



# OTIF

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## Guide for the application of the UTP PRM

**OTIF**



**ORGANISATION INTERGOUVERNEMENTALE  
POUR LES TRANSPORTS INTERNATIONAUX  
FERROVIAIRES**

**ZWISCHENSTAATLICHE ORGANISATION FÜR  
DEN INTERNATIONALEN EISENBahnVERKEHR**

**INTERGOVERNMENTAL ORGANISATION FOR  
INTERNATIONAL CARRIAGE BY RAIL**



### 0. DOCUMENT INFORMATION

#### 0.1. Amendment record

The basis of this document is the ERA Guide for the application of the PRM TSI with reference ERA/GUI/02-2013/INT.

The blue rectangles such as this one in this document contain information relevant to the application of the OTIF UTP applicable to the accessibility of the rail system: for persons with reduced mobility which is in force as of 1.1.2015 and further referred to as UTP PRM 2015. Because the PRM TSI and UTP PRM are fully equivalent, much of the information in the TSI application guide is also relevant to application of the UTP.

All text edited by OTIF is in blue rectangles, which means that without the blue rectangles the content of this document corresponds exactly to the ERA application guide.

As a general principle, where the guide refers to 'TSI', this can also be taken to cover the 'UTP'. Where this is not the case, this is pointed out specifically.

The following EU terms are to be considered as follows:

- EU: Notified Body – OTIF: Assessing Entity
- EC Declaration of Verification – OTIF: there is no mandatory equivalence in COTIF. As COTIF is a States Convention, the final responsibility for compliance with the UTP is at State level, evidences by a technical Certificate in accordance with ATMF Articles 10 and 11.

The OTIF reference for this document is: **A 92-01/1.2015**

<i>Version Date</i>	<i>Section</i>	<i>Description</i>
<b>V0.1</b> 05.01.2015	All blue rectangles	First draft for issued for attention of WG TECH 25



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## Guide for the application of the UTP PRM

### 1. SCOPE OF THIS GUIDE

#### 1.1. Scope

This document is an annex to the Guide for the application of TSIs. It provides information on the application of the Commission Regulation (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility.

The guide should be read and used only in conjunction with the PRM TSI. It is intended to facilitate its application, but does not replace it.

The general part of the 'Guide for the application of TSIs' should also be considered.

The information in this guide relates equally to the application of the UTP PRM. The PRM TSI application guide is published on the website of the European Railway Agency:

<http://www.era.europa.eu/Document-Register/Pages/TSI-Application-Guide-PRM-TSI.aspx>

At time of writing no OTIF equivalent to the "Guide for the Application of TSIs" exists. The application of UTPs is set out in ATMF. Explanations to ATMF are contained in the Explanatory report to COTIF, which is available from the OTIF website:

[http://www.otif.org/fileadmin/user\\_upload/otif\\_verlinkte\\_files/07\\_veroeff/03\\_erlaeut/COTIF\\_Rapport\\_explicatif\\_01\\_01\\_2011\\_e.pdf](http://www.otif.org/fileadmin/user_upload/otif_verlinkte_files/07_veroeff/03_erlaeut/COTIF_Rapport_explicatif_01_01_2011_e.pdf)

#### 1.2. Content of the guide

In the following sections of this document, extracts of the original text of the PRM TSI are provided, in a shaded text box, and these are followed by a text that gives guidance.

In few cases the extracts of the original text from the TSI PRM differ in terms of content from the provisions stated in the UTP PRM. In such cases these original extracts (from TSI PRM) are followed with blue boxes providing the extracts from the UTP PRM. These blue boxes always begin with the statement: "The text quoted from the PRM TSI is not identical to the text in the UTP PRM, the UTP reads:"

Guidance is not provided for points where the TSI requires no further explanation.

Guidance is of voluntary application. It does not mandate any requirement in addition to those set out in the TSI.

Guidance is given by means of further explanatory text and, where relevant, by reference to standards that demonstrate compliance with the TSI; relevant standards are listed in chapter 5 of this document.

The standards that are listed shall never be considered as the only acceptable means to comply with the TSI requirements.

The guide also contains some indications for the implementation strategy.



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### 1.3. Reference documents

Reference documents are listed in the general part of the 'Guide for the application of TSIs'.

Users of the guide are also invited to consult the ERA technical opinions and advices webpage where further clarifications, explanations or corrections of the TSI are regularly published:

[Opinions and advices](#)

Finally, the Questions and Clarifications and Recommendations for use issued by NB-Rail (Association of Notified Bodies) also represent a good source of clarifications.

[Nb-rail documents](#)

Where necessary OTIF will work together with ERA to publish equivalent clarifications, explanations or corrections in accordance with the appropriate processes as defined in COTIF.

### 1.4. Definitions and abbreviations

Definitions and abbreviations are given in the PRM TSI, points 2.2 and 2.3 and in the general part of the 'Guide for the application of TSIs'.



### 2. CLARIFICATIONS ON THE PRM TSI

#### UTP Section 0: Equivalence and transitional provisions

The UTP PRM is equivalent to the EU regulations PRM TSI, however

- The UTP PRM specifies vehicle related parameters and infrastructure related parameters. The vehicle related parameters in UTP PRM are mandatory for admissions of vehicles according to ATMF in the scope of UTP PRM. On the other hand the application of infrastructure related parameters, in particular those for stations and platforms, are voluntary.

General information regarding the use of UTPs in the scope of COTIF Appendix F (ATMF):

- The admission of vehicles to international traffic in the scope of COTIF should be done in accordance with ATMF (Art.3 §1). This means that the Contracting States should organise its procedures and discharge of responsibilities in accordance with ATMF. As a result, only Contracting States that have properly implemented procedures and responsibilities in accordance with ATMF can grant admission to international operation of vehicles in the meaning of COTIF.
- Article 7 makes mandatory for admission to international traffic, the application of UTPs (where available) and RID (where applicable). Vehicles in the scope of the UTP PRM should comply not only with the vehicle related provisions of the UTP PRM but also with the applicable provisions of the UTP LOC&PAS, UTP NOI and UTP for vehicle marking.
- Article 7a, which is implemented in ATMF Annex B, sets out the conditions and procedures to be followed for not applying UTPs as a result of derogations. In case a vehicle is subject to derogation, its admission to operation is not automatically valid in other Contracting States.
- Article 6 sets out the conditions for the validity of admissions in international traffic. It sets out in particular two situations:
  - o Vehicles meeting all essential requirements through full compliance with the UTPs, as set out in Article 6 §3: the UTPs cover all essential requirements and there are no open points related to network compatibility. If in such case the UTPs are applied without specific cases or derogations, the admission in one CS gives admission in all other CSs. As a result a RU may operate the vehicle on compatible infrastructure.
  - o Vehicles not meeting the conditions of Article 6 § 3, become subject of Article 6 §4. I.e. the vehicle is not compliant with the UTPs, or a specific case related to compatibility applies, or a derogation applies; the vehicle must receive individual admission in each CS where it is intended to be operated. However, each CS's competent authority should accept the verifications based of UTPs that have been made by other competent authorities.



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- Article 3a sets out the interaction between EU law and ATMF. In particular it sets out the provisions for recognition of EU authorisations in non-EU Contracting States (in § 1) and the recognition of non-EU admissions by Member States of the EU (in § 2). It also clarifies that for the authorisation of vehicles intended to be operated only in the EU, EU law applies.

### 2.1. Scope of the TSI

#### ***Scope related to Infrastructure***

*This TSI applies to all the public areas of stations dedicated to the transport of passengers that are controlled by the Railway Undertaking, Infrastructure Manager or Station Manager. This includes the provision of information, the purchase of a ticket and its validation if needed, and the possibility to wait for the train.*

The text quoted from the LOC&PAS is not identical to the text in the UTP, as application of the UTP PRM is not mandatory for infrastructure, the UTP reads:

#### ***Scope related to Infrastructure***

*The application of the UTP to stations on international lines is voluntary, but is recommended.*

That definition of the scope related to infrastructure clarifies that only those parts of the stations **dedicated to transport** are concerned (and not shopping malls for instance). Also, it clarifies that the TSI applies only to stations and not to (for instance) emergency exits, safe areas in tunnels or level crossings that are not part of the obstacle free route of a station.

Areas that are not controlled by the Railway Undertaking, Infrastructure Manager or Station Manager (either directly or through subcontractors) are out of scope; this can be the case, for instance, of car parks.

### 2.2. Definitions

#### 2.2.1. Definition of PRMs

*"Person with disabilities and person with reduced mobility" means any person who has a permanent or temporary physical, mental, intellectual or sensory impairment which, in interaction with various barriers, may hinder their full and effective use of transport on an equal basis with other passengers or whose mobility when using transport is reduced due to age.*

*The transport of oversized items (for example: bicycles and bulky luggage) is not within the scope of this TSI.*

The definition above is derived from the article 1 of the United Nations Convention on the Rights of Persons with Disabilities. It does not specifically include people with children, people with bulky luggage, and foreign people with lack of knowledge of the local language. It does not include automatically elderly people and pregnant women.



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Concerning those last two categories, they do not systematically lead to reduced mobility, but obviously old age can decrease the speed and ability with which passengers can move within the station or rolling stock environment. Therefore, elder passengers can be considered as persons with reduced mobility when compared with the average passenger. Similarly, pregnancy is not systematically a cause of reduced mobility. However, when a pregnant passenger's mobility is affected (for example preventing her from moving easily and quickly), then she may be considered a person with reduced mobility.

Consequently, the number of priority seats has not been affected by the change of definition. Also, the pictograms used to indicate priority seats have not been modified either: the symbols representing a pregnant woman and elder person are worldwide recognized.

### 2.2.2. Other definitions

#### **Level access**

*A level access is an access from a platform to the doorway of a rolling stock for which it can be demonstrated that:*

- *The gap between the door sill of that doorway (or of the extended bridging plate of that doorway) and the platform does not exceed 75 mm measured horizontally and 50 mm measured vertically and*
- *The rolling stock has no internal step between the door sill and the vestibule.*

For this demonstration the gap should be calculated according to the requirements in TSI PRM points 4.2.2.11.1 (1) and (2) (with  $\delta h$  = horizontal gap and  $\delta v$  = vertical gap), and the point 2.5.10 of the present Application Guide, considering a track radius 300 m and straight level track.

### 2.3. General parameters

#### 2.3.1. Clarification of the two categories specified for the infrastructure subsystem (point 4.2.1)

*((2) The basic parameters that are specified in points 4.2.1.1 – 4.2.1.15 apply to the scope of the infrastructure subsystem that is defined in point 2.1.1; they can be divided into two categories:*

- *Those for which technical details need to be specified, such as the parameters relative to the platforms and how to reach the platforms. In this first case, the basic parameters are specifically described and the technical details to be satisfied in order to fulfil the requirement are detailed.*
- *Those for which technical details are not necessary to be specified, such as the value of ramps or the characteristics of parking places. In this second case, the basic parameter is defined as a functional requirement that can be met by applying several technical solutions.*





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Regarding the second category of basic parameters, the Working Party drafting the PRM TSI ensured that they can always be covered by an international (ISO) or European (EN) standard, with a few exceptions<sup>1</sup>.

Therefore, for those parameters, the TSI is deliberately specifying a high level functional requirement: the present Application Guide lists some international and European standards that the applicant may apply in order to meet this functional requirement.

The application of these standards remains voluntary, and the applicant can always apply other standards to meet the requirements. As a matter of fact, the functional requirements are also generally covered by national, regional or local standards and sometimes even by company rules.

The principles for the application of other standards than the ones that are listed in this Application Guide are the following:

- National/regional/local standards can be applied when they provide an equivalent solution than the one specified in the standards listed in this guide.
- National/regional/local standards can only be applied on the territory they cover: one of the reasons for removing some detailed requirements from the TSI is to allow some harmonization at local level. An applicant that would intend to use a “foreign” standard would strictly be in contradiction with this objective.
- Company rules can be used when they are derived from the above standards or when they have been validated by a representative group of users.

Equivalence is to be understood as “having the same or a similar effect” as per the definition of Collins dictionary:

*Equivalent, adjective*

1. *equal or interchangeable in value, quantity, significance, etc*
2. *having the same or a similar effect or meaning.*

Examples of equivalent solutions are given in appendix 1.

In the following points, those requirements are called “parameters of the 2<sup>nd</sup> category”.

Guidance for the assessment of the parameters of the 2<sup>nd</sup> category is given in chapter 3.

### 2.3.2. Contrast

Contrast is a parameter of the second category.

The requirement to “contrast with the background” is a frequent one in the TSI. In general, visual contrast is a matter of having different light reflectance values (LRV) or having different luminance.

When it is required in the TSI to provide a contrast, this can be achieved by applying the standards listed in chapter 5, index A.

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<sup>1</sup> *In exceptional cases where a parameter is not covered by an international standard, a European standard and not either covered by a more local standard, it is possible to utilize standards from another EU Member States or from another region of the Member State.*



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The methodology provided in the Recommendation For Use 053 issued by NB-Rail (see point 1.3) can also be used, and can be adapted by using reflectance from RAL directly.

Other standards can be used according to the rules described in point 2.3.1.

For assessing this parameter, it is sufficient to provide the technical data sheet of the product(s). The assessment should not consider factors such as snow, ice, rain and different lighting conditions (shadows).

In some precise cases, it is required in the TSI to provide a self-contrasted marking on elements such as boarding aids: being obstacles to other passengers when they are in use, the boarding aids are frequently displaced and therefore they cannot be assessed by the “contrast with the background”. A methodology for providing self-contrasted marking is described in the standards listed in chapter 5, index B.

### 2.3.3. Tactile

The requirement to “tactile” is a frequent one in the TSI. Tactile is a parameter of the second category.

When it is required in the TSI to provide tactile signs and tactile controls, this can be achieved by applying the standards listed in chapter 5, index C.

When it is required in the TSI to provide tactile walking surface indicators, this can be achieved by applying the standards listed in chapter 5, index D.

Other standards can be used according to the rules described in point 2.3.1.

### 2.3.4. Readability of a typeface

The readability of a typeface is related to the ease of distinguishing one letter from another. Readability is a parameter of the second category.

When it is required in the TSI to ensure the readability of a typeface, this can be achieved by applying the standards listed in chapter 5, index E.

Other standards can be used according to the rules described in point 2.3.1.

Standards generally recommend the use of sans serif typefaces (“Serifs” are the small finishing strokes on the end of a character; “Sans serif” fonts do not have these small finishing strokes). However, some typefaces use horizontal lines to achieve a better readability, they should not be mistaken as serifs.

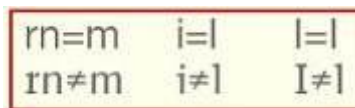


Figure 1: example showing horizontal lines (second line) to achieve better readability, which are no serifs.

### 2.3.5. Palm operation

When it is required in the TSI to provide a device that can be palm operated, this can be achieved by applying the standards listed in chapter 5, index F.



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### 2.3.6. Slip resistance of Floor surfaces

Slip resistance is a parameter of the 2<sup>nd</sup> category.

The slip resistance characteristics of infrastructure floor coverings can be assessed according to the standards listed in chapter 5, index G.

For external areas, slip resistance can be assessed according to the standards listed in chapter 5, index H

Other standards can be used according to the rules described in point 2.3.1.

For assessing this parameter, it is sufficient to provide the technical data sheet of the product(s) used as floor covering(s). When tests are realized, the assessment should not consider factors such as snow, ice, sand, rain and leaves.

The assessment of the slip resistance of boarding aids and rolling stock access steps can be done according to the methodology given in chapter 5, index I.

## 2.4. Infrastructure subsystem

Application of the UTP PRM is not mandatory for infrastructure. If the UTP PRM is used for the design and construction of infrastructure, it is also recommended to take into account the guidance provided in this section 2.4.

### 2.4.1. Parking facilities for PRM (point 4.2.1.1)

*(1) Where a station specific parking area exists, there shall be sufficient and adapted parking spaces reserved for PRM eligible to utilise them at the nearest practicable position, within the parking area, to an accessible entrance.*

The quantity and characteristics of parking places are parameters of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement are described in the standards listed in chapter 5, index J.

Other standards can be used according to the rules described in 2.3.1

### 2.4.2. Obstacle-free route (point 4.2.1.2)

*(1) Obstacle free routes shall be provided that interconnect the following public areas of the infrastructure if provided:*

- (...)

The requirement expressed in this sentence is that all routes that interconnect the public areas of a station, within the scope of the TSI, are required to be obstacle-free routes.

This does not mean that all paths that constitute a route shall be equally accessible by all passengers: the definition provided in clause 2.3 of the TSI clarifies: "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



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*obstacle free route constitutes the route accessible for all persons with disabilities and reduced mobility”.*

For example, an obstacle-free route can be the combination of a step-free part, a second part having a tactile path and further parts; the latter are not required to be step-free or equipped with guiding tactile walking surface indicators (TWSI) and they may have stairs provided that these stairs are compliant to the TSI requirements (contrast, warning TWSI, double handrail).

*(1) Obstacle free routes shall be provided that interconnect the following public areas of the infrastructure if provided:*

- *(..)*
- *waiting areas*
- *(..)*

A waiting area can be defined as a place to wait for the departure of the train having all the following characteristics:

- Seats are available
- Information about the departures of the trains is available
- People are protected against weather influences (i.e. rain, sun, wind).

The TSI differentiates between "waiting areas and "platform where passengers are allowed to wait for trains" (see 4.2.1.7 (3)).

The term "shelter" is also mentioned in the TSI (see 6.2.4). A shelter is a structure with a roof for weather protection but not necessarily walls." A simple shelter on a platform is not to be understood as a waiting area unless it has all above characteristics.

*(3) Obstacle-free route floor surfaces and ground surfaces shall have low reflecting properties.*

The reflectance of the floor surface and/or the ground surface is a parameter of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement for paints and varnishes are described in the standards listed in chapter 5, index K. For any other ground material and/or surface materials an assessment is not necessary

Other standards can be used according to the rules described in point 2.3.1.

### 2.4.3. Vertical circulation (point 4.2.1.2.2)

*(2) Staircases on the obstacle-free routes shall have a minimum width of 160cm measured between the handrails. As a minimum the first and last steps shall be indicated by a contrasting band and as a minimum tactile warning surface indicators shall be installed before the first descending step.*

The characteristics of the contrasting band and tactile warning surface indicator are parameters of the 2<sup>nd</sup> category. For contrast and tactile characteristics, refer to points 2.3.2 and 2.3.3.



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*(3) Ramps shall be installed for PRM unable to use stairs where lifts are not provided. They shall have a moderate gradient. A steep gradient is allowed for ramps on short distances only.*

The characteristics of ramps are parameters of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement are described in the standards listed in chapter 5, index L.

Other standards can be used according to the rules described in point 2.3.1.

The following picture gives a conversion of the value of ramps. It also provides interesting representations:

- On the left, representation of the height:length ratio, showing the length of ramps for overcoming the same vertical difference
- On the right, representation of the angular value, showing the vertical distance overcame by ramps of the same length but of different angles.

Length to height ratio Representation	Value	Ramp Value	Ramp angular value
	1:25	4,0%    40‰	2,3°
	1:20	5,0%    50‰	2,9°
	1:18	5,6%    56‰	3,2°
	1:15	6,7%    67‰	3,8°
	1:12	8,3%    83‰	4,8°
	1:10	10,0%    100‰	5,7°
	1:8	12,5%    125‰	7,1°
	1:6	16,7%    167‰	9,5°

Figure 2: conversion table and visual representation of ramps

### 2.4.4. Route identification (point 4.2.1.2.3)

*(2) Information on the obstacle-free route shall be given to visually impaired people by tactile and contrasting walking surface indicators as a minimum. This paragraph does not apply to obstacle free routes to and from car parks.*

The characteristics of tactile and contrasting surface indicators are parameters of the 2<sup>nd</sup> category. See points 2.3.2 and 2.3.3 of this guide.

Audible and tactile signs, talking signs or Braille maps may be used as complementary means to provide information.



### 2.4.5. Doors and entrances (point 4.2.1.3)

*(2) Doors shall have a minimum clear useable width of 90cm and shall be operable by a PRM.*

The characteristics of doors operating devices are parameters of the 2<sup>nd</sup> category.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index M.

Other standards can be used according to the rules described in point 2.3.1.

### 2.4.6. Highlighting of transparent obstacles (point 4.2.1.5)

*(1) 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. They are not required if passengers are protected from impact by other means – for example, by handrails or continuous benches.*

The characteristics of markings on transparent obstacles are parameters of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement are described in the standards listed in chapter 5, index N.

Other standards can be used according to the rules described in point 2.3.1.

This following partly glazed surface need not to have markings:

- third parties retail units in the area controlled by the Station Manager (e.g. shop windows used to present the products that are sold inside)

Partial glass walls and balustrades shall only be assessed when one contrasting band or more is possible to apply, because of the height of the object (see examples below).

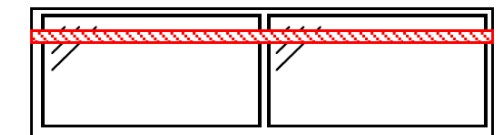


Figure 3: example of glass balustrades

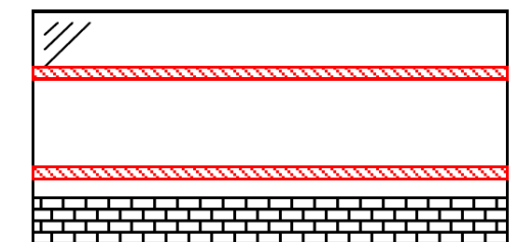


Figure 4: example of partial glass wall

For transparent obstacles lower than 950 mm there is no requirement.



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The handrail and frame of glass balustrades can be considered to fulfil the requirements for these markings, when they are broad enough (100 mm high, contrast with the background against which they are viewed)

### 2.4.7. Toilets and baby nappy changing facilities (point 4.2.1.6)

*(1) If toilets are provided at a station, then a minimum of one unisex cubicle shall be wheelchair accessible.*

The characteristics of a wheelchair accessible toilet are parameters of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement are described in the standards listed in chapter 5, index O.

Other standards can be used according to the rules described in point 2.3.1.

*(2) If toilets are provided at a station, baby nappy changing facilities shall be provided which are accessible to both men and women.*

Baby nappy changing facilities have to be available to wheelchair users (both men and women)

### 2.4.8. Furniture and free-standing devices (point 4.2.1.7)

*(1) All items of furniture and free-standing devices at stations shall contrast with their background, and have rounded edges.*

Free-standing devices are those elements, either fixed or removable, that are not part of the structure of the building and that can constitute obstacles: lighting masts, information pillars or columns, bins etc. Elements that are not included in this definition are signalling equipment, lifts, external staircase, walls, any free-hanging devices above 210cm above the walking floor and items that have a dimension greater than 200cm perpendicular to the walking direction (e.g. fence, waiting shelter etc). The background in the context of this clause is to be understood as the floor surrounding the furniture and/or the free-standing device and any adjacent wall or structure when existing.

Contrast with the background is a parameter of the 2<sup>nd</sup> category. See point 2.3.2 of this application guide.

A rounded edge is the opposite of a sharp edge that is defined in point 2.5.1.

*(2) Within the station confines, furniture and free-standing devices (including cantilevered and suspended items) shall be positioned where they do not obstruct blind or visually impaired people, or they shall be detectable by a person using a long cane.*

This paragraph combines free standing devices (resting on the floor) and cantilevered/suspended items (generally fixed on a wall or ceiling) because they all represent obstacles. Their proper positioning is important, away from the obstacle-free routes.





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In addition, when cantilevered and suspended items are positioned too low, they can constitute an undetectable obstacle for visually impaired persons. It is the same for elements such as inclined masts or pillars or stairs that can be a hazard. For instance in the case of stairs, when the space underneath the stairs is open, there is a need for a guard to be provided until the clear height under the stairs is sufficient.

In general, for every cantilevered, suspended or inclined item the need for a guard at floor level should be considered.

The minimum height and other characteristics of the guarding are parameters of the 2<sup>nd</sup> category.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index P.

Other standards can be used according to the rules described in point 2.3.1.

Alternatively, cantilevered items fitted below a height of 2100 mm, which protrude by more than 150 mm, are indicated by an obstacle, at a maximum height of 300 mm that can be detected by a blind person using a stick.

### 2.4.9. Ticketing, Information desks and Customer Assistance point (point 4.2.1.8)

*(1) Where manual ticket sales counters, information desks and customer assistance points are provided along the obstacle-free route, a minimum of one desk shall be accessible to a wheelchair user and to people of small stature and a minimum of one desk shall be fitted with an induction loop system for hearing assistance.*

The characteristics of an accessible desk are parameters of the 2<sup>nd</sup> category.

Acceptable technical means to satisfy the requirement are described in the standards listed in chapter 5, index Q.

Other standards can be used according to the rules described in point 2.3.1.

*(2) If there is a glass barrier between the passenger and sales person at the ticket counter, this shall either be removable or, if not removable, an intercom system shall be fitted. Any such glass barrier shall consist of clear glass.*

There are many varieties of barriers used, they are not all made of glass. Therefore, 'glass' in the context of this parameter is to be understood as transparent material. It can be extended to other materials such as PMMA or polycarbonate.

For the assessment of this parameter, "clear" is to be understood as allowing a minimum of 50% light transmission.

If there are holes in the transparent barrier allowing sound to propagate, then an intercom system is not required

*(4) Where ticket vending machines are provided on an obstacle free route at a station, a minimum*





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*of one of these machines shall have an interface that is reachable by a wheelchair user and people of small stature.*

The characteristics of accessible ticket vending machines are parameters of the 2<sup>nd</sup> category.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index R.

Other standards can be used according to the rules described in point 2.3.1.

### 2.4.10. Lighting (point 4.2.1.9)

*(1) The illuminance level of the external areas of the station shall be sufficient to facilitate way finding and to highlight the changes of level, doors and entrances.*

*(2) The illuminance level along obstacle-free routes shall be adapted to the visual task of the passenger. Particular attention shall be paid to the changes of levels, ticket vending offices and machines, information desks and information displays.*

The illuminance levels in the areas described are parameters of the 2<sup>nd</sup> category.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index S.

Other standards can be used according to the rules described in point 2.3.1.

*(4) Emergency lighting shall provide sufficient visibility for evacuation and for identification of fire-fighting and safety equipment.*

Emergency lighting is a parameter of the 2<sup>nd</sup> category.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index T.

Other standards can be used according to the rules described in point 2.3.1.

### 2.4.11. Visual information: signposting, pictograms, printed or dynamic information (point 4.2.1.10)

*(1) The following information shall be provided:*

- *Safety Information and Safety Instructions.*
- *Warning, prohibition and mandatory actions signs.*
- *Information concerning the departure of trains.*
- *Identification of station facilities, where provided, and access routes to those facilities.*



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Information concerning the departure of trains is the planned departure as a minimum. It is not mandatory to provide the actual time of departure. In stations and on platforms, it is not mandatory to install a dynamic visual information system.

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

Contrast with the background is a parameter of the 2<sup>nd</sup> category. See point 2.3.2 of this application guide.

*(3) Signposting shall be provided at all points where passengers need to make a route taking decision and at intervals on the route. Signage, symbols and pictograms shall be applied consistently over the whole route.*

This requirement expresses the need to provide the appropriate level of information required to make the decision. For example, "To the platforms" in general may be appropriate at the first decision making point when entering the station, rather than specific signs indicating each individual platform.

When a route leading to a specific zone is long, it is recommended to reiterate the signage at regular intervals (approximately every 100m maximum) so as to keep the passenger confident.

*(4) The information concerning the departure of trains (including destination, intermediate stops, platform number and time) shall be available at a height of 160cm maximum at least in one location in the station. This requirement applies to printed and dynamic information whatever is provided.*

The provision of visual information at a height of 160cm maximum is intended for people with visual impairment for whom, in case of dynamic information, the formula defining the area of use of displays (point 5.3.1.1 (3) of the TSI) is not appropriate for they have vision on a very short distance only. Therefore they need to be able to get their eyes very close to the message that is displayed.

It shall exist an appropriate and available visual information facility for those people once in each station. The station manager /infrastructure manager decides whether he provides printed or dynamic information.

People with a visual impairment should be directed to that place by an appropriate guiding system.

*(6) All safety, warning, mandatory action and prohibition signs shall include pictograms.*

Pictograms are signage containing only graphical symbols and/or figures within a frame with a particular meaning.

Applicable technical means to satisfy the requirement are described in the standards listed in chapter 5, index U.

Other standards can be used according to the rules described in point 2.3.1.

*(9) The following specific graphic symbols and pictograms shall be fitted with the wheelchair symbol in accordance with appendix N:*

- *If there is train configuration information on the platform, indication of the wheelchair*



*boarding location.*

Only the information about the train configuration shall contain an indication about the wheelchair boarding location by using the wheelchair symbol. It is not required to mark the platform surface.

### 2.4.12. Platform width and edge of platform (point 4.2.1.12)

*(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 limits of the danger area are defined in National rules

*(3) The minimum width of the platform without obstacles shall be the width of the danger area plus the width of two opposing freeways of 80cm (160cm). This dimension may taper to 90cm at the platform ends.*

The width requirement is applicable to both a single track platform and an island platform.

### 2.4.13. Passenger track crossing to platforms (point 4.2.1.15)

*– where accesses to level crossings are equipped with safety chicanes in order to prevent people from unintended/uncontrolled crossing of the tracks, the minimum width of the walkways in the straight line and in the chicane can be less than 120cm with a minimum of 90 cm; it shall be sufficient for a wheelchair user to manoeuvre.*

The following sketch shows two acceptable solutions where the manoeuvring space is sufficient for a wheelchair. The top version is adapted to platforms with constructional constraints.

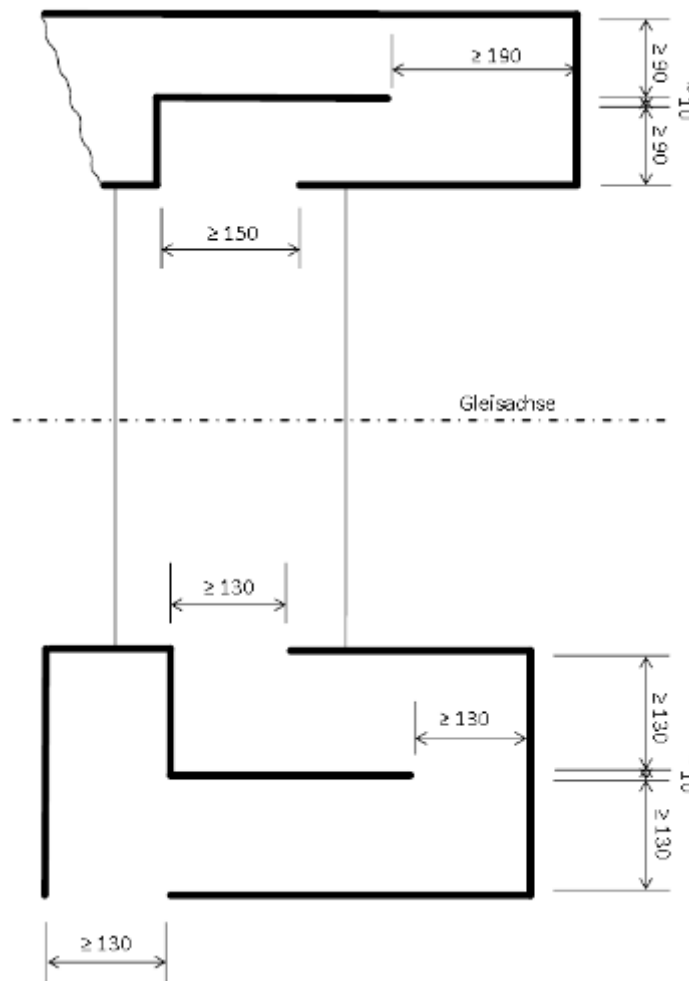


Figure 5: walkway and chicanes for level track crossing

### 2.4.14. Interoperability Constituent: Displays (point 5.3.1.1)

*(1) Displays shall be sized to show individual station names or words of messages. Each station name, or words of messages, shall be displayed for a minimum of 2 seconds.*

Station names can be displayed complete or abbreviated if this is more convenient and if the abbreviation is clear. However, for the assessment of the IC, it is not required to know which station names will be displayed by the device.

### 2.4.15. Interoperability Constituent: Platform lifts (point 5.3.1.3)

*(5) At surface level, the lift platform shall have a minimum clear width of 800mm and a length of 1200mm. According to appendix M, an additional length of 50 mm shall be available for feet above a height of 100 mm above the lift platform, considering both inboard and outboard orientations of the wheelchair user.*



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*(14) The loading-edge barrier (outer barrier) which functions as a loading ramp when the lift is at ground level, shall be sufficient when raised or closed, or a supplementary system shall be provided, to prevent a power wheelchair from riding over or defeating it.*

The following sketch shows an acceptable mean to comply with the requirements.

Required additional length for feet: 1250mm that shall be ensured at both platform ends (for inboard and outboard orientation)

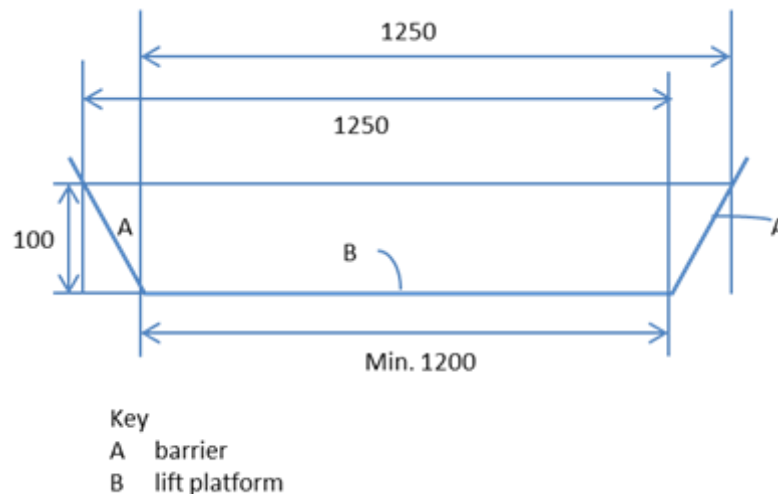


Figure 6: clear length of the lift platform

In order to prevent a power wheelchair from riding over the barrier, a height of 100mm is recommended (such value is prescribed for instance in EN 1756-2:2004+A1:2009: Tail lifts - Platform lifts for mounting on wheeled vehicles - Safety requirements - Part 2: Tail lifts for passengers).

## 2.5. Rolling Stock subsystem

### 2.5.1. Seats (point 4.2.2.1)

*(1) Handholds or vertical handrails or other items that can be used for personal stability, whilst using the aisle, shall be provided on all aisle-side seats unless the seat, when in the upright position, is within 200mm of*

- the back of another seat facing in the opposite direction which is fitted with a handhold or a vertical handrail or other items that can be used for personal stability*
- a handrail or a partition.*

When the seats are equipped with handholds (i.e. components that are fixed to the seat at their both ends), those are not required to comply with the handrail requirements that are expressed in point 4.2.2.9 of the TSI.

*(4) The handholds or other items shall not have sharp edges.*



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A sharp edge is a thin edge capable of cutting or an abrupt end or discontinuity of a surface which has the potential risk to injure a passenger in normal use.

### 2.5.2. Priority seats (point 4.2.2.1.2.1)

*(1) Not less than 10 percent of the seats by fixed trainset or individual vehicle, and by class shall be designated as priority seats for the use of persons with disabilities and persons with reduced mobility.*

The number of seats (from which 10% shall be calculated) includes all types of seats except those tip-up seats in the vestibule and regulated wheelchair spaces. Wheelchair spaces, standing supports and all other equipment where the user is not intended to sit down completely, are not considered as seats.

Where 10% of the number of seats does not produce a whole number, the number of priority seats required must be rounded up.

When the rolling stock is equipped with transfer seats, these can be included in the 10% priority seats when they comply with the requirements.

When the rolling stock is equipped with foldable seats and fixed seats, the proportion of priority seats that are foldable should not be greater than the proportion of general seats that are foldable.

*(3) The priority seats shall be located within the passenger saloon and in close proximity to external doors. In double deck vehicles or trainsets, priority seats can be present on both decks.*

It is not required here that all seats located near the access doors are priority seats. It is not required either that all priority seats are located immediately near access doors.

For the assessment of this parameter at design stage, Notified Bodies are invited to verify only that priority seats are identified as such in the general layout of the vehicle being assessed.

*(4) The level of equipment fitted to the priority seats shall, as a minimum, be the same as that fitted to general seats of the same type.*

*(5) When seats of a certain type are fitted with armrests, priority seats of the same type shall be fitted with movable armrests,*

“Type” in this context is understood as, for example, first class or second class seat, in row or face to face, etc...

For instance, when second class seats in row are fitted with a tray and a magazine holder, then second class priority seats in row shall also be fitted with the a tray and a magazine holder.

*(6) Priority seats shall not be tip-up seats.*

A tip-up seat is a seat that moves up into a vertical position when nobody is sitting in it.



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### 2.5.3. Wheelchair space (point 4.2.2.2)

*(1) According to the length of the unit, excluding the locomotive or power head, there shall be in that unit not less than the number of accessible wheelchair spaces shown in the following table:*

<i>Unit length</i>	<i>Number of wheelchair spaces by unit</i>
<i>Less than 30 m</i>	<i>1 wheelchair space</i>
<i>30 to 205 metres</i>	<i>2 wheelchair spaces</i>
<i>More than 205 to 300 metres</i>	<i>3 wheelchair spaces</i>
<i>More than 300 metres</i>	<i>4 wheelchair spaces</i>

*Table 5: minimum number of wheelchair spaces per unit length*

“Unit” in this context is understood as a railcar or trainset or several of them operated as a train, or rake of passenger coaches in predefined formation Units for general operation which are supplied as individual vehicles do not have to fulfil this requirement according to the chapter 6 point 6.2.7 of TSI PRM.

Therefore, when assessing such units intended to be used in general operation (i.e assessment of passenger coaches), it is not necessary that wheelchair spaces are provided in every coach.

As specified in point 6.2.7 of the TSI, it is the responsibility of the railway undertaking to make sure, when forming the train, that the requirements of the TSI are fulfilled. Therefore, the requirements above need to be satisfied at operational level.

*(6) The back of the wheelchair space shall be a structure or other acceptable fitting of at least 700mm wide. The height of the structure, or fitting, shall be capable of preventing a wheelchair that has been positioned with its back against the structure or fitting, from tipping over backwards.*

In some countries, a typical wheelchair space would include a backrest in addition to this mandatory structure. The backrest is higher and narrower than the structure. This arrangement is not prohibited, provided that a structure below the backrest complies with the above requirement.

*(10) On trains with a design speed higher than 250 km/h excepting double deck trains, it shall be possible for a wheelchair user occupying a wheelchair space to transfer onto a passenger seat that shall be equipped with a movable armrest. Such transfer is made by the wheelchair user in autonomy. In that case, it is allowed that the companion seat is shifted to another row. This requirement is applicable up to the number of wheelchair spaces per unit specified in table 5.*

This parameter affects the layout of the wheelchair space. Contrarily to the access to the toilet, here it is not mandatory to enable both a frontal and a lateral approach to the transfer seats. One of both is sufficient. No staff assistance is required to help the transfer, it is done either autonomously or with a personal assistant help.

After the transfer, the wheelchair can remain nearby the seat when it does not create an obstacle to other passengers. There is no storage place or fixation device required. It is understood that, from the transfer seat, it may not be possible to access the call for aid device.



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Transfer seats can be foldable seats (with two stable positions - unfolded or folded). They cannot be tip-up seats.

*(13) It (the call for aid device) shall not be placed within a narrow recess which prevents immediate intentional palm operation but can be protected from unintentional use.*

*(14) The interface of the call for aid device shall be as defined in point 5.3.2.6.*

Point 5.3.2.6 defines the requirements for the I.C “call for aid device”. In particular, the device shall “be indicated by a sign having a green or yellow background (according to the specification referenced in appendix A, index 10 of the TSI) and a white symbol, representing a bell or a telephone;” This symbol is specific to the call for aid device present in the wheelchair space, universal toilet and wheelchair accessible sleeping compartments. It is not required to be placed nearby other communication devices that may exist in the train.

“Immediate intentional palm operation” is to be understood as a palm operation which is done by a unique action from the user. “Immediate” here has the meaning of “without previous operation” and not a meaning of “within a time of x seconds”.

### 2.5.4. Exterior doors (point 4.2.2.3.2)

*(1) The doors to be used for wheelchair access shall be clearly labelled with a sign in accordance with appendix N.*

The sign required is the International wheelchair sign in accordance with the specifications referenced in Appendix A, index 12 of the TSI. It needs only to be placed on the wheelchair access door or very close to it. It is not necessary to repeat the sign on each coach with a directional arrow to indicate in which direction the wheelchair accessible door is.

### 2.5.5. Interior doors (point 4.2.2.3.3)

*(6) If more than 75% of a door's surface is made of a transparent material, it shall be clearly marked with visual indicators.*

Several possibilities exist for a clear marking of such transparent doors. Examples can be found in the standards listed in chapter 5, index N.

For this rolling stock parameter, the principles explained in point 2.3.1 are applicable, and therefore technical solutions equivalent to the standards listed above are acceptable too.

### 2.5.6. Toilets (point 4.2.2.5)

*(1) When toilets are fitted in a train, a universal toilet shall be provided accessible from the wheelchair space.*





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*(4) When toilets are fitted in a train a baby nappy changing facility shall be provided.*

When assessing units intended to be used in general operation (i.e assessment of passenger coaches), it is not necessary that universal toilets or baby nappy changing facilities are provided in every coach equipped with standard toilets.

As specified in point 6.2.7 of the TSI, it is the responsibility of the railway undertaking to make sure, when forming the train, that the requirements of the TSI are fulfilled. Therefore, the requirements above need to be satisfied at operational level.

### 2.5.7. Clearways (point 4.2.2.6)

*(1) From the vehicle entrance, the section of the clearway shall be as follows:*

- through the vehicles according to figure J1 of Appendix J,*
- between connecting vehicles of a single trainset, according to figure J2 of Appendix J,*
- to and from wheelchair accessible doors, wheelchair spaces and wheelchair accessible areas including sleeping accommodation and universal toilets if provided, according to figure J3 of Appendix J.*

Wheelchair users may access several spaces within the train: dedicated vestibule and dedicated spaces as a minimum, toilets when they are present, sleeping accommodation, etc. The train layout shall be sufficient to avoid a wheelchair user to find herself or himself in a cul-de-sac.

*(2) The minimum height requirement does not need to be verified in:*

- all areas of double-deck vehicles,*
- gangways and door areas of single deck vehicles,*

*In those areas, reduced headroom is accepted as a consequence of structural constraints (gauge, physical space).*

The figures provided in appendix J are applicable to the passenger seating and standing areas of single deck carriages. It is accepted that, in some particular locations of the single deck coaches, the minimum height specified will not be met: gangways and door areas are such locations. The minimum height need not be met either in double deck carriages.

There, the TSI does not specify any minimum and Notified Bodies are asked not to check the height, but only the width of the clearway.

*(3) A turning space, with a minimum diameter of 1500mm, shall be provided adjacent to the wheelchair space and in other locations where wheelchairs are supposed to turn 180°. The wheelchair space may be part of the turning circle.*

This point does not apply to the toilet modules that have their own requirements. It applies only to corridors within the train.



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Note: even for a 180° turn, a 360° turning space with a diameter of 1500mm is necessary.

### 2.5.8. Signage, pictograms and tactile information (point 4.2.2.7.2)

(3) *The following specific pictograms shall be fitted with the wheelchair symbol in accordance with appendix N:*

- *Directional information for wheelchair accessible amenities*
- *Indication of the wheelchair accessible door location outside the train*
- *Indication of the wheelchair space inside the train*
- *Indication of the universal toilets*

*The symbols can be combined with other symbols (for example: carriage number, toilet, etc).*

The sign required is the International wheelchair sign in accordance with the specifications referenced in Appendix A, index 12 of the TSI.

### 2.5.9. Handrails (point 4.2.2.9)

(5) *Those handrails shall be:*

- *vertical handrails that shall extend from 700mm to 1200mm above the threshold of the first step for all external doorways.*
- *additional handrails at a height of between 800 mm and 900 mm above the first useable step and parallel with the line of the step nosing for doorways with more than two entrance steps.*

The reference point for any measurement relative to handrails is the centre of that handrail.

### 2.5.10. Step position for vehicle access and egress (point 4.2.2.11.1)

(1) *It shall be demonstrated that the point situated in the central position on the nose of the access step of each passenger access door on both sides of a vehicle in working order with new wheels standing centrally on the rails, shall be located inside the surface identified as "step location" on the figure 1 below.*

The access step in this clause means the first step of a vehicle that a passenger uses when boarding or alighting a train. This will normally be the step that is closest to the platform edge. It may be a fixed or a moveable step.

(2) *The values of  $b_{q0}$ ,  $\delta_h$ ,  $\delta_{v+}$  and  $\delta_{v-}$  depend on the type of platform where the rolling stock is intended to stop. They shall be as follows:*



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- *bq<sub>0</sub> shall be calculated based on the gauge of the track in which the train is intended to operate in accordance with the specification referenced in Appendix A, index 8. Gauges are defined in chapter 4.2.3.1 of INF TSI.*
- *δ<sub>h</sub>, δ<sub>v+</sub> and δ<sub>v-</sub> are defined in tables 7 – 9.*

The text quoted from the PRM TSI is not identical to the text in the UTP PRM, the UTP reads:

(2) The values of bq<sub>0</sub>, δ<sub>h</sub>, δ<sub>v+</sub> and δ<sub>v-</sub> depend on the type of platform where the rolling stock is intended to stop. They shall be as follows:

- bq<sub>0</sub> shall be calculated based on the gauge of the track in which the train is intended to operate in accordance with the specification referenced in Appendix A, index 8. **The calculation shall take into account the loading gauge(s) on which the vehicle is designated to be operated.**
- δ<sub>h</sub>, δ<sub>v+</sub> and δ<sub>v-</sub> are defined in tables 7 – 9.

The horizontal gap δ<sub>h</sub> shall be calculated according to EN 15273-1:2013, Annex H1

The vertical gap δ<sub>v</sub> should be calculated considering:

- nominal platform height according to TSI INF: 2013 point 4.2.9.2

The absence of UTP INF does not influence the principle of the guidance.

The TSI INF and its particular clause 4.2.9.2 can be found at the following webpage:

<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2011:126:FULL&from=EN>

- nominal vehicle entrance height above track according to the vehicle construction drawing with design mass as defined in EN 15663:2009 (see also point 6.2.3.2 of the PRM TSI)
- zero track cant

### 2.5.11. Access/egress steps (point 4.2.2.11.2)

(2) *Internal steps for external access shall have a minimum depth of 240mm between the vertical edges of the step and a maximum height of 200mm. The height of each step may be increased to a maximum of 230mm if it can be demonstrated that this achieves a reduction of one in the total number of steps required.*

(5) *An external access step, fixed or moveable, shall have a maximum height of 230 mm between steps and a minimum depth of 150 mm.*

(8) *Rolling stock intended to stop, in normal operation, at existing platforms below 380mm height and having their passenger access doors above bogies need not comply with points (2) and*



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*(5) above if it can be demonstrated that this achieves a more even distribution of the steps height.*

The basic principle behind parameter 4.2.2.11.2 (8) is that the rolling stock cannot be asked to compensate for all deficiencies of the infrastructure compared to the target system.

When the platform is below 380mm, it is allowed for the rolling stock not to comply to the requirements (2) and (5), provided that it results in a better distribution of the steps height. The TSI does not mandate the presence of four steps in that case, because the presence of the bogies makes that impossible. It makes it also very difficult to comply to the requirement asking for 240mm deep steps.

Consequently, the access to those rolling stock may remain difficult. However, it was not the intention of the TSI to “kill” that particular architecture that presents some advantages in terms of capacity. Eventually, the infrastructure should be adapted, to better meet the accessibility requirements asked to the railway system.

It should also be noted that the revised TSI mandates inventories of assets to be done, and an implementation plan for the improvement of accessibility to be performed. Given the lifetime of rolling stock, proposing such a design is probably having a short-term strategy.

### 2.5.12. Movable step and bridging plate (point 4.2.2.12.1)

*(4) The extension of the moveable step or bridging plate shall be completed before the door opening permits the passengers to cross and conversely, removal of the step or plate may only begin when the door opening no longer permits any crossing of passengers.*

Operationally, it is not required that the moveable step is activated at every door opening/closing sequence.

Notified Bodies are invited to take this in consideration for the assessment of this parameter.

### 2.5.13. Interoperability constituent: interface of the door control device (point 5.3.2.1)

*(2) It shall be identifiable by touch (for example: tactile markings); this identification shall indicate the functionality.*

For example, the functionality “open door” can be identified with the following symbols “< >” while closing door can be identified by the opposite “> <”.

### 2.5.14. Interoperability constituent: standard and universal toilets: common parameters (point 5.3.2.2)

*(1) Any control device, including flushing system, shall contrast with the background surface, and shall be identifiable by touch.*

An exception should be made for devices controlled by an infrared. In such case, the pictogram has to be identifiable by touch, but the device itself cannot be.



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### 2.5.15. Interoperability constituent: Universal toilets (point 5.3.2.4)

*(10) All amenities shall be readily accessible to a wheelchair user.*

Amenities are: toilet paper holder, flush button, wash basin, soap dispenser, mirror, water dispenser and hand dryer (or paper towels when no hand dryer is provided).

The TSI is deliberately silent about the position from which the wheelchair user can reach those amenities: national preferences differ too much on that topic for reaching a common European position. It is therefore acceptable for conformity to the TSI that these amenities are reached either from a wheelchair position or from the toilet bowl.

### 2.5.16. Interoperability constituent: Displays (point 5.3.1.1)

*(1) Displays shall be sized to show individual station names or words of messages. Each station name, or words of messages, shall be displayed for a minimum of 2 seconds.*

Station names can be displayed complete or abbreviated if this is more convenient and if the abbreviation is clear. However, for the assessment of the IC, it is not required to know which station names will be displayed by the device.

### 2.5.17. Interoperability constituent: Baby nappy changing table (point 5.3.2.5)

*(3) It shall be possible to put it into the stowed position with only one hand, using a force not exceeding 25N.*

A methodology for the assessment of this parameter is given in the standard listed in chapter 5, index V.

### 2.5.18. Interoperability constituent: Boarding aids: on-board lifts (point 5.3.2.10)

*(2) The lift platform surface shall be slip resistant. At surface level, the lift platform shall have a minimum clear width of 760mm and a length of 1200mm. According to appendix M, an additional length of 50 mm shall be available for feet above a height of 100 mm above the lift platform, considering both inboard and outboard orientations of the wheelchair user.*

*(12) The loading-edge barrier (outer barrier) which functions as a loading ramp when the lift is at ground level, shall be sufficient when raised or closed, or a supplementary system shall be provided, to prevent a power wheelchair from riding over or defeating it. It shall be possible to put it into the stowed position with only one hand, using a force not exceeding 25N.*

See point 2.4.15 for explanations.



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### 2.6. Operational rules (points 4.4.1 and 4.4.2)

The applicable operating rules are set out in appendix K to the UTP LOC&PAS. The application of operational requirements as set out in the UTP PRM is subject to national implementation and is not mandatory within the scope of the UTP PRM.

*The following operating rules do not form part of the assessment of subsystems.*

It is reminded that the conformity to these rules need not be verified at the assessment of the subsystem or of the interoperability constituent. Therefore, the clarifications brought below are not intended to Notified Bodies but to applicants.

*Advertisements shall not be combined with routing information.*

Depending on the operational characteristics, advertisements and routing information can be physically separated (not on the same display), or displayed on the same display but not at the same moment.

*Operating rules shall be implemented to ensure consistency between essential visual and spoken information (refer to points 4.2.1.10 and 4.2.1.11). Staff making announcements shall follow standard procedures to achieve complete consistency of essential information.*

Essential information are information concerning the departure of trains (destination, departure time and delays, platform number).

#### *Access and Reservation of Priority Seats*

*Two possible conditions exist in connection with seats classified as 'priority'; (i) unreserved and (ii) reserved (refer to point 4.2.2.1.2). In case (i) the operating rules will be directed to other passengers (i.e. provision of signage) requesting them to ensure that priority is given to all persons with disabilities and persons with reduced mobility that are defined as being eligible to use such seats and that occupied priority seats should be given-up as appropriate. In case (ii) operating rules shall be implemented by the Railway Undertaking to ensure that the ticketing reservation system is equitable with regards to persons with disabilities and persons with reduced mobility...*

In case the seats need to be reserved mandatorily (case (ii)), the signage is not required in the train itself. The ticketing system will have the information about which seat numbers correspond to priority seats.

- *Rules for announcement of the final destination and the next stop*

*Operational rules shall be implemented to ensure that the next stop is announced no later than 2 minutes prior to the event (refer to point 4.2.2.7).*



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There can be operational rules that foresee that a staff member informs passengers individually of the next stop when they arrive at destination (case of night trains). In such cases, the audible signals required in point 4.2.2.7 need not be operated.

### 2.7. PRM Signage (appendix N)

#### *International wheelchair sign*

*The sign which identifies wheelchair accessible areas shall include a symbol in accordance with the specifications referenced in Appendix A, index 12.*

#### *Inductive loop sign*

*The sign indicating where inductive loops are fitted shall include a symbol in accordance with the specification referenced in Appendix A, index 13.*

#### *Priority seating sign*

*The sign indicating where there are priority seats shall include symbols in accordance with figure N1.*

When it is required that the sign includes a symbol "in accordance with", this refers only to the symbol (the drawing) and does not refer to the whole sign. This means that the shape of the pictogram is not necessary a square with right angles as shown in the TSI or in the referenced standards, but it can have, for instance, rounded angles. What is important is that the drawing inside is present and compliant.

*The signs provided for in point 4.2.1.10 shall have a dark blue background and a white symbol. Dark blue shall have a contrast of 0.6 relatively to white.*

A dark blue that would tend to black is acceptable provided that the contrast remains  $> 0,6$ .



### 3. CONFORMITY ASSESSMENT

#### 3.1. Assessment of the parameters of the second category

The international and European standards represent the state-of-the-art or the benchmark for accessibility. Therefore conformance to these standards is the easiest, clearest and in many cases the cheapest approach.

Where an applicant has chosen not to apply such standard then this approach is acceptable. However, this may involve additional efforts to justify that equivalence in terms of accessibility has been reached.

The application of a pre-existing National, Regional or local rule or standard, or validated company rule, when such rule has been commonly applied in other public areas, is acceptable. In such case, the equivalence only consists in a demonstration that the rule or standard is already commonly applied in railway /station infrastructure or other public areas or that it is mandatory by legislation.

When an applicant decides to apply neither the international or European standards nor a National, Regional, local or validated company rule or standard, but another rule, equivalence can be demonstrated by:

- The application of the “innovative solution” process described in the Article 7 of the Commission Regulation 1300/2014, or
- Prototyping and tests: tests shall involve representative groups of PRMs presenting different mobility reductions.

The figure below illustrates the possibilities given to an applicant for satisfying a requirement of the TSI, and the general rule for the verification of the conformity to the TSI in each case.

The first decision box is the only one that is mandatory, i.e when the requirement is technically detailed, it needs to be complied with.

Then, the different possibilities are listed in an order of easiness of the demonstration of compliance, not in an order of acceptability of the solution: all solutions are equally acceptable and none of them shall be considered preferable to the others.





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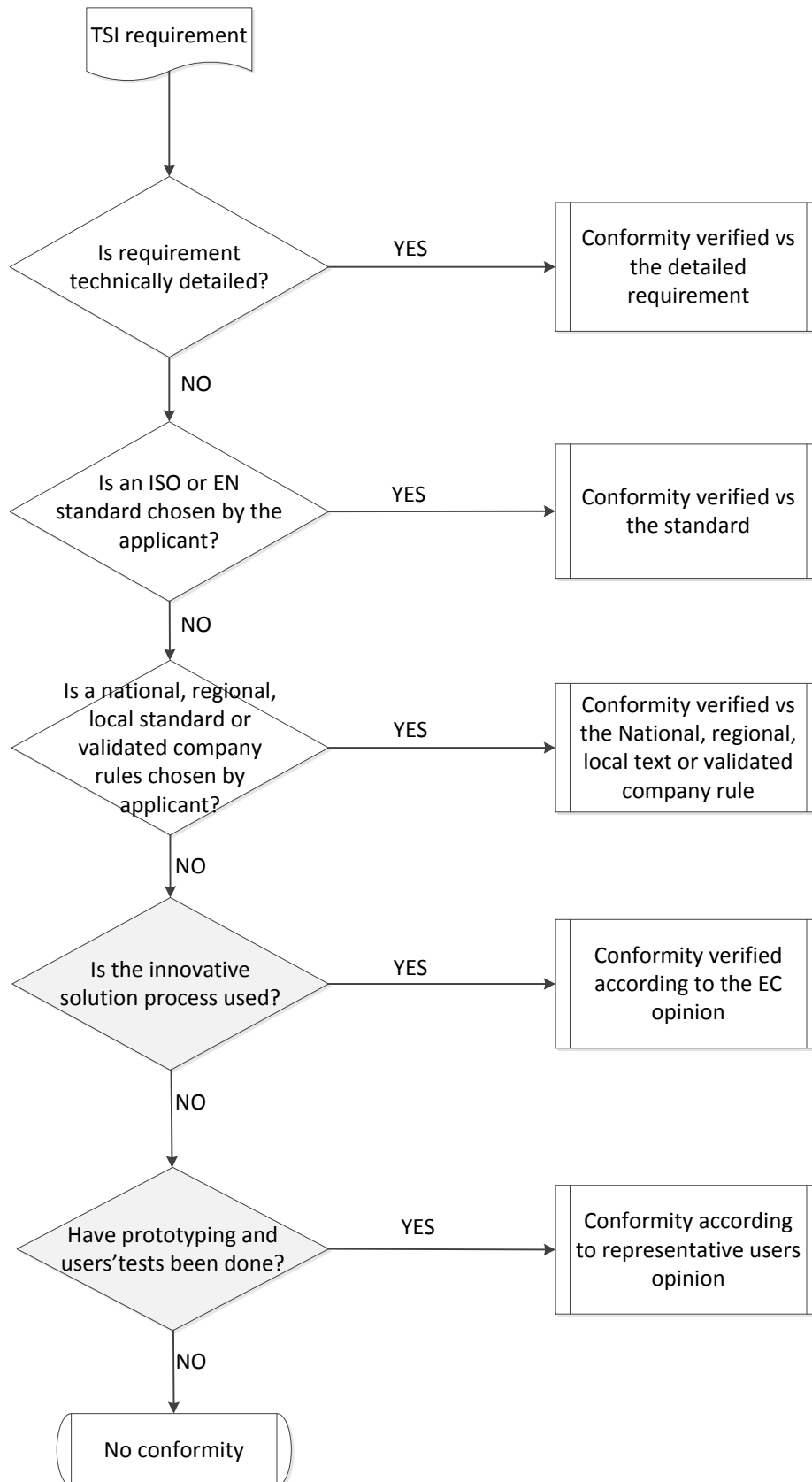


Figure 7: acceptable means of compliance



### 3.2. Assessment phases

#### 6.2.4. Technical solutions giving presumption of conformity at design stage

*With regard to this TSI, the infrastructure subsystem can be considered as an assembly made of a succession of recurring subcomponents such as:*

- *parking facilities,*
- *doors and entrances, transparent obstacles with their marking,*
- *tactile walking surface indicators, tactile information along obstacle-free routes,*
- *ramps and stairs with handrails,*
- *mounting and highlighting of furniture,*
- *ticketing or information counters,*
- *ticket vending and control machines,*
- *visual information: signposting, pictograms, dynamic information,*
- *platforms, including ends and edges, shelters and waiting areas when provided,*
- *level track crossings.*

*For those subcomponents of the infrastructure subsystem, presumption of conformity may be assessed at design stage prior to and independently from any specific project. An intermediate statement of verification (ISV) shall be issued by a notified body at design stage.*

An applicant can define a standard solution for covering each of the above listed points (which are not exhaustively listed). For instance, an applicant can design a standard accessible desk and have this design verified by a Notified Body who would issue an ISV for this “accessible desk”.

After this ISV has been issued, the applicant can install the verified “accessible desk” in any new, renewed or upgraded station without further verification.

*The characteristics of the subsystem to be assessed during the relevant phases are indicated in appendix E to this TSI, Table E.1 for infrastructure subsystem and Table E.2 for rolling stock subsystem. The applicant shall confirm that each subsystem produced complies with the type.*

In table E1, the line entitled “obstacle free route” covers both points 4.2.1.2.1 Horizontal circulation and 4.2.1.2.2 Vertical circulation of the TSI.

Regarding boarding aids on platforms (point 4.2.1.14 of the TSI), the only parameter to check is the secured storage of those boarding aids, and the absence of hazard or obstruction for passengers. This point 4.2.1.14 is not mentioned in the table because it is not required to be checked by a Notified Body.



### 4. IMPLEMENTATION

#### 4.1. Application of this TSI to new Infrastructure (point 7.1.1)

The application of infrastructure related parameters of the UTP PRM is voluntary, but recommended.

*This TSI does not apply to new stations which have already been granted a building permit or which are subject to a contract for construction works that is either already signed or under final phase of tendering procedure at the date of application of this TSI. Anyhow, in such cases, PRM TSI 2008 has to be applied within its defined scope. For those station projects, where PRM TSI 2008 will have to be applied, it is permissible (but not mandatory) to use the revised version, either totally or for particular sections; in case of application limited to particular sections, the applicant has to justify and document that applicable requirements remain consistent, and this has to be approved by the notified body.*

The text quoted from the PRM TSI is not identical to the text in the UTP PRM, the UTP reads:

*This UTP does not apply to new stations which have already been granted a building permit or which are subject to a contract for construction works that is either already signed or under final phase of tendering procedure at the date of application of this UTP.*

It is recommended to apply, as far as feasible, the UTP PRM to new stations which have already been granted a building permit or which are subject to a contract for construction works that is either already signed or under final phase of tendering procedure at the date of application of this UTP.

The revised TSI can be used for station projects that should normally be assessed according to the TSI 2008; in such a case it does not necessarily need to be applied in its entirety. There may be reasons not to apply the revised TSI entirely: for example, civil works may be advanced, with 800mm entrance doors already in place making the difficult the use of the revised TSI that requires 90cm. This should not prevent an applicant from using the new TSI for the marking of those doors, for instance.

In such case, it is necessary to ensure that the mix of TSIs remains consistent and does not result in contradictions or to the disappearance of some parameters. The applicant shall justify that, and a notified body has to approve it.

*Where stations which were closed for a long time to passenger service are put in service again, this may be treated as renewal or upgrade according to point 7.2.*

The purpose of this sentence is to clarify the case of the re-opening of stations in contexts such as the re-opening of lines. In case a station is re-opened to passenger service after being closed because no service was provided, it should not be considered as a new station subject to full compliance with the requirements of chapter 4 but as an upgraded existing station, subject to a gradual improvement of accessibility including conformity with the TSI only for those parts that are upgraded.



### 5. APPLICABLE SPECIFICATIONS AND STANDARDS

International and European standards of voluntary use which have been identified during the drafting process of the TSI are listed in the table, column “Clause(s) of the Standard N°”; as far as possible, the clause of the standard which is relevant for the conformity assessment of the TSI requirement is identified. In addition, the column “Purpose” gives a written explanation regarding the purpose of the reference to the standard.

The table is to be revised on a regular basis, in order to take into account new or revised harmonised standards.

In particular, a series of European standards about accessibility is expected to be published in 2015 or 2016; this annex will be adapted after their publication. Until their publication, some specific methodologies from these standards are available in appendix 2.

Index	Characteristics to be assessed	Clause(s) of the Standard N°	Purpose
A	Contrast	ISO 21542:2011, § 13.5, 35, 40.6	
		See Appendix 2, §1	
B	Self-contrast	See Appendix 2, §1	
C	Tactile	ISO 21542:2011, § 40.10 to 40.13	For the detailed characteristics of the tactile signage.
D	Tactile walking surface indicators	ISO 21542:2011, Annex A	
		ISO 23599:2012	
		ISO 21542:2011, § 13.5	For the details of the tactile walking surface indicators for stairs
E	Readability of a typeface	See Appendix 2, §2	
		ISO 21542:2011, § 40.5	Except the paragraph about the reading distance and letter height
F	Palm operation	See Appendix 2, §3	
G	Slip resistance of floor surfaces	See Appendix 2, §4	Applicable for the assessment of boarding aids and rolling stock access steps
		EN 14041:2004	



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Index	Characteristics to be assessed	Clause(s) of the Standard N°	Purpose
		DIN 51130	A category R9 and better is acceptable, R10 and better in toilets areas when provided For weather protected areas outside a building (e.g. platforms) R10 as a minimum applies. For outside areas (e.g. platforms) that are not weather protected R11 or R10 / V4 applies.
		NF XP 05-011	A category PC6 and better is acceptable, PC10 and better in toilets areas when provided
		EN 13893:2002	A dynamic coefficient of friction of 0.3 and better is acceptable
		CEN/TS 16165:2012	Determination of the slip resistance of pedestrian surfaces – Methods of evaluation
H	Slip resistance of ground surfaces	EN 1338 Concrete paving blocks — Requirements and test methods	
		EN 1339 Concrete paving flags — Requirements and test methods	
		EN 1341 Slabs of natural stone for external paving — Requirements and test methods	
		CEN/TS 16165:2012	Determination of the slip resistance of pedestrian surfaces – Methods of evaluation
I	Slip resistance of boarding aids and access steps	See Appendix 2, §4	Applicable for the assessment of boarding aids and rolling stock access steps
J	Parking places	ISO 21542:2011, § 6	§ 6.2 and 6.3 are used for the assessment. Other paragraphs can be used for guidance but they need not be assessed.
K	Reflectance of the floor surface	ISO 2813:1999	A gloss level of 50 or lower is acceptable.
L	Ramps	ISO 21542:2011, § 8.2	Tables 2 and 3 for the maximum slope and length of the ramps



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Index	Characteristics to be assessed	Clause(s) of the Standard N°	Purpose
M	Door operating devices	ISO 21542:2011, § 18.1, § 36.1 to § 36.6	Except 18.1.1 for the door width, 18.1.5, 18.1.6, 18.1.7 and 18.1.13
N	Highlighting of transparent obstacles	ISO 21542:2011, § 18.1.5	
O	Accessible toilets	ISO 21542:2011, § 26.1 to 26.15	§ 26.4 and 26.6 to 26.9 are used for the assessment. Other paragraphs can be used for guidance but they need not be assessed.
P	Guarding of suspended items	ISO 21542:2011, § 7.14	
Q	Accessible desk	ISO 21542:2011, § 19	
R	Accessible ticket vending machines	ISO 21542:2011, 36.8	
S	Illuminance levels	EN 12464-1 and -2.	
		ISO 21542:2011, 33	
T	Emergency lighting	EN 1838:2013	
U	Pictograms	ISO 3864-1:2011	For the colours and shapes of the signs
V	Baby nappy changing table	See Appendix 2, §5	



### Appendix 1: Examples to illustrate the “equivalence” of national standards with European or International standards

The basis for the appendixes of this document is the ERA appendix to the Application guide for PRM TSI, with reference ERA/GUI/02-2013/INT.

The appendix 2 contains only extracts from a series of standards that are at time of writing of this guide going through the very final stage of the CEN approval process. As soon as the standards are available, the text of this appendix will be replaced by references to the standards.

#### 1. Quantity of Parking Places (4.2.1.1)

*(1) Where a station specific parking area exists, there shall be sufficient and adapted parking spaces reserved for persons with disabilities and persons with reduced mobility eligible to utilise them at the nearest practicable position, within the parking area, to an accessible entrance.*

The requirement to be fulfilled is the provision of a sufficient number of adapted parking places. Being a parameter of the second category, this requirement can be satisfied by an International standard and by other standards as expressed in point 2.3.1.

Regarding the quantity of parking spaces, ISO 21542:2011 requires:

*“If no national requirements or regulations are available, the following minimum requirements concerning the number of parking places shall apply:*

- a minimum of 1 accessible designated parking space should be provided in every parking area,*
- up to 10 parking spaces: 1 designated accessible parking space,*
- up to 50 parking spaces: 2 designated accessible parking spaces,*
- up to 100 parking spaces: 4 designated accessible parking spaces,*
- up to 200 parking spaces: 6 designated accessible parking spaces,*
- over 200 parking spaces: 6 designated accessible parking spaces + 1 for each additional 100.”*

For example, the French regulation (Annexe 8 of the Circulaire Interministerielle n° DGUHC 2007-53 of 30<sup>th</sup> of November 2007) requires the following quantity to be provided:

*“Adapted parking places shall represent a minimum of 2% of the total number of places for the public. The minimum number of adapted places is rounded up to the superior value. Above 500 places, the minimum number, which shall not be lower than 10, is determined by a “Municipal Arrêté” (i.e regulated by the City).”*

In the UK, the Code of Practice about Accessible Train Station Design for Disabled People, published by the Department for Transport (version 2 from September 2010) quotes the British Standard BS 8300, § 4.2.1.4:

*“The number of designated disabled persons’ parking spaces will depend on the overall capacity of the car park. The minimum number of spaces designated for disabled motorists must be 5 per cent of the total capacity of the car park.*



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*In addition to this 5 per cent of capacity, a minimum of one space should be provided per employee who is a disabled motorist.”*





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The table below summarizes the quantity of adapted parking places to provide according to each of the standards:

Number of parking places	Quantity of adapted places		
	ISO 21542	French legislation	British code of Practice (places for the public only)
10	1	1	0.5
50	2	1	2
80	4	2	4
100	4	2	5
150	6	3	7.5
200	6	4	10
400	8	8	20
600	10	10 or more (City regulation)	30

Obviously, the number of adapted parking places is not identical when calculated according to the three different standards. However, all solutions should be considered equivalent because they define a minimum quantity of adapted parking places to be provided: reasons why the French Regulation results in a lower number of places than ISO 21542 while the British Code of Practice results in a higher number need not to be examined as long as these National rules commonly apply to other car parks than station car parks.

For that reason, the point 3.1 of this guide mentions that “the equivalence only consists in a demonstration that the rule or standard is already commonly applied in railway /station infrastructure or other public areas or that it is mandatory by legislation.”

Also, this example illustrates the clarification provided in point 2.3.1 of this guide: “National/regional/local standards can only be applied on the territory they cover”: it is not the intention of the PRM TSI to allow cherry picking between all national/regional/local standards applicable in Europe; such cherry picking would be detrimental to the harmonisation at national or local level.

## 2. Value of the ramps

*(3) Ramps shall be installed for persons with disabilities and persons with reduced mobility unable to use stairs where lifts are not provided. They shall have a moderate gradient. A steep gradient is allowed for ramps on short distances only.*



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The ISO 21542 authorizes several gradients from 5% to 12.5%, and for each gradient authorizes a maximum length between two landings (no landing required for a 5% gradient, one landing every 600mm for a 12.5% gradient).

The French Regulation already cited authorizes a gradient of 5% with a landing every 10m, 8% with a landing every 2m and 10% with a landing every 500mm.

The Règlement Grand-Ducal of 25th January 2008 modifying the text from 23rd November 2001 from Luxembourg, relative to the accessibility to public buildings authorizes a gradient of 6% with a landing every 6m,

The British code of Practice already cited authorizes several gradients from 5% to 8.3%, and for each gradient authorizes a maximum length between two landings (10m between landings for a 5% gradient, and 2m between landings for a 8.3% gradient).

The Swiss standard (SN 640238) points out: for straight ramps with a slope of more than 6% a landing is required after a vertical height of 2,00m to 2,50m. Ramps to rail platforms need normally short ramps without landings (because of the safety for passengers waiting on the platform to reduce the part of the platform with narrow/small dimensions). A landing is required when the direction of the ramp is changing  $\geq 90^\circ$ .

These examples, which are not exhaustive, illustrate again the equivalence of technical solutions for the fulfilment of the requirement. They are all acceptable, even if resulting in different ramps.



### Appendix 2: Specific methodologies

#### 1. Determination of the LRV values and of the contrast

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

For the purposes of this methodology “Contrast” is to be assessed by the diffused light reflectance value, but can be enhanced by variation in hue and chroma.

##### 1.1 Establishing LRV values

###### Method of establishing LRV value if the specification of the colour IS known

If the materials chosen are from a colour system that defines the LRV values of any given colour (e.g. NCS) or have a previously confirmed LRV value (following testing) then these are used when calculating the contrast.

Define colours for all items, surfaces, materials, etc. where contrast is required existing known LRV values shall be used.

###### Method of establishing LRV value if the specification of the colour IS NOT known

The method of test is applicable to:

- opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a surface texture of < 2 mm;
- opaque coverings including those that cause extreme angular dependences of reflected light, and those that have an unyielding texture of < 2 mm;
- opaque coverings with a yielding pile, e.g. carpet;
- opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a texture of < 2 mm, e.g. finished metals;
- 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 texture of < 2 mm;
- multi-coloured surfaces;
- ordinary materials.

The method of test is not suitable for the following surfaces:

- thermochromic; photochromic; retroreflecting; fluorescent; phosphorescent; surfaces involving electrical power for light emission; self-luminous characteristics or for free-standing, non-opaque materials, e.g. glass and clear plastic for curved surfaces.

###### Apparatus

A sphere-type spectrophotometer shall be used, capable of measuring LRV to a precision compatible with the reproducibility of 1 unit % E CIE  $L^*a^*b^{*2}$ .

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<sup>2</sup> See CIE Colorimetry 15:2004



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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 (Y2) (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° shape of the instrument makes it applicable for high-gloss surfaces as well as matt surfaces. A spectrophotometer designed to meet the same conditions as 7.2 but with the light path reversed is permitted. Where a single beam integrating sphere is used, the treatment of the outputs needs to include a correction for the reduction in sphere efficiency caused by specimen absorption. Without such a correction the instrument shall give a non-linear output.<sup>3</sup>

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.

### Preparation of test specimens

Three specimens shall be selected as being representative of the surface for the test. Where there is variability in the colour of the three specimens, then nine specimens shall be selected.<sup>4</sup>

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.<sup>5</sup>

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.

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<sup>3</sup> Standard illuminant, CIE D65, (as defined in CIE 15:2004.)

<sup>4</sup> Variability in the colour of the three specimens occurs where the difference between the highest and lowest LRV is W4

<sup>5</sup> Surfaces that are not sensitive to stroking do not need to be pre-treated in this way.



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Where there is concern with regard to 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.<sup>6</sup>

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

### Procedure

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

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<sup>7</sup>:

- wavelength range and interval;
- size of aperture;
- specular component included;
- standard illuminant type;
- where there is choice of % UV, select 100 % UV.

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.

### Test

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

- the specimen shall be determined to be opaque, using the method shown above;
- the method of preparation and presentation of the specimens shall be selected;
- if the instrument conditions required to measure the specimen are not those used during the calibration, adjust to comply with the calibration requirements;
- measure the LRV of the specimen in accordance with this standard, using CIE Tristimulus Y10, Illuminant D65 and the 10° colorimetric observer;
- all measurements shall be taken with the instrument using even pressure without deforming the specimen.

When selecting the measuring points, they shall be distributed over the entire surface of the specimen.

- 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;
- the specimens shall be measured on a measurement grid as shown in Figure 8.

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<sup>6</sup> For textiles the stability of the colour and appearance of a specimen is defined in BS EN ISO 105-B05 and BS 8475.

<sup>7</sup> The sequence to be followed varies between different instruments



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- 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 75 mm × 75 mm grid that covers the surface of the specimen, as shown in Figure 8b.
- 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<sub>av</sub>) for the overall specimen is given by:

$$\text{LRV}_{\text{av}} = [(\text{LRV}_{\text{av}1} \times A_1) + (\text{LRV}_{\text{av}2} \times A_2) + (\text{LRV}_{\text{av}n} \times A_n)]/A$$

Where:

- LRV<sub>av</sub> = average LRV of the overall specimen (CIE Y10)
- LRV<sub>av1</sub> = average LRV of distinct colour “1” of the specimen (CIE Y10)
- A<sub>1</sub> = area of distinct colour “1” (m<sup>2</sup>)
- LRV<sub>av2</sub> = average LRV of distinct colour “2” of the specimen (CIE Y10)
- A<sub>2</sub> = area of distinct colour “2” (m<sup>2</sup>)
- LRV<sub>avn</sub> = average LRV of the last distinct colour “n” on the specimen (CIE Y10)
- A<sub>n</sub> = area of the last distinct colour “n” (m<sup>2</sup>)
- A = total area of specimen (m<sup>2</sup>).

The area of the specimen is to be either 0,202 5 m<sup>2</sup> for a 450 mm × 450 mm specimen or 0.81 m<sup>2</sup> for a 900 mm × 900 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<sub>av</sub>) is found in accordance with 6.2.2.4.

Measurements on general surfaces, including carpet specimens, shall be taken on specimens of a minimum size of 450 mm × 450 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 mm × 150 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 8a).

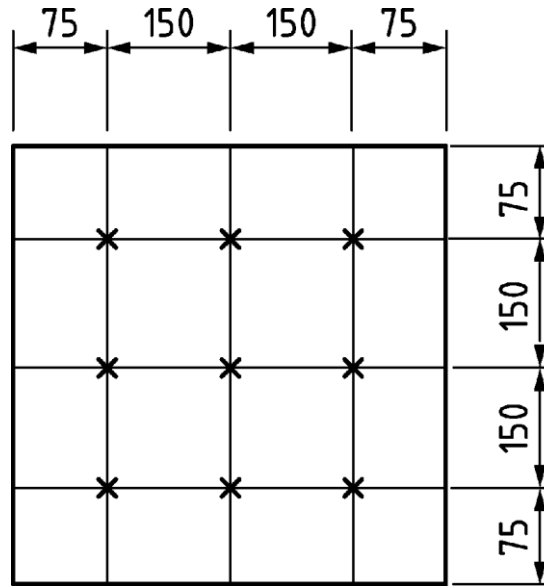
Following the first measurement at each measurement point the instrument shall be turned 90° three times and measurements taken after each 90° turn. The results of each measurement shall be recorded and the average LRV (LRV<sub>av</sub>) for the specimen determined.

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

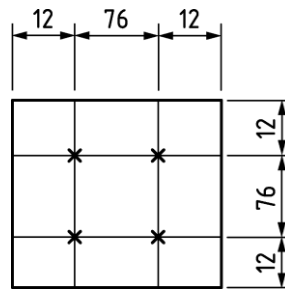
Dimensions in millimetres



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a) Measurement grid for 450 × 450 mm specimens



b) Measurement grid for 100 × 150 mm specimens



c) Typical paint samples (150 mm × 100 mm)  
Figure 8 Measurement grids for specimens

### Expression of results

The instrument shall, either independently or with additional software and hardware, calculate the LRV, which is the CIE Tristimulus Y10 value.

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



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### 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:

- the reference to this application guide;
- name of organization carrying out the test;
- date of test;
- the specimen identification details;
- the number of specimens measured;
- the method of specimen preparation used;
- identification of the instrument used including, where appropriate, manufacturer, model, serial number and optical geometry;
- details of the conditions of test;
- measurement area and observer angle;
- description of specimen including CIE Y10, x10, y10 colour identification;
- description of additional feature, e. g. texture, gloss or grain;
- size of specimen used in the test;
- LRV measurements for all measurement points;
- average LRV (LRVav) measurement for each specimen and the range of measured LRVs;
- for multi-coloured specimens the average LRV for the overall specimen (LRVav) and the average LRV for each of the distinct colours on the specimen;
- any deviations from the specified procedures.

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

### **1.2 Specific assessment criteria for stainless steel**

Stainless steel has many unique properties 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 and can give a variance in excess of 5 points. The following condition shall then be considered when assessing stainless steel:

- Stainless steel in all other applications than the specific situation specified in 7.2 shall meet the contrast requirement to its background in accordance with the assessment/measuring methodology above and shall be assessed with an increased difference of 35 points (0,35) to ensure that the variance in readings doesn't drop below 30 points.

### **1.3 Method of assessing contrast with LRV values established**

The contrast shall be assessed using Figure 9 which has been derived from the following:

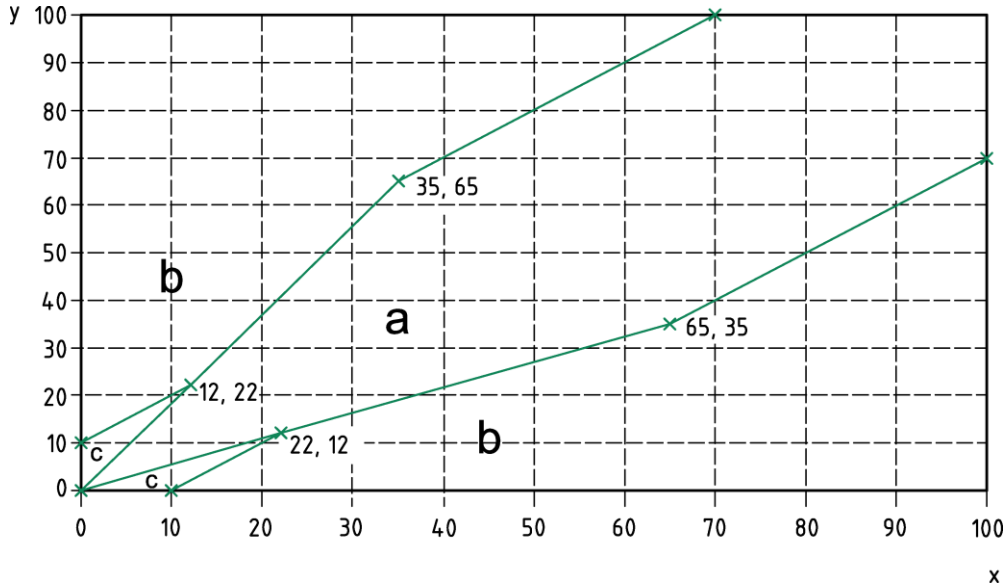
- 1) TSI/DIN formula up to a point then 30 points constant with an initial 10 point minimum difference for non flooring finishes;





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2) Flooring finishes uses the lines derived from the formula 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).



### Key

'a' LRV values that intersect in this area do not achieve an acceptable contrast level

'b' LRV values that intersect in this area achieve an acceptable contrast level

'c' LRV values that intersect in this area achieve an acceptable contrast level ONLY if the material being assessed is a flooring material

x the LRV of the object L0

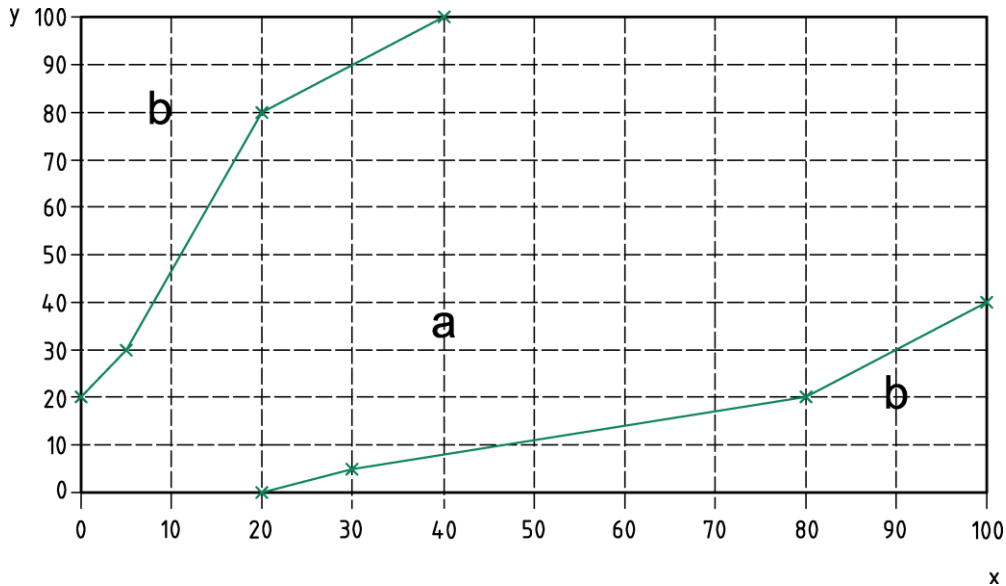
y the LRV of the background or adjacent surface Lh

Figure 9: Acceptable and not acceptable contrast chart

The contrast measured value shall be maintained in normal operation and not just when assessed as new. Therefore 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 shall be used when assessing the durability of signage and decals.

### 1.4 Specific requirements for signage

When the LRV values for the parts of the sign are known then the simple calculation based on 0,6 minimum is all that is required. It is accepted that the areas marked 'b' in the following diagram correspond to the fulfilment of this requirement..



### Key

a' LRV values that intersect in this area do not achieve an acceptable contrast level

'b' LRV values that intersect in this area achieve an acceptable contrast level

x the LRV of the background or adjacent surface Lh

y the LRV of the character Lc (number, letter or symbol)

Figure 10: Contrast for signage

## 1.5 Specific requirements for displays

As above when the relevant criteria from the electronic displays is known then the simple calculation based on 0,6 minimum is all that is required.

The criteria that are pertinent to this assessment are:

- 1) visual acuity of 0,3 shall be the assumed minimum with a recommended 0,1;
- 2) reading distance range, height and angle range of the display, height the eye points shall be assumed to be 1,5 m above the floor;
- 3) ambient light limits;
- 4) luminance of the display and reflection of the screen (including the protective housing/cover/ glass);
- 5) character heights (quantity of information and size of display are key consideration when defining the character height).

Points 1 to 5 can be assessed independently to the installation (e.g. under laboratory conditions) except point 3 which is dependent on the installation so can only be defined as a set of limits under which a display is acceptable.

## 1.6 Self-contrast

Visual bands consisting of two separate colours that have a minimum difference in LRV of 60 points can be considered to be adequate to achieve contrast against varying lighting conditions and backgrounds.

Regarding stainless steel grab-poles, grab-rails and handrails (including bends in that rail or pole) the use of stainless steel with a surface finish of K300 to K500 is sufficient for the item to be considered as a self contrasting pole (when the lighting is in accordance with the requirements of the TSI).



### 2. Readability of a typeface

Written information should use Sans Serif fonts, in mixed case (i.e. not in capital letters only). Descenders (i.e. part of any of the characters g, j, p, q or y which protrudes below the level of the baseline as shown in the figure below) and ascenders (i.e. part of any of the characters b, d, f, h, i, j, k, l or t which protrudes above the x-height of the characters as shown in the figure below) should not be compressed. Descenders should have a minimum size ratio of 20% to the upper case characters.



**Key**  
a Baseline  
b Descender height  
c Ascender height  
d x-height of character  
e Uppercase character height

Figure 11: typeface - definitions

### 3. Palm operation

A palm operated device is a device operable by the palm or any part of the hand in its working position, not requiring fingers to be unclenched

The design need is that passengers with painful conditions, which affect their joints such as arthritis, may be unable to exert any force with the tip of a single finger and they are likely to experience discomfort or pain if they do. Many will not be able to unclench their fingers to do this or perform any pulling action.

Assessment of palm operation of a control device can be done by pulling or pushing the device depending on its normal mode of operation with a clenched fist or hand (without extending fingers) as per the definition above.

The following figure represents a device that can be used to represent a clenched fist when assessing any need to pull or push a control, control device or component. The representative clenched fist will be manufactured from aluminium and attached to a force meter for the tests.

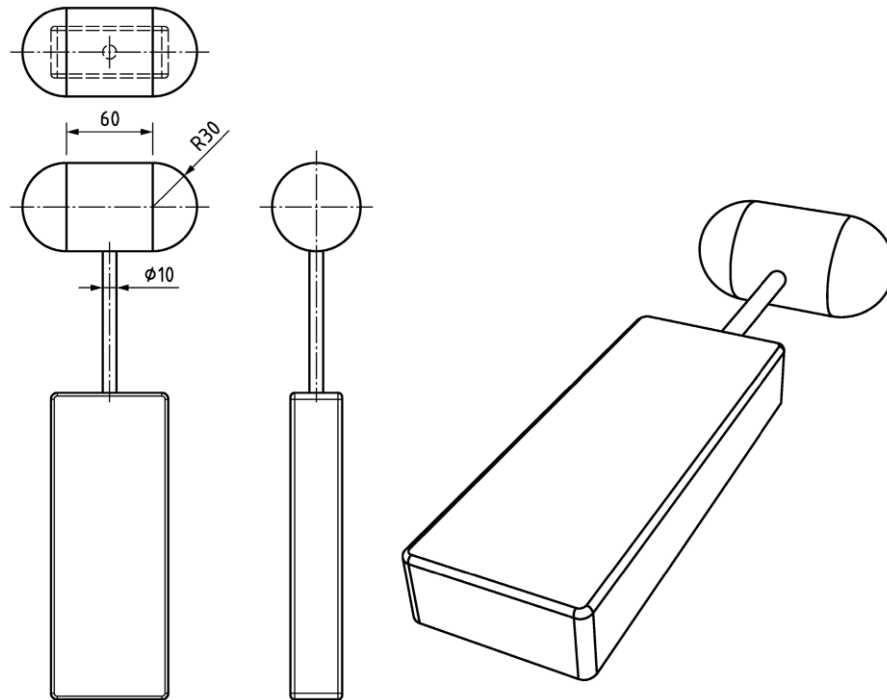


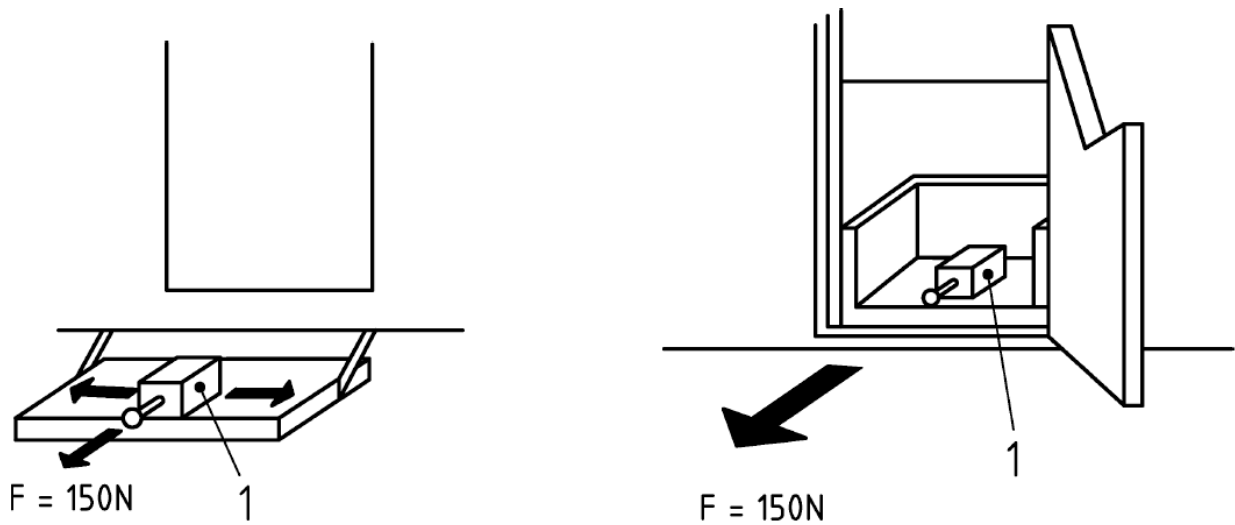
Figure 12: clenched fist device attached to a force meter

#### 4. Slip resistance of boarding aids and rolling stock access steps

This test method is to determine the slip resistance of the surface of entrance steps, separate, attachable or integral, ramps and lifts.

##### 4.1 Preparation and procedure

1. Place the step (separate, attachable or integral) in an horizontal position  $\pm 2^\circ$  (3,5 %) (See Figure below);
2. Carry out the test at an ambient temperature of  $15^\circ\text{C} \pm 10^\circ\text{C}$ ;
3. Roughen the surface of the rubber sole of the friction test piece once before each test by placing it on a sheet of grade 60 to 63 emery paper and pull it, at a constant rate of  $(150 \pm 10)$  mm/s, a distance of 300 mm across the surface of the emery paper;
4. Spray evenly the top surface of the tread to be tested with a minimum of 1 l of drinking water immediately prior to carrying out procedures 5) and 6);
5. Place the friction test piece upon the step;
6. Apply a horizontal force of 150 N for approximately 10 s, using a load cell, to the friction test piece during which there shall be no visually discernible movement of the friction test piece;
7. The above procedure 5) and 6) shall be carried out as many times as necessary to test the complete surface of the tread(s) of the step(s).



### Key

1 Friction test piece

Figure 13: Friction Test Piece shown on an external or moveable step and an integral step

## 4.2 Expression of results

The item under assessment shall be considered to have passed the test and, in case of a rolling stock, for its step(s) to be suitably slip resistant in accordance with the requirements if during the test there was no visually discernible movement of the friction test piece.

## 4.3 Test Report

A test report shall be prepared stating whether the item under assessment passed or failed the test.

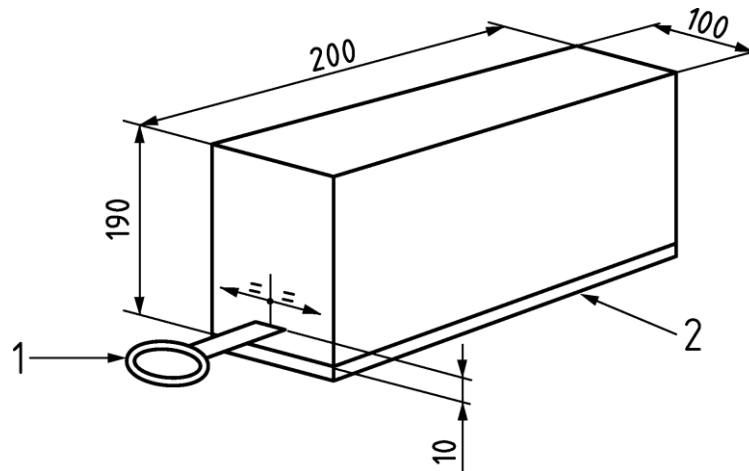
The report shall state the following, if applicable:

- the approximate degree of movement of the friction test piece on the step;
- the position of the friction test piece on the step when movement was discerned.

## 4.4 Friction test piece

The friction test piece is comprised of a 30 kg steel block, 200 mm long, 100 mm wide approximately 190 mm deep (depending on the density of the steel) with an 8 mm thick rubber sole bonded to its base. The rubber sole shall be as specified in ISO 4649:2010. A typical friction test piece is shown in the figure below.

Dimensions in millimetres



**Key**

- 1 Pulling hook securely attached
- 2 8 mm rubber sole

Figure 14: friction test piece

### 5. Stowing a baby nappy changing table (Interoperability Constituent)

Assessment should be shown to be within the normal reach of the agreed design range (e.g. 5%ile female to 95%ile male in a wheelchair) demonstrated by 3D model/drawing and relevant anthropometric data or within the reach envelopes as described in Figure L.1 of the PRM TSI.

Assessment of the stowing operation: the force required to stow the baby changing table shall not exceed 25 N. Stowing that baby changing table with only one hand should be possible.