



SLOVENSKI STANDARD
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Železniške naprave - Zgornji ustroj proge - Zagotavljanje varnosti med delom na progi - 2-2. del: Skupne rešitve in tehnologija - Zahteve za pregrade

Railway applications - Track - Safety protection on the track during work - Part 2-2: Common solutions and technology - Requirements for barriers

Bahnanwendungen - Oberbau - Sicherungsmaßnahmen während Gleisbauarbeiten - Teil 2-2: Allgemeine Lösungen und Technologie - Anforderungen an Absperrungen

Applications ferroviaires - Voie - Protection et sécurité durant des travaux sur la voie - Partie 2-2: Solutions communes et technologie - Exigences relatives aux barrières

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**Railway applications - Track - Safety protection on the track
during work - Part 2-2: Common solutions and technology -
Requirements for barriers**

Applications ferroviaires - Voie - Protection et sécurité
durant des travaux sur la voie - Partie 2-2: Solutions
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Bahnanwendungen - Oberbau - Sicherungsmaßnahmen
während Gleisbauarbeiten - Teil 2-2: Allgemeine Lösungen
und Technologie - Anforderungen an Absperrungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 256.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Foreword

This document (prEN 16704-2-2:2014) has been prepared by Technical Committee CEN/TC 256 "Railway applications", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This European Standard is one of the series EN 16704 "*Railway applications – Track – Safety protection on the track during work*" as listed below:

- *Part 1: Railway risks and common principles for protection of fixed and mobile work sites*
- *Part 2-1: Common solutions and technology – Technical requirements for Track Warning Systems (TWS)*
- *Part 2-2: Common solutions and technology – Requirements for barriers*
- *Part 3: Competences of personnel related to work on or near the railway track*

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prEN 16704-2-2:2014 (E)**Introduction**

The purpose of this standard is to define and harmonize requirements for barriers to separate working zone and danger zone and to prevent workers from entering the danger zone unintentionally.

The purpose of this standard is not to define requirements:

- for structural separation to provide safe train operation in the area of a work site⁽¹⁾;
- for structural separation to provide safety on a work site during train operation⁽²⁾.

NOTE Examples to found why to exclude the abovementioned purposes:

- (1) In case of crane operation on a work site the crane arm could hit or even intrude into the gauge of an open track and endanger the safety of train operation.
- (2) In case of a train derailment workers might be hit and get injured on the working track or in the area nearby the work site by a derailed train or wagon.

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1 Scope

This European Standard deals with requirements for barriers to give users the possibility to prevent workers from entering the danger zone unintentionally by the use of such barriers.

This standard defines minimum requirements and test procedures for these barriers concerning the dimensions, the stability and electrical properties.

This standard also gives recommendations for the marking (visual demarcation line) where a person would enter the danger zone.

For combinations of barriers and TWS see also prEN 16704-2-1:2014.

This standard contains remarks for electrical hazards by a third rail.

This standard does not deal with:

- risk assessment for safety protection on the track during work;
- hierarchy of safety measure for safety protection on the track during work;
- safety measure to provide safe working and safe train operation in the area of a work site;
- national safety regulations to plan and operate barriers in track;
- safety regulations and additional requirements e.g. due to national or operational rules or negotiation between the user and the manufacturer;
- electrical hazards by different potential of different electrified circuits.

2 Normative references

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

EN 338, *Structural timber – Strength classes*

EN 364, *Personal protective equipment against falls from a height – Test methods*

EN 1263-1, *Safety nets – Part 1: Safety requirements – Test methods*

EN 13374, *Temporary edge protection systems – Product specification and test methods*

EN 12811-2, *Temporary works equipment – Part 2: Information on materials*

EN 12811-3, *Temporary works equipment – Part 3: Load testing*

EN 15273-3, *Railway applications – Gauges – Part 3: Structure gauges*

ISO 13587, *Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs*

EN 50125-3, *Railway applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock*

prEN 16704-2-2:2014 (E)**3 Terms and definitions**

For the purposes of this document the following definitions apply.

3.1**separation**

method to keep apart the working track and the danger zone of the adjacent track/operational track. Separation prevents workers from entering unintended into the danger zone. Measures of separation are barriers, (steel) walls, work wagons etc.

3.2**limitative separation**

marking of the beginning of the danger zone by visual demarcation lines e.g. by flexible or rigid bands

3.3**preventive separation**

prevent unintentional entering of workers into the danger zone e.g. by a barrier

3.4**rigid separation**

prevent entering of workers into the danger zone e.g. by a wall

3.5**barrier**

common technical solution to realize preventive separation by a set of components to separate working zone and danger zone and to prevent workers from entering the danger zone unintentionally

3.6**marking/visual demarcation line**

common technical solution to realize limitative separation by marking (visual demarcation line) of where a person would enter the danger zone

Note 1 to entry Separation by marking (visual demarcation line) is no autonomous and independent measure for safety protection on the track during work (see clause 8).

3.7**module**

smallest entity of a barrier consisting of fixing and extendable devices, vertical and horizontal components (to be defined by the manufacturer in the manual)

3.8**extendable device**

adjustable component to realize different distances to the track or different heights above the rail

3.9**principal guardrail / upper horizontal component**

continuous horizontal component forming the top of the barrier

3.10**intermediate guardrail/intermediate horizontal component**

guardrail positioned between the principal guardrail and the working surface

3.11**intermediate protection**

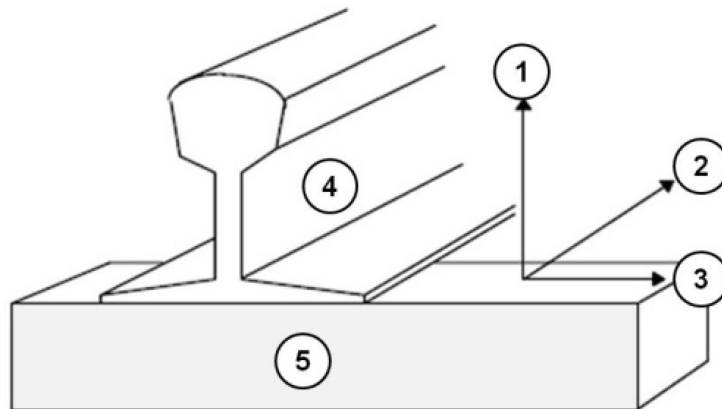
protection barrier formed (e.g. as a fencing structure or a safety net) between the principal guardrail and the working surface

3.12**post/vertical component**

principal vertical component to which horizontal components are attached

3.13**axis**

axis used in this standard are explained in Figure 1.



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Key

- 1 vertical
- 2 longitudinal, horizontal
- 3 transversal
- 4 rail
- 5 sleeper

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Figure 1 — Track section plus position name and three axis

4 Classification of barriers

For the purposes of this document the following classification, abbreviations and specifications apply.

Table 1 — Specification for barriers

type of barrier	clause	barrier	marking
purpose		prevention of unintentional entering into the dangerous zone	limitative separation only, marking of the beginning of the danger zone by a visual demarcation line
max length of components	5.1	$l_{\max} \leq 3,2 \text{ m}$	not specified
min./max height	5.6	See Annex A	not specified

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static stability	6.4.2.2.1	0,3 kN 50 mm	not specified
test-load	6.4.2.2.2		
max. deflection δ	6.4.2.2.3		
dynamic stability (oscillation and vibration)	6.4.3 6.4.4	0,3 kN → 0 kN 2 mm	not specified
dynamic stability (aerodynamic)	6.4.5	additional approval (calculation or testing) for a speed > 160 km/h	
electric requirements	6.6	No unintended influence on the signalling resistance between hor. components: min. 50 k Ω at 500 V AC resistance between vertical components: min. 50 k Ω at 500 V AC	not specified
3rd rail hazards	7	structure or net (max 40 mm mesh) or other adequate measures according to the risk analysis	not specified
marking	8	red/white yellow/black blue	chapter 8

NOTE Separation by marking (visual demarcation line) is no autonomous and independent measure for safety protection on the track during work (see chapter 8).

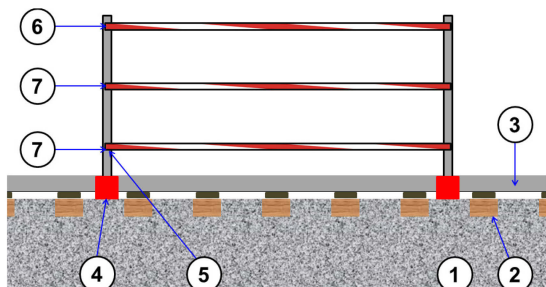
5 Requirements for barriers type

5.1 General

Barriers shall comprise at least:

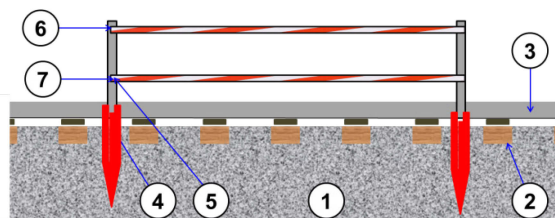
- a principal guardrail (the upper horizontal component), and
- an intermediate guardrail or an intermediate protection (net, plate).

Examples for barriers with rail mounted and non rail mounted fixation are shown in Figure 2.



Key

- 1 ballast
- 2 sleeper and rail fastening
- 3 rail
- 4 rail/track mounted fixation
- 5 extendable device with vertical components
- 6 principal guardrail



Key

- 1 ballast
- 2 sleeper and rail fastening
- 3 rail
- 4 non rail/track mounted fixation
- 5 extendable device with vertical components
- 6 principal guardrail

7 intermediate guardrail

7 intermediate guardrail

2.a) Rail mounted barrier**2.b) Non-rail mounted barrier****Figure 2 —Examples for a module and components of a barrier**

Barriers shall comply with all requirements of clause 5 up to clause 8.

All values (e.g. for height or distances) refer to straight horizontal tracks with a gauge of 1435 mm without cant.

NOTE For special situations (e.g. cant, 3rd rail) as a result of the risk assessment according to prEN 16704-1:2014 other and/or additional measurement could be necessary.

Barriers shall have no sharp or jagged edges.

They should be usable on switches and crossings too, for example by special devices.

They shall be constructed in a way that the track circuit system is not influenced and accidental electrical hazards are minimized (for details see sub-clause 6.6).

It shall be possible to mount, position and remove all components easily and:

- preferable from outside of the track, and
- preferable without removing ballast or anti-vibration devices mounted to the rail.

The various associated components shall allow quick assembly and disassembly.

The construction shall allow during use:

- temporary demounting of single modules;
- variation of the distance to the track;
- the evacuation in case of emergency. It should be possible to remove the horizontal components without a tool. If this is not possible, the manufacturer shall give instructions for this case in the manual.

Component made of non-conductive materials shall have a maximum length less than 3,2 m. Components made of metal or other conductive material shall have a maximum length less than 2,0 m.

NOTE In case of a maximum length of 3,2 m the distance from the track does change only in a range of $f = 1 \text{ cm to } 2 \text{ cm}$, even in small curves ($R = 80 \text{ m}$) [$f \text{ approximately } \text{length}^2/8R$].

It shall be possible to adjust the length of a module in a range of 0,4 m minimum (e.g. by adjustable horizontal components or by variable fixation points for the horizontal components).

5.2 Horizontal components

Principal and intermediate guardrails shall have a minimum cross-section height of 35 mm (see Figure 5).

If intermediate guardrails are provided, any gap shall be so dimensioned that a sphere of 470 mm diameter will not pass through the protection. If there are no intermediate guardrails or if it is not

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continuous, the intermediate protection shall be so dimensioned that a sphere with a diameter of 250 mm will not pass through it.

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