



BSI Standards Publication

Railway applications — Design for PRM use — General requirements

Part 1: Contrast

National foreword

This British Standard is the UK implementation of EN 16584-1:2025. It supersedes BS EN 16584-1:2017, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RAE/1/-/15, Railway Applications - People with Reduced Mobility.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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**Railway applications - Design for PRM use - General
requirements - Part 1: Contrast**

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l'usage par les PMR - Exigences générales - Partie 1:
Contraste

Bahnanwendungen - Gestaltung für die Nutzung durch
PRM - Allgemeine Anforderungen - Teil 1: Kontrast

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Contents	Page
European foreword	4
Introduction	6
1 Scope.....	7
2 Normative references.....	8
3 Terms and definitions	8
4 Symbols and abbreviations	13
5 Requirements and assessment	14
5.1 General.....	14
5.2 Infrastructure.....	14
5.2.1 Obstacle-free routes.....	14
5.2.2 Doors and entrances.....	14
5.2.3 Transparent obstacles	16
5.2.4 Furniture and free-standing devices	16
5.2.5 Handrails.....	16
5.2.6 Platform danger area and edge of platform.....	16
5.2.7 End of platform.....	17
5.3 Rolling stock	17
5.3.1 Seats.....	17
5.3.2 Doors	19
5.3.3 Exterior doors	20
5.3.4 Interior doors.....	23
5.3.5 Toilets (standard and universal)	24
5.3.6 Customer Information.....	26
5.3.7 Height changes.....	29
5.3.8 Handrails.....	30
5.3.9 Access/egress steps	30
5.3.10 Call for aid devices.....	31
5.3.11 Boarding aids	31
6 Methodologies for assessing contrast	32
6.1 General.....	32
6.2 Establishing LRVs.....	33
6.2.1 General.....	33
6.2.2 Method of establishing LRV	33
6.2.3 Specific assessment criteria for stainless steel.....	38
6.3 Method of assessing contrast with LRVs established (as in 6.2).....	39
6.3.1 General requirements for contrast	39
6.3.2 Specific requirements for contrast on signage	39
6.3.3 Durability of contrast	39
6.3.4 Specific requirements for electronic display.....	40
Annex A (normative) Contrast Charts.....	41
A.1 General.....	41

A.2	Worked examples for contrast	43
A.3	Self-contrasting bands	45
	Annex B (normative) Contrast for doors and transparent obstacles.....	46
B.1	General	46
B.2	Exterior doors.....	46
B.3	Case 1: If the window is less than or equal to 40 % of the visible door leaf.....	46
B.4	Case 2: If the window is greater than 40 % of the visible door leaf.....	48
B.5	Case 3: Alternative if the door leaf is not coloured to contrast with the bodyside	49
B.6	Markings for interior doors or transparent obstacles.....	49
	Annex C (normative) Effective contrast calculation for displays	52
C.1	Illuminated displays.....	52
C.2	Back lit and/or self-lit displays	52
	Annex D (informative) Supporting information from published documents.....	54
D.1	General	54
D.2	CIE Publication 196:2011 CIE Guide to Increasing Accessibility in Light and Lighting	54
D.3	ADA (Americans with Disabilities Act) Accessibility Guidelines for Buildings and Facilities.....	54
D.4	BS 8300-2 2018 Design of an Accessible and Inclusive Built Environment Part 2 Buildings - Code of practice.....	54
	Annex ZA (informative) Relationship between this European Standard and the Essential requirements of EU Directive (EU) 2016/797 aimed to be covered.....	56
	Bibliography	59

European foreword

This document (EN 16584-1:2025) 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 2026, and conflicting national standards shall be withdrawn at the latest by April 2026.

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 EN 16584-1:2017.

In comparison with the previous edition, the following technical modifications have been made:

- the document template has been updated;
- the document has been revised generally for document references and editorial issues with grammar;
- scope modified;
- normative references updated;
- terms and definitions revised;
- 5.1 removed references to annexes covering EC verification and testing requirements;
- 5.2.6 Platform danger area and edge of platform – Note 1 changed to be a bullet point, Note 2 moved from 7) to 5);
- 5.2.7 End of Platform – addition of ‘contrast requirement for the barrier shall be assessed according to free-standing device’;
- 5.3.4 Interior doors – text modified;
- 5.3.6.2 - text amended and additional Figures added;
- 5.3.11 Boarding aids – text changed from ‘up-stand’ to ‘tapered lip’;
- Annex D “EC verification - Interoperability constituents” removed;
- Annex E “Summary of testing requirements” removed;
- Subsequent Annexes renumbered;
- Annex ZA updated;
- Bibliography updated.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document is part of a suite of four ‘Design for PRM use’ standards that have in total nine parts:

EN 16584 is a standard that covers both infrastructure and rolling stock — Railway applications — Design for PRM use — General requirements:

- Part 1: Contrast (EN 16584-1);
- Part 2: Information (EN 16584-2);
- Part 3: Optical and friction characteristics (EN 16584-3).

EN 16585 is a standard that covers rolling stock — Railway applications — Design for PRM use — Equipment and components on board rolling stock:

- Part 1: Toilets (EN 16585-1);
- Part 2: Elements for sitting, standing and moving (EN 16585-2);
- Part 3: Clearways and internal doors (EN 16585-3).

EN 16586 is a standard that covers rolling stock — Railway applications — Design for PRM use — Accessibility of persons with reduced mobility to rolling stock:

- Part 1: Steps for access and egress (EN 16586-1);
- Part 2: Boarding aids (EN 16586-2).

EN 16587 is a standard that covers infrastructure — Railway applications — Design for PRM use — Requirements for obstacle-free routes for infrastructure.

These standards aim to clarify the requirements (with clear and consistent terms and definitions) and to define the associated criteria and, where appropriate, methodologies to allow a clear pass/fail assessment”.

1 Scope

This document describes the specific 'Design for PRM use' requirements applying to both infrastructure and rolling stock and the assessment of those requirements. The following applies to this document:

The definitions and requirements describe specific aspects of 'Design for PRM use' required by persons with disabilities and persons with reduced mobility as defined in the PRM TSI.

This document defines elements that are universally valid for board-free travelling relating to visual contrast. The definitions and requirements of this document cover the infrastructure and rolling stock applications.

This document only refers to aspects of accessibility for PRM passengers; it does not define non-PRM related requirements and definitions.

This document assumes that the infrastructure or rolling stock is in its defined operating condition.

Where minimum or maximum dimensions are quoted these are absolute NOT nominal requirements.

The 'General requirements' standard is written in three parts:

This document is Part 1 and contains:

- contrast.

Part 2 contains:

- spoken information;
- written information;
- tactile information;
- pictograms;
- audible signals.

Part 3 contains:

- lighting;
- low reflective properties;
- transparent obstacles;
- slip resistance.

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 10088-2:2024, *Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resistant steels for general purposes*

EN 13272-1:2019, *Railway applications - Electrical lighting for rolling stock in public transport systems - Part 1: Heavy rail*

EN 16584-2:2025, *Railway applications — Design for PRM use — General requirements — Part 2: Information (Basel)*

EN 16584-3:2025, *Railway applications — Design for PRM use — General requirements — Part 3: Optical and friction characteristics*

EN 16586-1:2025, *Railway applications — Design for PRM use — Accessibility of persons with reduced mobility to rolling stock — Part 1: Steps for access and egress*

EN 16587:2025, *Railway applications — Design for PRM use — Requirements for obstacle-free routes for infrastructure*

ISO 17398:2004, *Safety colours and safety signs — Classification, performance and durability of safety signs*

ISO 21542:2021, *Building construction — Accessibility and usability of the built environment*

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

bezel

raised area that surrounds a pressel as part of a pushbutton

3.2

boarding aid

device (fixed or portable) that bridges the gap between rolling stock and platform to allow a PRM to board or alight from a train

Note 1 to entry: This includes manual, semi-automatic or automatic ramps, lifts and other devices.

3.3**bridging plate**

retractable device integrated into the vehicle as close as possible to the door threshold level that enables access for wheelchair users, fully automatic and activated/controlled in conjunction with the door opening/closing sequences or semi-automatic on demand from passenger or staff

Note 1 to entry: It retains its strength without support on the station platform when extended.

3.4**character height**

vertical size of uppercase letters or numbers

3.5**clear width****clear usable width**

unobstructed width of an open door or clearway to allow all passengers, including PRM, to pass through

3.6**contrast**

perception of a difference visually between one surface or element of a building/rail vehicle and another by reference to their light reflectance values (LRV) or luminance values

Note 1 to entry: See BS 8300-1 and BS 8300-2 for further information.

3.7**customer information**

all visual and spoken information other than information intended only for staff

3.8**doorway**

opening in the vehicle body side that allows access to and egress from that vehicle

3.9**effective clear width**

horizontal usable width of the surface of a boarding aid or entrance step

3.10**first step**

step that is the first step for a passenger to use, to overcome a height change

Note 1 to entry: For the external access/egress steps this will normally be the step that is closest to the platform edge (fixed or movable step), therefore this is the first step when boarding and the last step when alighting.

Note 2 to entry: In the context of steps for internal height changes (other than the external access/egress steps) this means the first usable step when ascending and the edge of the walking floor when descending.

3.11**fixed longitudinal seat**

passenger seat which is installed along the body side (not foldable or intended to tip up) facing perpendicular to the direction of travel

3.12**free-standing device**

element or item within the confines of the station and on platforms, whether fixed or removable, that is not part of the station structures

Note 1 to entry: Elements that are not included in this definition are lifts, external staircases, walls, any suspended devices, (the lower most part of which is more than 2 100 mm above the walking floor) and items that have a dimension greater (perpendicular to the walking direction) than 2 000 mm (e.g. fence, waiting shelter).

3.13**gap**

distance between a platform and the closest point on the rolling stock at the passenger door where passengers traverse from one to the other (both vertical and horizontal)

3.14**halo**

illuminated ring surrounding a pressel, not necessarily continuous

3.15**handhold**

discontinuous element designed to be gripped or held in order to aid personal stability

3.16**handrail**

continuous element with round cross section for passengers to use to aid personal stability by gripping around

3.17**hue and chroma**

attributes of a colour which include its hue (frequency) and saturation (the dominant wavelength of a colour) also known as "chromaticity"

Note 1 to entry: A colour system (colour space, colour model) defines colour by hue, saturation and brightness. The hue is the predominant colour, the saturation is the colour intensity from achromatic (colourless) to the pure colour and the value (result) is the brightness from light to dark.

3.18**innovative solution**

technological progression that results in a solution that does not comply with the specification set out in Clause 5 of this standard or for which there are no assessment methods

Note 1 to entry: An innovative solution (Article 6 Commission Regulation (EU) N° 2023/1694 of 10 August 2023 may only be used following a positive opinion from the European Commission.

3.19**last step**

final step for an ascending passenger to use to overcome a height change, forming the edge of the walking floor

3.20**Light Reflectance Value****LRV**

total quantity of visible light that is reflected by a surface at all wavelengths and directions when illuminated by a light source

Note 1 to entry: The measured range of LRV is between 0 and 100 points, with a value of 0 points for pure black and a value of 100 points for pure white.

Note 2 to entry: See Annex D for further information.

3.21**obstacle-free route**

link between two or more public areas dedicated to the transport of passengers that can be navigated independently by all persons with disabilities and reduced mobility

Note 1 to entry: In order to achieve this, the route can be divided to better meet the needs of all persons with disabilities and reduced mobility. The combination of all the parts of the obstacle-free route constitutes the route accessible for all persons with disabilities and reduced mobility.

3.22**pictogram**

graphical symbol, diagram or Figure with a particular meaning which directly represents or conveys its meaning independently of language through a pictorial representation of a physical object, action or character

Note 1 to entry: Refer to ISO 7001:2023, ISO 22727:2007 and ISO 9186 (all parts) for rules regarding graphical symbols and frames.

3.23**pressel**

surface of the pushbutton which is pressed in order to activate the pushbutton

3.24**routeing information**

information, used by passengers to guide them on their journey, a guide as to which route to take to get to a required destination or facility and changes along that journey

Note 1 to entry: This can be temporary information to an event e.g. exhibition or sporting event but NOT any form of commercial advertising.

3.25**spoken information**

information audibly communicated in words

Note 1 to entry: This can be direct, pre-recorded or synthesized information.

3.26**standard toilet**

toilet not designed to be accessible to a passenger in a wheelchair

3.27**station**

any form of infrastructure where a train operates and passengers can board or alight in normal operation

3.28

step nose

step nosing

intersection point of the projections of horizontal and vertical surfaces of a step

Note 1 to entry: This is illustrated in EN 16586-1:2025, Annex B showing example step noses.

3.29

tactile

information that is relayed through the physical sense of touch

Note 1 to entry: Tactile signs, controls, symbols, pictograms, guide path and Braille or raised characters are a physical means by which tactile information is provided.

3.30

transparent obstacle

obstacle that allows objects or images to be seen as if there were no intervening material, seen through with a level of clarity

Note 1 to entry: Transparency in this standard is when an obstacle allows at least 50 % direct light transmission.

3.31

universal toilet

toilet designed to be used by all passengers including passengers in wheelchairs

3.32

visual acuity

threshold of the capacity of the eye to perceive fine details of a visual object (a sign), the recognizability of which depends on the visual angle

3.33

visual information

written information, pictograms and markings

3.34

wheelchair space

designated space in the passenger compartment for a wheelchair user and their wheelchair

3.35

written information

information visually communicated in words, letters and numerals, excluding pictograms and markings

4 Symbols and abbreviations

For purposes of this document, the symbols and abbreviations in Table 1 and Table 2 apply.

Table 1 — Abbreviations

Abbreviation	Designation
CIE	Commission Internationale de l'Eclairage.
EN	European Standard
ISO	the International Organization for Standardization
LRV	Light Reflectance Value
NCS	Natural Colour System
PRM	Persons with disabilities and persons with reduced mobility
TSI	Technical Specification for Interoperability
UV	Ultraviolet light

Table 2 — Symbols

Symbol	Designation	Unit
E_F	brightness of extraneous light	
k	unit of contrast	
K	correlated colour temperature (of a light source)	Kelvin
K_{eff}	the effective contrast	
L	unit of luminance in candela per square metre	cd/m ²
L_o	the LRV of the object	
L_1	the luminance for self-lit displays when off	cd/m ²
L_2	the luminance for self-lit displays when on	cd/m ²
L_c	the LRV of the character (signage only)	
L_F	the luminance generated by extraneous light	cd/m ²
L_h	the LRV of the background or adjacent surface	
lx	illuminance	lux
m	length	metre
mm	length	millimetre
nm	length (one billionth of a metre)	nanometre
ρ_A	reflectance value of surface of the display	

5 Requirements and assessment

5.1 General

The fonts, symbols and pictograms used for visual information shall contrast with their background.

Contrast shall be assessed according to Annex A.

All dimensions in the Figures are in millimetres (mm) unless otherwise stated.

Colours used in the Figures in this document are for illustrative purposes only and not to be considered as demonstrating compliance.

5.2 Infrastructure

5.2.1 Obstacle-free routes

5.2.1.1 Horizontal circulation

Where thresholds are installed on a horizontal route, they shall contrast with the surrounding floor and shall not be higher than 25 mm.

- Contrast shall be assessed according to Annex A.
- Assessment of height shall be according to EN 16587:2025.

5.2.1.2 Vertical circulation

As a minimum the first and last steps of a flight of stairs shall be indicated by a contrasting band. This shall apply from a single step.

- Contrast shall be assessed according to Annex A.

5.2.2 Doors and entrances

This clause applies to all doors and entrances that are on obstacle-free routes according to EN 16587:2025 with the exception of doors giving access to the toilets which are not dedicated to persons with disabilities and persons with reduced mobility.

If pushbuttons or other control devices are provided for operation of doors, then each pushbutton or device shall contrast with its surroundings:

- Contrast shall be assessed according to Annex A;
- The surroundings shall be defined as 100 mm in at least two directions (at least 90 degrees apart) from the edge of the control bezel outwards over at least the full width of that control (the resultant area shall be at least 20 000 mm²) see Figures 1a and 1b;
- The control for the doors if it is a pushbutton shall be assessed as the pressel, the illuminating halo and the bezel combined which shall have a minimum area of 5 000 mm². See Figure 2.

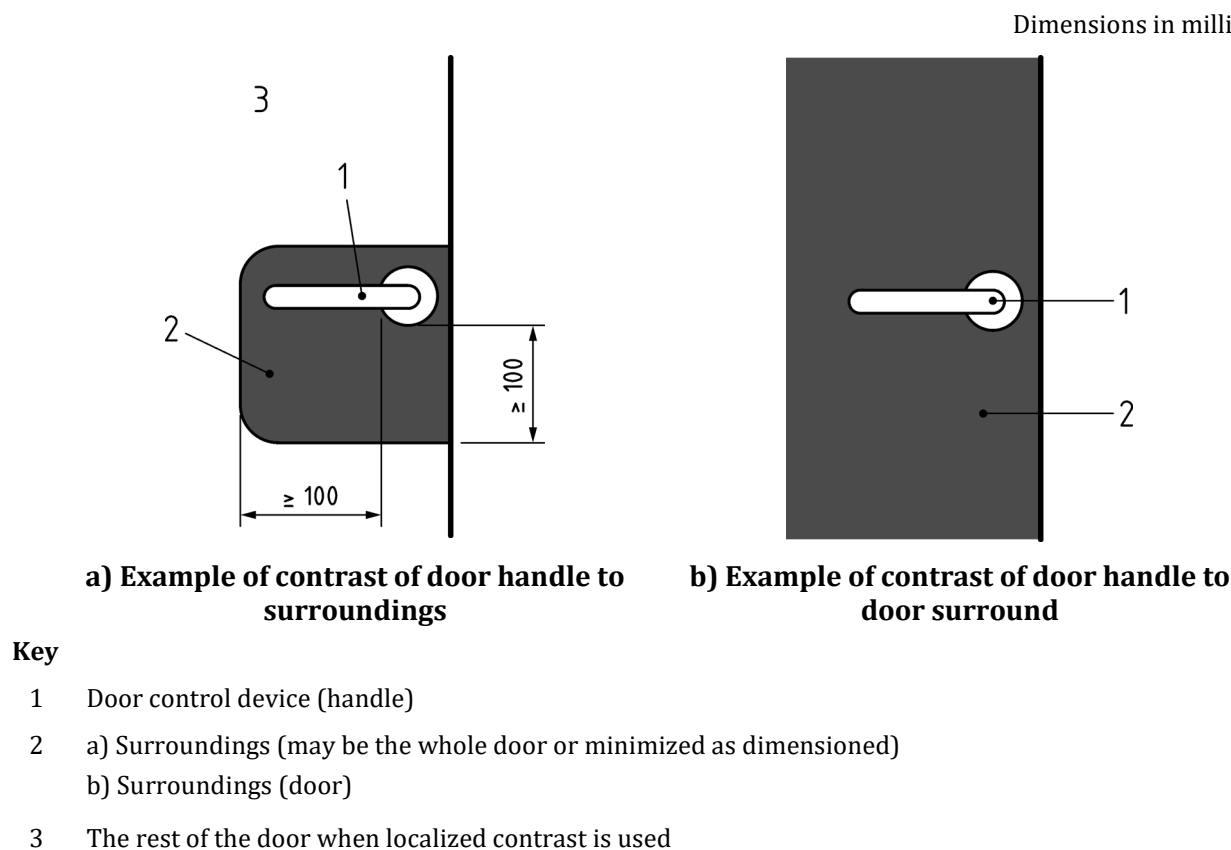


Figure 1 — Examples of contrast of door handles

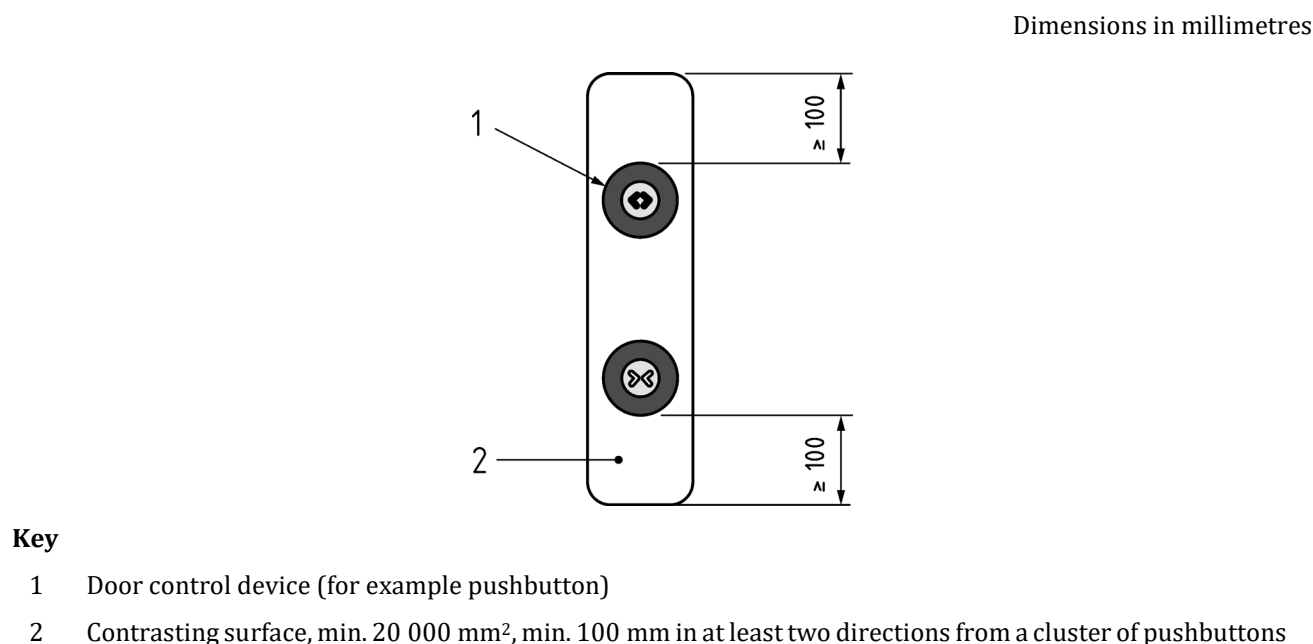


Figure 2 — Example of contrast of pushbuttons to background

5.2.3 Transparent obstacles

Transparent obstacles on or along the routes used by passengers, consisting of glass doors or transparent walls, shall be marked. These markings shall highlight the transparent obstacles.

- Assessment shall be according to ISO 21542:2021 or appropriate national or regional standards.

These markings shall:

- i. Contrast with the background against which they are viewed.

- Contrast shall be assessed according to Annex A.

NOTE 1 The background is the area behind the obstacle as viewed in the direction of passenger movement.

or

- ii. Consist of two separate colours that have a minimum difference in LRV of 60 points and comply with requirements in B.3.

NOTE 2 60-point difference in LRV achieves contrast against varying lighting conditions and backgrounds.

- iii. If the obstacle can be approached from two different directions the requirement shall be met on each side that the obstacle can be approached.
- iv. These markings are not required along transparent walls if passengers are protected from impact by other means – for example, by handrails or continuous benches.

5.2.4 Furniture and free-standing devices

All items of furniture and free-standing devices at stations shall contrast with their background:

- Contrast shall be assessed according to Annex A or
- According to ISO 21542:2021 or
- According to appropriate national or regional standards.

5.2.5 Handrails

Handrails shall contrast with the surrounding wall colours:

- Contrast shall be assessed according to Annex A.

NOTE The surrounding wall is the surface immediately behind the handrail.

Where used, stainless steel handrails shall meet the appropriate requirements of Clause 6.

5.2.6 Platform danger area and edge of platform

- 1) The danger area of a platform commences at the rail side edge of the platform and is defined as the area where passengers are not allowed to stand when trains are passing or arriving.
 - The danger area shall be according to National Standards or Guidance.
- 2) The boundary of the danger area, furthest from the rail side edge of the platform, shall have visual marking and tactile walking surface indicators.

- The tactile walking surface indicators shall be according to EN 16584-2:2025.
- 3) The visual marking shall be a contrasting, slip resistant, warning line with a minimum width of 100 mm:
 - Contrast shall be assessed according to Annex A;
 - The surface, with which the warning line shall contrast, is the immediately adjacent area of the platform;
 - Slip resistance shall be assessed according to EN 16584-3:2025.
- 4) The width shall be measured horizontally and perpendicular to the track.
- 5) The rail side edge of the platform shall contrast with the darkness of the gap.

NOTE As this refers to the gap, it assumes that a train is present and casting a shadow, so the gap is therefore dark and assumed to have an LRV of 0.
- 6) The LRV of the rail side edge of the platform shall be defined and measured according to Clause 6 (Methodologies for assessing contrast).
- 7) The LRV of the rail side edge of the platform shall be greater than 30 points.
- 8) If the gap is illuminated by artificial lighting from below, 30 points difference to that gap shall be demonstrated.

5.2.7 End of platform

Where there is no physical barrier that prevents public access, then the end of the platform shall have a visual marking and tactile walking surface indicators with an attention pattern indicating a hazard.

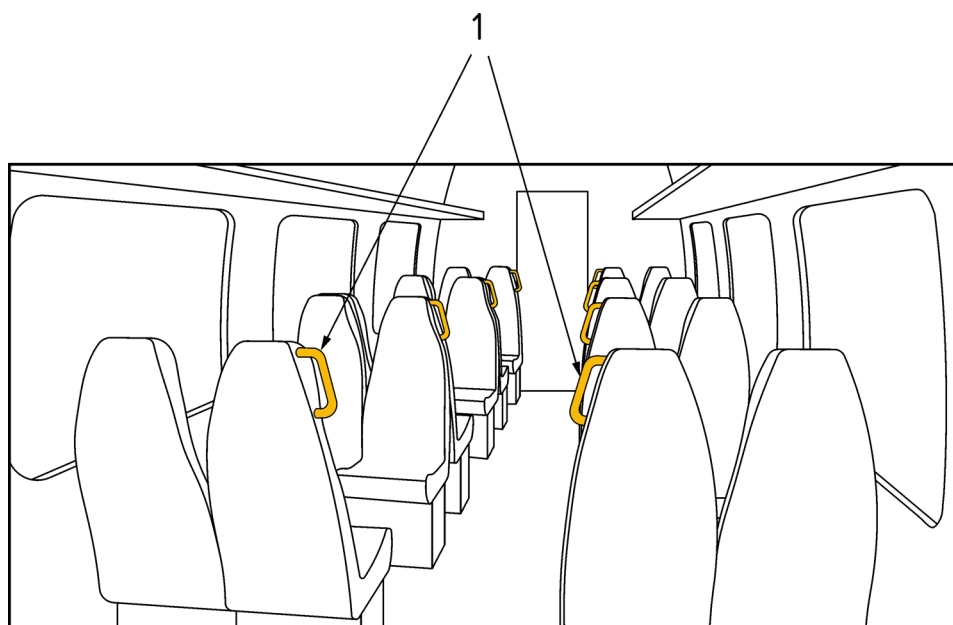
- Contrast of the visual marking shall be assessed according to Annex A;
- The tactile walking surface indicators shall be assessed according to EN 16584-2:2025;
- For contrast requirement for the barrier this shall be assessed according to free-standing device, 5.2.4.

5.3 Rolling stock

5.3.1 Seats

Handholds or other items that can be used for personal stability shall contrast with the seat:

- Contrast shall be assessed according to Annex A.
- The surface of the seat that the handhold shall contrast against is the surface that can be viewed in the normal use of that handhold i.e. the front and/or back of the seats depending on the application see Figure 3.



Key

- 1 handhold contrasting to back and front of seats

Figure 3 — Contrast of handholds to background

In seating areas with fixed longitudinal seats, handrails shall contrast with the vehicle interior surroundings:

- Contrast shall be assessed according to Annex A
- The vehicle interior surroundings are the surfaces behind or adjacent to the seat as viewed in the direction of normal use, these surfaces shall include the wall panels and the seat covering but not the windows or armrests see Figure 4.



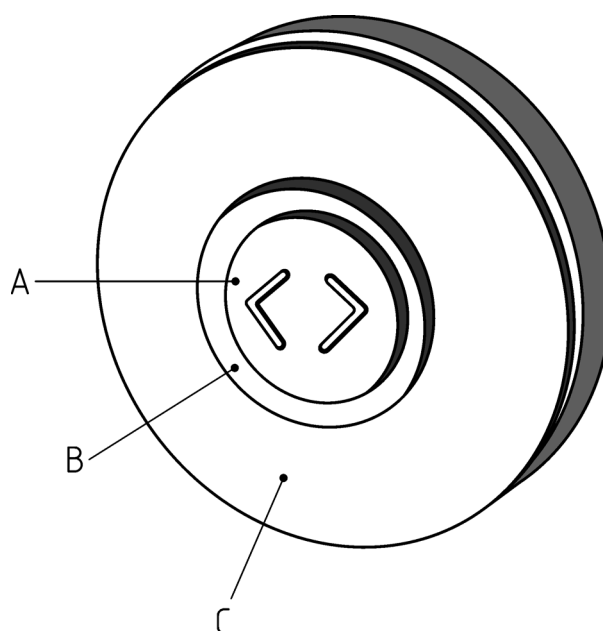
Figure 4 — Contrast of handrails to background

5.3.2 Doors

5.3.2.1 General

Door controls, whether manual, pushbuttons or other devices, shall contrast with the surface on which they are mounted:

- Contrast shall be assessed according to Annex A.
- Where the control is a manual device see Figure 1 for examples.
- Where the control is a pushbutton for the vehicle exterior door (internal and external control) it shall be assessed as the pressel, the illuminating halo and the bezel combined. These elements shall have a minimum area of 5 000 mm² of which 3 250 mm² as a minimum shall contrast with the surrounding surface. See Figure 5. In all cases the bezel (C) shall be part of the contrasting area.

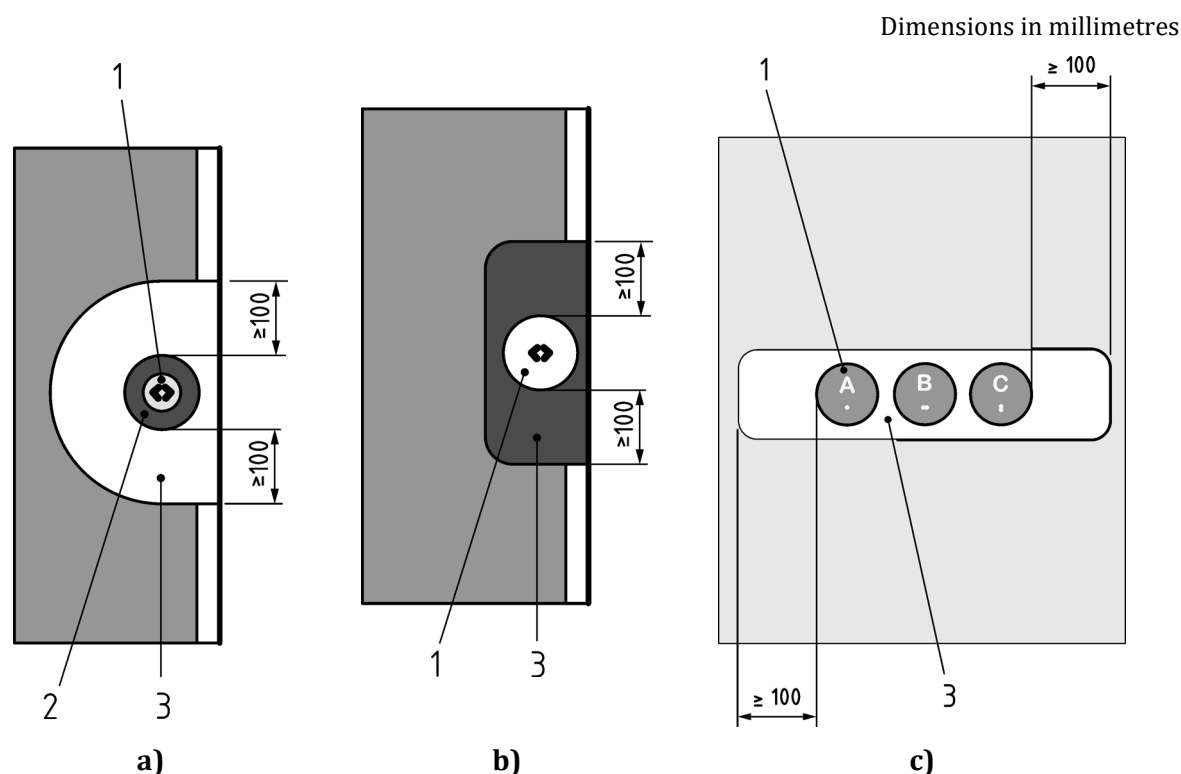


Key

- A pressel
- B illuminated halo
- C bezel

Figure 5 — Key elements of an example door control pushbutton

- The contrasting surface shall be defined as 100 mm in at least two directions (at least 90° apart) from the edge of the control bezel outwards over at least the full width of that control (the resultant area shall be at least 20 000 mm²), see Figure 6a, Figure 6b and Figure 6c. and Figure 1a and Figure 1b.



Key

- 1 pressel
- 2 bezel, total area of pressel and bezel min. 5 000 mm²
- 3 contrasting surface, min. 20 000 mm², min. 100 mm in at least two directions from control

NOTE The text on the control is an example only.

Figure 6 — Examples of contrasting door controls

5.3.3 Exterior doors

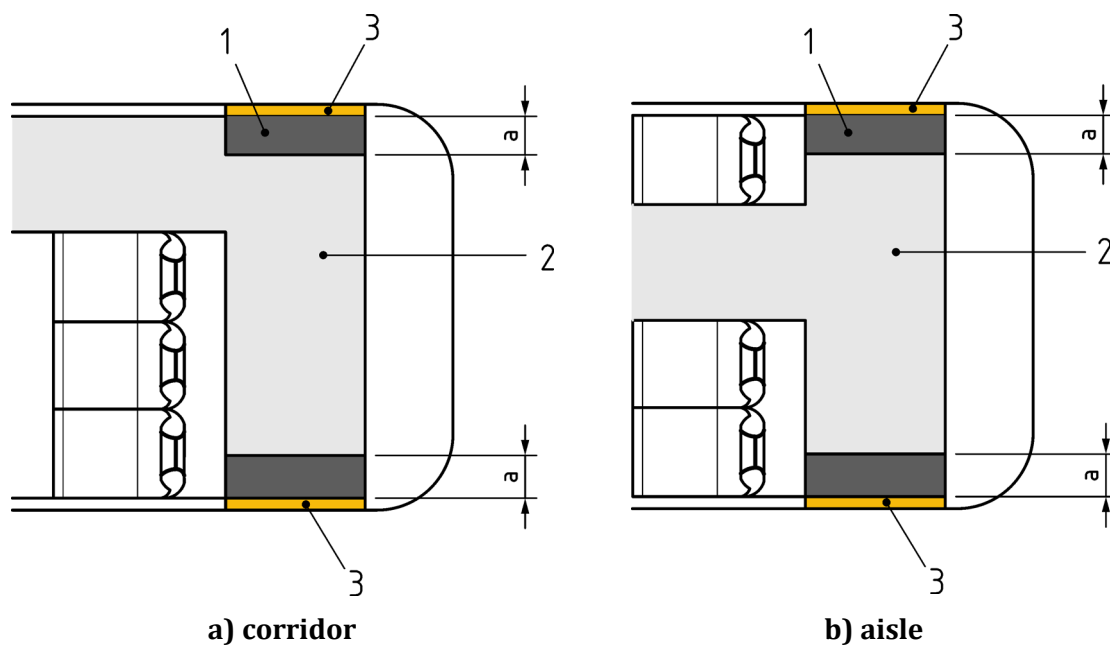
- 1) All exterior passenger doorways shall be marked on the outside in a way that gives a contrast to the vehicle body-side surrounding them:
 - Contrast shall be assessed according to Annex A.
 - The contrasting surface shall be as defined in Annex B.

NOTE 1 Examples of compliant and non-compliant marking of the doors are shown in Annex B.

- 2) From the inside of the vehicle the position of external doorways shall clearly be marked by use of contrast on the flooring adjacent to the doorway, as compared with the rest of the flooring of the vehicle:
 - Contrast shall be assessed according to Annex A.
 - The flooring adjacent to each doorway shall as a minimum be assessed as the clear width of the external doorways and for a minimum depth of 200 mm and shall contrast with the adjacent floor in the passenger areas of that vehicle – as shown in Figure 7a) and Figure 7b), but can also be the complete vestibule floor – as shown in Figure 8a) and Figure 8b).

- If entrance steps are present, then Figure 9 and Figure 10 show the minimum contrasting flooring.

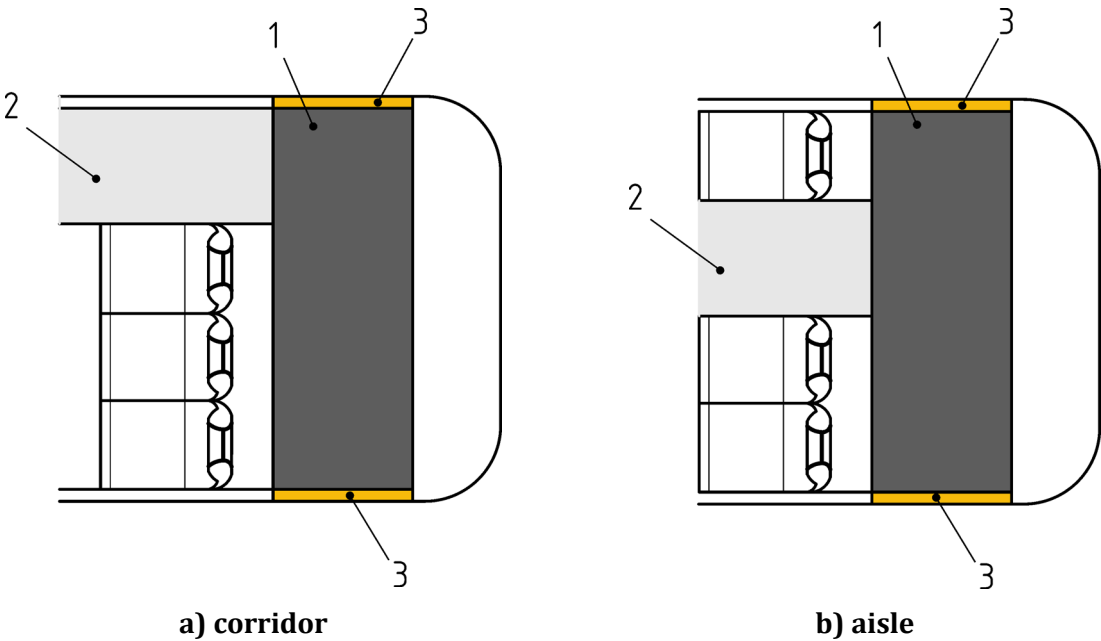
NOTE 2 The rest of the flooring in the vehicle is the primary flooring in the saloon area not the toilet etc.



Key

- 1 contrasting floor area
- 2 rest of the flooring of the vehicle
- 3 contrasting band
- a 200 mm minimum

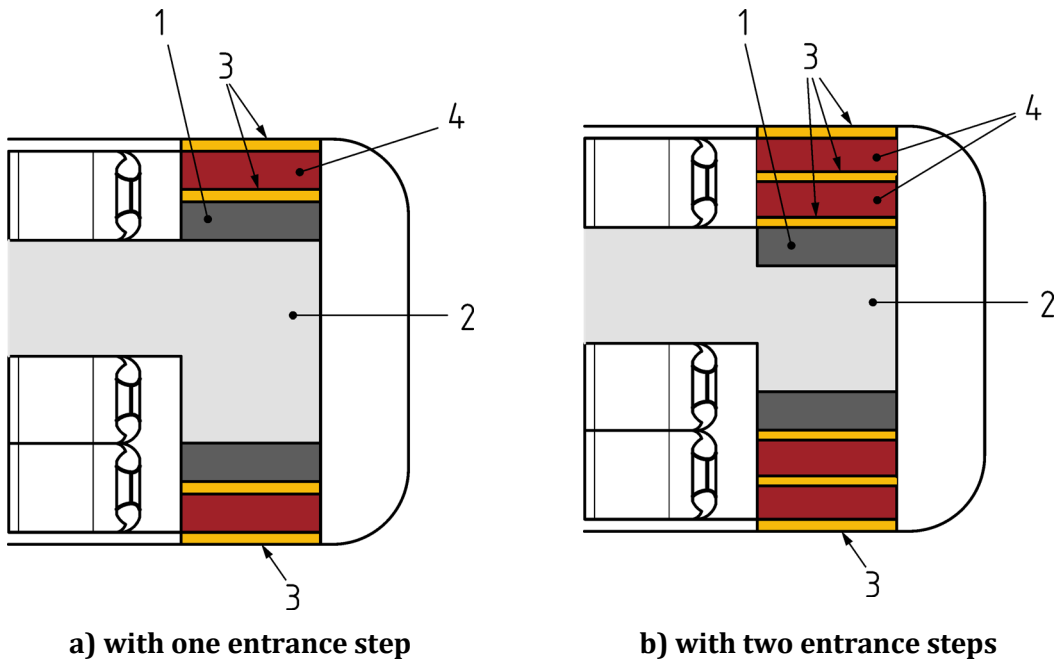
Figure 7 — Examples of minimum doorway position markings (without entrance steps)



Key

- 1 contrasting floor area (200 mm deep minimum)
- 2 rest of the flooring of the vehicle
- 3 contrasting band

Figure 8 — Examples of alternative doorway position markings

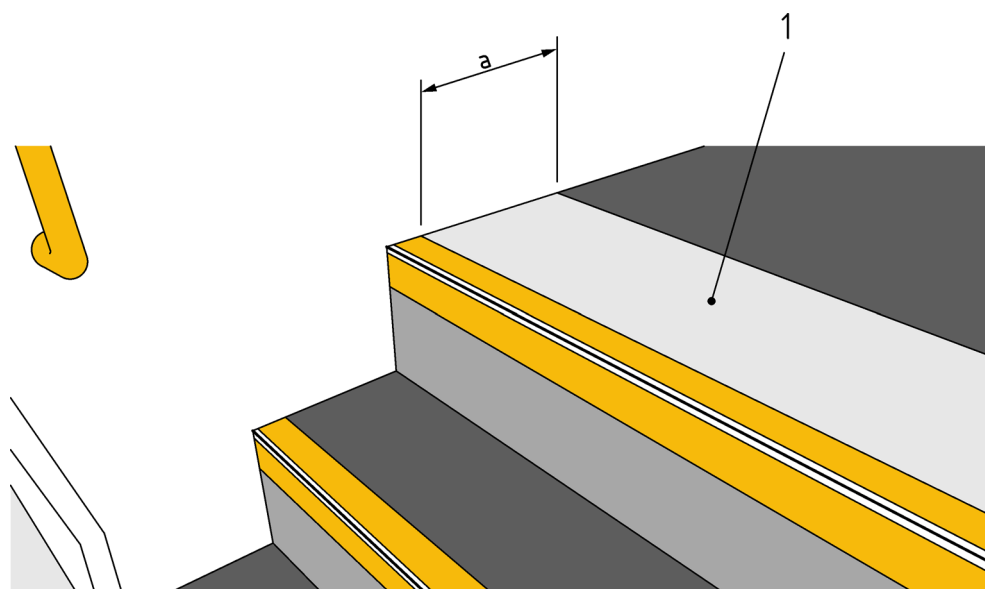


Key

- 1 contrasting floor area (200 mm deep minimum)
- 2 rest of the flooring of the vehicle
- 3 contrasting band
- 4 step surface covering

NOTE Contrasting band is only mandatory for the first and last step.

Figure 9 — Examples of minimum doorway position markings (with entrance steps)

**Key**

- 1 contrasting floor area
- a 200 mm minimum

Figure 10— Example of minimum doorway position marking (with entrance steps)

5.3.4 Interior doors

If more than 75 % of a door's visible surface is made of a transparent material, it shall be clearly marked with visual indicators that:

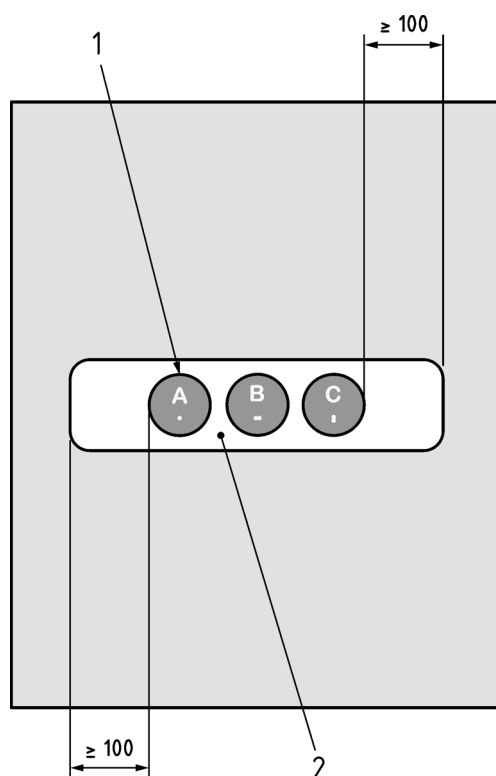
- i. Consist of a minimum of two prominent bands made of signs, logos, emblems or decorative features, examples of compliant and non-compliant marking of the doors are shown in Annex B.
- ii. Shall be at a height between 1 500 mm and 1 650 mm for the upper band, and between 850 mm and 1 000 mm for the lower band.
 - Measured vertically from the walking floor.
- iii. Shall provide contrast over the entire width of the door.
 - Contrast to the background shall be assessed according to Annex A and shall be achieved on both sides of the door
 - The background is the area behind the door as viewed in the direction of passenger movement.
 - The visual bands shall either contrast as defined in Annex A to the background or the self-contrasting bands shall consist of two separate colours that have a minimum difference in LRV of 60 points. See Figure B.10 and Figure B.11 in Annex B.
 - The 60-point difference in LRV achieves contrast against varying lighting conditions and backgrounds across the full width of the transparent area,
 - The share of each of both contrasting colours shall be at least 30 % of the total surface of the band.

- The total share of these two colours shall be at least 75 % of the total surface of the band.
 - The grid dimension of contrasting colours shall be more than 30 mm. See Figure B.15 in Annex B.
- iv. If the band is formed of signs, logos, emblems or decorative features then the remaining transparent part of the band shall form no more than 25 % of the band.
- These bands shall be a minimum of 100 mm high.
 - Measured vertically from the walking floor.

5.3.5 Toilets (standard and universal)

- 1) Any control device, including flushing system shall contrast with the background surface:
- Contrast shall be assessed according to Annex A.
 - The controls to be assessed under this requirement are:
 - Door controls (open, close and lock).
 - Toilet flush control.
 - Controls for soap dispenser, hand dryer and water dispenser.
 - i. These controls, if pushbuttons shall include the pressel, the illuminating halo (if fitted) and the bezel. More than one pressel may be fitted to a bezel e.g. open and close pressels on a bezel. See Figure 11.
 - ii. The contrasting surface shall be defined as 100 mm in at least two directions, at least 90° apart, from the edge of the control outwards over the full width of that control. The resultant area shall be at least 20 000 mm², see Figure 11.

Dimensions in millimetres



Key

- 1 control area min. 5 000 mm² of which 3 250 mm² as a minimum shall contrast with the surrounding surface.
- 2 contrasting surface or bezel, min. 20 000 mm², min. 100 mm in at least two directions from control.

NOTE The text on the control is an example only.

Figure 11 — Example of contrast of toilet door / flush controls

- 2) The toilet seat and lid, and any handrails shall contrast with the background:
 - Contrast shall be assessed according to Annex A.
 - The background shall be the surfaces adjacent to the toilet seat/lid, seen in every direction of normal approach. These surfaces include the floor, the wall panels and the sanitary ware (due to the space constraints in a standard toilet, the normal approach shall see the toilet seat/lid against the floor rather than the wall.)
 - The background shall be the surfaces adjacent to the handrails, seen in every direction of normal approach.

NOTE In addition to the above requirements, it is good practice to ensure contrast for other elements in the toilet used by a PRM, for example wash basin, taps, toilet paper or hand towel dispenser, litter bin, coat hook etc to help with identification and usability.

5.3.6 Customer Information

5.3.6.1 General

The requirements in 5.3.6.2 below shall apply to the following information:

- Safety information and safety instructions.
- Warning, prohibition and mandatory actions signs.
- Information concerning the route of the train, including information about delays and unplanned stops.
- Information concerning the location of on-board facilities.

All information should be coherent and consistent with the general routeing and information system especially colour and contrast on trains.

5.3.6.2 Contrast of signage, pictograms and seat identification characters

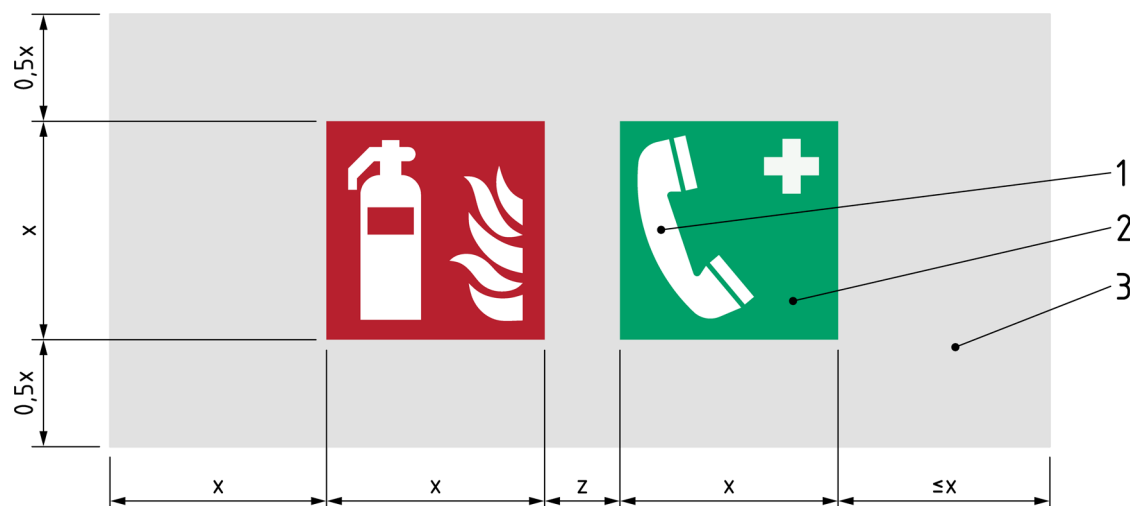
1) Visual information shall contrast with its background:

- Contrast shall be assessed according to Annex A.
- The background in this context means both:
 - Within the sign, see Figure 14, the background is the main colour on which the pictogram or information is displayed see Figure A.2.
 - The main colour of the sign shall contrast with the surface on which the sign is displayed or mounted see Figure A.1.
 - All safety, warning, mandatory action and prohibition signs shall be designed according to ISO 3864-1:2011.

2) The PRM sign dimensions shall be according to EN 16584-2:2025, Annex A.

3) Where signs are applied to a transparent surface, they can be mounted on a horizontal band across the width of the transparent surface to provide an adequate contrast to the sign background, this band shall be a minimum of 140 mm high. See Figure 12.

- This allows for the 70 mm x 70 mm required for mandatory safety signs plus 50 % of the sign height above and below the sign and as a minimum 100 % of the width of the sign on each side of the sign, where there is more than 1 sign the gap between signs shall be a minimum of 9 mm.

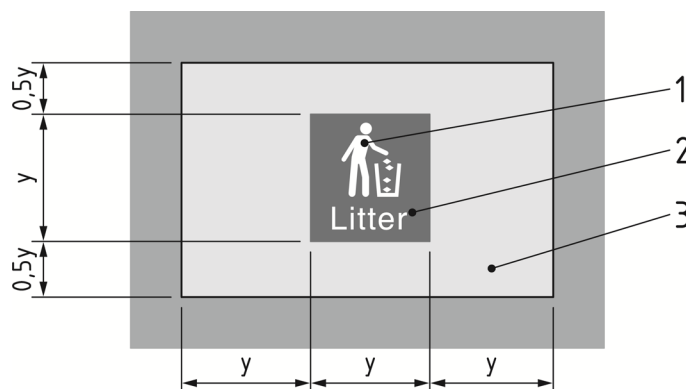


Key

- X a minimum of 70 mm (mandatory safety sign dimensions)
- Z the gap between signs shall be a minimum of 9 mm
- 1 pictogram
- 2 sign background
- 3 contrasting surface / background

Figure 12 — Required surface dimensions for a horizontal band used to provide a contrasting background on transparent surfaces or for grouped signs on a wall/partition.

- 4) Where there are several signs required to be grouped together on a wall or partition the horizontal band can be used when the contrast to the surface of the wall or partition cannot be achieved due to the combination of mandatory signs background colours relative to the surface colour. The minimum dimensions shall be according to Figure 12.
- 5) Where there is only a small surface on which a sign needs to be mounted, for example a litter bin flap, then to provide a contrasting background this surface shall have as a minimum 50 % of the sign height above and below the sign and 100 % of the width of the sign on each side of the sign this results on the minimum dimension of 120 mm high and 180 mm wide for a small surface with a single 60 mm × 60 mm sign see Figure 13.



Key

- y a minimum of 60 mm (70 mm for mandatory safety signs)
- 1 pictogram
- 2 sign background
- 3 contrasting small surface / background

Figure 13 — Required surface dimensions for a small surface to be a contrasting background

- 6) Where the contrast between the sign background and the surface on which it is mounted cannot achieve the contrast as required in Annex A then a wider frame/border can be used to achieve the contrast.
- For the signs used on the vehicle interior a frame/border of 9 mm minimum shall be used and for the vehicle exterior sign a frame/border of 13 mm minimum. See Figure 14.
 - Not achieving the required contrast between sign background and the surface on which the sign is mounted is only acceptable where the required combination of signage and contrast requirements result in a situation where all the requirements cannot be achieved not as a result of just a colour choice.

NOTE For example, where the required combination of mandatory and PRM signs cannot all contrast with the surface colour.



Key

- 1 information on the sign
- 2 background colour of the sign
- 3 background surface on which the sign is mounted or displayed
- 4 frame/border (when used for contrast it shall be a minimum of either 9mm for interior signs or 13 mm for exterior signs)

Figure 14 — Example sign to show background contrast required

5.3.7 Height changes

Where internal steps (other than those for external access) are provided, as a minimum the first and the last step shall be indicated by a contrasting band with a depth of 45 mm to 55 mm:

- Contrast shall be assessed according to Annex A.
- The band shall extend to the full useable width of the steps on both the front and the top surfaces of the step nosing.
- The depth of the top band shall be measured horizontally and perpendicular to the step edge.
- The depth of the front band shall be measured vertically down the face of the step riser and perpendicular to the step edge.
- The edge of the contrasting band closest to the step nosing shall be within 10 mm of the effective nose both vertically and horizontally see Figure 15.
- Where the nose of the step is curved or chamfered, the effective nose of the step shall be as shown in EN 16586-1:2025.

NOTE First and last step are to be interpreted for this set of requirements as the top of the first and last riser as you ascend the steps.

5.3.8 Handrails

All handrails shall contrast with their background:

- Contrast shall be assessed according to Annex A.
- The background shall be the surfaces adjacent to the handrails seen in every direction of normal approach.
- As an alternative the contrast to the background is not required when the characteristics specified in 6.2.3.2 are met.

5.3.9 Access/egress steps

The first and the last step shall be as defined in EN 16586-1:2025, as a minimum the first and the last step shall be indicated by contrasting bands:

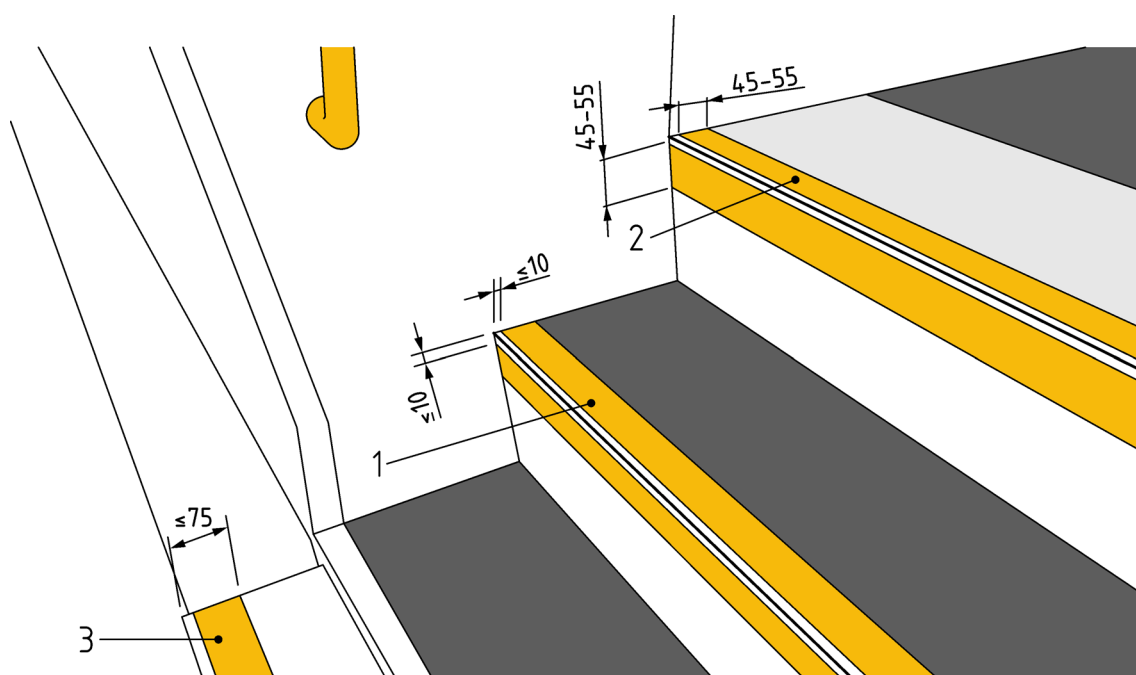
The contrasting bands shall have a depth of 45 mm to 55 mm.

- Contrast shall be assessed according to Annex A.
- If intermediate steps are indicated by a contrasting band then all the bands shall be the same colour, depth and width.

The band shall extend to a minimum of 80 % of the full useable width of the top surface of the first and last steps and on the front surface of the step nosing of the last step when entering.

- The depth of the top band shall be measured horizontally and perpendicular to the step edge.
- The front band shall be measured down the face of the step riser and perpendicular to the step edge.
- The edge of the contrasting band closest to the step nosing shall be within 10 mm of the effective nose both vertically and horizontally, see Figure 15 for renewal or upgrade this requirement is permitted to be within 15 mm of the effective nose.
- Where the nose of the step is curved or chamfered, the effective nose of the step shall be as defined in EN 16586-1:2025, Annex B.
- If the first step is an external step-board or a moving step, then this band shall be within the first 75 mm of the step edge in the horizontal plane ONLY and measured perpendicular to the step edge.

Dimensions in millimetres



Key

- 1 first step contrasting band
- 2 last step contrasting band
- 3 first step contrasting band when external step-board or a moving step is defined as first step

Figure 15 — Example of a first and last step indication including a movable step

5.3.10 Call for aid devices

The call for aid devices fitted in the wheelchair space, universal toilet and wheelchair accessible sleeping accommodation shall:

- i. Be distinct from all other control devices within the locations specified above.
 - Assessment shall be according to EN 16584-2:2025.
- ii. Be coloured differently from other control devices.
 - Assessment shall be according to EN 16584-2:2025.
- iii. Contrast with their background.
 - Contrast shall be assessed according to Annex A.

5.3.11 Boarding aids

The tapered lip on boarding aids (ramps, lifts and bridging plates), for infrastructure and rolling stock, including those fitted or stored on platforms or on board rolling stock shall have:

Contrasting hazard warning bands that shall have a depth of 45 mm to 55 mm, see Figure 16.

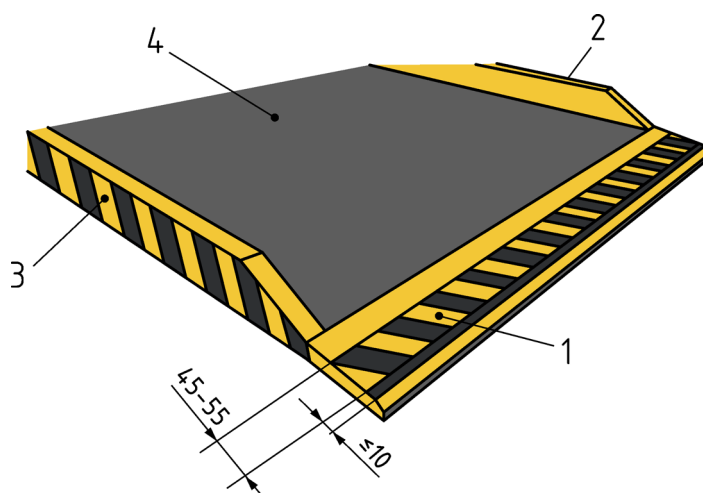
- Contrast shall be assessed according to Annex A.

- Due to the variety of backgrounds against which this band will be viewed, it shall be self- contrasting according to A.3.
- The band shall be consistent over the full effective clear width of the device and start no further than 10 mm from the edge of the device.

Both the inner and outer faces of the raised sides or edges on boarding aids (lifts or ramps) including those fitted or stored on platforms or on-board rolling stock shall have contrasting markings.

- For the inner faces of the raised sides or edges, contrast shall be assessed according to Annex A where the background to contrast against is the main surface of the ramp.
- For the outer faces of the raised sides or edges, contrast shall be assessed according to Annex A where self-contrasting markings shall be used.

Dimensions in millimetres



Key

- 1 45 mm to 55 mm wide self-contrasting hazard warning band on the tapered lip
- 2 inner face of raised edge (to contrast with main surface)
- 3 outer face of raised edge (to self- contrast)
- 4 main surface

NOTE Max 10 mm allowed from edge of tapered lip to self-contrasting hazard warning band

Figure 16 — Example of use of contrast on boarding aid

6 Methodologies for assessing contrast

6.1 General

When applying colour to two adjacent surfaces, to provide sufficient contrast, the contrast between the colours shall be determined by the light reflectance value (LRV), the hue and by the chromatic value of each.

NOTE For the purposes of this standard “Contrast” is to be assessed by the diffused light reflectance value (LRV) but can be enhanced by variation in hue and chroma.

6.2 Establishing LRVs

6.2.1 General

Colours for all items, surfaces, materials, etc. shall be defined with an LRV, where contrast is required. The methods for defining the LRV are set out below.

6.2.2 Method of establishing LRV

6.2.2.1 Where the specification of the colour IS known

If the colours of the materials:

- 1) are from a colour system that defines the LRV of those colours (e.g. NCS) and/or
- 2) have a previously confirmed LRV (test output to be used as evidence).

then these may be used rather than re-testing when calculating the contrast.

For infrastructure only:

The reflectance or the light reflectance value of the surface can be approximated by using appropriate colour swatches or panels of colour samples. This approximation method can be used for a preliminary site assessment only and a tolerance shall be included with this method, therefore a further 5 points difference should be added.

6.2.2.2 Where the specification of the colour IS NOT known

6.2.2.2.1 General

This clause is based on BS 8493:2008+A1:2010. The method of test is applicable to:

- 1) Opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a smooth surface where the texture varies by less than 2 mm.
- 2) Opaque coverings including those that cause extreme angular dependences of reflected light, and those that have a surface where the texture varies by less than 2 mm.
- 3) Opaque coverings with a flexible pile, e.g. carpet.
- 4) Opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a smooth surface where the texture varies by less than 2 mm, e.g. finished metals.
- 5) Opaque materials coated with non-opaque coatings or coverings, e.g. timber door coated with a wood stain, including those that:
 - Cause extreme angular dependences of reflected light.
 - Have a surface where the texture varies by less than 2 mm.
- 6) Multi-coloured surfaces.
- 7) Ordinary materials.

The test method is neither suitable for:

- Thermochromic photochromic retro reflecting fluorescent or phosphorescent surfaces.

- Surfaces involving electrical power for light emission.
- Surfaces with self-luminous characteristics.
- Free-standing, non-opaque materials, e.g. glass and clear plastic for curved surfaces.

6.2.2.2.2 Apparatus

A sphere-type spectrophotometer shall be used, capable of measuring LRV to a precision compatible with the reproducibility of 1 unit ΔE CIE $L^*a^*b^*$.

NOTE 1 See CIE 15:2004 Colourimetry.

This is termed “instrument” within this standard. The instrument shall have a spectral range capable of measuring the LRV of a specimen at 16 wavelength points spaced at 20 nm wavelength intervals from 400 nm across the visible spectrum. The instrument shall be capable of measuring a 10° visual field (Y10 or the 10° standard colorimetric observer).

The differences between the LRVs obtained from the 10° standard colorimetric observer and the 2° standard colorimetric observer (Y_2) (CIE 15:2004) are generally minor. An LRV obtained from the 2° observer can be up to 1 point higher and for strong yellows up to 4 points higher.

The measured LRVs are affected by the geometric relationships between the measuring equipment geometry and the specimen, therefore a specific geometry is required. The instrument shall be designed such that a correctly positioned specimen is irradiated uniformly from all directions within the hemisphere bounded by its plane. The instrument aperture shall be delimited by the area over which the receiver senses flux rather than the area illuminated. Radiation reflected at the sampling aperture shall be evaluated uniformly at all directions within 5° of the axis of the collection beam. The axis of the reflected beam shall be 8° off the normal of the centre of the specimen plane in which the specimen is placed during measurements. The reduction in sphere efficiency due to specimen absorption shall be corrected to produce a linear output.

The $d/8^\circ$ setting of the instrument makes it applicable for high-gloss surfaces as well as matt surfaces. A spectrophotometer designed to meet the same conditions as 6.2.2.2.3.2 but with the light path reversed is permitted. Where a single beam integrating sphere is used, the treatment of the outputs shall include a correction for the reduction in sphere efficiency caused by specimen absorption. Without such a correction the instrument shall give a nonlinear output.

NOTE 2 CIE standard illuminant, D65, (as defined in CIE 15:2004.).

NOTE 3 This is generally representative of a phase of daylight with a correlated colour temperature of approximately 6 500 K.

Measurement area shall be at least 7 mm diameter compatible with that provided by commercially available spectrophotometers.

The measurement area allows the LRV of solid colour surfaces and surfaces having a fine coloured pattern to be determined.

6.2.2.2.3 Preparation of test specimens

6.2.2.2.3.1 General

Three specimens shall be selected as being representative of the surface for the test. Where there is variability in the measured value of the three specimens, then nine specimens shall be selected.

Variability in the measured value of the three specimens occurs where the difference between the highest and lowest LRV is greater than or equal to 4.

6.2.2.2.3.2 Specimen preparation

The surface of the specimens shall be clean and representative of the surface of the material. There shall be no pressure marks on, or foreign matter attached to, the surface of the specimens to be tested. Plastic or painted specimens require no specimen preparation but shall be clean. Prior to starting the test, specimens that are sensitive to stroking shall be brushed with a clothing brush, once against the grain, where the specimen would appear darker, and then once with the grain, where the specimen would appear lighter and more homogeneous in structure. Cut pile carpets shall be brushed with a clothing brush in the direction of the natural pile lay before measurement.

NOTE 1 Surfaces that are not sensitive to stroking do not need to be pre-treated in this way.

Prior to starting the test, all specimens shall be held between an observer and an unobstructed patch of sky seen through a north-facing window glazed with clear glass. Any specimens that are light permeable, or non-opaque, shall not be measured.

Where there is concern about the stability of the colour and appearance of a specimen over the period of the test, the specimen shall be tested in accordance with measurement requirements of the appropriate European or National Standard for the material as represented by the specimen.

NOTE 2 For textiles the stability of the colour and appearance of a specimen is defined in EN ISO 105-B05.

Specimens shall be large enough to extend beyond the measurement area of the instrument.

6.2.2.2.4 Procedure

6.2.2.2.4.1 Instrument performance and measurement

The manufacturer's recommendations for monitoring the instrument performance and maintenance shall be followed.

6.2.2.2.4.2 Calibration

The instrument shall be switched on and have been allowed sufficient time for stabilization in accordance with the manufacturer's recommendations. Where applicable, it shall be ensured that the instrument has sufficient battery voltage and capacity to undertake the required measurements.

Select the measurement conditions required for calibration of the instrument being used as follows:

- 1) Wavelength range and interval.
- 2) Size of aperture.
- 3) Specular component included.
- 4) Standard illuminant type.
- 5) Where there is choice of percentage UV, select 100 % UV.

NOTE The sequence to be followed varies between different instruments.

The instrument shall be calibrated in accordance with the manufacturer's recommendations.

During the use of the instrument, repeat the calibration at regular intervals in accordance with the manufacturer's recommendations.

Where appropriate, re-calibration may be required at regular intervals during measurements.

6.2.2.2.5 Test

The sequence to be followed may vary from one instrument to another, but shall include the following steps:

- a) The specimen shall be determined to be opaque, using the method shown above.
- b) The method of preparation and presentation of the specimens shall be selected.
- c) If the instrument conditions required to measure the specimen are not those used during the calibration, adjust to comply with the requirements of 6.2.2.2.3.2.
- d) Measure the LRV of the specimen in accordance with this standard, using CIE Tristimulus Y_{10} Illuminant D65 (as defined in CIE 15:2004) and the 10° colorimetric observer.

NOTE 1 See 6.2.2.2.7 item j.

- e) All measurements shall be taken with the instrument using even pressure without deforming the specimen.
- f) When selecting the measuring points, they should be distributed over the entire surface of the specimen.
- g) The measuring points for specimens that have a texture or surface structure shall be distributed over the surface so as to ensure that all differences in surface texture or structure are measured.
- h) The specimens shall be measured on a measurement grid as shown in Figure 17a) and Figure 17b).
- i) For specimens which do not have a patterned or textured surface a specimen size of a minimum 150 mm × 100 mm shall be used. LRV measurements shall be taken at the centre points of a 76 mm × 76 mm grid that covers the surface of the specimen, as shown in Figure 17b).

For multi-coloured specimens where areas of the surface are composed of different uniform colours, which when viewed from a distance of 3 m remain distinct areas of colour, the LRV shall be measured as follows. At least four measurement points shall be located on each distinct area of colour. Following the first measurement at each measurement point, the instrument shall be turned 90° three times and measurements taken after each 90° turn. The results of each measurement shall be recorded and the average LRV for each area of distinct colour determined.

The average LRV (LRV_{av}) for the overall specimen is given by:

$$LRV_{av} = \left[(LRV_{av1} \times A_1) + (LRV_{av2} \times A_2) + (LRV_{avn} \times A_n) \right] \div A \quad (1)$$

Where:

LRV_{av} = average LRV of the overall specimen (CIE Y_{10}).

LRV_{av1} = average LRV of distinct colour "1" of the specimen (CIE Y_{10}).

A_1 = area of distinct colour "1" (m^2).

LRV_{av2} = average LRV of distinct colour "2" of the specimen (CIE Y_{10}).

A_2 = area of distinct colour "2" (m^2).

LRV_{avn} = average LRV of the last distinct colour "n" on the specimen (CIE Y_{10}).

A_n = area of the last distinct colour "n" (m^2).

A = total area of specimen (m^2).

NOTE 2 All of the “Y” terms in the formula in 6.2.2.2.5, item i) are Y_{10} , as 6.2.2.2.5, item d).

NOTE 3 The area of the specimen is to be either $0,2025 \text{ m}^2$ for a $450 \text{ mm} \times 450 \text{ mm}$ specimen or $0,81 \text{ m}^2$ for a $900 \text{ mm} \times 900 \text{ mm}$ specimen.

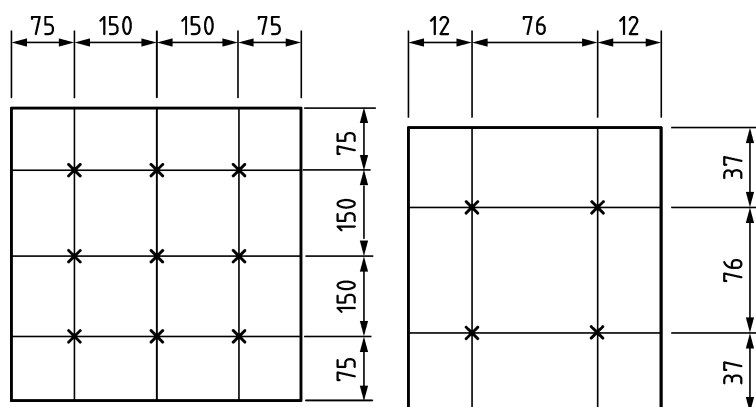
Where the surface comprises many small colour specks or chips which, when viewed from a distance of 3 m, assume the appearance of one slightly varying colour, the average LRV (LRV_{av}) is found in accordance with 6.2.2.2.5.

Measurements on general surfaces, including carpet specimens, shall be taken on specimens of a minimum size of $450 \text{ mm} \times 450 \text{ mm}$ where the nature of the pattern is such that a specimen size of these dimensions is fully representative of the pattern. LRV measurements shall be taken at the 9 centre points of each of the $150 \text{ mm} \times 150 \text{ mm}$ area grids which cover the surface of the specimen, by placing the measurement point at the centre of equal areas of the specimen surface, as shown in Figure 17a).

Following the first measurement at each measurement point the instrument shall be turned 90° three times and measurements taken after each 90° turn. The results of each measurement shall be recorded and the average LRV (LRV_{av}) for the specimen determined.

Where patterns on surfaces cannot be fully represented by a specimen of this size ($450 \text{ mm} \times 450 \text{ mm}$) then a specimen size of $900 \text{ mm} \times 900 \text{ mm}$ shall be used and the LRV measurements shall be taken at the 36 centre points of each of the $150 \text{ mm} \times 150 \text{ mm}$ grid, set out to place the measurement point at the centre of equal areas of the specimen surface.

Dimensions in millimetres



a) measurement grid for
 $450 \text{ mm} \times 450 \text{ mm}$
specimens

b) measurement grid for
 $100 \text{ mm} \times 150 \text{ mm}$
specimens



c) typical paint samples
($100 \text{ mm} \times 150 \text{ mm}$)

Figure 17 — Measurement grids and paint samples

6.2.2.2.6 Expression of results

The instrument shall, either independently or with additional software and hardware, calculate the LRV, which is the CIE Tristimulus Y_{10} value.

Additionally, the x_{10} , y_{10} of the colour shall be calculated. Output and record the LRV as required.

6.2.2.2.7 Test report

The results of all the LRV measurements for the specimen surface shall be reported in a way that enables the LRV difference between two visually adjacent surfaces to be readily determined. The test report shall contain at least the following information:

- a) The number and date of this standard, for example EN 16584-1:2025.
- b) Name of organization carrying out the test.
- c) Date of test.
- d) The specimen identification details.
- e) The number of specimens measured.
- f) The method of specimen preparation used.
- g) Identification of the instrument used, including; where appropriate, manufacturer, model, serial number and optical geometry.
- h) Details of the conditions of test as specified in 6.2.2.2.4.
- i) Measurement area and observer angle.
- j) Description of specimen including CIE Y_{10} , x_{10} , y_{10} colour identification.
- k) Description of additional feature, e.g. texture, gloss or grain.

NOTE In the test report inclusion of a visual record of the specimen, e.g. a photograph or scan is useful.

- l) Size of specimen used in the test.
- m) LRV measurements for all measurement points.
- n) Average LRV (LRV_{av}) measurement for each specimen and the range of measured LRVs.
- o) For multi-coloured specimens the average LRV for the overall specimen (LRV_{av}) and the average LRV for each of the distinct colours on the specimen.
- p) Any deviations from the specified procedures.

6.2.3 Specific assessment criteria for stainless steel

6.2.3.1 General

Stainless steel has many benefits that make it a desirable material for handrail, grab rail and grab pole applications but as it is a reflective surface it has had problems with consistency when measuring resulting in an LRV variance in excess of 5 points. The following conditions shall be considered when assessing stainless steel.

6.2.3.2 For cylindrical grab-poles, grab-rails and handrails ONLY

For cylindrical grab-poles, grab-rails and handrails (including bends in that rail or pole) the use of stainless steel with a 'dull buffed' surface finish shall be permitted as it performs as a self-contrasting pole (ONLY when the lighting is in accordance with EN 13272-1:2019 for rolling stock and European or national standards for infrastructure).

A 'dull buffed' surface shall have a uniform straight grained finish that is equivalent to either a 2J mechanically brushed or dull polished finish according to EN 10088-2:2024.

6.2.3.3 Other applications of stainless steel

Other than the specific situation in 6.2.3.2, stainless steel in all other applications shall meet the contrast requirement to its background in accordance with the assessment/measuring methodology as in Annex A and 6.2.3 and shall be assessed with an increased difference of 35 points (0,35) to ensure that the variance in readings does not drop below 30 points.

6.3 Method of assessing contrast with LRVs established (as in 6.2)

6.3.1 General requirements for contrast

The contrast shall be assessed using Figure A.1 in Annex A which has been derived from the following:

- 1) Michelson contrast formula in A.1 up to 30 points then a 30-point constant difference with an initial 10-point minimum difference for non-flooring finishes.
- 2) Flooring finishes use the lines derived from the Michelson contrast formula in A.1 from 0 up to the 30-point difference point on the graph (this is required due to the degradation of a flooring material with use or wear).

NOTE 1 See Annex A for further clarification and worked examples (written examples i.e. L_0 of 1 requires L_h of 11 to 100.)

NOTE 2 Michelson contrast formula referenced as:

$$K = \frac{L_o - L_h}{L_o + L_h} \quad (2)$$

6.3.2 Specific requirements for contrast on signage

Establish LRV for parts of the sign.

If the LRVs for the parts of the sign are not known the method is according to 6.2.2.2.

Once the LRVs for the parts of the sign are established, use the simple calculation based on a 60-point difference according to Figure A.2.

See Figure A.2 for simple calculation method.

6.3.3 Durability of contrast

To maintain minimum required contrast in normal operation and not just when assessed as new, when reviewed at type test etc, the selected materials chosen to deliver requirements shall be demonstrated to have suitable properties that make them fit for purpose, e.g. decals shall be UV stable and colour fast as applicable to the relevant application. ISO 17398:2004 shall be used when assessing the durability of signage and decals.

For example, if a selected material or process is known to degrade over the design life in a way that impacts its contrasting properties, this should be anticipated and compensated for in the original colours

selected. Therefore, if the LRV is anticipated to degrade by 8 points, for example, then the original difference should be at least 38-points, not the 30-point minimum prescribed.

An alternative method of proving contrast is being maintained can be to test periodically for compliance to the minimum requirement.

6.3.4 Specific requirements for electronic display

When the relevant criterion from the electronic displays is known then a calculative K value of 0,6 or greater is required.

See Annex C of this standard for the method of calculation and EN 16584-2:2025.

The criteria that are pertinent to this assessment are:

- a) Visual acuity of 0,5 shall be the minimum (or prescriptive character height requirements in EN 16584-2:2025, Clause 5 with a recommended 0,1).
- b) Reading distance range, height and angle range of the display, height of the eye points shall be assumed to be 1,5 m above the floor.
- c) Ambient light limits, see EN 16584-3:2025.
- d) Luminance of the display and reflection on the screen (including the protective housing/cover/glass).
- e) Character heights (quantity of information and size of display are a key consideration when defining the character height).

Points a) to e) can be assessed independently to the installation (e.g. under laboratory conditions) except point c) which is dependent on the installation so can only be defined as a set of limits under which a display is acceptable.

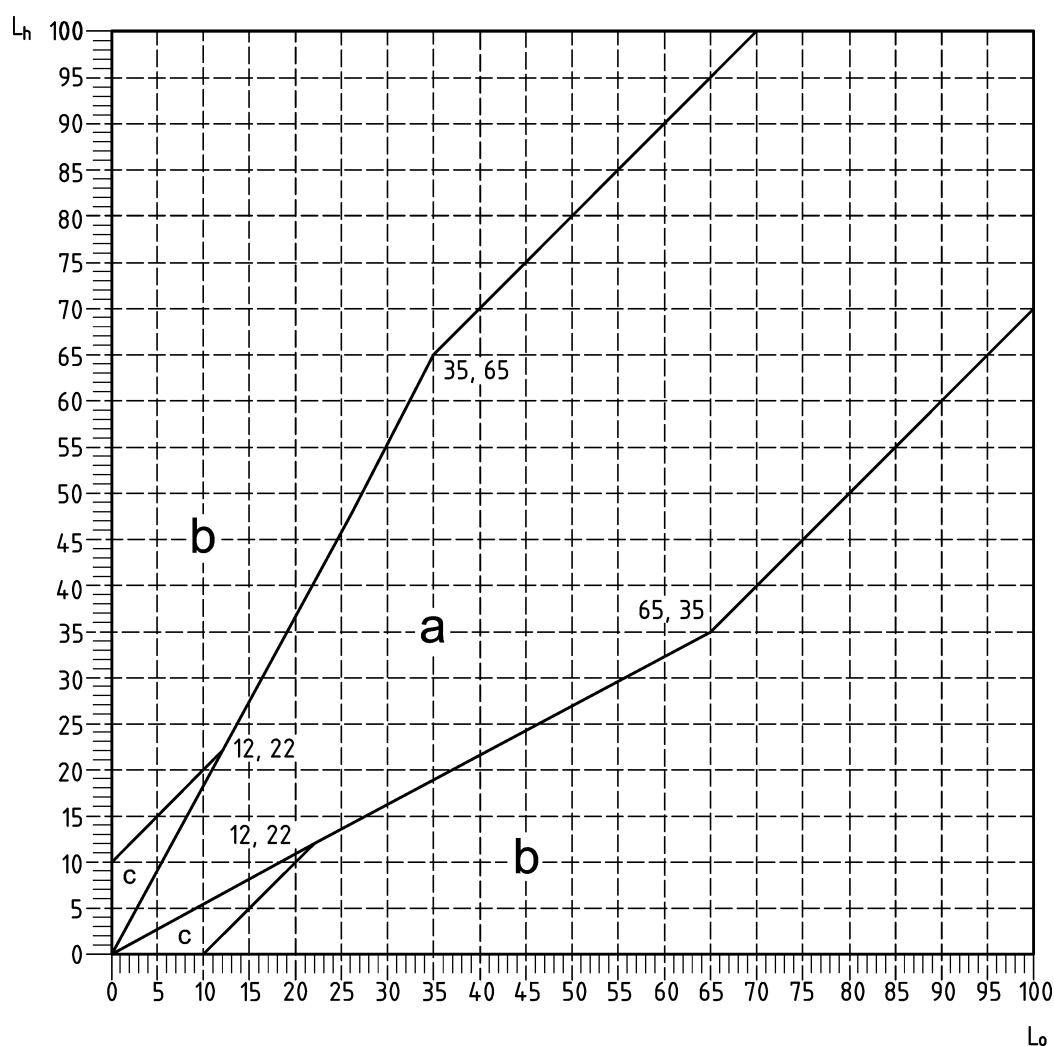
NOTE See EN 16584-2:2025 for applicable criteria when assessing electronic display contrast.

Annex A (normative)

Contrast Charts

A.1 General

When LRVs of the surfaces that are required to contrast are known, these should be plotted on the appropriate chart. For general contrast use Figure A.1.

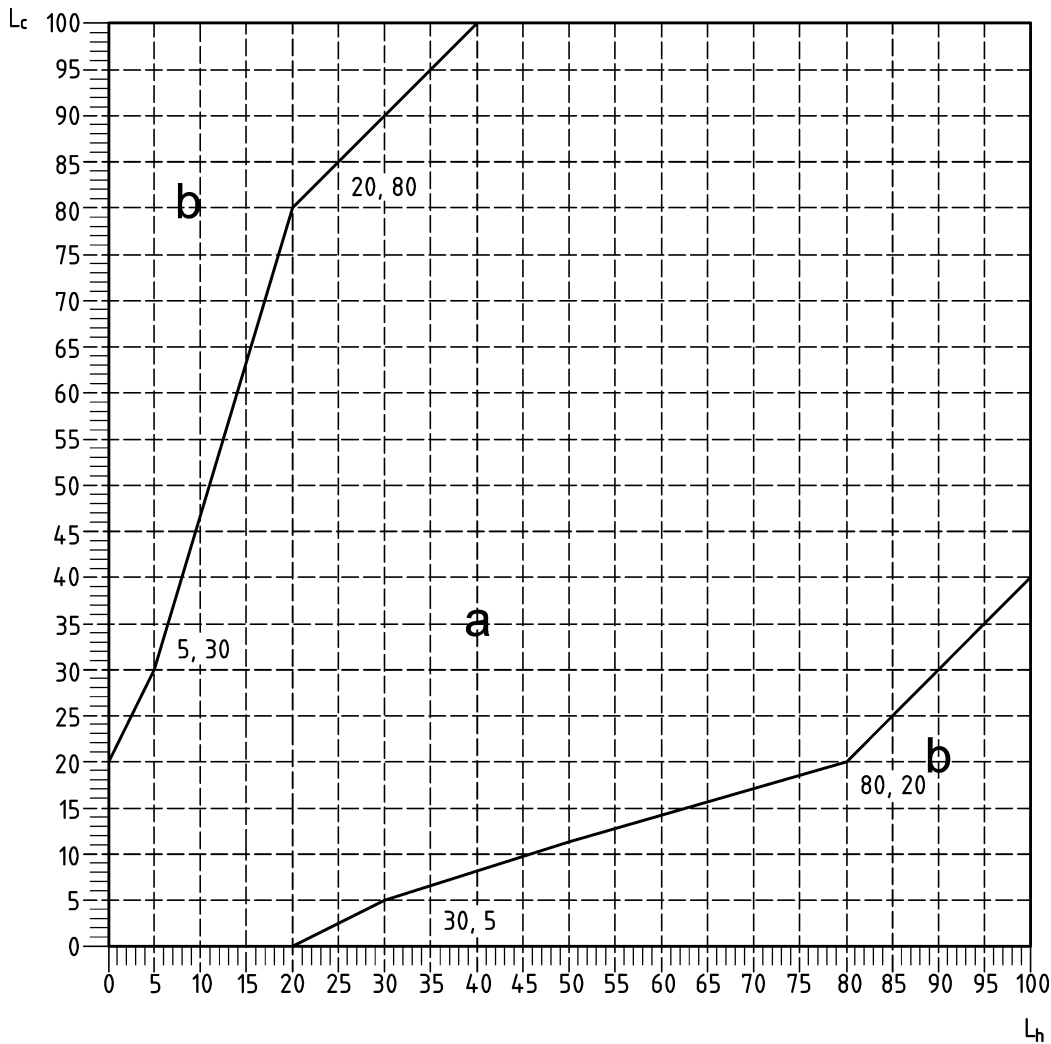


Key

- 'a' LRVs that intersect in this area do not achieve a compliant contrast level
- 'b' LRVs that intersect in this area achieve a compliant contrast level
- 'c' LRVs that intersect in this area achieve a compliant contrast level ONLY if the material being assessed is a flooring material
- L_o the LRV of the object
- L_h the LRV of the background or adjacent surface

Figure A.1 — General Contrast Chart

For signage contrast use Figure A.2.



- Key**
- 'a' LRVs that intersect in this area do not achieve a compliant contrast level
 - 'b' LRVs that intersect in this area achieve a compliant contrast level
 - L_h the LRV of the background or adjacent surface
 - L_c the LRV of the character (number, letter or symbol)

Figure A.2 — Colour contrast for signage

The position of the intersection point of the LRVs on the chart determines whether compliant contrast has been achieved.

A.2 Worked examples for contrast

Worked examples of the values vs. the compliant contrast diagram are contained below.

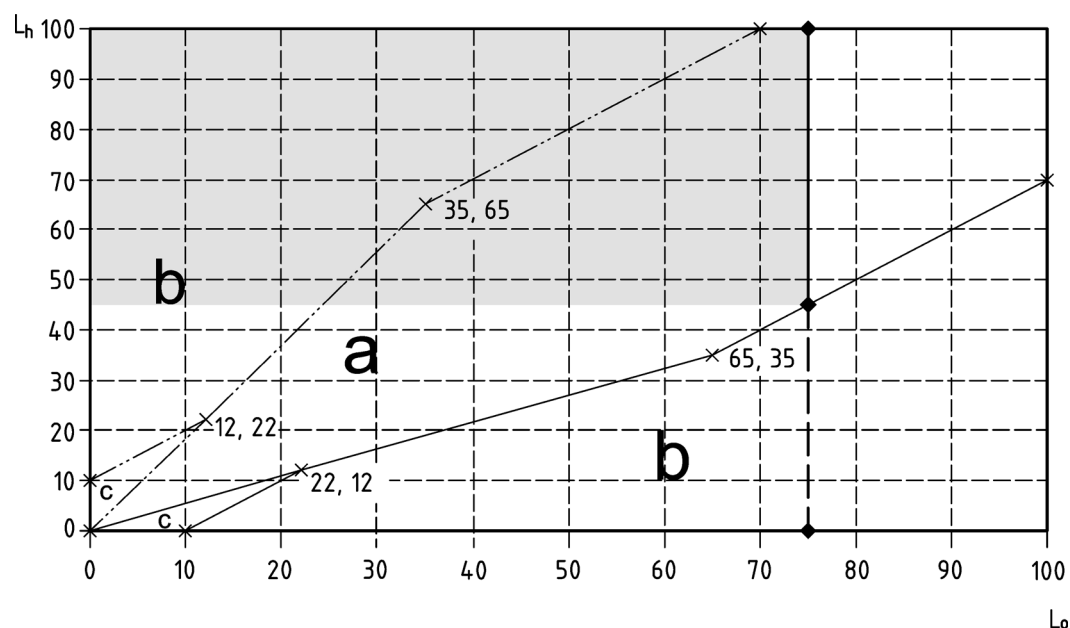


Figure A.3 — Worked example 1

Figure A.3 gives an example where the value of L_o is 76 then the value of L_h to be compliant shall be between 0 and 46 points.

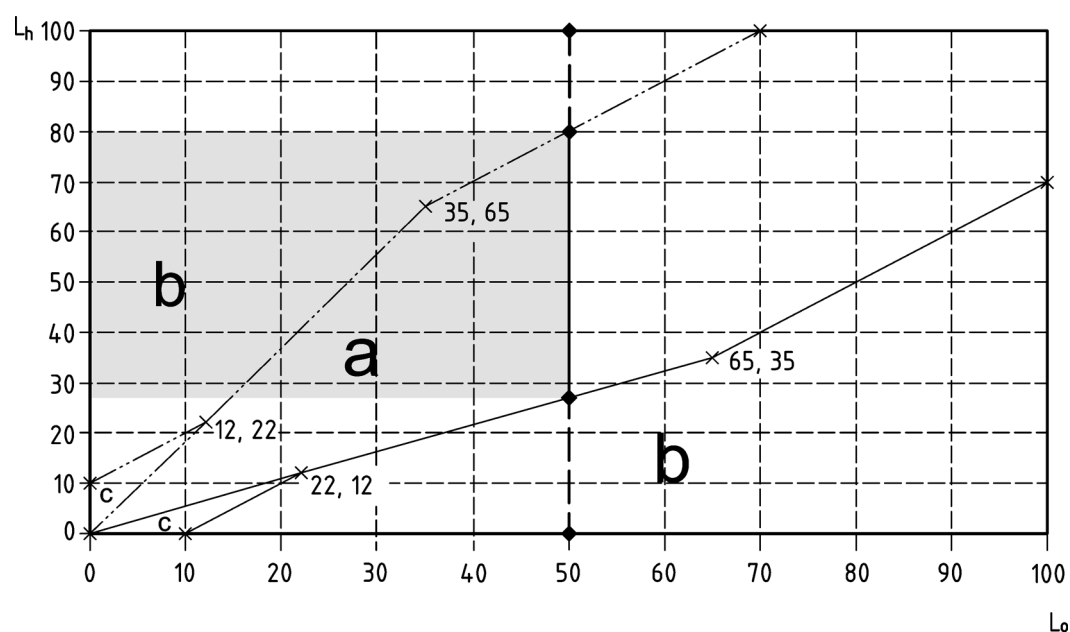


Figure A.4 — Worked example 2

Figure A.4 gives an example where the value of L_o is 50 then the value of L_h to be compliant shall be between 0 and 26 or between 80 and 100 points.

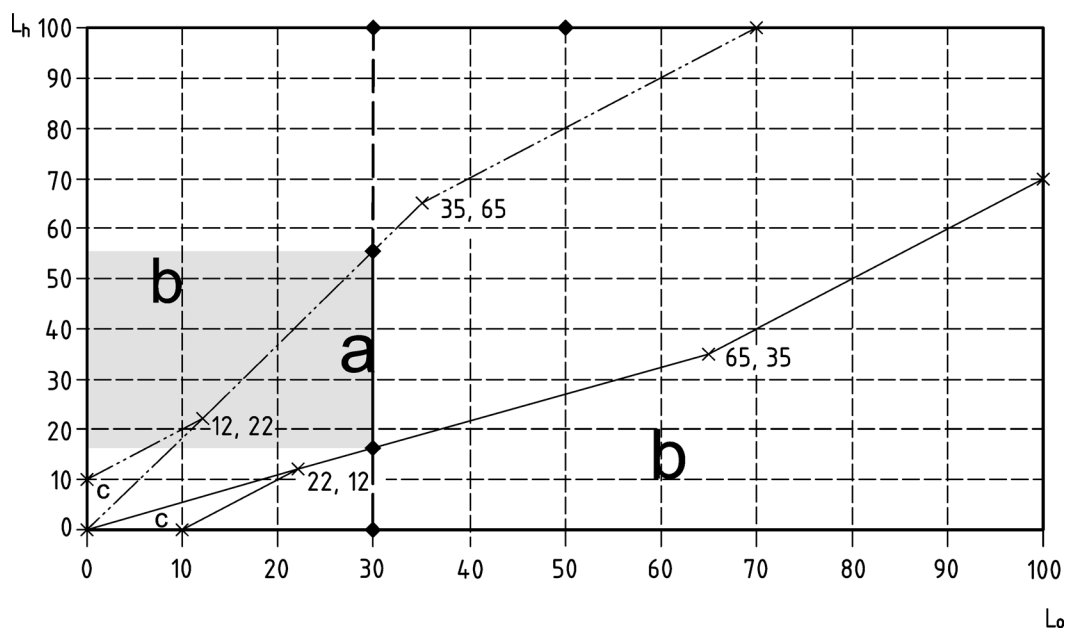


Figure A.5 — Worked example 3

Figure A.5 gives an example where the value of L_o is 30 then the value of L_h to be compliant shall be between 0 and 16 or between 56 and 100 points.

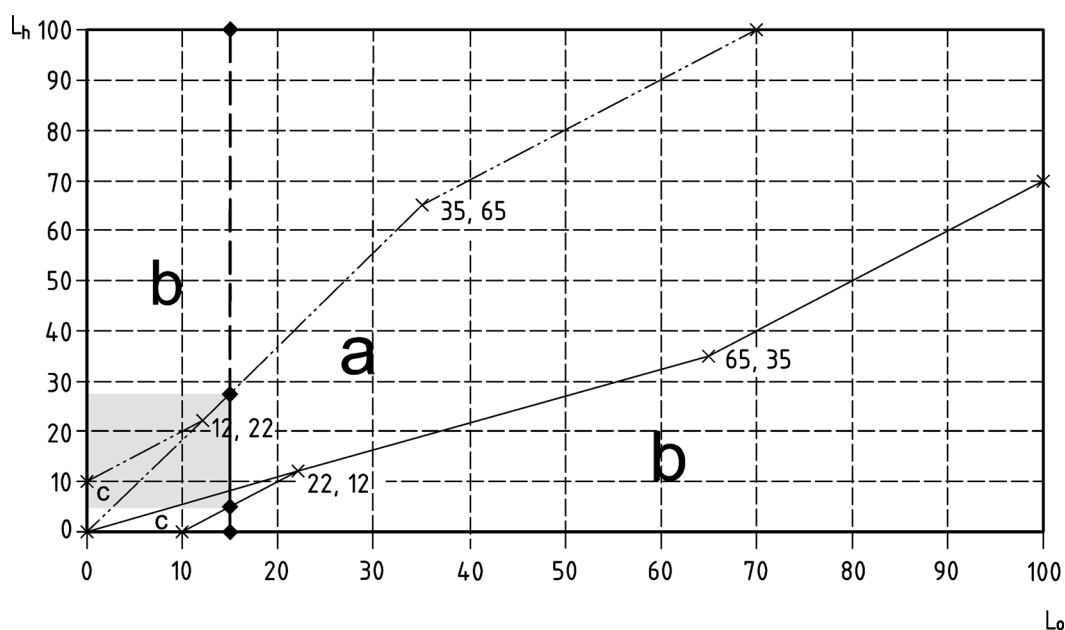


Figure A.6 — Worked example 4

Figure A.6 gives an example where the value of L_o is 14 then the value of L_h to be compliant shall be between 0 and 5 or between 26 and 100 points unless the materials being assessed are flooring materials which allows the use of zone c and therefore the lower range for L_h would be between 0 and 7.

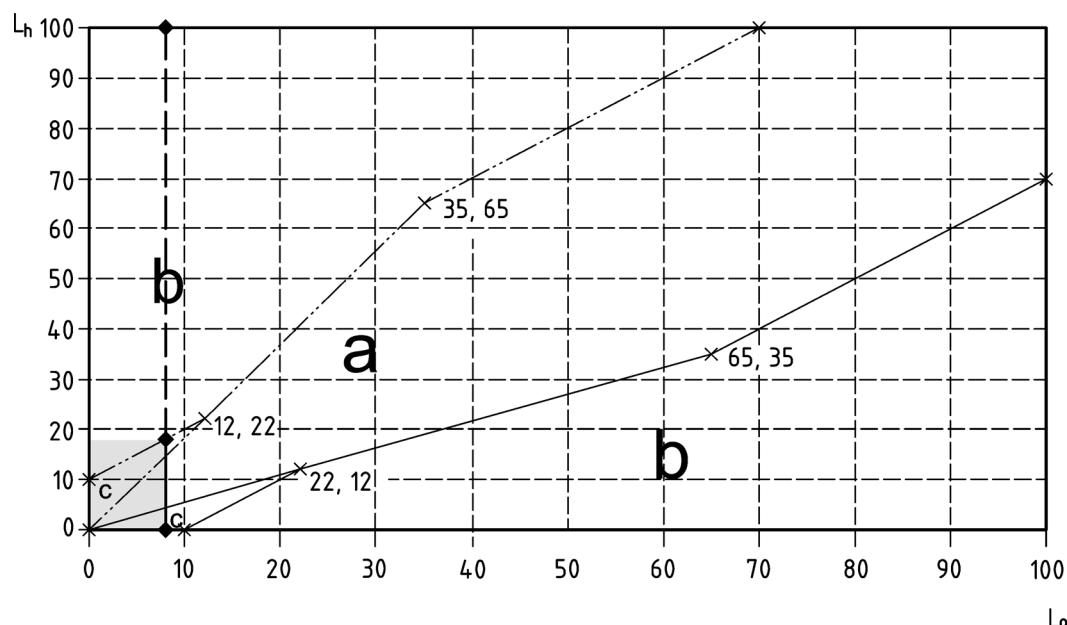


Figure A.7 — Worked example 5

Figure A.7 gives an example where the value of L_0 is 7 then the value of L_h to be compliant shall be between 17 and 100 points unless the materials being assessed are flooring materials which allows the use of zone c and therefore the lower range for L_h would be between 0 and 4 and the upper range of 13 to 100.

A.3 Self-contrasting bands

Where a contrasting band is made up from two contrasting colours, with a minimum difference in LRV of 60 points, the requirement to contrast with its background need not be met. This shall be used for transparent obstacle marking and hazard warning bands on boarding aids where the specific background is difficult to determine.

- i. For transparent obstacles see 5.2.3.
- ii. For interior doors see 5.3.4 and Annex B.
- iii. For hazard warning bands see ISO 3864-1:2011.

Annex B (normative)

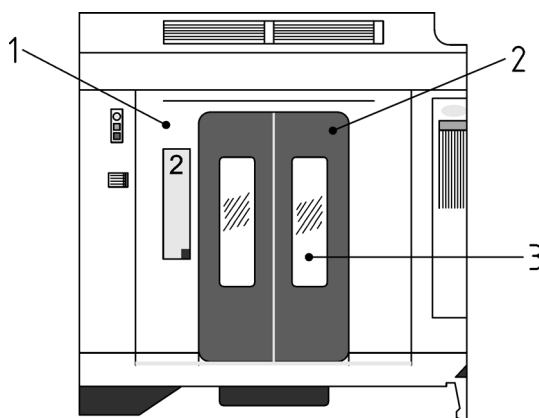
Contrast for doors and transparent obstacles

B.1 General

This annex contains diagrams and examples to explain the requirements in Clause 5 of this standard, for contrast of doors and transparent obstacles.

B.2 Exterior doors

This clause contains diagrams and examples to explain the requirements in Clause 5 of this standard, for the contrast between the passenger body-side entrance doors and the exterior of the train.



Key

- 1 Exterior of train
- 2 Door leaf (visible part)
- 3 Window (transparent part of the door)

If there is another element of the door leaf assembly other than seals, for example window frame, it shall be coloured as the main contrasting part of the door leaf.

Figure B.1 — Key elements for door contrast requirements

B.3 Case 1: If the window is less than or equal to 40 % of the visible door leaf

The contrast area shall be as a minimum 75 % of the door leaf starting not higher than a point corresponding with the first step (see Figure B.2 for examples).

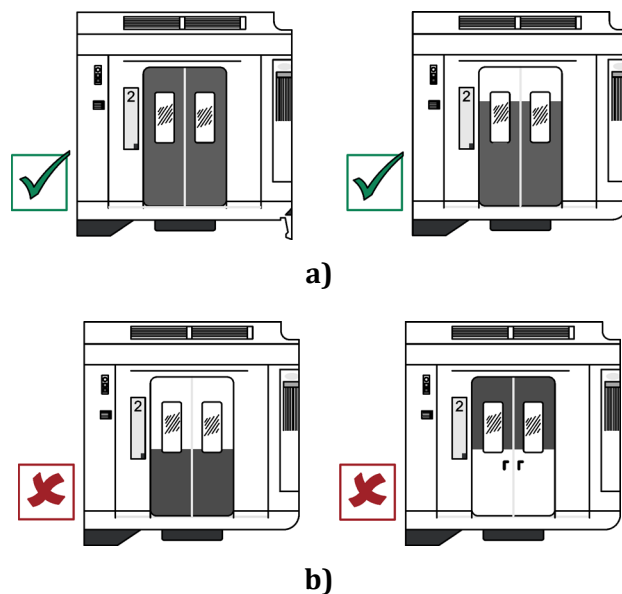


Figure B.2 — Two compliant and two non-compliant examples

Where the contrast area extends beyond the door leaf it should be no greater than or equal to 1,5 times the width of the visible door leaves (when closed) and centred on the axis of the door leaf or leaves, see Figure B.3 for compliant examples and Figure B.4 for non-compliant examples.

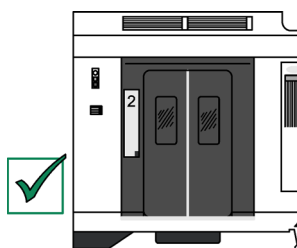


Figure B.3 —Example showing a compliant contrast area not exceeding 1,5 times the width of the door leaves and centred on the door

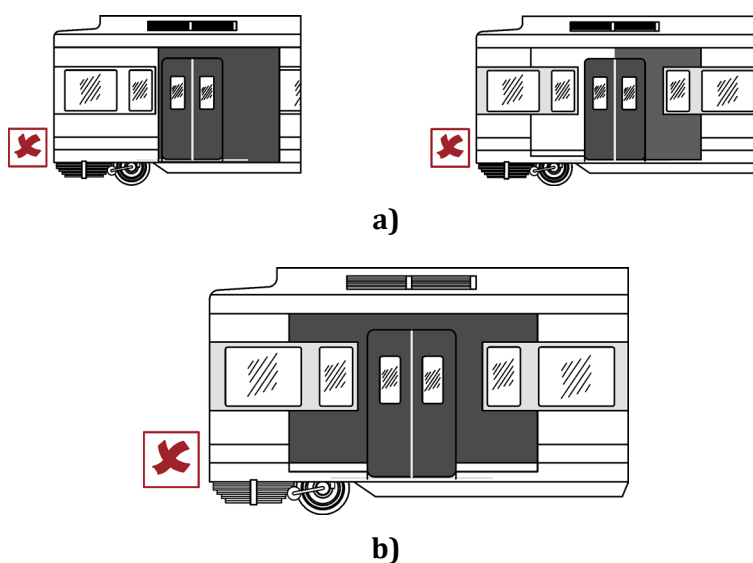


Figure B.4 —Examples of non-compliant contrasting areas where they are either not centred and/or exceed 1,5 times the width of the door leaves.

B.4 Case 2: If the window is greater than 40 % of the visible door leaf



Figure B.5 — Example of where the window is greater than 40 % of the total visible area of the door leaf

Where the transparent area of the window in the door leaf is greater than 40 % of the total visible area of that door leaf the following shall apply:

- The contrasting area shall be a minimum of 75 % of the total area of the door leaf or leaves (where double doors are fitted).
- The contrasting area shall therefore extend to the bodyside but shall not be greater than 1,5 times the length of the doors.
- The contrasting area shall be centred on the axis of the door leaf or leaves (see Figure B.6 for a compliant example and Figure B.7 and Figure B.8 for non-compliant examples).



Figure B.6 — Compliant example showing the contrasting area correctly centred on the axis of the door and of the required surface area

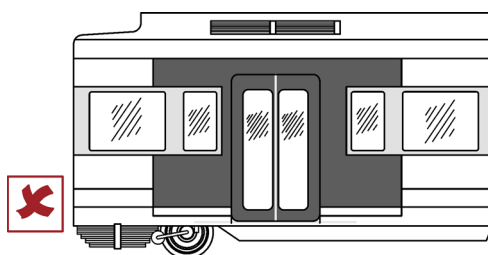


Figure B.7 — Non-compliant example as the contrasting area is not of the required surface area



Figure B.8 — Non-compliant examples as the contrasting area is not centred on the axis of the door

B.5 Case 3: Alternative if the door leaf is not coloured to contrast with the bodyside

If the door leaf is not coloured to contrast with the bodyside, a contrasting area shall be created on the bodyside that shall be to the sides and on top of the door leaves. This contrasting area shall be as a minimum 150 mm wide at the sides of the doorway up to the full height of the door leaves with the addition of a minimum of 150 mm above the door leaves across the full width of the door leaf or leaves (plus the additional band width on either side). See Figure B.9 for a compliant example.

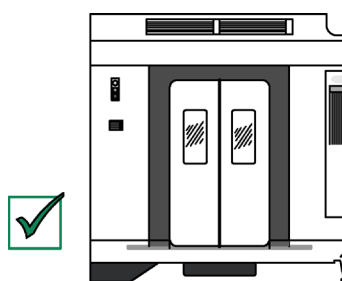


Figure B.9 — Compliant example

B.6 Markings for interior doors or transparent obstacles

This clause contains diagrams and examples to explain the requirements in Clause 5 of this standard, for markings for interior doors or transparent obstacles by means of a contrasting band.

The contrasting band shall be made up from two contrasting colours unless it can be proven that a solid single colour band contrasts with the background as described in 5.3.4.

A minimum of 75 % of the area of the 100 mm tall band across the door or obstacle shall be made from two contrasting colours and a maximum of 25 % of the area of the contrasting band may be transparent or other. The minimum either of the two colours shall be is 30 % of the total contrasting band area but combined shall always be a minimum of 75 % of the total contrasting band area.

The contrasting band shall always be across the full width of the transparent area of the door or obstacle.

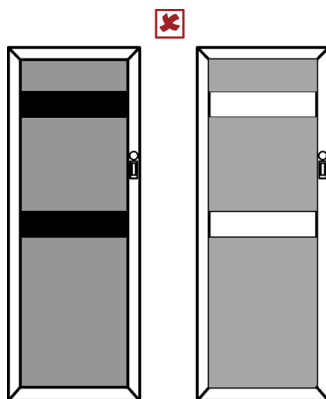


Figure B.10 — Non-compliant examples (not self-contrasting)

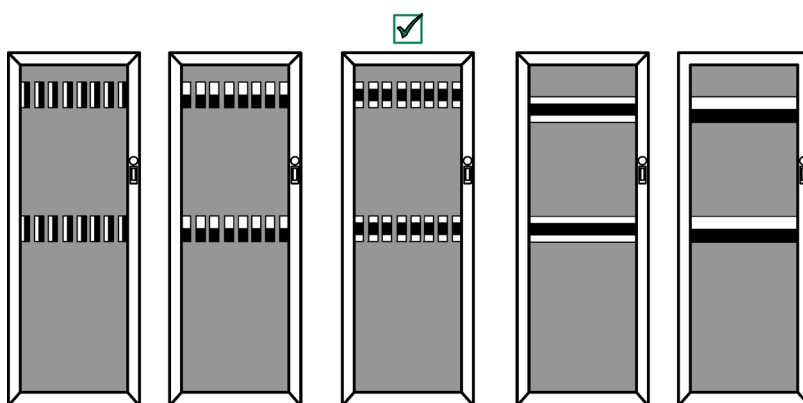


Figure B.11 — Compliant examples (self-contrasting with correct proportions and areas of colour)

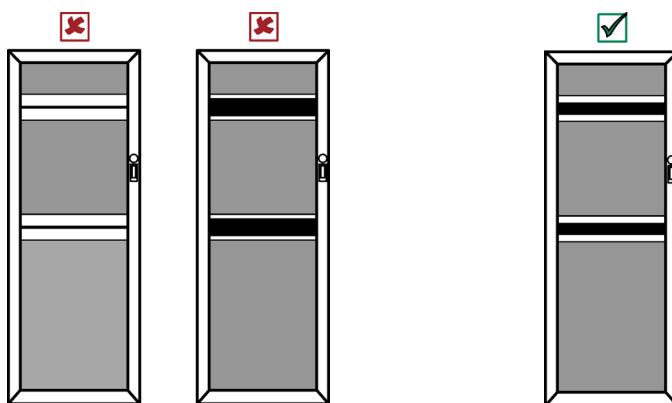


Figure B.12 — Two non-compliant examples where the proportion of each colour is wrong and a compliant example

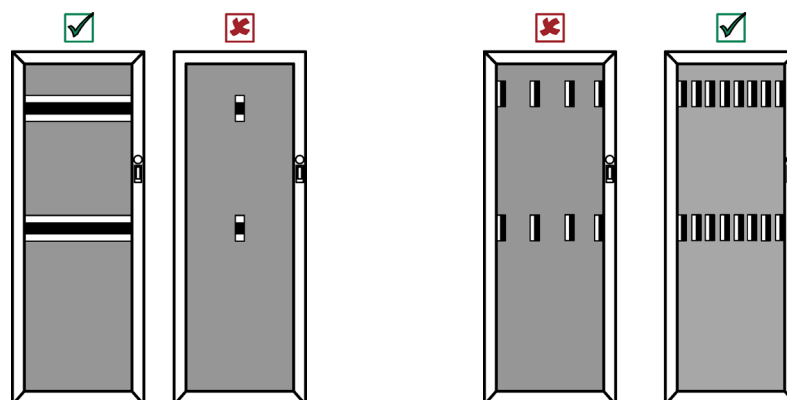


Figure B.13 — Two non-compliant examples as the total area of colours is wrong and two compliant examples

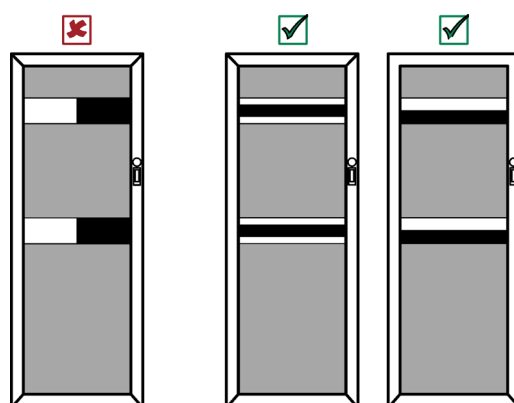


Figure B.14 — Two examples where the proportion of each colour is compliant and a non-compliant example

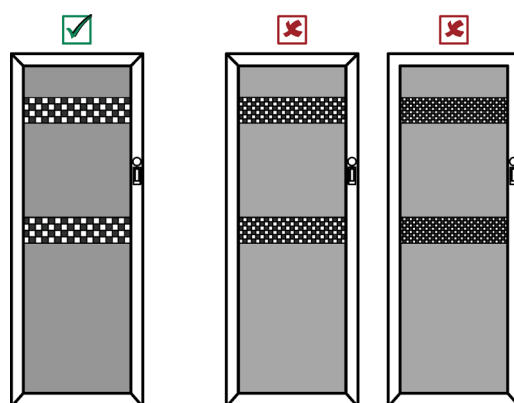


Figure B.15 — Example showing a compliant band (120 mm height) made up from the minimum 30 mm x 30 mm grid and two non-compliant examples where the grid used is less than 30 mm x 30 mm

Annex C (normative)

Effective contrast calculation for displays

C.1 Illuminated displays

For illuminated displays, the luminance L_1 and L_2 of two adjacent surfaces (print and background) required for the determination of the (Michelson) contrast K (Formula (C.1)) can be derived from the knowledge of the reflection properties of the surfaces and the illumination provided by the lighting installation.

$$K = \frac{L_1 - L_2}{L_1 + L_2} \quad (\text{C.1})$$

C.2 Back lit and/or self-lit displays

For backlit and/or self-lit displays, a luminance L_F , caused by extraneous light, can superimpose the luminance's L_1 and L_2 and reducing the original contrast K .

NOTE 1 For self-lit displays the luminance's L_1 (OFF) and L_2 (ON) are determined one after the other at the same position (pixel contrast).

The effective contrast K_{eff} (Formula (C.2)) then results from the original contrast K (without extraneous light) as:

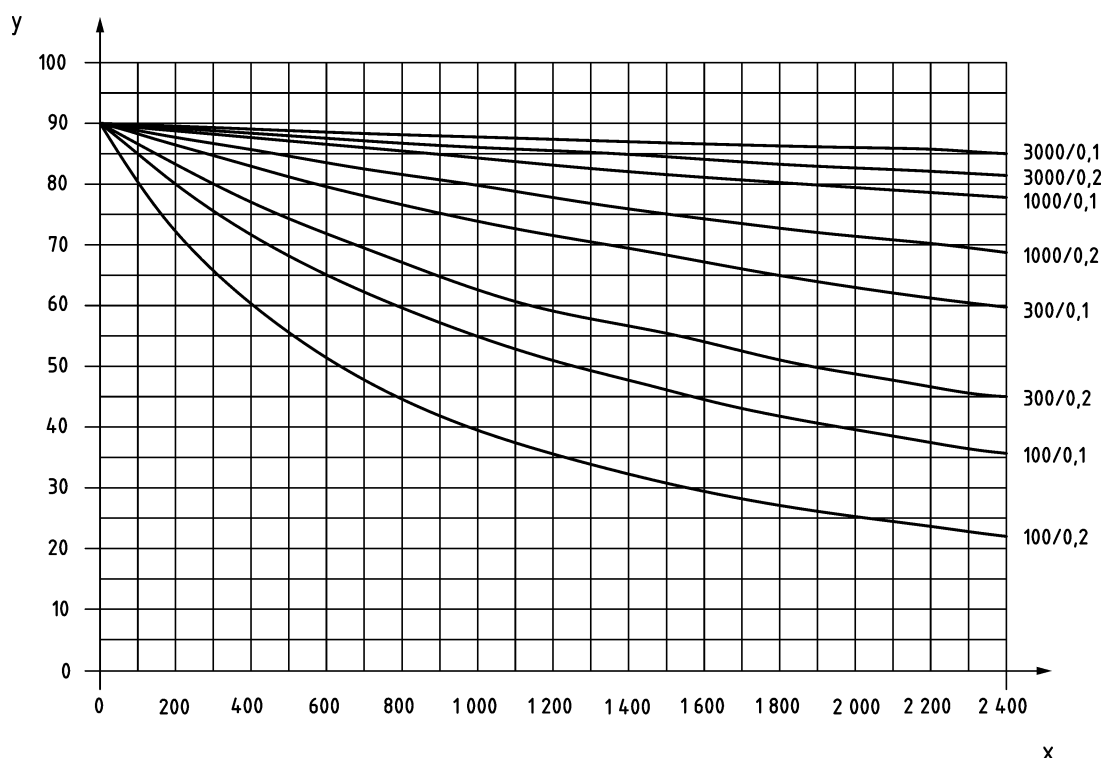
$$K_{\text{eff}} = \frac{L_1 - L_2}{L_1 + L_2 + 2 \times L_F} \quad (\text{C.2})$$

Assuming perfect diffuse reflection, the luminance L_F caused by extraneous light can be determined from the knowledge of the reflectance value ρ_A and the extraneous illuminance E_F :

$$L_F = \frac{\rho_A}{\pi} \times E_F \quad (\text{C.3})$$

A contrast K without extraneous light of 0,90 results in an effective contrast K_{eff} as a function of the extraneous illuminance E_F as shown in Figure C.1 for luminance of the lighter surface of 100 cd/m², 300 cd/m², 1 000 cd/m² and 3 000 cd/m² and assumed reflectance's ρ_A of 0,10 and 0,20.

The contrast required for the representation of information consisting of letters and signals shall be observed for displays fastened in interiors without the effect of daylight at least up to a vertical extraneous brightness of 200 lx and for outdoor installation at least up to an extraneous illuminance of 2 000 lx.



Key

- x Brightness of extraneous light (lx)
- y Effective contrast

Figure C.1 — Effective contrast as a function of the extraneous light brightness (lx) for selected combinations of sign luminance (cd/m^2) and reflectance value. Initial contrast $K = 0,9$

NOTE 2 The illustrated contrast reduction by the reflection of extraneous light at the surfaces of the self-lit displays assumes constant initial luminance. For energy saving purposes on one hand and for the prevention of blooming on the other hand, self-lit displays are increasingly brightness controlled. For transfective displays high extraneous illuminances can be used to increase the initial illuminance, which counteract the contrast reduction.

NOTE 3 In outside areas self-lit displays are often provided with a protective pane (e.g. to protect them from humidity and dust). In this case the additional reflection given by this protective pane can be considered in the examination of contrast conditions.

NOTE 4 This method is an extract from DIN 32975:2009.

Annex D (informative)

Supporting information from published documents

D.1 General

This annex contains extracts from several published documents that support the requirements and assessment methodologies in this document.

D.2 CIE Publication 196:2011 CIE Guide to Increasing Accessibility in Light and Lighting

Extract from applicable document that gives information to support assessment.

4.2.3 Special considerations for fonts used in display screens

Visual appearance of images in self-luminous screen displays is different from those reflected in printed medium (hard copy documents, books, etc.), and the difference shall be taken into consideration for the display design. In particular, colour appearance of self-luminous displays differs from that of reflected images even if the physical characteristics of the light are the same.

Some reference values for the display design have been reported. For example, contrast values between 6:1 and 10:1 are preferred for display screens in DIN/TR 124, while 3:1 is recommended in ISO 9241-303 for screens.

D.3 ADA (Americans with Disabilities Act) Accessibility Guidelines for Buildings and Facilities

Extract from applicable (ADA) document that gives information to support contrast requirements and signage.

703.5 Finish and Contrast: Characters and their background shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.

Signs are more legible for persons with low vision when characters contrast as much as possible with their background. Additional factors affecting the ease with which the text can be distinguished from its background include shadows cast by lighting sources, surface, glare and the uniformity of the text and its background colours and textures.

D.4 BS 8300-2 2018 Design of an Accessible and Inclusive Built Environment Part 2 Buildings - Code of practice

Extract from applicable documentation that gives information on LRVs and visual contrast requirements.

For people with good vision, differences in hue (the nature of the colour) or chroma (the intensity of the colour) provide adequate visual contrast. Unfortunately, this is not the case for all blind and partially sighted people. The main feature of a surface, which appears to be strongly correlated with the ability of blind and partially sighted people to identify differences in colour, is the amount of light the surface reflects, or its light reflectance value (LRV).

The LRV scale runs from 0, which is a perfectly absorbing surface that could be assumed to be totally black, up to 100, which is a perfectly reflective surface that could be considered to be the perfect white.

Because of practical influences in any application, black is always greater than 0 and white never equals 100. For a definition of light reflectance value, see 3.10.

Annex ZA (informative)

Relationship between this European Standard and the Essential requirements of EU Directive (EU) 2016/797 aimed to be covered

This European Standard has been prepared under Commission implementing decision C(2023)1057 of 20.2.2023 on a standardization request to the European Committee for Standardization and the European Committee for Electrotechnical Standardization as regards products in support of Directive (EU) 2016/797 of the European Parliament and of the Council (M/591) to provide one voluntary means of conforming to (parts of) Essential Requirements of Directive (EU) 2016/797 of the European Parliament and of the Council of 11 May 2016 on interoperability of the rail system (recast) as specified in the relevant technical specifications for interoperability (TSI).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 for PRM TSI confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive as specified in the technical specifications for interoperability (TSI), and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard, Commission Regulation (EU) N° 1300/2014 concerning the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility*

Essential Requirements of Directive (EU) 2016/797	Clauses of the Annex to the Technical Specification for Interoperability (TSI)	Clause/ subclauses of this European Standard	Comments
Section 3 of the Annex to the TSI indicates the correspondence between the TSI clauses and the Essential Requirements of Directive (EU) 2016/797	4.2.1.2.1. Horizontal circulation	5.2.1.1 and Annex A	
	4.2.1.2.2. (2a) Vertical circulation	5.2.1.2 and Annex A	
	4.2.1.5. Highlighting of transparent obstacles	5.2.3 and Annex A	
	4.2.1.7. (1) Furniture and free-standing devices	5.2.4 and Annex A	
	4.2.1.10. (2) Visual information: signposting, pictograms, printed or dynamic information	Annex A and Annex B B.6	
	4.2.1.12. (1) Platform width and edge of platform	5.2.6 (1)	
	4.2.1.12. (6) Platform width and edge of platform	5.2.6 (2)	
	4.2.1.12. (7) Platform width and edge of platform	5.2.6 (3)	
	4.2.1.12. (9) Platform width and edge of platform	5.2.6 (5), 5.2.6 (6), 5.2.6 (7), 5.2.6 (8) and Annex A	

	4.2.1.13. (1) End of platform	5.2.7 and Annex A	
	4.2.2.1. Seats	5.3.1 and Annex A, A.2 and A.3	
	4.2.2.3.1. (3) Doors General	5.3.2 (1), Annex A, A.2 and A.3 and Annex B	
	4.2.2.3.2. (3) Exterior doors	5.3.3 (1), Annex A, A.2 and A.3 and Annex B	
	4.2.2.3.2. (6) Exterior doors	5.3.3 (2) and Annex A, A.2 and A.3	
	4.2.2.3.3. (6) Interior doors	5.3.4, Annex A, A.2 and A.3 and Annex B	
	4.2.2.7.1. (2) Customer Information - General	5.3.6.1	
	4.2.2.7.2. (7) Signage, pictograms and tactile information	5.3.6.2 and Annex A, A.2 and A.3	
	4.2.2.8. (2) Height changes	5.3.7 and Annex A, A.2 and A.3	
	4.2.2.9. (3) Handrails	5.3.8 and Annex A, A.2 and A.3	
	4.2.2.10. (10) Wheelchair accessible sleeping accommodation	5.3.10 and Annex A, A.2 and A.3	
	4.2.2.11.2 (4) Access / egress steps	5.3.9 and Annex A, A.2 and A.3	
	5.3.1.2. (7 and 9) Platform ramps	5.3.11 and Annex A, A.2 and A.3	
	5.3.1.3. (16) Platform lifts	5.3.11 and Annex A, A.2 and A.3	
	5.3.2.2. (4 and 6) Standard and universal toilets: common parameters	5.3.5 and Annex A, A.2 and A.3	
	5.3.2.4. (16) Universal toilet	5.3.10 and Annex A, A.2 and A.3	
	5.3.2.9. (7 and 10) Boarding aids: on-board ramps	5.3.11 and Annex A, A.2 and A.3	
	5.3.2.10. (14) Boarding aids: on-board lifts	5.3.11 and Annex A, A.2 and A.3	
	6.2.3.3. Assessment of contrast for the rolling stock subsystem	Annex A, A.2 and A.3	

* As amended by Commission Implementing Regulation (EU) 2019/772 and Commission Implementing Regulation (EU) 2023/1694.

NOTE The Technical Specification for Interoperability (TSI) can refer to other clauses of this standard making the application of those clauses mandatory. Possible references to such clauses are found in the Appendix A to the TSI.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the products falling within the scope of this standard.

Bibliography

- [1] Commission Regulation (EU) No 1300/2014, Technical Specification of Interoperability for Persons of Reduced Mobility as amended by Commission Implementing Regulation (EU) 2019/772 and Commission Implementing Regulation (EU) 2023/1694
- [2] BS 8493:2008+A1:2010, *Light Reflectance Value (LRV) of a Surface - Method of test*
- [3] DIN 32975:2009+CORR:2012, *Designing visual information in the public area for accessible use*
- [4] EN ISO 9241-303:2011, *Ergonomics of human-system interaction - Part 303: Requirements for electronic visual displays (ISO 9241-303:2011)*
- [5] ISO 7001, *Graphical symbols — Registered public information symbols*
- [6] ISO 22727:2007, *Graphical symbols — Creation and design of public information symbols — Requirements*
- [7] ISO 9186-1, *Graphical symbols — Test methods — Part 1: Method for testing comprehensibility*
- [8] ISO 9186-2, *Graphical symbols — Test methods — Part 2: Method for testing perceptual quality*
- [9] ISO 9186-3, *Graphical symbols — Test methods — Part 3: Method for testing symbol referent association*
- [10] ADA (Americans with Disabilities Act) Standards for accessible design 2010
- [11] BS 8300-1, *Design of an accessible and inclusive built environment. External environment. Code of practice*
- [12] BS 8300-2, *Design of an accessible and inclusive built environment. Buildings. Code of practice*
- [13] DIN/TR 124, *Products in design for all*
- [14] CIE Publication 196:2011, *CIE Guide to Increasing Accessibility in Light and Lighting*
- [15] CIE 15, *Colorimetry*
- [16] EN ISO 105-B05, *Textiles - Tests for colour fastness - Part B05: Detection and assessment of photochromism (ISO 105-B05:1993)*
- [17] EUROPEAN UNION RAILWAYS AGENCY. ¹ Reference document database (RDD) – Part 2 – National Reference Documents (NRDs), <https://rdd.era.europa.eu/RDD/> and The Single Rule Database (SRD) at <https://srd.era.europa.eu/home>

¹ ERA RDD-NRD & ERA SRD are the registers of national rules notified to ERA following the process of Directive (EU) 2016/797 article 14.

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