SLOVENSKI STANDARD
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Železniške naprave - Ploščad pregradnih sistemov

Railway applications - Platform barrier systems

Bahnanwendungen - Bahnsteig-Barrieresysteme

Applications ferroviaires - Systèmes façades de quai

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Railway applications - Platform barrier systems

Bahnanwendungen - Bahnsteig-Barrieresysteme

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European foreword

This document (prEN 17168:2017) 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.

Introduction

Platform barrier systems provide a moveable barrier between trains and other guided transit vehicles, and passengers waiting at stations and boarding points.

Platform barrier systems are used increasingly on metro and other rail networks to ensure the safety of passengers on the station platform who are waiting to board vehicles. Such systems are also used on 'people-mover' guided systems for short-distance transits, for example at airports. Their use is recommended by IEC 62267 for any fully automated transit system.

In particular platform barrier systems can be used to control the risks of:

— incursion by passengers or other persons on the railway track (deliberate or accidental);

— contact between passengers and moving vehicles.

These risks can be especially significant where there is the possibility of overcrowding on station platforms at busy locations. Barriers can in fact increase the safely useable space in the station for passengers waiting and circulating on the platforms.

Platform barrier systems integrate the operation of the platform barrier doors and gates with opening and closing of train doors and also assist in the management of station operations, to safely permit higher entry and exit speeds for trains serving the stations.

Barrier installations can also be part of a continuous partition between the running tracks and the station areas for the purposes of:

— fire safety (including smoke management);

— tunnel and station ventilation;

— trackside noise reduction;

— passenger comfort at climate controlled stations.

Additionally the terminology used in connection with platform barrier systems; in particular to improve the specification and understanding of safety requirements, should be standardized.

1 Scope

This European Standard specifies requirements for the design, construction and operation of platform barrier systems positioned at the edge of a station platform immediately adjacent to rail or other guided vehicles in stations and boarding points for passenger services and includes:

— requirements for the fixed structure and fixed parts along the platform;

— physical requirements for the movable doors and gates normally used by passengers;

— requirements for emergency doors;

— requirements for driver access doors;

— requirements for platform extremity doors;

— requirements for management of safety risks that are particular to barrier systems.

This European Standard also gives requirements for the integration of barriers with the overall rail system including:

— synchronization of vehicle and platform barrier doors or gates;

— audible and visible alerts;

— integrity of control systems;

— testing of the barrier installation;

— operational performance;

— requirements relating to other interfacing sub-systems, notably signalling and vehicles.

For barrier systems set back from the platform edge, which are used to control access to trains or for crowd management, relevant sections of the document can be used as guidance.

This European Standard applies to all actors involved in the implementation and system integration of a platform barrier system, including owners, designers, installers and operators.

This European Standard does not cover barrier systems using bars, ropes, etc. or which operate in a vertical direction. Nevertheless, compliance with relevant clauses from this document can be used in developing safety justifications for these alternative types of barrier system.

This European Standard applies to light rail services, e.g. metro and tramway systems and heavy rail services as requested by a project specification. It applies to small systems, working in conjunction with a single vehicle, or with larger systems working with a complete train.

This European Standard applies to platform barrier systems used at sub-surface stations, enclosed surface stations (e.g. those enclosed for the purposes of providing an air-conditioned environment for waiting passengers), and those fully in the open-air.

This European Standard does not cover normative requirements relating to fire performance or fire requirements arising from use of platform barrier systems as fire barriers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1090-2, *Execution of steel structures and aluminium structures — Part 2: Technical requirements for steel structures*

EN 1090-3, *Execution of steel structures and aluminium structures — Part 3: Technical requirements for aluminium structures*

EN 1125, *Building hardware — Panic exit devices operated by a horizontal bar, for use on escape routes - Requirements and test methods*

EN 1990:2002, *Eurocode — Basis of structural design*

EN 1991-1-1:2002, *Eurocode 1: Actions on structures — Part 1-1: General actions — Densities, self-weight, imposed loads for buildings*

EN 1991-1-4, *Eurocode 1: Actions on structures — Part 1-4: General actions — Wind actions*

EN 1993-1-9, *Eurocode 3: Design of steel structures — Part 1-9: Fatigue*

EN 1998-1, *Eurocode 8: Design of structures for earthquake resistance — Part 1: General rules, seismic actions and rules for buildings*

EN 1999-1-3, *Eurocode 9: Design of aluminium structures — Part 1-3: Structures susceptible to fatigue*

EN ISO 12543-1, *Glass in building — Laminated glass and laminated safety glass — Part 1: Definitions and description of component parts (ISO 12543-1)*

EN 13501-1, *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13501-6, *Fire classification of construction products and building elements — Part 6: Classification using data from reaction to fire tests on electric cables*

EN 12600, *Glass in building — Pendulum test — Impact test method and classification for flat glass*

EN 13272, *Railway applications — Electrical lighting for rolling stock in public transport systems*

EN 15273-1, *Railway applications — Gauges — General — Common rules for infrastructure and rolling stock*

EN 14752:2015, *Railway applications — Body side entrance systems for rolling stock*

EN 16584-3, *Railway applications — Design for PRM use — General requirements — Part 3: Optical and friction characteristics*

EN 50121-4, *Railway applications — Electromagnetic compatibility — Emission and immunity of the signalling and telecommunications apparatus*

EN 50122-1:2011+A4:2017, *Railway applications — Fixed installations — Electrical safety, earthing and the return circuit — Protective provisions against electric shock*

EN 50122-2, *Railway applications — Fixed installations — Electrical safety, earthing and the return circuit — Part 2: Provisions against the effects of stray currents caused by d.c. traction systems*

EN 50126-1, *Railway applications — The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS) — Part 1: Basic requirements and generic process*

EN 50128, *Railway applications — Communication, signalling and processing systems — Software for railway control and protection systems*

prEN 50129, *Railway applications — Communication, signalling and processing systems — Safety related electronic systems for signalling*

EN 50155, *Railway applications — Electronic equipment used on rolling stock*

EN 50162, *Protection against corrosion by stray current from direct current systems*

IEC 60364-4-41, *Low-voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock*

IEC 60364-5-54, *Electrical installations of buildings — Part 5-54: Selection and erection of electrical equipment — Earthing arrangements and protective conductors*

IEC 60364-6, *Low voltage electrical installations — Part6: Verification*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments IEC 61000-6-4:2017)*

EN 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments(IEC 61000-6-4:2006)*

IEC 61140, *Protection against electric shock — Common aspects for installation and equipment*

IEC 61508, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

IEC 62279, *Railway applications — Communication, signalling and processing systems — Software for railway control and protection systems*

EN 62305-1, *Protection against lightning — Part 1: General principles*

3 Terms and definitions

For the purposes of document, the following terms and definitions apply.

3.1
correct alignment
doors of the vehicle are longitudinally positioned relative to the corresponding platform barrier doors/gates, to permit safe and efficient transfer of passengers between vehicles and platform

3.2
doorway
section of a platform barrier through which passengers can board or alight from vehicles when platform doors or gates are open

3.3
driver access door/gate
openable panel in a platform door or gate system designed to align with the driving cab doorway of a train stopped at the station or boarding point

Note 1 to entry: Such panels can open with a hinged or sliding action.

3.4
dynamic gauge
maximum cross-sectional swept envelope of a vehicle when running at speeds up to the locally permitted maximum speed adjacent to platform doors or gates

3.5
emergency egress device
operating element for manual opening from the trackside, in case of emergency, of any type of platform door or gate

3.6
emergency egress door/gate
panel in a platform door or gate system which can be opened in an emergency, or if the vehicle(s) are not in correct alignment with the main platform doors/gates

Note 1 to entry: Emergency egress doors/gates can be of any design - hinged/sliding/push-out, etc.

3.7
entrapment
trapping of a person between the vehicle bodyside and the platform barrier after the vehicle and platform doors or gates have been closed

3.8
facade
complete framework and panels (fixed and moving) of the platform barrier

3.9
finished floor level
level of the platform floor when all surface finishes (e.g. tiles, screed, threshold) have been applied

3.10
glazing
glass or equivalent transparent material fixed in frames

3.11
leading edge
edge of a door or gate, leading during closing movement

3.12
local control panel
control panel adjacent to the platform barrier which enables opening and closing of a complete set of doors/gates in a barrier system by a member of operations staff

3.13
mechanical gap filler
moveable device mounted at the platform edge, at a platform door or gate, fully automatic and actuated/controlled in conjunction with the barrier system opening/closing sequences

Note 1 to entry: The purpose of a mechanical gap filler is to reduce the horizontal stepping distance to a vehicle to acceptable limits, or to facilitate access to a vehicle by persons with reduced mobility. Its structural integrity does not rely on support from the vehicle.

3.14
operations staff
persons including train crew and station personnel authorized to carry out duties for door/gate operation

3.15
person with reduced mobility (PRM)
person with disabilities and/or reduced mobility, being any person who has a permanent or temporary physical, mental, intellectual or sensory impairment which, in interaction with various barriers, might hinder their full and effective use of transport on an equal basis with other passengers, or whose mobility when using transport is reduced due to age

3.16
platform
section of pathway, alongside rail tracks at a railway, metro or other guided transit system station at which passengers can board or alight from vehicles

3.17
platform barrier system
system providing a protective barrier between vehicle and platform, having power operated movable panels with associated drive and control equipment, allowing passenger transfer through the barrier when a train is positioned at the platform

3.18
platform door
movable panel or panels moving parallel to the edge of the platform and forming part of a platform door system through which passengers normally access and egress vehicles

3.19
platform door system
platform barrier system in which horizontally movable panels are carried on a portal structure having headers or lintels above the moving panels, carrying all or part of the weight of the panels

Note 1 to entry: Such a system can form part of a structure completely enclosing the platform area and separating it entirely from the track on which vehicles move.

3.20
platform extremity door/gate
panel at the extremity of a platform door or gate system (usually, but not necessarily, at right angles to the main structure) to allow access by authorized persons to the track, or to a tunnel walkway beyond the station, or as emergency egress for persons evacuating from the track area

Note 1 to entry: Such panels can open with a hinged or sliding action.

3.21
platform gate
movable panel or panels moving parallel to the edge of the platform and forming part of a platform gate system through which passengers normally access and egress the vehicle

3.22
platform gate system
platform barrier system in which horizontally movable panels are supported from the bottom, or by cantilever arrangement at an intermediate height on the barrier

3.23
routine test
test to which each system or item of equipment is subjected during or after manufacturing

3.24
static gauge
cross-sectional stationary envelope of a vehicle when standing adjacent to platform doors or gates, as described in EN 15273-1

3.25
station
unit comprising buildings and structures containing technical equipment, loading or unloading areas or platforms, and any associated areas for reception and shelter

3.26
synchronization
co-ordinated movement of vehicle doors with platform doors or gates

3.27
system integration
process (particularly in the context of this standard) of assuring that the design, installation and operation of the barrier system is consistent with the overall safety and operational targets of the complete rail system, of which the barrier system is part

Note 1 to entry The activity of system integration is elaborated on in Annex D (informative)

3.28
train
operational formation consisting of one or more vehicles

3.29
type test
test of one system and its components to prove that the design meets the standard and the relevant specifications

3.30
user Population
range of persons (including operations staff) expected to use a platform barrier system, defined in terms of their physical characteristics

4 System design requirements

4.1 Physical and structural requirements of the platform barrier

4.1.1 General structural requirements

4.1.1.1 Platform barrier systems form a safety barrier separating customers/passengers from moving trains until it is safe to grant access. As such they shall be designed to resist crowd loading. Platform barriers are also subject to aerodynamic loads induced by trains passing the structure. Platform barrier systems installed in open sections shall also resist wind loading. In addition, platform barrier systems might be subject to pressures generated by tunnel ventilation systems and might be required to resist earthquakes. These separate actions shall be combined in accordance with Structural Eurocodes referenced from this standard.

4.1.1.2 Tunnel ventilation systems are normally associated with platform door systems that completely enclose the platform area separating it from the track on which vehicles move. Detailed modelling/simulation shall be undertaken during system integration and shall consider all operating and degraded modes of operation of the ventilation system to determine their effect on the platform door system and how they combine with the aerodynamic actions from trains. In particular, pressures generated by operation of ventilation systems for smoke extract or fire management shall not inhibit operation of emergency doors in accordance with 4.1.7.

4.1.1.3 Structural design shall take account of the requirements arising from the physical interface with trains intended to operate in conjunction with the barrier system, in particular regarding entrapment (4.1.10) and gauging (5.2.3).

4.1.1.4 General construction of platform barriers shall be in accordance with the Structural Eurocode series. EN 1991-1-1 covers general actions and imposed loads. Imposed loads are defined by categories of use is Clause 6. This series of standards explicitly includes barriers on railway platforms, in particular Category C5 which gives requirements for 'Areas susceptible to large crowds, e.g. in building for public events like concert hall, sports halls including stands, terraces and access areas and railway platforms.'

4.1.1.5 The Structural Eurocode series of standards mandate the use of Ultimate and Serviceability Limit States to ensure safety of the structure in extreme conditions (e.g. storm-force winds for open-air systems) and combinations of loads; however, normal operation of the platform doors/gates might not be practicable under all such limit states. At least one Operational Limit State should be specified to reflect normal operation of the barrier system. Further guidance is given in Annex B.

4.1.1.6 Deflection of the platform barrier system towards the track under any loading conditions envisaged in this standard shall not exceed the limits defined by the gauging strategy for the platform barrier system as described in 5.2.3. Plastic deformation may be permitted under Ultimate Limit State as defined by the Eurocodes referenced in Annex B, subject to compliance with the gauging strategy.

4.1.1.7 Infill panels (i.e. glazing, or sheets of other materials, which separate the platform area from the running tracks and are secured to the main structural framework of the barrier system) shall sustain the applied loads. In addition, deflection of an infill panel that is structurally safe should not alarm station users through large visible deformations when subject to normal service conditions. Therefore, for serviceability considerations, the limiting condition for deflection is that the total horizontal displacement of the infill panel at any point from its original unloaded position shall not exceed the deflection limits determined from the relevant structural design code (where applicable) for the material used or 25 mm, whichever is the smaller.

4.1.1.8 This standard covers the requirements for the platform barrier system. It does not specify requirements for the platforms, or other foundations and structures to which the platform barrier system is secured. Design and construction of platforms, foundations or other structures are covered by other appropriate structural Eurocode documents. However, the load cases considered in such designs shall be consistent with those adopted for the design of the platform barrier system.

4.1.2 Structural design principles

4.1.2.1 Designs shall be in accordance with the requirements of EN 1990.

4.1.2.2 Where steel is used, structural design shall be in accordance with EN 1993-1-1.

4.1.2.3 Where aluminium is used, structural design shall be in accordance with EN 1999-1-1.

4.1.2.4 In the event that structural materials other than steel or aluminium are used, performance of the design shall be demonstrated to be equivalent with the performance requirements of Eurocodes category C5 as defined in 4.1.1.4.

4.1.2.5 Where required by the relevant National Annex to EN 1998-1 regarding design of structures for earthquake resistance, the provisions of EN 1998-1 shall be applied in addition to the provisions of the other relevant Eurocodes.

4.1.2.6 Where glass is used the thickness of the glazing material may be calculated using finite element analysis. Alternatively thickness may be determined using empirical national codes but this can result in conservative design and increased weight.

4.1.3 Structural loading conditions

4.1.3.1 Crowd loading

4.1.3.1.1 Design for horizontal crowd loading shall be in accordance with EN 1991-1-1:2002, 6.4. The characteristic value for the line load q_k as defined in the standard shall be selected from the range for Category C5 from Table 6.12.

4.1.3.1.2 The design value for crowd loading shall correspond to the minimum value defined in EN 1991-1-1:2002 category C5 from Table 6.12. A higher value shall only be considered when a site specific risk assessment confirms a greater value is required. The structural design shall not be specified beyond what is essential in foreseeable conditions, since such 'over-design' can result in increased volume and mass of moving and other parts with disadvantages for gauging and for safe and efficient motion of doors and gates.

4.1.3.2 Aerodynamic loading from trains

4.1.3.2.1 Aerodynamic loads arising from the movement of trains alongside platform barrier systems that completely enclose the platform area shall be considered in the structural design of the barrier. In such case the platform area is completely separated from the track on which vehicles move (e.g. where separation is designed to support operation of a tunnel ventilation system, or climate control of the station). Such systems shall be fully analysed in accordance with the requirements of 4.1.1.2.

4.1.3.2.2 Aerodynamic loads arising from the movement of trains alongside barrier systems that do not fully enclose the platform area shall be considered in the structural design of the barrier system. In such cases design loads may be calculated in accordance with the methodology in Annex E, or be based on empirical measurement of comparable train and barrier combinations.