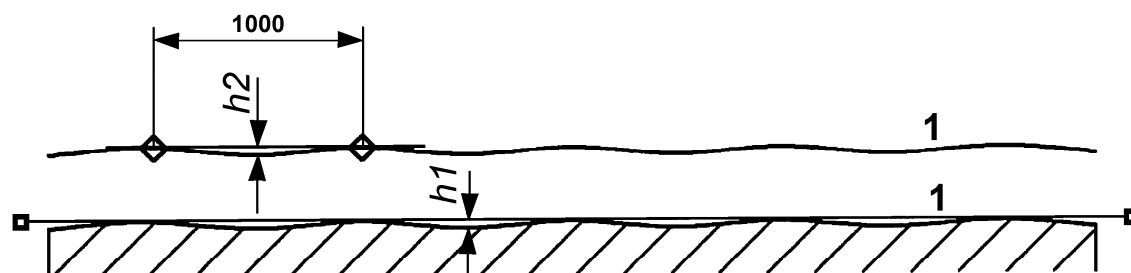


Key

CS contact switch rail to stud

Figure 53 — Critical dimensions for obtuse crossing with moveable parts – switch rail/stud contact

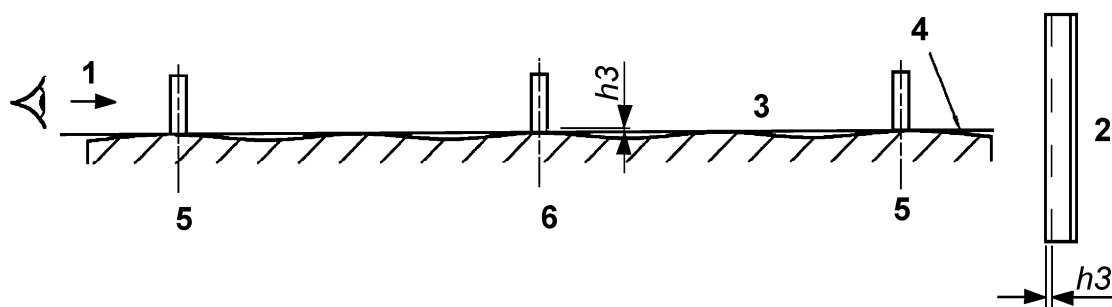
Dimensions in millimetres



Key

- 1 top surface
- $h1$ running table flatness
- $h2$ intermediate running table flatness

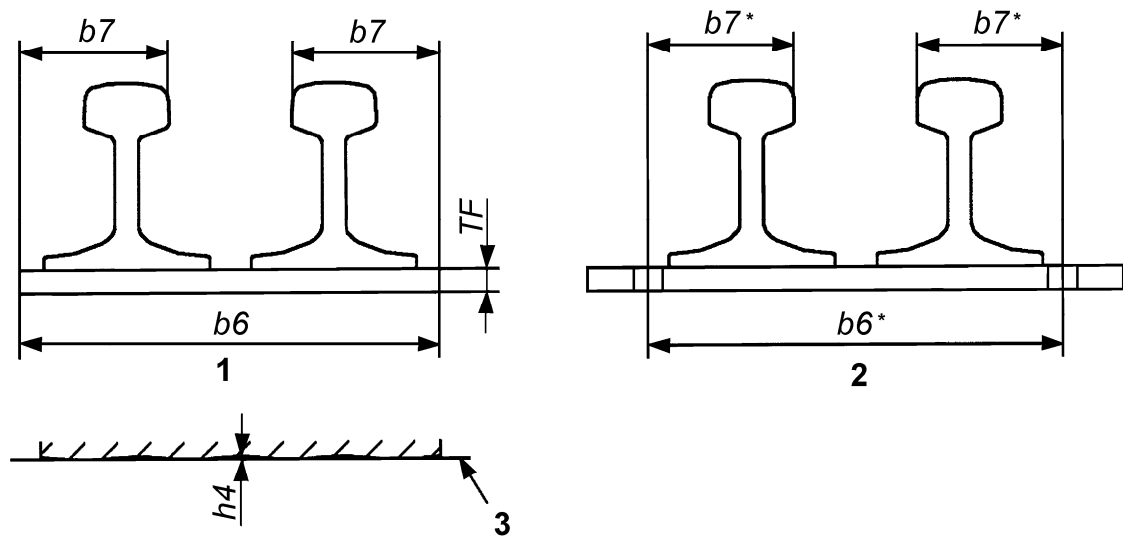
Figure 54 — Critical dimensions for obtuse crossing with moveable parts – top surface



Key

- 1 arrow A
- 2 view on arrow A
- 3 bottom surface
- 4 reference plane
- 5 end position bearer
- 6 intermediate bearer positions
- $h3$ underside flatness at bearer positions

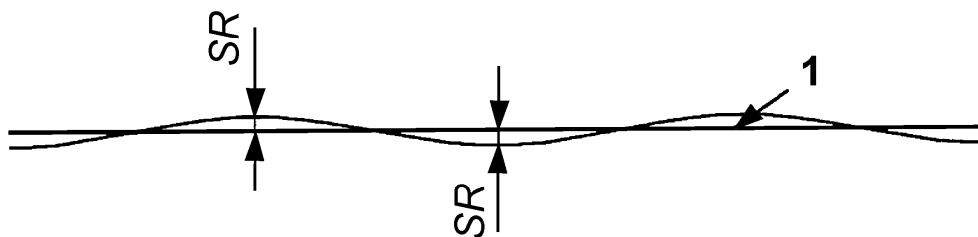
Figure 55 — Critical dimensions for obtuse crossing with moveable parts – bottom surface



Key

- | | |
|----------------------|--|
| 1 indirect fastening | $h4$ underside transverse flatness at bearer positions |
| 2 direct fastening | $b6$ crossing foot width |
| 3 reference plane | $b7$ relative position foot edge/running edge |
| | $b6^*$ distance of baseplate hole at bearer position |
| | $b7^*$ relative position running edge from the baseplate hole at bearer position |
| | TF thickness of crossing foot |

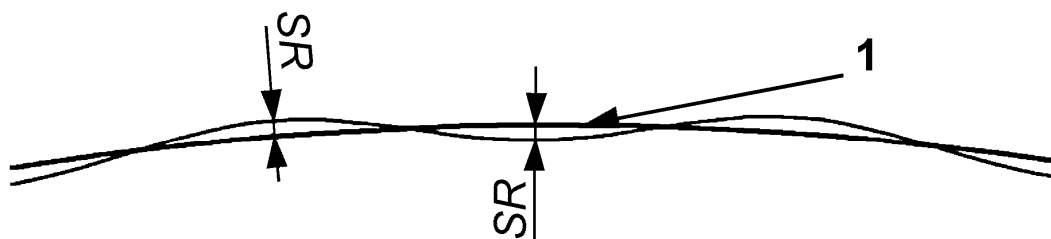
Figure 56 — Critical dimensions for obtuse crossing with moveable parts – cross-section



Key

- | |
|--------------------------------|
| 1 theoretical running edge |
| SR alignment of running edge |

Figure 57 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge (straight)

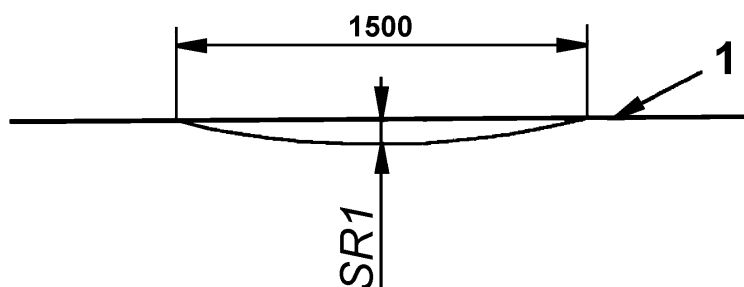


Key

- 1 theoretical running edge
- SR alignment of running edge

Figure 58 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge (curved)

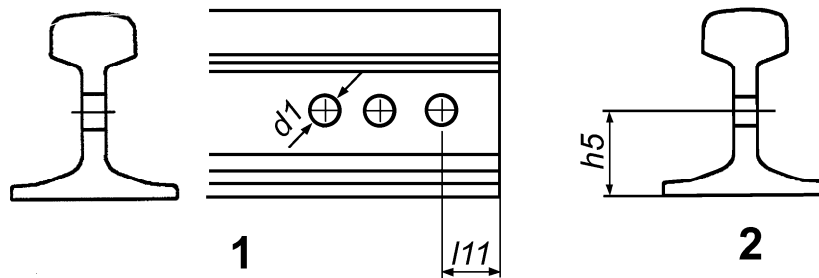
Dimensions in millimetres



Key

- 1 theoretical running edge
- SR1 local alignment of running edge

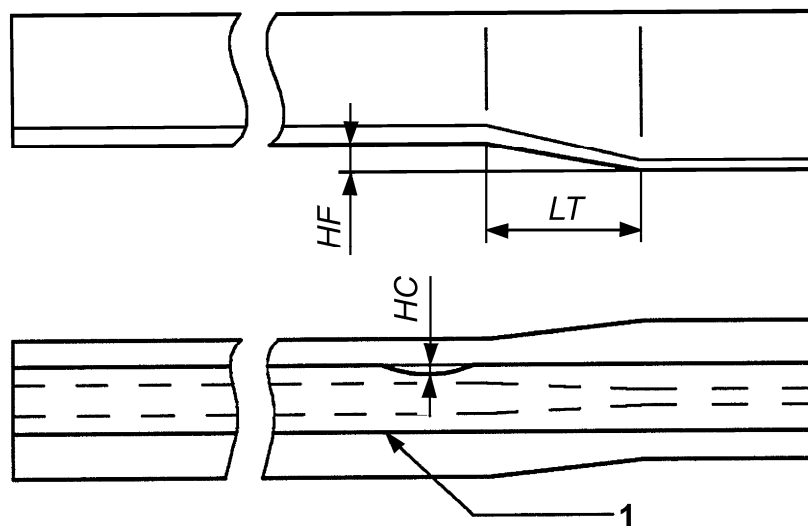
Figure 59 — Critical dimensions for obtuse crossing with moveable parts – alignment of running edge



Key

- | | | | |
|---|---|-------|---|
| 1 | hole position relative to end of crossing | $d1$ | diameter of fishbolt holes |
| 2 | hole position relative to crossing foot | $h5$ | hole position relative to rail foot |
| | | $l11$ | hole position relative to end of crossing |

Figure 60 — Critical dimensions for obtuse crossing with moveable parts – hole position



Key

- | | | | |
|---|--------------|------|---|
| 1 | running edge | HF | height difference from one rail foot to the other rail foot |
| | | LT | transition length |
| | | HC | head profile concavity |

Figure 61 — Critical dimensions for obtuse crossing with moveable parts – point forging (transition) area

Annex ZA (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 2008/57/EC¹.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for HS Infrastructure and in Table ZA.2 for CR Infrastructure confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

¹ This Directive 2008/57/EC adopted on 17th June 2008 is a recast of the previous Directives 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29th April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system'.

Table ZA.1 — Correspondence between this European Standard, the HS TSI INF, published in OJEU dated 19th March 2008, and Directive 2008/57/EC

Clause(s)/ sub-clause(s) of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
3 Types of crossings with moveable parts 3.4 Geometry 3.5 Inclination of the running table 5 Design requirements 5.1 Geometric data 5.2 Rolling stock data 5.2.1 Maximum axle load 5.2.2 Maximum speed 5.3 Supports and fastenings 5.4 Interface between crossing with moveable parts and operating system 5.5 Transfer of longitudinal track forces 6 Tolerances and inspection 6.3 Critical dimensions 6.4 Certification	4. Description of the infrastructure domain 4.2.2 Nominal track gauge 4.2.8 Cant deficiency 4.2.11.b) Rail inclination – Switches and crossings 4.2.12.2 Switches and crossings 4.2.13 Track resistance 5. Interoperability constituents 5.3 Constituents performances and specifications 5.3.1.1.b) Railhead profile – Switches and crossings 5.3.2 The rail fastening systems 5.3.4 Switches and crossings Annex A – Table A1 Annex B 1 – Table B1	Annex III Essential requirements 1. General requirements 1.1 Safety Clauses 1.1.1 – 1.1.2 and 1.1.3 1.2 Reliability and availability 1.5 Technical compatibility	

Table ZA.2 — Correspondence between this European Standard, the CR TSI INF published in OJEU dated 14th May 2011, and Directive 2008/57/EC

Clause(s)/ sub-clause(s) of this European Standard	Chapters/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
3 Types of crossings with moveable parts 3.4 Geometry 3.5 Inclination of the running table 5 Design requirements 5.1 Geometric data 5.2 Rolling stock data 5.2.1 Maximum axle load 5.2.2 Maximum speed 5.3 Supports and fastenings 5.4 Interface between crossing with moveable parts and operating system 5.5 Transfer of longitudinal track forces 6 Tolerances and inspection 6.3 Critical dimensions 6.4 Certification	4. Description of the infrastructure subsystem 4.2.5.1 Nominal track gauge 4.2.5.4 Cant deficiency 4.2.5.7 2 Rail inclination – Requirements for switches and crossings 4.2.6 Switches and crossings 4.2.6.1 Means of locking 4.2.6.2 In-service geometry of switches and crossings 4.2.7 Track resistance to applied loads 6. Assessment of conformity of the constituents and EC verification of the subsystems 6.2.4.7 Assessment of geometry of switches and crossings 6.2.5.2 Assessment of track resistance for switches and crossings	Annex III Essential requirements 1. General requirements 1.1 Safety Clauses 1.1.1 – 1.1.2 and 1.1.3 1.2 Reliability and availability 1.5 Technical compatibility	Rails, fastenings and sleepers used for short length of track for specific purposes, for example in switches and crossings, at expansion devices, transition slabs and special structures, are not to be considered to be interoperability constituents according to § 5.2 (3) of the CR TSI INF

WARNING — Other requirements and other EC Directives may be applicable to the product(s) falling within the scope of this standard. 

Bibliography

- [1] EN 13232-3:2003, *Railway applications — Track — Switches and crossings — Part 3: Requirements for wheel/rail interaction*
- [2] prEN 13803-2, *Railway applications — Track alignment design parameters — Track gauges 1 435 mm and wider — Part 2: Switches and crossings and comparable alignment design situations with abrupt changes of curvature*

BSI - British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001 Email: orders@bsigroup.com You may also buy directly using a debit/credit card from the BSI Shop on the Website <http://www.bsigroup.com/shop>

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact Information Centre. Tel: +44 (0)20 8996 7111 Fax: +44 (0)20 8996 7048 Email: info@bsigroup.com

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002 Fax: +44 (0)20 8996 7001 Email: membership@bsigroup.com

Information regarding online access to British Standards via British Standards Online can be found at <http://www.bsigroup.com/BSOL>

Further information about BSI is available on the BSI website at <http://www.bsigroup.com>

Copyright

Copyright subsists in all BSI publications. BSI also holds the copyright, in the UK, of the publications of the international standardization bodies. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI.

This does not preclude the free use, in the course of implementing the standard, of necessary details such as symbols, and size, type or grade designations. If these details are to be used for any other purpose than implementation then the prior written permission of BSI must be obtained.

Details and advice can be obtained from the Copyright and Licensing Manager. Tel: +44 (0)20 8996 7070 Email: copyright@bsigroup.com

BSI Group
Headquarters 389
Chiswick High Road,
London, W4 4AL, UK
Tel +44 (0)20 8996 9001
Fax +44 (0)20 8996 7001
[www.bsigroup.com/
standards](http://www.bsigroup.com/standards)