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Building construction — Guardrail systems and rails for buildings

Construction immobilière — Rampe, main courante et balustrade fixées à demeure dans les bâtiments

ICS 91.060.30; 91.120.99

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Foreword

The International Organisation for Standardisation (ISO) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organisations, governmental and non-governmental, in liaison with ISO, also take part in this work.

Draft International Standards adopted by the technical committee are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the members voting.

International Standard ISO 12055 was prepared by the Technical Committee ISO/TC 59 on "*Building Construction*", SC3 on Functional/User Requirements and Performance in Building Construction, WG 8 on "*Permanent Guardrail Systems and Rails for Buildings*".

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

Attention is drawn to the fact that in certain countries additional/different requirements may be applicable due to existing national regulations or the equivalent.

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Building construction — Guardrail systems and rails for buildings

1 Scope

This international standard specifies requirements for the design and construction of permanent guardrail systems and rails to be provided in and around buildings and places of assembly, designed and positioned to protect and assist building occupants and users.

This standard concerns the health and safety of all potential users of buildings and concerns requirements and criteria that lead to satisfactory products under normal use conditions. This standard does not give consideration to design criteria for such specific field conditions, the establishment of which is the prerogative and responsibility of the designer, specification writer, and code agencies involved.

The standard does not apply to:

- a) temporary guarding related to building operations and works of engineering construction;
- b) guarding related to the moving of vehicles.

This International Standard is written for use by both the technical expert and the non-expert. A bibliography is provided in annex D to facilitate studies concerning the reasoning behind the statements made in this standard. <https://standards.iteh.ai/catalog/standards/sist/8d5b87f6-7276-429b-91e2-49da7c3303c/iso-dis-12055>

The terms are listed in alphabetical sequence. Compound terms appear in the natural spoken order. The order of sequence within each term is as follows: Preferred term, abbreviation in brackets, and synonyms and their status (e.g. equivalent, deprecated). A listing of relevant equivalent North American (U.S.) and British (U.K.) terms is provided in annex E.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this standard. For undated references, the latest edition of the normative document referred to applies. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

ISO 6707-1:1989, *Building and Civil engineering — Vocabulary — Part 1: General terms and Part 2: Contract terms*
(under revision)

ISO/DIS 10493.1995, *Building construction — Fasteners — Tests for determining stability performance under load*

ISO/FDIS 12944, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 6707 and the following apply.

3.1

baluster

baluster bar (picket)

one of series of closely spaced, upright and usually parallel infill members of a balustrade, located between top rail or handrail and bottom rail or tread or floor beneath balustrade and providing support to the top rail

3.2

baluster casting (picket casting)

- (1) ornamental cast element attached to baluster
- (2) cast element designed to attach baluster to top and bottom rails

3.3

balustrade

baluster guardrail system (picket railing system; baluster railing system)

protective barrier system consisting of posts and rows of balusters capped by top rail or hand rail or both, and bottom rail if any

3.4

baluster guardrail system

see balustrade

3.5

barrier

element or structure, including parapet, fence, and guardrail, often, but not necessarily, incorporating infilling, to prevent people from falling, to bar passage, to prevent access, and to retain, stop, guide, or control the movement of people

3.6

bottom rail

lowest member of guardrail system, supporting balusters or panels where present

3.7

building

structure comprising partially or totally enclosed space, erected by means of planned process of forming and combining materials. (In the context of this standard, building does not include such a structure which is designed to accommodate motor vehicles and sports arenas, where special relevant features must be provided)

3.8

cap

fitting or plug used to close end of pipe or tubular post, newel, or rail

3.9

cap rail (rail cap)

secondary railing element, often, but not necessarily a handrail, fastened to top rail

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3.10

collar
cover flange
cover plate
cover ring
rosette
escutcheon

protective or ornamental cover located at termination of post, baluster, or rail against tread, floor, or wall

3.11

datum

finished surface reference level or grade of floor, ramp, landing, platform, deck, balcony, hatch way, man hole, floor opening, porch, accessible roof, or nosing line of stairway treads

3.12

design level

height at which horizontal and other forces are, for purposes of design, assumed to act on guardrail, post or rail

3.13

drop cap

cover of guardrail post or newel, exposed to view, usually below stair stringer or floor

3.14

easement
wreath

compound curved section of rail and handrail providing continuity and transition of two adjoining and diverging vertical, horizontal, and inclined sections

3.15

escutcheon
 see collar

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3.16

expanded metal screen

see screen

3.17

finial

ornamental piece on top of post, newel, or guardrail; frequently in form of urn or pineapple, and so named

3.18

flange

flat plate or formed piece at end of baluster or rail element for attachment to adjoining construction or supporting member and to cover up any joint opening

3.19

grab bar
grab rail

short length of rail located for safety or convenience to assist person in movement at a specific location

3.20

guardrail system

guardrail

guarding (railing system, railing)

system intended to retard, stop, or guide people and providing protection for building users against accidental fall, located at or near outer edge of stair, ramp, landing, platform, deck, raked seating, balcony, hatchway, man hole, floor opening, porch, or accessible roof; at perimeter of opening or accessible area, such as stair opening; or at location at which operating condition requires access limitation to designated area - see balustrade

3.21

guardrail-system penetration limitation

arrangement of guardrail elements designed to prevent passage of sphere or cone of specified diameter through guardrail system

3.22

guardrail return

bend at end of handrail, turning toward wall or post to which handrail is attached

3.23

handgrip

part of handrail designed to provide secure grasp

3.24

handrail

horizontal, sloping, or vertical member, normally grasped by hand for guidance or support. (Handrail may be part of guardrail system and is often, but not necessarily, top rail, or may be attached to guardrail or mounted on wall or other building element. When part of a stair-rail system, handrail parallels pitch of stair flight and is often, but not necessarily, the top member)

3.25

handrail bracket

device attached to wall, post, or other surface to support handrail

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3.26

handrail height

vertical distance from top surface of top rail or handrail to datum

3.27

infilling (infill)

series of balusters or structural as well as decorative elements of baluster or panel guardrail system, including panels, screens, mesh, or similar elements of panel guardrail system; located between top and bottom rails and posts; to serve two-fold purpose of (a) protecting bodies from penetrating and falling through infill areas and (b) providing specific resistance to horizontal forces as are potentially encountered. (Infilling shall be designed in such a way as to deter climbing of guardrail system, especially where the presence of children can be expected)

3.28

infill area

field of baluster and panel guardrail systems, bordered by top and bottom rails and posts

3.29

intermediate rail

horizontal or inclined rail, located between top and bottom rails or between top rail and floor in the absence of a bottom rail

3.30**kick plate****toe plate****toe board**

vertical element at bottom of guardrail system located at such open edges as those of stairwell platform, ramp, or floor; forming low kerb to provide barrier to prevent objects from falling beyond it; normally not used for stair guardrail systems

3.31**lamb's tongue**

ornamental, curved or tapered fitting terminating handrail, usually tapered to tip end

3.32**lateral scroll**

fitting that curves in horizontal plane, used to terminate handrail; often ending as round plate covering top of post

3.33**low-density occupation**

population equal to or less than one person per three square metres of floor or building area

3.34**mid rail**

horizontal or inclined rail, located centrally between top and bottom rails or between top rail and floor in the absence of a bottom rail

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3.35**mitre ending (miter)**

angular or dove-tailed member end, designed to fit adjacent matching members, thereby providing continuity of profile at connection

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3.36**newel**

decorative or structural post member at start or end of stair run, often extending above handrail; usually square or rectangular in cross section, supporting end of stair guardrail or serving as common support for ends of two stair guardrails; often, but not necessarily, supporting stair stringer or platform or both; also centre post of spiral stair

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3.37**ogee**

moulding (molding) with profile having double curve formed by convex line turning into concave line, resulting in S-shape in cross-section

3.38**overcrowding**

population density equal to or greater than three persons per one square metre of floor or building area

3.39**panel**

flat infilling between top rail, bottom rail, and posts

3.40**panel guardrail system (panel railing system)**

system consisting of posts, top rail, bottom rail, and infilling panels with or without infill-panel frames

3.41**picket**

see baluster

3.42

pillar (post)

singular vertical supporting member

3.43

queue-guardrail system

see queue-rail system

3.44

queue-rail system

rail system designed to direct movement of people, requiring special consideration for given use conditions

3.45

rail

horizontal or inclined member of guardrail system, such as top, intermediate, mid or bottom member connecting balusters or posts, or both, at specified intervals

3.46

rail cap

see cap rail

3.47

ramp-rail system

guardrail system located along open side(s) of ramp

3.48

rosette

see collar

3.49

screen

expanded metal screen

stamped metal screen

wire fabric

wire mesh

perforated sheet consisting of wire mesh, wire fabric, or solid or expanded flattened metal, serving as infilling panel or integral part of panel guardrail system

3.50

scroll

ornamental, cast or forged, spirally or convolutely shaped element, serving as decorative panel or infilling

3.51

side mount

guardrail-system support, anchoring post or baluster of guardrail system to vertical or inclined surface, such as fascia or stair stringer

3.52

spindle

tapered baluster of circular cross section(s), having diameter(s) of central part larger or smaller than end diameter

3.53

stair-guardrail system

guardrail system located along open side(s) of stair or landing

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3.54**toe board**

see kick plate

3.55**top rail**

uppermost member of guardrail system directly below cap rail if any

3.56**transfer-guardrail system**

guardrail system designed to support and permit transfer of body weight in such locations as toilets, showers, and tub enclosures

3.57**tubular guardrail system**

tubular barrier: guardrail fabricated from tubing or pipe

3.58**urn**

ornamental vase used as finial

3.59**volute**

ornamental spiral or scroll-shaped form serving, for example, as handrail termination

3.60**wall bracket**

bracket used for anchoring intermediate supports of handrail to wall

3.61**wall clip****wall flange**

bracket used for anchoring end of handrail to wall

3.62**wall handrail****wall rail**

handrail attached to wall adjacent to stair and along landings, walkways, ramps, and corridors, paralleling pitch of stair or slope of inclined floor surfaces

3.63**wall rail return**

bend at end of wall handrail, turning toward wall to which handrail is fastened

3.64**wire fabric****wire mesh**

see screen

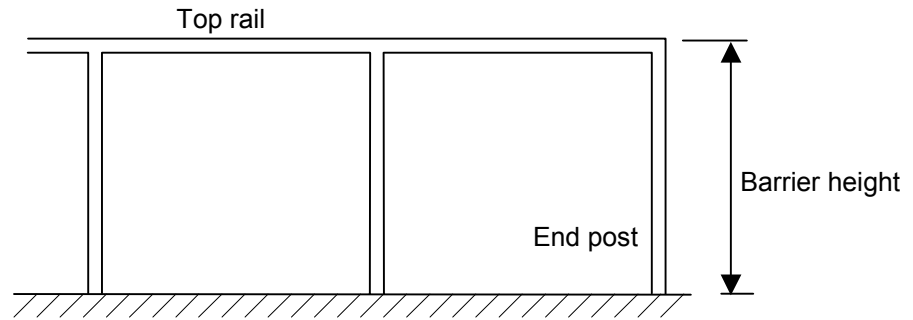
3.65**wreath**

see easement

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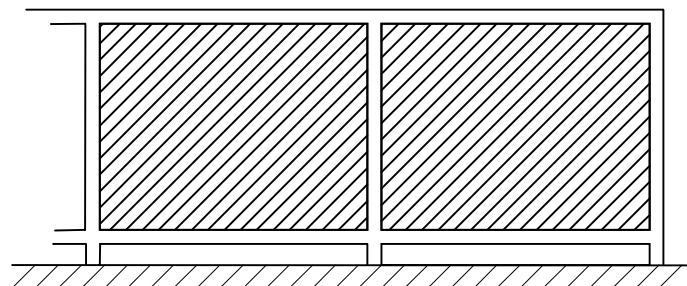
Tubular guardrail system

(Pipe railing system)



Baluster guardrail system

(Picket railing system)



Guardrail system with infill panel

(Panel railing system)

- 1 Top rail
- 2 End post
- 3 Barrier height

Figure 1 — Schematic front views of three typical guardrail systems

4 Significance and use

4.1 Guardrail systems and rails for buildings are usually designed, manufactured, and installed to withstand forces potentially exerted by the building users and, under given conditions, by adverse environmental exposure.

4.2 Guardrail systems and rails shall not be considered a part of the structural system of the building unless this is expressly provided for in the design.

5 Design considerations

5.1 Purpose and limitations

5.1.1 The principal purpose of guardrail systems and rails is to provide protection for building users against accidental falls within, and to discourage passage beyond, the accessible public area protected by the system. Permanent guardrail systems and rails are usually not provided at the landing side of loading docks. In dwellings pedestrian guarding systems should be provided that are capable of preventing people being injured by falling from a height of more than 600 mm. In other buildings pedestrian guarding systems should be provided that are capable of preventing people from falling more than the height of two risers (or 380 mm, if not part of a stair).

5.1.2 The principal purpose of rails and handrails is to provide a means of assisting in the support of the building users, such as when ascending and descending stairs and ramps and when transferring the body weight of physically handicapped persons. Building regulations, codes, and standards, as well as other applicable regulatory documents shall be given full consideration.

5.2 Special provisions shall be made to protect guardrail systems and rails as well as their anchorages against deterioration resulting from adverse environmental exposure conditions (see ISO 12944). Regular inspection and maintenance shall be scheduled.

6 Design requirements

6.1 General

Applicable permissible stress or limit-state design procedures shall be used whenever required. When using limit state design, the partial factors for loads and materials shall be those recommended in the applicable standards.

6.2 Height of guardrail systems, rails, and similar building elements

6.2.1 Guardrail systems

6.2.1.1 The height of a guardrail system, measured from its uppermost surface to the finished floor level or from above the pitch line of a stair, should be a minimum of 1.10 m in non-residential and 0.90 m in residential buildings. Under specified conditions, intermediate rails shall be installed to provide for the safety and convenience of the building users.

6.2.1.2 Guardrail heights specified in 6.2.1.1 may in certain circumstances be lowered. Table I provides additional guidance with regard to specific locations.