

# Railway applications — Track — Switches and crossings —

## Part 2: Requirements for geometric design

ICS 45.080

# National foreword

This British Standard is the UK implementation of EN 13232-2:2003+A1:2011. It supersedes BS EN 13232-2:2003, which is withdrawn.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 committee can be obtained on request to its secretary.

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This British Standard, was published under the authority of the Standards Policy and Strategy Committee on 29 August 2003

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ISBN 978 0 580 71892 2

## Amendments/corrigenda issued since publication

| Date             | Comments                                |
|------------------|-----------------------------------------|
| 30 November 2011 | Implementation of CEN amendment A1:2011 |
|                  |                                         |
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English Version

## Railway applications - Track - Switches and crossings - Part 2: Requirements for geometric design

Applications ferroviaires - Voie - Appareils de voie - Partie  
2: Exigences de la conception géométrique

Bahnanwendungen - Oberbau - Weichen und Kreuzungen -  
Teil 2: Anforderungen an den geometrischen Entwurf

This European Standard was approved by CEN on 7 February 2003 and includes Amendment 1 approved by CEN on 13 September 2011.

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## Foreword

This document (EN 13232-2:2003+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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

 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. 

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

This document supersedes EN 13232-2:2003.

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

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 European Standards "*Railway Applications – Track – Switches and Crossings*" covers the design and quality of switches and crossings in flat bottomed rail. 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 movable parts*
- *Part 8 : Expansion devices*
- *Part 9 : Layouts*

Part 1 contains terminology used throughout all parts of this series. 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. Part 9 defines the functional and geometric dimensions and tolerances for layout assemblies. These use Parts 1 to 4 as a basis.

The following terms are used within to define the parties involved in using the European Standard 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 European Standard 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.

## 1 Scope

This part of this European Standard covers the following subjects:

- geometric design principles for wheel guidance;
- definition of basic limits of supply;
- applied forces and their adequate support;
- tolerance levels.

These are illustrated herein by application to a turnout. The main switch and crossing components are represented in turnouts and the principles used in turnouts apply equally to more complex layouts.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13232-1:2003, *Railway applications – Track – Switches and crossings – Part 1: Definitions.*

prEN 13232-3, *Railway applications – Track – Switches and crossings – Part 3: Requirements for wheel/rail interaction.*

prEN 13232-5, *Railway applications – Track – Switches and crossings – Part 5: Switches.*

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

## 3 Principles of geometry and running dynamics

### 3.1 Introduction

Geometry is represented in the running plane by the running edges. For the purpose of determination of permissible speeds and for definition of the turnout, curvature is defined by the radius of the track centreline.

The guiding principles of curves are given in this standard as they apply to switches and crossings. Switches and crossings are normally designed without differential cant; particular requirements shall be specified.

In order to maintain safe and continuous support and guidance of wheels, certain rules of tangency are imposed. Speed and radius are then related to lateral acceleration. Cant deficiency is derived from this. Switches and crossings are characterised by changes in lateral acceleration, so rules for both steady and sudden changes between radii are included in this section.

Calculations and rules relate to vehicles with 2 axles or vehicles with 2-axle bogies. Vehicles with other than 2 axles may require special consideration and as such their configuration shall be provided by the Customer.

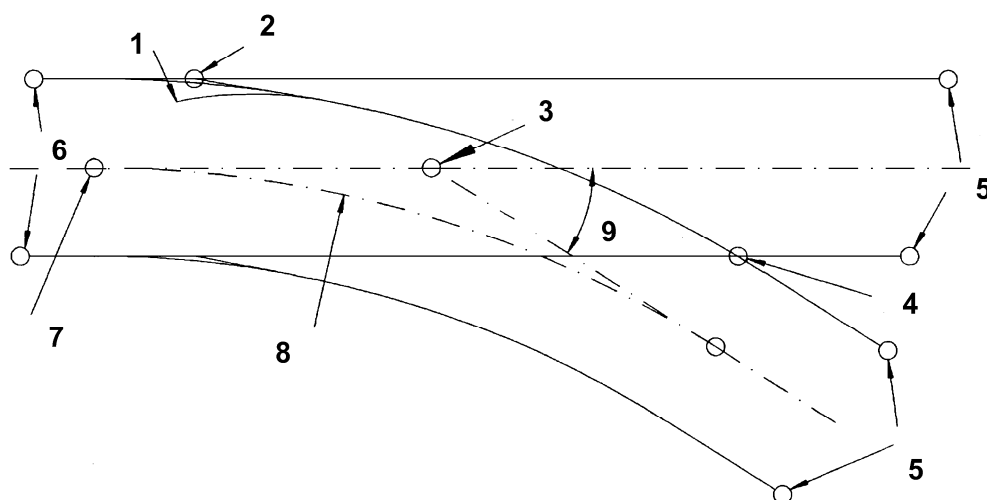
These rules are defined for steady-state design, i.e. without acceleration. Requirements of a dynamic nature shall be stated by the Customer.

## 3.2 General requirements

### 3.2.1 References, terms and definitions

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

Key reference points relating to turnout geometry and the limits of supply of a turnout are illustrated in Figure 1.



#### Key

|   |                                |   |                                 |
|---|--------------------------------|---|---------------------------------|
| 1 | Actual switch toe              | 6 | Limits of supply (front joints) |
| 2 | Mathematical point of switch   | 7 | Origin of switch curve          |
| 3 | Turnout intersection           | 8 | Centreline radius               |
| 4 | Theoretical intersection       | 9 | Turnout angle                   |
| 5 | Limits of supply (heel joints) |   |                                 |

Figure 1 — Key reference points

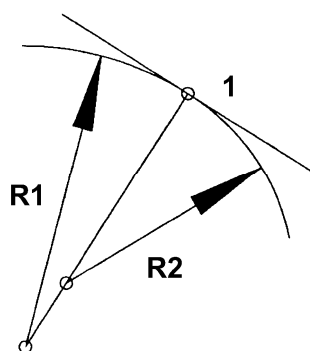
### 3.2.2 General tangency rules

At any change in radius the two radii shall be mutually tangential at the running edges. To achieve this the centres of adjacent curves shall lie on the same radial line (see Figure 2).

Exceptions to the mutual tangency rule may occur. These are:

- along the low-side curve of a turnout where gauge variation occurs;
- at the switch toe, for example, to shorten the switch rail.

Details are given in prEN 13232-3 and prEN 13232-5.



### Key

1 Tangent

Figure 2 — Mutual tangency

### 3.2.3 Key determinants

For a concise definition of the geometry of an assembly of switches and crossings, a minimum amount of basic quantitative information is required. The following items are both necessary and sufficient for such a definition of a turnout.

The following shall be defined by the Customer and numerical values provided to the Supplier. Note that some values may be different from those for plain line :

- gauge;
- speed;
- maximum lateral acceleration or cant deficiency;
- maximum rate of change of lateral acceleration or cant deficiency;
- turnout intersection point and angle (see Figure 3);
- limits of supply (front joints, heel joints);
- lowside gauge variation (if any).

For a crossover or junction, in addition, the following shall be defined by the Customer and provided to the Supplier:

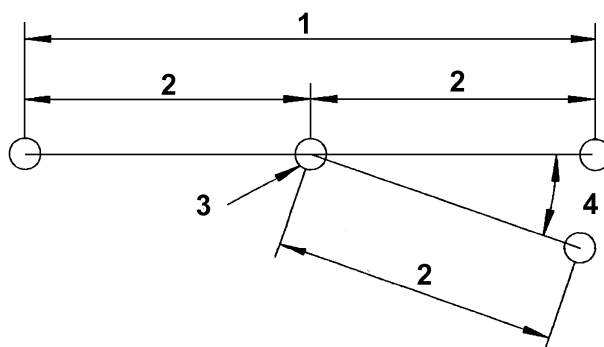
- distance between main line track centrelines.

For switches and crossings on a curved main line, the following must be defined and provided by the Customer:

- main line curvature;
- main line and branch line cant through turnout.

The key points whose location shall be agreed between Customer and Supplier are as follows:

- origin of switch curve;
- real switch toe (RP);
- theoretical intersection (of crossing).



### Key

- 1 Overall length
- 2 Tangent length
- 3 Turnout intersection
- 4 Turnout angle

**Figure 3 — Setting out diagram**

Radii of main and branch lines and the positions at which they change shall be agreed, for example as illustrated in Figure 4a) for circular geometry and 4b for transitional geometry, together with:

- centreline radii;
- origin of switch curve to positions of changes of radii;
- tangent offset (if any);

where such changes of radii shall be bounded either by included angle, or by longitudinal distance or by lateral offset, or in the case of a transition section, by such data as is necessary to uniquely define its shape.

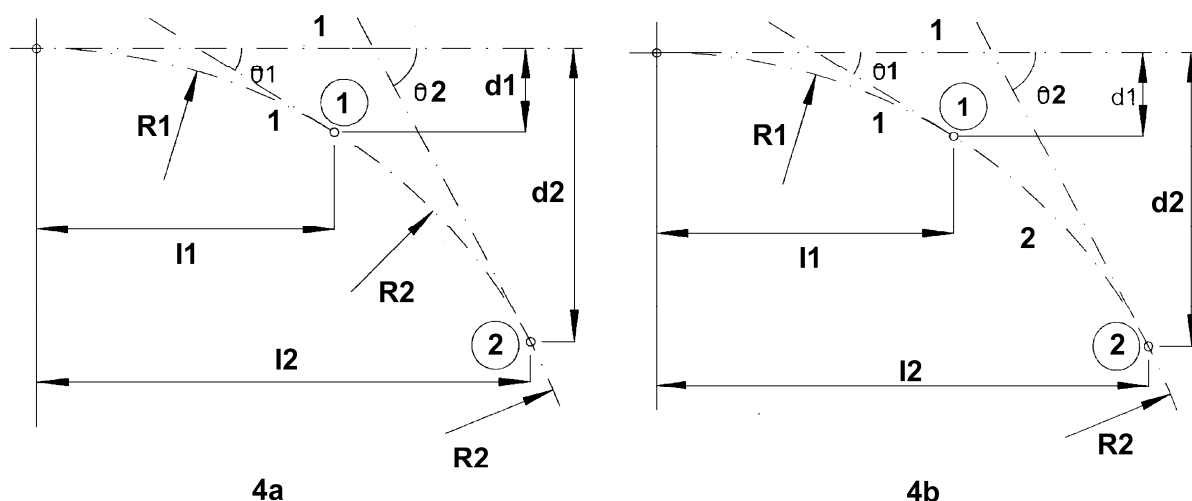


Figure 4a) — Circular

Figure 4b) — Transitional

### Key

- 1 Centreline
- 2 Transition

Figure 4 — Key dimensions related to radius

## 3.3 Speed relationships

Fundamental rules of circular motion determine the relationship between radius and speed around a curve. For railway specific applications the following formula applies:

$$v_{\max} = \sqrt{(a_{\max} R_c)} \quad (1)$$

where

$R_c$  is the local centreline radius of the curve in metre;

$a_{\max}$  is the maximum lateral acceleration in  $\text{m/s}^2$ ;

$v_{\max}$  is the maximum local velocity in m/s.

Alternatively with  $V_{\max}$  in km/h:

$$V_{\max} = 3,6 \sqrt{(a_{\max} R_c)} \quad (2)$$

Often it is convenient to express maximum speed in terms of more physical measures, using the variables cant deficiency and wheel contact gauge. Firstly, wheel contact gauge is expressed conventionally as:

$$S_w = S_t + S_r \quad (3)$$

where

$S_w$  is the wheel contact gauge, or distance between the two upper wheel/rail contacts, in millimetre;

$S_t$  is the track gauge in millimetre;

$s_r$  is the rail head width in millimetre.

If  $s_r$  is not specified then, for standard gauge (1 435 mm),  $s_w$  takes the value 1 500 mm. The speed relationship is then given by:

$$V_{\max} = 3,6 \sqrt{(h_d g R_c / s_w)} \quad (4)$$

where

$h_d$  is the maximum permitted cant deficiency in millimetre;

$g$  is the acceleration due to gravity, normally taken as 9,81 m/s<sup>2</sup>.

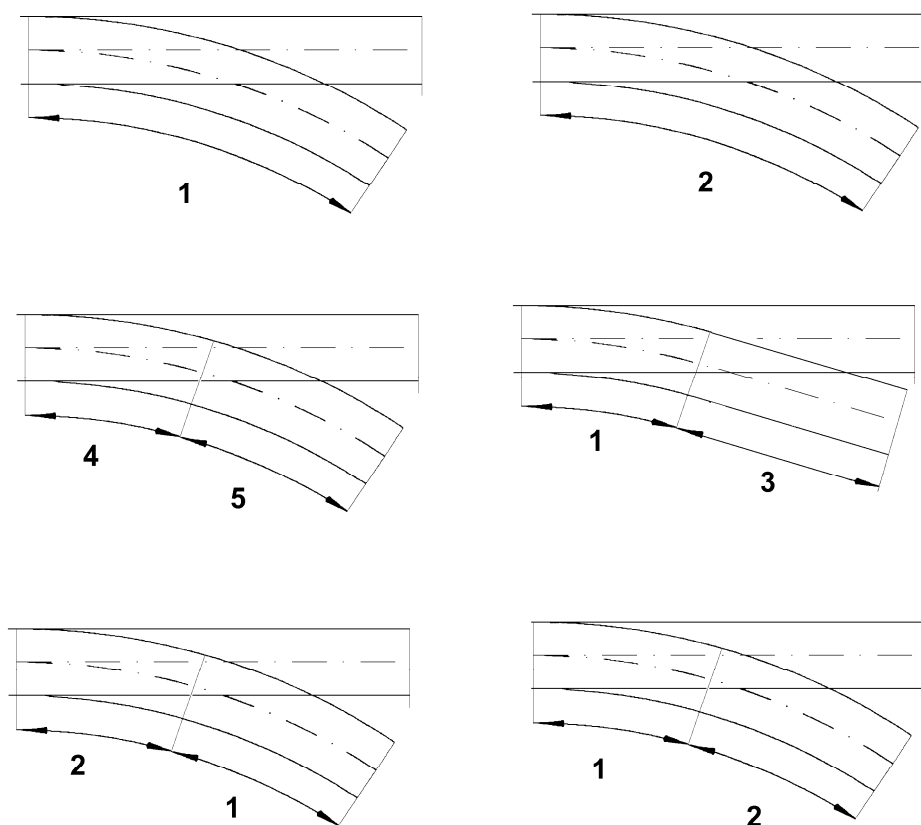
### **3.4 Effects of changes in curvature**

#### **3.4.1 Introduction**

Most real situations yield a step change in curvature, since a smooth curvature change only occurs in transition curves. The effects of step changes are mitigated by the vehicle's suspension system, but an approximate rule is necessary to enable the switch and crossing supplier to match the vehicle's requirements. In the following the rules for steady transitions are covered first, then the rules for step changes in curvature.

See Figure 5 for examples of alternative arrangements of transitions within turnouts.

Figure 5



#### Key

- 1 Radius
- 2 Transition
- 3 Straight
- 4 Radius 1
- 5 Radius 2

Figure 5 — Examples of geometry types

### 3.4.2 Change of lateral acceleration

The steady change of curvature is quantified by the rate of change of lateral acceleration. Alternatively it may be termed a rate of change of cant deficiency. This is related to a rate of change of lateral acceleration which is calculated with the following formula:

$$\frac{dh_d}{dt} = \frac{s_w}{g} \cdot \frac{da}{dt} \quad (5)$$

where

$\frac{dh_d}{dt}$  is the rate of change of cant deficiency in mm/s;

$\frac{da}{dt}$  is the rate of change of lateral acceleration in m/s<sup>3</sup>.

The equations in paragraphs 3.4.4 and 3.4.5 below are defined in terms of the variable  $A$ , which can be used with either lateral acceleration ( $A$  in  $\text{m/s}^2$ ,  $\frac{dA}{dt}$  in  $\text{m/s}^3$ ) or cant deficiency ( $A$  in  $\text{mm}$ ,  $\frac{dA}{dt}$  in  $\text{mm/s}$ ), the units of measurement depending on which alternative is preferred.

### 3.4.3 Types and locations of transitions

Transition curves are used to eliminate the effects of step changes by employing a suitable rate of change of lateral acceleration. Speed is calculated according to the sharpest radius using equations 1, 2 and 4 above.

There follow various calculations for transitions. These are based on the steady transition but approximations to it may be permitted. An example of a steady transition is the clothoid, which employs a constant rate of change of lateral acceleration. The definition of the clothoid transition curve is:

$$\frac{d\left(\frac{1}{r}\right)}{dl} = \text{constant} \quad (6)$$

where  $r$  is the instantaneous radius at an arc length  $l$  from the origin.

A characteristic of the clothoid transition curve is that, at constant speed:

$$\frac{dA}{dt} = \text{constant} \quad (7)$$

provided the curve is long relative to the length of vehicle. A useful practical approximation to the clothoid is the cubic parabola.

### 3.4.4 Rules for steady changes in curvature

The time  $t$  (s) taken to traverse a long transition is given by:

$$t = 3,6 \frac{L_t}{V} \quad (8)$$

where

$L_t$  is the length of transition (m).

Therefore the equation for the rate of change in lateral acceleration or cant deficiency for a clothoid transition can be represented as follows:

$$\frac{dA}{dt} = (A_1 - A_2) \frac{V}{3,6L_t} \quad (9)$$

where

$A_1$  is the lateral acceleration or cant deficiency at start of curve;

$A_2$  is the lateral acceleration or cant deficiency at end of curve;

either of which is zero for straight track. This and similar equations are valid for  $A_1 > A_2$ , reversing sign for  $A_1 < A_2$ .

### 3.4.5 Rules for step changes in curvature (virtual transitions)

In the case of step changes in curvature, as occur in turnouts and crossovers, the changes in lateral acceleration or cant deficiency are dealt with according to the following procedure. Note that equations 10 to 15 below are approximate. The Customer shall provide a correction factor if a more precise result is required.

The time  $t$  (s) taken to traverse the change in radius is given by:

$$t = 3,6 \frac{L_b}{V} \quad (10)$$

where

$L_b$  is the length between bogie centres in m, to be defined and provided by the Customer.

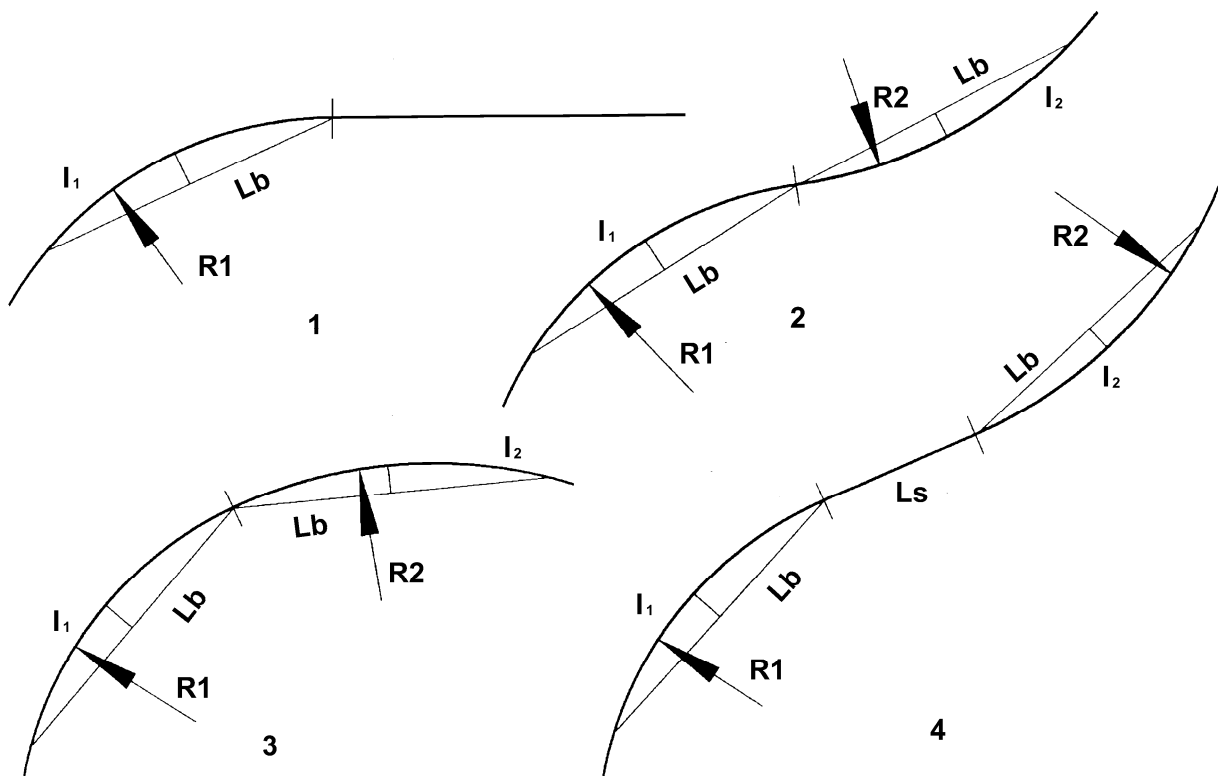
Four distinct cases are shown in Figure 6, covering the range of purely circular geometries. As for smooth changes,  $A$  may be defined in terms of either lateral acceleration or cant deficiency.

For a radius  $R_1$  adjoining a straight:

$$\frac{dA}{dt} = A_1 \frac{V}{3,6L_b} \quad (11)$$

For a reverse curve with adjacent radii  $R_1$  and  $R_2$  :

$$\frac{dA}{dt} = (A_1 + A_2) \frac{V}{3,6L_b} \quad (12)$$



#### Key

- 1 See equation 11
- 2 See equation 12
- 3 See equation 13
- 4 See equation 14

Figure 6 — Rules for changes in curvature

For a curve with adjacent radii  $R_1$  and  $R_2$  of the same hand:

$$\frac{dA}{dt} = (A_1 - A_2) \frac{V}{3,6L_b} \quad (13)$$

For a reverse curve with radii  $R_1$  and  $R_2$  separated by a straight of length  $L_s$  ( $L_s < L_b$ ), we must consider for  $dA/dt$  the greatest value calculated according to either formula (11) at a distance  $L_b/2$  from the straight ends, or the formula:

$$\frac{dA}{dt} = (A_1 + A_2) \frac{V}{3,6(L_b + L_s)} \quad (14)$$

#### 3.4.6 Rules for special cases

Where the length of the transition is less than  $L_b$ , an alternative method must be used. An equivalent radius should be determined between the customer and supplier. One way of doing this is to use the versine  $f$  of the curve at the mid-point of the vehicle bogie centres, instead of the radius of the curve, measured in the worst case. An example is given in Figure 7a). In place of  $R$  in the equations above, substitute the following:

$$R_{eff} = \frac{L_b^2}{8f} \quad (15)$$

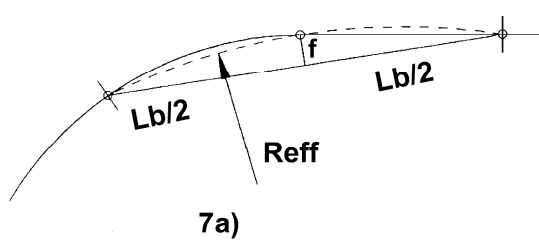


Figure 7a) — Short transition

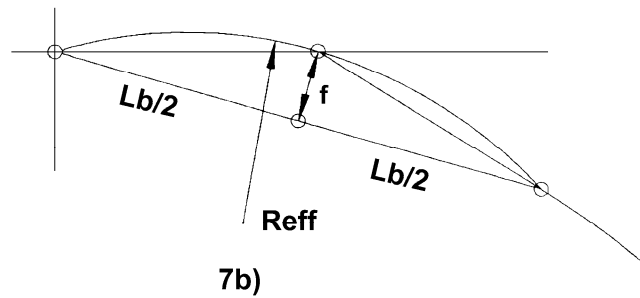


Figure 7b) — Switch entry angle

Figure 7 — Special cases of change in radius

A further example of equation 15 also applies in the case of an angular discontinuity such as may occur at a switch toe. The procedure shown in Figure 7b) applies. This yields an effective radius which may be used with any of the above rules.

### 3.5 Switches and crossings on curves

Clauses 3.3 and 3.4 apply equally when switches and crossings are installed in curved track. In such cases a 'standard' turnout (see Figure 8a)) with diverging radius  $R_1$  installed in a track in which the radius is  $R_0$  will yield an equivalent radius  $R_{eq}$  of the diverging route of:

$$R_{eq} = \frac{R_0 R_1}{(R_0 + R_1)} \quad (16)$$

as shown in Figure 8b) for inside curvature.

For outside curvature (see Figure 8c)) the following applies:

$$R_{eq} = \frac{R_0 R_1}{(R_0 - R_1)} \quad (17)$$

The equations for speed and lateral acceleration apply using the equivalent values of diverging and main radii. Note that equations 16 and 17 are approximate. The customer shall provide a correction factor if a more precise result is required.

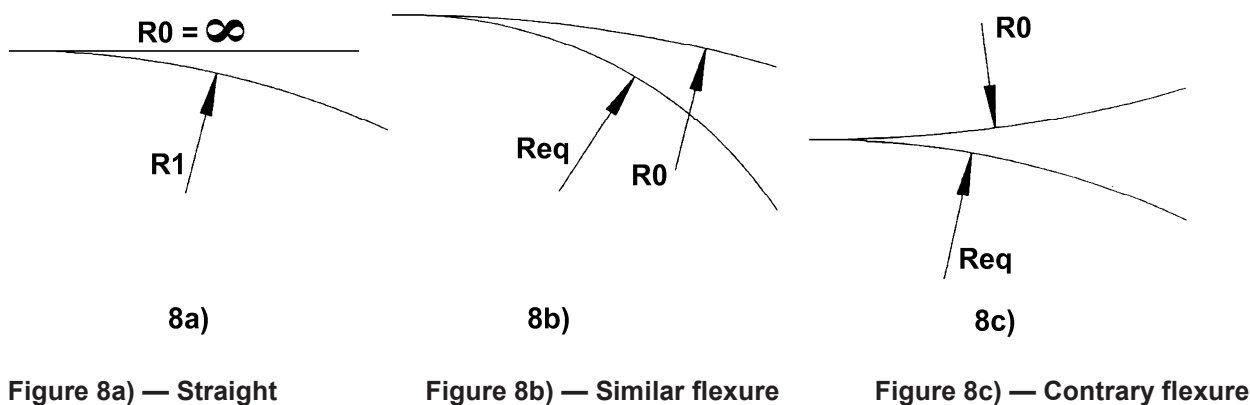


Figure 8 — Equivalent radius

Refer to EN 13232-1 for definitions of types of curvature. The type of curvature shall be specified by the Customer.

## 4 Non-geometric aspects of design

Design of switches and crossings involves aspects other than geometry. The component parts of switches and crossings are dealt with in Parts 5 to 10 (see Foreword) but some non-geometric design issues are of a more general nature:

- rail section and inclination;
- ability to withstand thermal forces;
- ability to support axle loading;
- performance under rail creep conditions (e.g. braking);
- influence of bearer cross-section and spacing;
- safety in operation;
- condition and loading of rolling stock;
- ability to function under the prevailing environmental conditions.

These issues are influenced by the axle spacing and frequency, temperature changes, ballast and subgrade quality, etc. They will be affected by maintenance practices and in turn will affect the economic service life. Some of these issues are within the Supplier's work, some are not.

The Supplier is responsible for meeting the Customer's specification, via this standard, for the items within the Supplier's scope. These items possess interfaces to other items outside the Supplier's scope. The Customer shall define in verifiable terms the characteristics required at these interfaces.

## 5 Tolerances

### 5.1 Accumulation of tolerances

For the build-up of tolerances on switches and crossings within a layout, refer to prEN 13232-9 in preparation.

## **5.2 Acceptance basis**

Radii and angles are considered to be nominal, that is, effectively exact. Acceptance criteria shall be based on longitudinal or lateral measurements or those obtained from versine calculations. Sufficient longitudinal, lateral and versine dimensions shall be verified by measurement to prove that the nominal radii and angles are correct.

In addition the following dimensions shall be verified by measurement in accordance with the tolerances specified by the Customer or agreed with him:

- gauge;
- distances to limits of supply (front joints, heel joints);
- width and depth of wheel flangeway gaps in switches, crossings and checks;
- lengths and entry/exit flare dimensions for check rails and wing rails, together with their position relative to the crossing nose;
- height of check rail above running rail;
- switch toe opening;
- minimum flangeway opening for free passage in switches.

Other dimensions requiring verification by measurement shall be agreed at the design stage.

## Annex ZA (informative)

### **A1** 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/EC<sup>1</sup>.

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.

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<sup>1</sup> This Directive 2008/57/EC adopted on 17<sup>th</sup> 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 29<sup>th</sup> 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 19<sup>th</sup> March 2008, and Directive 2008/57/EC**

| Clause(s)/<br>sub-clause(s) of this<br>European Standard | Chapter/§/annexes of the<br>TSI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Corresponding text,<br>articles/§/annexes of the<br>Directive 2008/57/EC                                                                                                 | Comments |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| The complete standard is<br>for application              | <p>4. Description of the<br/>infrastructure domain</p> <p>4.2.2 Nominal track gauge</p> <p>4.2.4 Distance between track<br/>centres</p> <p>4.2.8 Cant deficiency</p> <p>4.2.11.b) Rail inclination –<br/>Switches and crossings</p> <p>4.2.12.3 Switches and<br/>crossings – Geometrical<br/>characteristics</p> <p>4.2.13 Track resistance</p> <p>5 Interoperability constituents</p> <p>5.3 Constituents<br/>performances and<br/>specifications.</p> <p>5.3.1.1.b) The rail - Railhead<br/>profile – Switches and<br/>crossings</p> <p>5.3.4.c) Switches and<br/>crossings – Geometrical<br/>characteristics</p> <p>Annex A – Table A1</p> <p>Annex B1 – Table B1</p> | <p>Annex III Essential<br/>requirements</p> <p>1. General requirements<br/>1.1 Safety<br/>Clauses 1.1.1 – 1.1.2 and<br/>1.1.3</p> <p>1.5 Technical<br/>compatibility</p> |          |

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

| Clause(s)/<br>sub-clause(s) of this<br>European Standard | Chapter/§/annexes of the<br>TSI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Corresponding text,<br>articles/§/annexes of the<br>Directive 2008/57/EC                                                                                                       | Comments                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The complete standard is<br>for application              | <p>4. Description of the<br/>infrastructure subsystem.</p> <p>4.2.4.2 Distance between<br/>track centres</p> <p>4.2.5 Track parameters</p> <p>4.2.5.1 Nominal track gauge</p> <p>4.2.5.3 Rate of change of cant<br/>(as a function of time)</p> <p>4.2.5.4 Cant deficiency</p> <p>4.2.5.7 2 Rail inclination –<br/>Requirements for switches<br/>and crossings</p> <p>4.2.6.2 Switches and<br/>crossings – In-service<br/>geometry of switches and<br/>crossings</p> <p>4.2.6.3 Maximum unguided<br/>length of fixed obtuse<br/>crossings</p> <p>4.2.7 Track resistance to<br/>applied loads</p> <p>5. Interoperability constituents</p> <p>5.3.1 Constituents<br/>performances and<br/>specifications - The rail</p> <p>6. Assessment of conformity<br/>of interoperability constituents<br/>and EC verification of the<br/>subsystems</p> <p>6.2.4.7 Assessment of<br/>geometry of switches and<br/>crossings</p> <p>6.2.5.2 Assessment of track<br/>resistance for switches and<br/>crossings</p> <p>Annex B – Table 21</p> | <p>Annex III Essential<br/>requirements</p> <p>1. General requirements</p> <p>1.1 Safety</p> <p>Clauses 1.1.1 – 1.1.2 and<br/>1.1.3</p> <p>1.5 Technical<br/>compatibility</p> | <p>Rails, fastenings and<br/>sleepers used for short<br/>length of track for<br/>specific purposes, for<br/>example in switches<br/>and crossings, at<br/>expansion devices,<br/>transition slabs and<br/>special structures, are<br/>not to be considered to<br/>be interoperability<br/>constituents according<br/>to § 5.2 (3) of the<br/>CR TSI INF</p> |

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

## **Bibliography**

- [1] prEN 13232-6, *Railway applications – Track – Switches and crossings – Part 6: Fixed common and obtuse crossings*

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