
British Standard

Safety rules for the construction and installation of escalators and passenger conveyors

Normes de sécurité pour la construction et l'installation des
escaliers mécaniques et des trottoirs roulants

Sicherheitsregeln für die Konstruktion und den Einbau von Fahrtreppen und Fahrsteigen

This European Standard EN 115 was given, as from 31 October 1983, the status of a British Standard. The status of the existing relevant British Standard BS 2655 : Part 4 is explained in the national foreword and national appendix W.

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National foreword

This British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and is identical with European Standard EN 115 ‘Safety rules for the construction and installation of escalators and passenger conveyors’.

It is to be noted that in 1976, the Commission of the European Communities (CEC) conferred a mandate to the European Committee for Standardization (CEN) regarding the creation of a standard with a view to promoting the free traffic of escalators, pallet passenger conveyors, belt passenger conveyors and parts of this equipment, within the European Community. The CEN Conseil de Gérance accepted this mandate through Resolution 10 taken at the 4 to 5 November 1976 meeting and appointed CEN/TC 10 to carry it out. European Standard EN 115 will be presented to the CEC as the implementation of such a mandate.

Together with the publication of this British Standard BS 2655 : Part 4 has been made obsolescent by amendment action. The obsolescent requirements will be retained in

BS 2655 for reference purposes to enable new installations ordered before publication of this standard to be completed and to enable existing escalators and passenger conveyors to be maintained. The dates and conditions for implementing BS 5656 are stated in appendix W.

In addition to the requirements for escalators specified in this standard readers should note that the Health and Safety Executive (HSE) has published Guidance Note PM 34† ‘Safety in the use of escalators’ which describes some of the inherent hazards and areas of risk experienced in the use of escalators and recommends certain precautions that should be taken to alleviate those hazards.

Attention is drawn to the use in this standard of the comma as a decimal marker. This is to accord with European practice, but it should be noted that it is current practice in British Standards to use a full point on the baseline as a decimal marker.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

*EN 115 contains its own contents list.
†Obtainable from HMSO.

National appendix V

National variations

V.1 Introduction. This national appendix provides details of national variations that are permitted to supplement the requirements of this British Standard.

V.2 Specific national variations

V.2.1 *Clause 5.1.5.6.3*

The following extract from HSE Guidance Note No 34* is relevant.

'15. Deflector devices for new escalators

A deflector device is intended to minimise the likelihood of contact with the possible trapping point by causing feet to be more safely positioned, loose clothing to be kept clear or, should someone fall on the escalator, by deflecting fingers from the trapping area.

Such devices should be fitted to all escalators ordered after 1 January 1984. They should be requested from the manufacturers or their UK agents by firms and organisations purchasing escalators. Several types of deflector device can be made available. One particular type has been in use for many years in public transport undertakings. More recently other types have become available which make use of suitably placed brush bristles.'

V.2.2 *Clause 16.2, paragraph 2*

Not applicable to this British Standard. There are no such approved persons or organizations in the UK.

V.2.3 *Clause 16.3.2*

There are at present no UK regulations covering responsibility for such a register. The National Committee recommends that the register be lodged with the person(s) designated as immediately responsible for the escalator by legislation relating to the particular circumstances.

V.2.4 *Clause 16.4*

No national variation.

National appendix W

Dates and conditions for implementing BS 5656

(hereinafter in this national appendix referred to as 'this standard').

W.1 This standard is applicable to all new escalators and passenger conveyors installed in such new buildings as are designed after the date of publication of this standard (31 October 1983).

W.2 All new escalators and passenger conveyors ordered after 31 October 1983, for installation in such buildings as have not yet been commenced but for which final plans existed before 31 October 1983, should be constructed preferably in accordance with this standard or in accordance with BS 2655 : Part 4 ('Lifts, escalators, passenger conveyors and paternosters Part 4 General requirements for escalators and passenger conveyors'). If, however, such escalators and passenger conveyors installations are scheduled for commissioning after 31 October 1987, the requirements of this standard only are applicable.

W.3 All new escalators and passenger conveyors ordered after 31 October 1983, for installation in such new buildings as were under construction or completed before that date, are permitted to be constructed in accordance with either this standard or BS 2655 : Part 4. If, however, such escalators and passenger conveyors installations are scheduled for commissioning after 31 October 1987, the requirements of this standard only are applicable unless it can be shown that compliance is not reasonably practicable.

W.4 Such new replacement escalators and passenger conveyors and major modifications to existing escalators and passenger conveyors as are commissioned before 31 October 1987, for use in existing buildings that were built before 31 October 1983, are permitted to be in accordance with either this standard or BS 2655 : Part 4. After 31 October 1987, the requirements of this standard only are applicable unless it can be shown that compliance is not reasonably practicable. Special provisions are permissible to meet certain site conditions often present in buildings that have been in use for many years. It is intended that the use of new equipment should not automatically be restricted because certain site conditions are now more rigorous than formerly. However, any deviations from this standard will have to ensure a minimum acceptable standard of safety having regard to the circumstances affecting the installation, whilst permitting an installation of reasonable standard to be modernized or reconstructed, in stages if necessary.

National appendix X

Corresponding British Standards for international standards and for CENELEC harmonization documents referred to

X.1 International standards. Clause 2 of EN 115 lists a number of international standards that are referred to in the text of the standard. The available corresponding British Standards are as follows.

International standard	Corresponding British Standard
IEC 158-1 : 1970	BS 5424 Specification for control-gear for voltages up to and including 1000 V a.c. and 1200 V.d.c. Part 1 : 1977 Contactors (Identical)
IEC 337-1 : 1970	BS 4794 Specification for control switches (switching devices, including contactor relays, for control and auxiliary circuits, for voltages up to and including 1000 V.a.c. and 1200 V.d.c.) Part 1 : 1979 General requirements (Identical)
IEC 439 : 1973	BS 5486 Specification for factory-built assemblies of switchgear and controlgear for voltages up to and including 1000 V.a.c. and 1200 V d.c. Part 1 : 1977 General requirements (Identical)

*See national foreword.

X.2 CENELEC harmonization documents. Clause 2 of EN 115 also lists a number of CENELEC harmonization documents that are referred to in the text of the standard. Some of these harmonization documents have been, or will be, the subject of British Standards:

HD 21 is reflected in:

BS 6004 : 1975 PVC-insulated cables (non-armoured) for electrical power and lighting

BS 6500 : 1975 Insulated flexible cords

BS 6746 : 1976 PVC insulation and sheath of electric cables;

HD 22 is reflected in:

BS 6007 : 1975 Rubber-insulated cables for electric power and lighting

BS 6500 : 1975 Insulated flexible cords

BS 6899 : 1976 Rubber insulation and sheath of electric cables;

HD 384 is reflected in the 15th edition of 'Regulations for electrical installations' published by the Institution of Electrical Engineers.

HD ——— is at present clause 32 of IEC 364-3 : 1977 for which there is no British Standard. Chapter 32 of the 15th edition of 'Regulations for electrical installations' has been reserved to cover the external influences dealt with in HD ———.

(Copies of the above publications are available from BSI Sales Department.)

X.3 Classification of degrees of protection. Reference is made in 13.1.2 and 14.1.2.2.2 to degrees of protection to be provided by enclosures, full information on the IP codes used is given in the following British Standards:

BS 5490 Specification for degrees of protection provided by enclosures
(Identical with IEC 529);

BS 5420 Specification for degrees of protection of enclosures of switchgear and controlgear for voltages up to and including 1000 V.a.c and 1200 V.d.c
(Identical with IEC 144).

UDC : 621.876.32 : 625.36 : 001.4 : 003.62 : 614.8

Key words: escalators, passenger conveyors, safety requirements, definitions, structural members, illumination, machine rooms, handrail, stair steps, type tests, mechanical drives, equipment specifications, dimensions, specifications, braking, electrical installations, electrical faults, safety devices, direction (of movement), marking, maintenance, acceptance inspection

English version

Safety rules for the construction and installation of escalators and passenger conveyors

Normes de sécurité pour la construction
et l'installation des escaliers
mécaniques et des trottoirs roulants

Sicherheitsregeln für die Konstruktion
und den Einbau von Fahrtreppen und
Fahrsteigen

This European Standard was accepted by CEN on 31 May 1983. CEN members are bound to comply with the requirements of CEN Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to CEN Central Secretariat has the same status as the official versions.

CEN members are the national standards organizations of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Brief history

During its June 1974 meeting, Technical Committee CEN/TC 10 'Passenger, goods and service lifts' formed working group WG 2. The latter was charged with the setting up of a draft European Standard on escalators and passenger conveyors (Resolutions No. 13, 14 and 15).

The Secretariat of this working group was allocated to the German Member body.

In December 1974 the Secretariat circulated a first proposal based on the safety regulations set up by the 'International Committee for Lifts Regulations (CIRA)' for safe construction and installation of escalators.

Working group CEN/TC 10/WG 2 examined this proposal for 32 working days, which resulted in the drawing up of an amended text which was distributed in June 1977 to all CEN Member bodies for comment (document CEN/TC 10 N 49).

Document N 49 was then the subject of a second reading which was carried out by WG 2, for 14 days, in the light of the comments received.

The problem concerning the equipment intended for public services which had been raised at the commencement of the work was brought up once again, and a special meeting gathering the representatives of public transport

organizations of eight CEN Member countries had to be organized. The wishes expressed during this meeting were transmitted to WG 2 who then had to include in the draft proposal some specifications, particularly applicable to the so-called equipment 'for public services'.

For another 14 days the WG 2 has carried out a third reading on the comments given to the second reading. The result was the final draft prEN 115, December 1980.

This European Standard was adopted by CEN on the strength of its acceptance by the following member countries:

Belgium, Denmark, Germany, Greece, Italy, Netherlands, Spain Switzerland, United Kingdom.

It is to be noted that in 1976, the Commission of the European Communities conferred a mandate to CEN regarding the creation of a standard with a view to promoting the free traffic of escalators, pallet passenger conveyors, belt passenger conveyors and parts of this equipment, within the European Community. The CEN Conseil de Gérance accepted this mandate through Resolution 10 taken at the 4–5 November 1976 meeting and appointed CEN/TC 10 to carry it out. Standard EN 115 will be presented to the CEC as the implementation of such a mandate.

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0 Introduction

The purpose of this standard is to define safety rules for escalators and passenger conveyors in order to safeguard people and objects against risks of accidents during operation, maintenance and inspection work.

0.1 It is necessary that all components

0.1.1 are promptly dimensioned, of sound mechanical and electrical construction and made of material with adequate strength and of suitable quality and free from defects;

0.1.2 are kept in good repair and working order. In particular, care shall be taken that the dimensions indicated are maintained despite wear; if necessary, the worn parts shall be replaced.

0.2 Where for elucidation of the text, a design is mentioned this shall not be considered as the only possible design. Any other solution leading to the same result is permissible if it is guaranteed that with an equivalent function the same safety level exists.

0.3 It is not the purpose of this standard to preclude new developments of escalators and passenger conveyors from becoming incorporated provided they satisfy the safety requirements of this standard.

0.4 Certain escalators and passenger conveyors are subject to special operational conditions. In these cases some additional requirements have to be fulfilled, marked in this standard with the note 'for public service escalators and public service passenger conveyors'. Such operational conditions generally exist on escalators and passenger conveyors when all the following conditions apply:

- (a) they are part of a public traffic system including entrance and exit points;
- (b) they are suitable for regularly operating for approximately 140 h/week with a load reaching 100 % of the brake load (**12.4.4.1** and **12.4.4.3**) during periods lasting for at least 0,5 h during any time interval of 3 h.

During the planning stage it should be specified if it will be a public service escalator or public service passenger conveyor.

0.5 Special requirements

0.5.1 Fire protection and building requirements differ from country to country and so far neither have been harmonized, either on the international level or in Europe.

Therefore, this standard cannot include specific requirements for fire protection. However, it is recommended that as far as possible, escalators and passenger conveyors are made of materials that are not easy to ignite.¹⁾

0.5.2 If escalators or passenger conveyors have to be operated under special conditions, such as directly exposed to the weather or explosive atmosphere, or in exceptional cases serve as emergency exits, appropriate design criteria, components, materials and instructions for use shall be used that satisfy the particular conditions.

In addition, it is recommended that for escalators and passenger conveyors which otherwise would be exposed to weather conditions, the customer provides a roof and enclosure.

0.6 Requirements related to the life of the escalators and passenger conveyors are not included in this standard as it depends on the place of installation and customers' special specifications.

0.7 This standard has been drawn up taking into account in certain cases the imprudent act of the user. However, this standard takes into consideration proper use and not abuse.

0.8 An interpretation committee is to be established to clarify, if necessary, the spirit in which the clauses of the standard have been drafted and to specify the requirements appropriate to particular cases.

¹⁾ 'not easy to ignite' equals 'schwer entflammbar' in German and 'difficilement inflammable' in French

1 Scope

1.1 This standard is applicable for all new escalators and passenger conveyors (pallet or belt type).

1.2 Existing escalators and passenger conveyors are not subject to this standard. It is, however, recommended that they be adapted to this standard.

2 References

- IEC Publication 158-1 (1970) Low-voltage controlgear. Part 1: Contactors
- IEC Publication 337-1 (1970) Control switches (low-voltage switching devices for control and auxiliary circuits, including contactor relays) Part 1: General requirements
- IEC Publication 439 (1973) Factory-built assemblies of low-voltage switchgear and controlgear
- CENELEC
- HD 21 PVC-insulated cables for rated voltages U_o/U up to and including 450/750 V
- HD 22 Rubber-insulated cables for rated voltages U_o/U up to and including 450/750 V
- HD 384 Electrical installations of buildings
- HD . . . Classification of external influences (in preparation, at present clause 32 of IEC Publication 364)
- 73/23 EEC Council Directive on the harmonization of the Member States relating to electrical equipment designed for use within certain voltage limits.

3 Definitions

The following definitions aim to indicate the precise technical sense in which the listed terms have been used in this standard.

escalator. Power-driven installation with endless moving stairway for the conveyance of passengers in the upward or downward direction.

passenger conveyor. Power-driven installation with endless moving walkway (e.g. pallets, belt) for the conveyance of passengers either on the same or between different traffic levels.

handrail. Moving part intended to serve as a handhold for the passengers.

combs. Parts which at both landings mesh with the steps, pallets or the belt in order to facilitate the transition of passengers.

rated speed. Speed in the direction of the moving steps, pallets or the belt, when operating the equipment under no load condition, stated by the manufacturer as that for which the escalator or passenger conveyor had been designed and at which it should operate.

angle of inclination. Maximum angle to the horizontal in which the steps, the pallets or the belt move.

theoretical capacity. Number of persons that can be carried theoretically by the escalator or passenger conveyor in 1 h.

NOTE. For the determination of the theoretical capacity it is assumed that on one step with an average depth of 0,4 mm, and per 0,4 m visible length of a pallet or belt, there are carried:

- 1 person at a nominal width $z_1 = 0,6$ m
- 1,5 persons at a nominal width $z_1 = 0,8$ m
- 2 persons at a nominal width $z_1 = 1,0$ m.

The theoretical capacity calculation is then:

$$c_t = \frac{v}{0,4} \times 3600 \times k$$

c_t = theoretical capacity (pers/h)

v = rated speed (m/s)

For the most common widths there will be

$$\text{factor } \begin{cases} k = 1 & \text{for } z_1 = 0,6 \text{ m} \\ k = 1,5 & \text{for } z_1 = 0,8 \text{ m} \\ k = 2 & \text{for } z_1 = 1,0 \text{ m} \end{cases}$$

With this formula the theoretical capacity will be:

Nominal width m	Rated speed		
	m/s		
	0,5	0,65	0,75
0,6	4 500 pers/h	5 850 pers/h	6 750 pers/h
0,8	6 750 pers/h	8 775 pers/h	10 125 pers/h
1,0	9 000 pers/h	11 700 pers/h	13 500 pers/h

4 Symbols

4.1 Units

The units used are chosen from the International System of units (SI).

4.2 Symbols

Clause	Measurements (in the order they appear in the document)	Symbol	Unit
3	theoretical capacity	c_t	pers/h
3	rated speed	v	m/s
3	factor for different step width	k	—
5.1.5.6	vertical distance between top edge of skirting or bottom edge of cover joints and the tread surface of the steps, pallets or belt	h_2	mm
5.1.5.7	angle of inclination between the interior profile and the balustrade interior panelling	γ	degree
5.1.5.7.1	horizontal part of the interior profile that directly joins the balustrade interior panelling	b_4	mm
5.1.5.9	newel including the handrail in longitudinal direction measured from the combs	l_2	m
5.2.2	root of the comb teeth	L_1	—
5.2.3	free height above the steps, pallets or belt	h_4	m
5.2.4	vertical obstruction	h_5	m
5.2.4	distance between the centreline of the handrail and an obstacle	b_9	m
5.3 and 8.1.3	nominal width for the load carrying area (step pallet or belt)	z_1	m
5.3	distance between supports	l_1	m
7.2	horizontal portion of the handrail in the direction of landing measured from the root of the comb teeth	l_3	m
7.3.1	distance between the handrail profile and guide or cover profiles	b_6	mm
7.3.2	width of the handrail	b_2	mm
7.3.3	distance between the handrail and the edge of the balustrade	b_5	mm
7.4	distance between the handrail centrelines	b_1	m
7.4	distance between skirting	z_2	m
7.5.1	distance between the entry of handrail into the newel and the floor	h_3	m
7.5.2	horizontal distance between the furthest point reached by the handrail and the point of entry into the newel	l_4	m
7.6	vertical distance between the handrail and step nose or pallet surface or belt surface	h_1	m
8.1.1	step height	x_1	m
8.1.2	step depth	y_1	m
8.2.3.2 and 8.2.4.2	width of the grooves	b_7	mm
8.2.3.3 and 8.2.4.3	depth of the grooves	h_7	mm
8.2.3.4 and 8.2.4.4	web width	b_8	mm
8.2.4.6.1.1	transverse distance between the supporting rollers	z_3	mm
8.3.2.3	design angle of the teeth of the comb	β	degree
10.1.1	angle of inclination of the escalator or passenger conveyor	α	degree
11.3.1 and 11.4.1	mesh depth of the comb into the grooves of the tread	h_8	mm
11.3.2 and 11.4.2	clearance between the upper edge of the tread surface and the root of the comb teeth	h_6	mm
14.2.1.1	comb intersection line	L_2	—

5 Enclosure, surrounds, supporting structure and lighting

5.1 Enclosure of the escalator and passenger conveyor

5.1.1 General

5.1.1.1 All mechanically moved parts of the escalator or passenger conveyor shall be completely enclosed within imperforate panels or walls. Exempt from this are the accessible steps, the accessible pallets, the accessible belt and that part of the handrail available for the user. Apertures for ventilation are permitted.

5.1.1.2 It is permissible to omit an enclosure of the mechanically moved parts if other measures (such as rooms with locked doors accessible to authorized personnel only) make a hazard to the public impossible, and if this omission is not contrary to other regulations.

5.1.1.3 If the underside of the escalator or passenger conveyor is enclosed it should be possible to clean it in order to prevent accumulation of dirt. If such cleaning is not possible, other precautions shall be taken to avoid the related fire hazard arising.

5.1.2 The enclosure shall have adequate mechanical strength and rigidity.

5.1.3 Inspection doors and trap doors

5.1.3.1 Inspection doors and trap doors shall be provided only where necessary for the inspection and maintenance of the equipment.

5.1.3.2 It shall be possible to open inspection doors and trap doors by means only of a key or a tool specially suited for that purpose, which shall be in the hands of authorized persons only.

If rooms behind inspection or trap doors can be entered, it shall be possible to open the inspection or trap doors from the inside without a key even when locked.

5.1.3.3 Inspection doors or trap doors which open on to adjacent escalator or passenger conveyor treadways shall be provided with safety contacts which prevent adjacent escalators or passenger conveyors from being operated when these doors are opened.

5.1.3.4 Inspection doors and trap doors shall be imperforate and conform to the same conditions as required for the enclosure material (see 5.1.2).

5.1.4 Apertures for ventilation

It shall not be possible to touch any moving part through a ventilation aperture.

5.1.5 Balustrades (see figure 2)

5.1.5.1 Balustrades shall be installed on each side of the escalator or passenger conveyor.

The balustrade consists of components for which the following terms are usual:

5.1.5.1.1 Skirting (A)

Portion of the enclosure adjacent to the outer edges of the steps, pallets or belt.

5.1.5.1.2 Interior profile (B)

This profile connects the skirting with the balustrade interior panelling.

5.1.5.1.3 Balustrade interior panelling (C)

Interior panels between the skirting or the interior profile and the balustrade decking underneath the handrail.

5.1.5.1.4 Balustrade decking (E)

This decking is situated underneath the handrail and forms the top cover of the balustrade panelling.

5.1.5.1.5 Balustrade exterior panelling (D)

Exterior panelling which from the balustrade deckings encloses the escalator or passenger conveyor.

5.1.5.1.6 Newel.

End of the balustrade on the landings, where the handrails change their direction of movement.

5.1.5.2 The balustrades shall have no parts on which a person would normally stand.

Appropriate measures shall be taken to discourage people from climbing on the outsides of the balustrade if there is a danger of people falling from them.

5.1.5.3 With a vertical force of 900 N distributed over the surface of the handrail for a length of 0,5 m there shall be no permanent deformation, no breakage or displacement of any balustrade parts.

5.1.5.4 The parts of the balustrade facing the steps, pallets or belt shall be smooth. Covers or strips not in the direction of travel shall not project more than 3 mm. They shall be sufficiently rigid and have rounded or bevelled edges. Covers or strips of such nature are not permitted at the skirting.

Cover joints in the direction of travel (in particular between the skirting and the balustrade interior panelling) shall be arranged and formed in such a manner that the risk of trapping is reduced to a minimum.

Gaps between the interior panels of the balustrade shall be not wider than 4 mm. The edges shall be rounded off or bevelled.

The balustrade interior panelling shall have adequate mechanical strength and rigidity. When a force of 500 N is applied to the balustrade interior panelling on any point of the panelling at right angles on an area of 25 cm², there shall be no gap greater than 4 mm and no permanent deformation (setting tolerances are permitted).

The use of glass for the balustrade interior panelling is permitted provided it is splinter-free one-layer safety glass (tempered glass) and has sufficient mechanical strength and rigidity. The thickness of the glass shall be not less than 6 mm.

5.1.5.5 Protrusions and indentations shall not present sharp edges.

5.1.5.6 The skirting shall be vertical. The vertical distance h_2 between top edge of skirting or bottom edge of projecting cover joints and the tread surface of the steps, pallets or belt shall be at least 25 mm (see figure 2).

5.1.5.6.1 The skirting shall be extremely rigid, plane, smooth and butt-jointed. However, special arrangements instead of butt-jointing will possibly be necessary for long passenger conveyors at the points where they pass over building expansion joints.

5.1.5.6.2 The skirting shall yield not more than 4 mm under a single force of 1500 N acting at the most unfavourable point at right angles to the surface over an area of 25 cm². No permanent deformation shall result from this.

5.1.5.6.3 On escalators, the possibility of trapping between skirting and steps shall be reduced, e.g. by appropriate