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Oprema cest - Varnostne ograje za pešce - Ograje za pešce

Road restraint system - Pedestrian restraint system - Pedestrian parapets

Rückhaltesysteme an Straßen - Fußgängerrückhaltesysteme - Brückengeländer

Dispositifs de retenue routiers - Dispositifs de retenue pour piétons - Garde-corps

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93.080.30	Cestna oprema in pomožne naprave	Road equipment and installations

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CEN/TR 16949

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ICS 13.200; 93.080.30

Supersedes CEN/TR 1317-6:2012

English Version

Road restraint system - Pedestrian restraint system - Pedestrian parapets

Dispositifs de retenue routiers - Dispositifs de retenue pour piétons - Garde-corps

Rückhaltesysteme an Straßen - Fußgängerrückhaltesysteme - Brückengeländer

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (CEN/TR 16949:2016) has been prepared by Technical Committee CEN/TC 226 “Road equipement”, the secretariat of which is held by AFNOR.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 1317-6:2012.

CEN/TR 16949:2016 includes editorial changes with respect to CEN/TR 1317-6:2012 for correcting mistakes which could lead to an incorrect or unsafe application of the document.

Introduction

The safety considerations of pedestrians using road bridges, footbridges and similar elevated structures require the installation of special road restraint systems, so called pedestrian restraint systems or pedestrian parapets.

Pedestrian parapets are used to prevent people from falling off a bridge or other type of elevated structure.

Aspects included in the Technical Report are:

a) safety in use for pedestrians and other highway users (excluding motor vehicles);

b) the safety considerations of pedestrians using road bridges and footbridges and similar structures;

c) analysis and test methods;

d) durability;

e) labelling and marking.

1 Scope

This Technical Report specifies geometrical and technical requirements for the design and manufacture for pedestrian parapets on road bridges, on footbridges, on top of retaining walls and on similar elevated structures.

This Technical Report also specifies test methods and provision for the labelling and marking of these products.

This Technical Report does not cover:

— vehicle restraint systems;

— pedestrian restraint systems in residential, commercial or industrial buildings and within their perimeter;

— non-rigid rails i.e. rope, cables.

This Technical Report may be used for pedestrian parapets on structures which cross over railways, rivers and canals.

2 Normative references

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

EN 1317-1:2010, *Road restraint systems - Part 1: Terminology and general criteria for test methods*

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

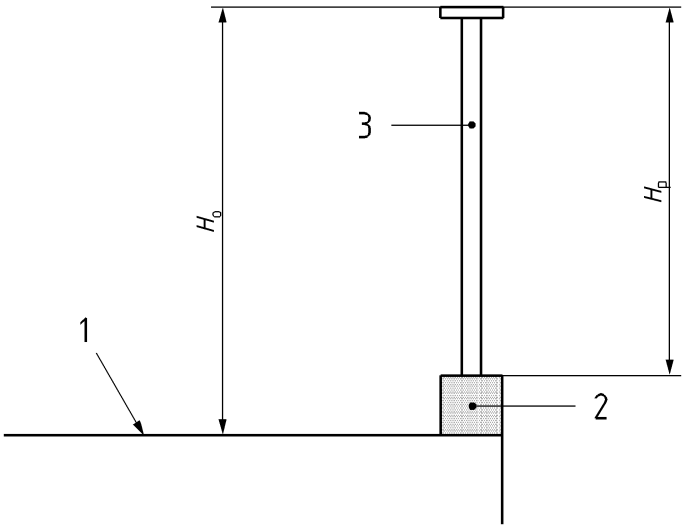
EN 10204, *Metallic products - Types of inspection documents*

EN 12767, *Passive safety of support structures for road equipment - Requirements, classification and test methods*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1317-1:2010 and the following apply.



NOTE 1 See Figure 1:

Key

H_o Pedestrian parapet height (m) above the walking surface (ground level)

H_p (Manufactured) pedestrian parapet height (m) above the plinth (fixing level)

1 pedestrian walking surface

2 plinth (concrete, steel, or other material)

3 manufactured pedestrian parapet covered by this Technical Report (manufactured product in steel, aluminium, wood, or other material which is capable of meeting the requirements of this Technical Report)

Figure 1 — Pedestrian parapet

NOTE 2 See informative Annex E for examples of parapets, Figure E.1 and E.2.

3.1.1
base-plate
plate attached to the base of a pedestrian parapet post, which is used to fix the pedestrian parapet to the structure

3.1.2
design working life
period of time in which the product or component is required to maintain the declared performance characteristics and will not require repair or withdrawal from service under normal maintenance and intended use conditions

3.1.3
handrail
rigid rail attached to or part of a pedestrian parapet to assist and guide pedestrians

Note 1 to entry: The top rail may also function as the handrail.

3.1.4
infilling
material that is fixed to posts and/or rails of a pedestrian parapet in order to reduce the size of openings (voids)

3.1.5
kicking plate
continuous upstand which can be attached to the bottom of the pedestrian parapet

3.1.6
overall working height
H_O
total working height (regulatory height) of the pedestrian parapet above the pedestrian walking surface

Note 1 to entry: See Figure 1.

3.1.7
panel
section of a pedestrian parapet bounded by two posts

Note 1 to entry: The panel includes any surrounding posts and rails.

3.1.8
pedestrian parapet
pedestrian or other users restraint system along or on top of a bridge, retaining wall or similar structure which is not intended to act as a road vehicle restraint system

3.1.9
pedestrian restraint system
product designed to meet the requirements of this Technical Report

3.1.10
plinth
continuous upstand which supports the posts of the pedestrian parapet and which is part of the main structure to which it is attached

3.1.11
post
vertical or inclined member of a pedestrian parapet which withstands both horizontal and vertical forces and transmits these forces to the supporting structure

3.1.12
product height
H_p
overall height of the manufactured product including base-plate if provided

Note 1 to entry: See Figure 1.

3.1.13
rail
member of a pedestrian parapet that transmits vertical and horizontal forces to the posts

Note 1 to entry: Top and other rails are included.

3.1.14
spaces, gaps and voids
space formed by the surrounding infilling of posts and rails

3.1.15
traffic loads
non-vehicular loads caused by pedestrians and other highway users e.g. cyclists and equestrians

3.2 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply:

3.2.1 Latin upper case letters

A_d	Design value of an accidental action
C_d	Limiting design value of the relevant serviceability criterion
D_s	Declared dimension(s) of spaces and voids
D_b	Diameter of spherical object which defines the dimensions of the spaces and voids
E	Energy
E_d	Design value of effect of actions
F_d	Design value of an action (load)
F_{dc}	Design value of connection to main structure
F_{hk}	Characteristic horizontal point load caused by traffic
F_{pdn}	Design load perpendicular on the infill
F_T	Test load
$F_{T,S}$	Test load at serviceability level
$F_{T,U}$	Test load at ultimate level
F_w	Resultant Wind force
G_k	Characteristic value of a permanent action
H_O	Overall height in metres of the pedestrian parapet above the pedestrian walking surface
H_P	The vertical height of the manufactured pedestrian parapet
Q_{hk}	Characteristic value of the concentrated horizontal traffic loads
Q_{vk}	Characteristic value of the concentrated vertical traffic loads
R_d	Design resistance
R_k	Characteristic resistance
R_T	Resistance derived from testing
S	Slope of load/deformation curve
$S_{n,dyn}$	Load from snow removal machinery
S_n	Snow load
SLS	Serviceability Limit State
ULS	Ultimate Limit State

3.2.2 Latin lower case letters

b	Width of footway
q_{hk}	Characteristic value of the uniformly distributed horizontal traffic loads (line load or patch load)-top rail
q_{hki}	Characteristic value of the uniformly distributed horizontal traffic loads (line load or patch load)-other rails
q_{vk}	Characteristic value of the uniformly distributed vertical traffic loads (line load or patch load)

3.2.3 Greek lower case letters

α	Test resistance reduction factor (and include bag angle B.5.3.3.2)
γ	Partial factor
γ_A	Partial factor for accidental actions
γ_{Gs}	Partial factor for permanent actions (e.g. self weight permanent actions)
γ_M	Partial factor for a material property
γ_Q	Partial factor for variable actions (traffic loads, wind loads, snow loads)
δ_h	Horizontal deformation or deflection
ψ	Combination factor
ψ_0	Factor for the combination value of a variable action
ψ_1	Factor for the frequent value of a variable action

4 Requirements

4.1 General

Pedestrian parapets should be designed and/or tested and should conform to the requirements of this Technical Report.

Where a vehicle restraint system is required to also function as a pedestrian parapet, the requirements of EN 1317–5 should be met.

Figures in Annex E illustrate the constituent parts of a pedestrian parapet.

Manufacturers may provide other design types which are not shown in Annex E provided they comply with the requirements of this Technical Report.

4.2 Construction

4.2.1 Assembly

Design, drawing, installation and maintenance instructions should be provided describing the measures that have to be taken in order to achieve the following performances where they form part of the pedestrian parapet:

a) a continuous flowing alignment;

b) smooth surfaces;

c) the absence of sharp edges that could cause injury to users;

d) the provision for expansion, contraction and movement of the main structure (e.g. under traffic loads and temperature effects) so that these do not endanger the performance or flowing alignment;

e) the avoidance of corrosion pockets;

f) the provision for adequate drainage in hollow sections and channels;

g) the compatibility between component parts so that there is avoidance of electrolytic action;

h) that fixings and fittings cannot be loosened without using tools;

i) to demonstrate the ease of assembly at site location, the ease of maintenance and repair including the replacement of parts;

j) finish and surface protection;

k) any special provisions for end posts/panels.

NOTE A method for ensuring a smooth finish is described in Annex G.

4.2.2 Optional facilities

The following optional facilities may be declared:

a) safety provisions for maintenance personnel;

b) provision for the fixing of a safety harnesses to support the weight of maintenance personnel to be fixed to the posts;

c) special provisions for the safe passage of cyclists;

d) the manufactured height of a kicking plate;

e) the manufactured height of solid infill where horses and cattle are expected to use the bridge or structure, the position of the infill is to be specified;

f) measures to prevent snow, debris and other hazards from falling on to traffic below the bridge or structure;

g) the provision of a plinth, which shall have a minimum height of 50 mm;

h) specification for the provision of a steel cable inside the handrail;

i) avoidance of footholds to discourage climbing;

j) provision for intervisibility;

k) meeting the requirements of EN 12767.

4.3 Geometrical requirements

4.3.1 Height of manufactured product

The height H_p of the manufactured pedestrian parapet should be declared. Where the pedestrian parapet is to be installed at an angle, the vertical height H_p should be declared m; see Figure 1.

The overall height H_0 of the pedestrian parapet is related to Hp but depends on the location of the fixing. See Figure 1 for examples. Where the post height exceeds the height of the top horizontal rail the declared height should be to the top of the top rail.

Table 1 — Minimum heights

Height (H_p)	**Height** m
A	1
B	1,1
C	1,2
D	1,4
F	1,6
E	1,5
G	1,8

Height should be measured with equipment that accords to EN ISO 9001.

4.3.2 Spaces and voids

The spaces and voids should not allow the passage of a spherical object with a diameter D_b. The maximum value of D_b should be declared as D_s. Various values for D_s should be declared in relation to height, see Figure 2.

Determination of D_s should take account of manufacturing tolerances and measured from a sample (using callipers) and/or an analysis of the manufacturing drawings.