BS 5656-2:2004

Escalator and moving walks — Safety rules for the construction and installation of escalators and moving walks —

Part 2: Code of practice for the selection, installation and location of new escalators and moving walks

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Contents

Foreword

This part of BS 5656 has been prepared by Subcommittee MHE/4/3/2.

This part of BS 5656 paraphrases many of the requirements specified in all other relevant standards (listed in the bibliography). It indicates the information that should be exchanged between the interested parties and the sequence of events from the preliminary planning stage to the putting into service. The most important issue to take into account during the selection and installation of escalators and moving walks is their safe use by all persons.

General guidance is given in Clause **4** on the procedure to be adopted in obtaining an installation that is satisfactory from the aspects of operation, safety and maintenance. This clause also provides guidance on the exchange of information between the escalator and moving walk contractor and other trades in providing various service facilities, and gives the overall chronological sequence.

The building recommendations for the equipment have been brought together in Clause **5** because of their interest to the architect or other persons responsible for specifying the details of the building construction, which is not a prime responsibility of the escalator and moving walk contractor.

Clause **6** deals with sizing the installation to meet the traffic demands. Clause **7** gives guidance to architects and designers on the options permitted in BS EN 115 with regard to the dimensions for boarding and alighting areas. This clause also offers guidance on equipment location and measures to reduce the risk to users. Clause **8** deals with electrical installation. Escalator and moving walk technology, duty categories and operating control systems are discussed in Clause **9**.

Although the main provision for vertical access for disabled people is a lift, it is recognized that many people with disabilities use escalators and moving walks. Therefore this part of BS 5656 takes their needs into account as far as possible and recommendations are given in Clause **10**. Guidance on lift provision for disabled people is given in BS 5655-6.

Attention is drawn to the Supply of Machinery (Safety) Regulations 1992 [1] in respect of procedures for contracting parties and in respect of CE marking. Attention is also drawn to the list of relevant statutory regulations given in Annex A.

This part of BS 5656 should be read in conjunction with BS 7801, which gives recommendations for safe working that are additional to the features recommended in this part of BS 5656 and are applicable when installing, examining, inspecting, testing, servicing, repairing, dismantling and demolishing permanent installations.

As a code of practice, this part of BS 5656 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 32, an inside back and a back cover.

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1 Scope

This part of BS 5656 gives recommendations for the location, selection and installation of new escalators and moving walks in new or existing buildings. It is applicable at the early stages of a project for architects, developers, building owners, building managers, building contractors, general and specialized engineering consultants and other interested parties.

This part of BS 5656 does not give recommendations for existing installations.

NOTE Although this part of BS 5656 does not give recommendations for existing installations, it may be used as guidance when making alterations to such installations.

2 Normative references

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

BS 1363-2, *13 A plugs, socket-outlets and adaptors — Part 2: Specification for 13 A switched and unswitched socket-outlets.*

BS 2853, *Specification for the design and testing of steel overhead runway beams.*

BS 5499-1, *Graphical symbols and signs — Safety signs, including fire safety signs — Part 1: Specification for geometric shapes, colours and layout.*

BS 5606, *Guide to accuracy in building.*

BS 7375, *Code of practice for distribution of electricity on construction and building sites.*

BS 7671, *Requirements for electrical installations — IEE Wiring Regulations — Sixteenth edition.*

BS 7801, *Escalators and moving walks — Code of practice for safe working on escalators and moving walks.*

BS EN 115:1995, *Safety rules for the construction and installation of escalators and passenger conveyors.*

BS EN 12015, *Electromagnetic compatibility — Product family standard for lifts, escalators and passenger conveyors — Emission.*

BS EN 12016, *Electromagnetic compatibility — Product family standard for lifts, escalators and passenger conveyors — Immunity.*

3 Terms and definitions

For the purposes of this part of BS 5656 the following terms and definitions apply.

3.1
angle of inclination
maximum angle to the horizontal in which the steps, the pallets or the belt move

3.2
auxiliary isolating switch
switch located in the vicinity of the drive machinery, or in the return station, or in the vicinity of the control devices, which interrupts the supply to auxiliary equipment

NOTE 1 Auxiliary equipment includes heating, balustrade lighting, comb lighting, under-step lighting, etc. but excludes any switched sockets, bulkhead lights or portable hand lamps, direction indicators, etc.

NOTE 2 Auxiliary isolating switches should be located close to the main isolating switch (see **3.17**) and marked unambiguously.

3.3
belt
power-driven and tensioned continuous surface that forms the treadway of a moving walk, which is supported along its length by various means

3.4
building contractor
person responsible for construction works

NOTE The building contractor may be the principal contractor.

3.5
client
person for whom a escalator or moving walk installation is carried out

3.6
comb
part of an escalator or moving walk that meshes with the steps, pallets or belt at each landing, in order to facilitate the transition of passengers

3.7
contractor
party who is contracted to supply, install, modernize, repair, inspect, service, or dismantle an escalator or moving walk

NOTE For the purposes of this part of BS 5656 the contractor is the escalator/moving walk contractor and is not to be confused with the building contractor (**3.4**).

3.8
control system
system that controls the manner in which an escalator or moving walk operates

3.9
driving station
area within the truss of an escalator or moving walk, where the drive machinery is located

3.10
duty cycle
loading in terms of number of passengers per hour over a defined period

3.11 escalators

3.11.1
compact escalator
escalator where the drive machinery is located within the truss and access to the machinery is gained from the passenger side

3.11.2
escalator
power-driven installation with endless moving stairway for the conveyance of passengers in an upward or downward direction

3.11.3
remote drive escalator
escalator where the drive machinery is located external to the truss and within a separate machine room

3.12
floor plate
removable plate at the ends of an escalator or moving walk to provide access to the driving and return stations

3.13
handrail
moving part intended to serve as a handhold for passengers

3.14
landing
unrestricted space at the top or bottom of an escalator or moving walk to permit the manoeuvring, boarding and alighting of persons

3.15
machinery space
space in which one or more driving machine(s) and/or associated equipment are located

3.16
main contractor
see *principal contractor* (**3.25**)

3.17
main isolating switch
switch in the vicinity of the machinery, the return stations or the control devices, capable of breaking the supply to the motor, to the brake releasing device and to the control circuit in the live conductors

NOTE This switch can also control auxiliary equipment (see **3.2**).

3.18
moving walk
power-driven installation with endless moving walkway (e.g. pallets, belt) for the conveyance of passengers either on the same level or between different levels

NOTE A moving walk was formerly known as a passenger conveyor.

3.19
nominal width
width of the step, pallet or belt carrying the load

3.20
owner
legal entity having right of possession of an escalator or moving walk and responsibility for its safe working

NOTE The owner is usually the landlord or proprietor of the building in which an escalator or moving walk is situated.

3.21
passenger
person transported by an escalator or moving walk

3.22
permit to work
authority in writing which includes details of:

a) work to be undertaken;

b) procedures involved;

c) precautions needed;

d) emergency procedures to be in place;

e) persons to undertake the work;

f) timescale of the work to be undertaken;

g) restrictions on the workplace or equipment

3.23
planning supervisor
person responsible for overall coordination of health and safety issues

3.24
power system
system that provides power for directly controlling the motion of an escalator or moving walk

3.25
principal contractor
person responsible for health and safety issues, including employee training

NOTE The principal contractor is commonly referred to as the “main contractor”.

3.26
putting into service
making available for safe use an escalator or moving walk that has undergone examinations and tests

3.27
premises
place and its immediate vicinity, where an escalator or moving walk is situated

3.28
rated speed
speed to move an escalator or moving walk under rated load condition

3.29
return station
area within the truss of an escalator or moving walk where the moving steps, pallets or belts commence their return to the driving station

3.30
safe system of work
formal procedure, resulting from a risk assessment, which specifies safe methods of work to ensure that risks to health and safety are minimized and the remaining risks are mitigated

3.31
structural opening
area in which escalators and moving walks are installed in their final location

3.32
truss
structural framework of an escalator or moving walk

3.33
user
person (not necessarily a passenger) making use of the services of an escalator or moving walk installation

3.34
work platform
designated area, moving or fixed, for carrying out work tasks

4 Planning

NOTE General guidance is given in this clause on the procedure to be adopted in obtaining an installation that is satisfactory from the aspects of operation, safety and maintenance. Guidance is also given on the exchange of information between the contractor and other trades in providing various service facilities. This clause provides the overall chronological sequence and subsequent clauses provide detailed guidance on other activities needed during the life of a project.

4.1 Classification of escalator and moving walk equipment

The classification of escalator or moving walk equipment is given in BS EN 115 as summarized below.

The most commonly available nominal widths for escalators are 600 mm, 800 mm and 1 000 mm. The most commonly available rated speed is 0.50 m/s; other speeds available are 0.65 m/s and 0.75 m/s. The most commonly recommended angle of inclination is 30°, which is permitted for any rise. An angle of inclination of 35° is permitted for rises not exceeding 6 m and rated speeds not exceeding 0.5 m/s.

The most commonly available nominal widths for moving walks are 800 mm, 1 000 mm and 1 400 mm, but this is dependant on the inclination. These nominal widths are permitted up to an angle of inclination of 6°. Above 6° to the maximum permissible angle of inclination of 12°, the nominal width should not exceed 1 100 mm.

4.2 Enquiry or invitation to tender

4.2.1 *General*

Information exchanged between parties should be carried out using a specified format, e.g. paper-based, web-based, etc.

The purchaser's representative should allow adequate time for the contractor to tender. A period of 4 weeks to 8 weeks is generally sufficient, although a longer period can be necessary dependent on the complexity and size of the scheme.

The enquiry documents should be strictly confined to material relevant to the work and the particular project. The enquiry documents should state which regulations and standards the equipment is to conform to. Extracts from standards and regulations should not be quoted in the enquiry documents.

NOTE 1 Attention is particularly drawn to the Supply of Machinery (Safety) Regulations 1992 [1] with regard to new escalators and moving walks.

NOTE 2 A typical checklist of the information to be exchanged is shown in Annex B (**B.1** and **B.2.1**).

Where building restrictions preclude the use of escalators or moving walks conforming to the relevant requirements of BS EN 115, additional data should be included in the enquiry documents as necessary, according to the particular circumstances.

4.2.2 *Additional items*

The enquiry documents should indicate any additional items beyond those required by BS EN 115, such as:

a) dismantling of an existing escalator or moving walk;

b) fire detection;

c) fire protection;

d) level of fire resistance and compartmentation;

e) forced ventilation;

f) landing features and fixtures;

g) any special controls and designations;

h) any beneficial or temporary use (see **4.5.3**);

i) any factors which affect health and safety;

j) any special equipment;

k) any special guarding.

The principal contractor should specify the building construction method for the escalator or moving walk and any machine room or machinery space.

The contractor should provide details of support points for equipment, loadings, dimensions, etc. The contractor, in consultation with the principal contractor, should specify any proposed installation method for the escalator or moving walk.

Escalators or moving walks to be installed in adverse conditions, e.g. outside buildings, in chemical works, seaside locations, sandy (desert) locations, vandal-prone situations and similar applications, require special consideration according to the circumstances.

4.2.3 *Finishes*

Finishes should be specified at the enquiry stage. It is important that any surface finishes to components, e.g. handrails, balustrades, skirt panels, floor plates, etc., do not hinder or prevent safe access and egress for all users.

NOTE Attention is drawn to the Disability Discrimination Act 1995 [2]. See Clause **10** and **A.3**.

4.2.4 *Other items*

A number of other items are associated with an escalator or moving walk installation, of which some should normally be provided by the principal contractor and some should normally be provided by the contractor. The items vary with the type of installation. It is important that the limits of responsibility are clearly understood by all parties, particularly with respect to turnkey projects, and the enquiry documents should be specific in this respect.

NOTE **B.2.2** gives details of the items normally supplied by the contractor and **B.2.3** gives details of the items normally supplied by the building contractor.

More detailed recommendations for site preparation and work by other trades are given in **4.4** and Clause **8**.

4.2.5 *Support points and fixings*

According to the construction methods adopted, support points and fixings for attaching equipment might be required. The principal contractor and the contractor should agree the exact requirements, particularly with respect to dimensions and tolerances, before a tender is offered.

4.2.6 *Building contract programme*

The enquiry should indicate as accurately as possible the building contract programme as it affects the contractor, and a mutually acceptable programme should be agreed.

4.2.7 *Pre-tender-stage health and safety plan*

NOTE Attention is drawn to Regulation 15 of the Construction (Design and Management) Regulations 1994 [3], which requires a pre-tender-stage health and safety plan to be prepared that is sufficiently developed for it to form part of the tender documentation supplied to the contractor.

The pre-tender-stage health and safety plan should make plain the issues specific to the project, so that contractors can take account of these in their proposals. As a minimum it generally includes:

— information the client has made available;

— information about risks which cannot be avoided;

— any surveys of the site and its neighbourhood with the related health and safety implications;

— contributions from designers;

— any identified precautionary measures to be taken against particular risks.

4.2.8 *Tender submissions*

Tender submissions should be returned as instructed, and should include all the information required, additional information to support the tender bid and the pre-tender-stage health and safety plan, associated risk assessments and operational issues.

4.3 Acceptance of tender and subsequent procedure

NOTE The procedure indicated in **4.3.1** to **4.3.6** particularly relates to the most usual case, where the contractor is a subcontractor (contractor under the Construction (Design and Management) Regulations 1994 [3]).

4.3.1 *Order*

An order is placed with the selected contractor. If alternative schemes have been offered, the order should clearly indicate which has been accepted.

4.3.2 *Escalator or moving walk contractor's programme*

As noted in **4.2.6**, the building contract programme should have been indicated as accurately as possible at the time of enquiry. At the time of order the contractor's programme for manufacture and installation of the escalator or moving walk should be agreed. The contractor's programme should cover each escalator or moving walk separately and should indicate the dates when:

a) the order was placed;

b) all approvals are to be complete, i.e. when:

1) all relevant building information is to be finalized;

2) builders' work and layout drawings prepared by the contractor are to be finalized and approved;

3) the finishes are to be finally accepted and approved;

c) the procurement and manufacture of the equipment is to be completed;

d) the escalator or moving walk site is to be ready for installation;

e) the provision of electricity supplies are required;

f) the escalator or moving walk is to be installed and commissioned;

g) handover and CE marking is required;

h) the technical file is to be available, etc.

For additional information relevant to programming the site work, see **4.4** and **4.5**.

NOTE 1 As the equipment units are large, it is important that liaison with the local authorities and police is undertaken at an early date in order to ensure that road closures are programmed into the schedule. Attention is particularly drawn to local byelaws and to the Health and Safety at Work, etc. Act 1974 [4].

NOTE 2 Attention is also drawn to the Lifting Operations and Lifting Equipment Regulations 1998 [5] and to local regulations and byelaws with regard to access, storage and cranage facilities.

4.3.3 *Drawings*

After the order has been placed the contractor should supply drawings showing the builders' work required, the structural loadings, electrical loadings, sprinkler details, any machine room layouts, etc., indicating minimum dimensions and tolerances (see Clause **5**). To enable these to be prepared, the purchaser's representative should provide the contractor with the relevant detailed building drawings.

4.3.4 *Approval of drawings*

Written approval should be given by the purchaser's representative for the drawings (see **4.3.3**) submitted by the contractor, after modification, if necessary, and within the limitations of the information provided.

4.3.5 *Selection of finishes*

The final choice of finishes (see **4.2.3**) such as panel finishing, decorative features, decorative finishes, colours, etc., should be communicated by the purchaser's representative to the contractor, not later than the time of approval of the drawings.

NOTE Attention is drawn to the Disability Discrimination Act 1995 [2]. See Clause **10** and **A.3**.

4.3.6 *Electricity supplies to escalator or moving walk*

A permanent power supply is recommended for final commissioning and testing of the escalator(s) or moving walk(s), but a temporary supply is acceptable provided that it is equivalent to the permanent supply. A permanent power supply should be available before the escalator or moving walk is put into service (see **8.3**).

NOTE If an electrical supply is not available when required, this can cause additional works and delays.

4.4 Coordination of site work

4.4.1 *Pre-construction and site meetings*

For the successful progress of site work, full cooperation between all parties is essential, and on large sites regular meetings are beneficial. Programmes for the construction and installation work in that part of the building containing the escalator or moving walk should be made in consultation between all parties concerned. It is important that critical dimensional tolerances (see **5.2.1**) are fully discussed at this stage as correction after structural openings have been formed can result in time delays.

4.4.2 *Health and safety plan and file*

4.4.2.1 *Construction-phase health and safety plan*

NOTE 1 Attention is drawn to Regulation 15 of the Construction (Design and Management) Regulations 1994 [3], which requires a construction-phase health and safety plan to be prepared prior to any work being carried out, in order that the contractor can carry out or manage the construction work.

The construction-phase health and safety plan should draw on:

— the principal contractor's health and safety policy and assessments;

— the health and safety plan prepared by the planning supervisor (**3.23**);

— details of the management and risks created by the contractors and subcontractors.

The detail and size of the construction-phase health and safety plan depends on the nature and extent of the project and the contracting arrangements for the construction work and should be relevant to the circumstances of the project. The construction-phase health and safety plan should continually evolve in order to provide a focus for the coordination of health and safety as the construction progresses.

NOTE 2 The planning supervisor has a duty to ensure that a health and safety plan is prepared.

4.4.2.2 *Health and safety file*

NOTE 1 Attention is drawn to Regulation 14(d) of the Construction (Design and Management) Regulations 1994 [3], which requires the planning supervisor to produce a health and safety file.

NOTE 2 The health and safety file is essentially an extended maintenance manual alerting persons responsible to the risks to be managed during the operation, repair, service, renovation or demolition of the structure and plant, after the escalator or moving walk has been put into service.

The production of the health and safety file should draw on at least the following information:

— record or "as built" drawings and plans used and produced throughout the construction phase;
— general details of the construction methods and materials used;
— risk assessments and method statements;
— details of the equipment and maintenance facilities;
— maintenance requirements;
— manuals produced by specialist contractors;
— details of the location and nature of services, including emergency and fire-fighting systems;
— operational issues.

During the construction phase the principal contractor and other contractors and subcontractors should provide all relevant information to the planning supervisor to enable the file to be reviewed, amended or additions made.

4.4.3 ***Preparatory work on site***

It is customary for the contractor to make periodic visits to the site before the starting date, to check progress on the construction of the escalator or moving walk location and discuss relevant matters with the building contractor. The building contractor should check that all building work has been carried out in accordance with the agreed dimensions (see **5.2**). In existing buildings, where equipment is being replaced, the contractor should check the dimensions and other requirements for the new equipment to be installed.

Immediately before the time for escalator or moving walk installation to commence, the contractor should check that site conditions are fit to permit installation to proceed.

In some circumstances where a very large escalator or moving walk is to be installed or the building presents difficult conditions (e.g. poor access) then the escalator may be delivered to site in sections to be assembled in situ. Where an escalator or moving walk is to be installed in adverse conditions it can be necessary for the building contractor to temporarily deck out and waterproof the location prior to delivery. Any special requirements should be included in the pre-tender-stage health and safety plan and should be specified at the time of the tender enquiry.

4.4.4 ***Delivery of material***

The contractor should advise the building contractor when equipment is ready for dispatch. The building contractor in consultation with the contractor should make arrangements on site to receive and unload the equipment with appropriate cranage, hoisting equipment, etc. onto a hard flat surface at an agreed location as near as possible to the final escalator or moving walk position.

Movement of the units through the building should be via an agreed route, clear of obstructions and step level changes, ramped (where appropriate), protected against damage and supported to bear the weight of the units. Where necessary, pulling and tie-back anchorages should be provided along the route and lifting points should be provided above the upper and lower seating positions together with access scaffolding.

4.4.5 ***Storage and protection***

The contractor should ensure that the equipment is protected from damage, at all times, during the installation phase.

Arrangements should be made by the building contractor, during the installation until entering into service, for the storing, protecting and preserving against loss, deterioration or damage, of the escalator or moving walk and materials on the site.

NOTE Attention is drawn to the potential adverse effect of associated construction activities on the site affecting the subsequent performance of the mechanical and electrical equipment.

Escalator or moving walk equipment normally receives a final coat of paint at the works before dispatch to site. Any additional painting required owing to adverse site conditions or damage to decorative finishes should be subject to separate negotiation between the contractor and the purchaser.

4.4.6 *Services of other trades*

The contractor might require the services of electricians, joiners, bricklayers and other trades as the work proceeds. It is essential that the contractor gives due notice to the building contractor of the demands to be made on other trades, so that work can be planned accordingly.

In particular liaison is required where fire prevention and protection equipment, such as sprinklers and fire shutters, is to be installed.

4.4.7 *Scaffolding, fencing, etc.*

The guarding and close fencing of the escalator or moving walk location should be provided, erected and maintained by the building contractor. This is particularly important around all openings in the floor slab.

The escalator or moving walk machinery space should be handed over to the contractor complete, and no other trades should be allowed to work in them during the whole time of installation of the escalator or moving walk, except by arrangement with the contractor and under the provisions of a safe system of work and/or permits to work (see BS 7801).

4.4.8 *Connecting to power supply*

The contractor should give prior warning to the building contractor of the date the power supply to the escalator or moving walk is required, so that suitable arrangements for connection can be made (see **4.3.6**, **8.3** and **8.4**). Commissioning should be carried out over one continuous period.

4.4.9 *Lighting of work area*

It is essential that the area in which the escalator or moving walk is to be installed is sufficiently illuminated during installation and commissioning.

NOTE Guidance on suitable levels of illumination is given in HSG 38 [6].

4.4.10 *Use of the escalator or moving walk prior to acceptance*

Until the escalator or moving walk is put into service, it should not be operated by any persons other than those involved in the actual installation and commissioning of the escalator or moving walk. It should never be used as a thoroughfare for the movement of materials, supports for scaffolding or as work platforms by other trades.

NOTE The use of the escalator or moving walk as a support for scaffolding can impart loads on the equipment for which it is not designed and result in subsequent failures.

4.4.11 *Testing prior to acceptance*

Following the installation, the contractor should undertake any necessary tests and inspections prior to the issue of the declaration of conformity.

NOTE Attention is drawn to the Essential Safety Requirements of the Supply of Machinery (Safety) Regulations 1992 [1].

4.5 Procedure following test, including inspection and maintenance

NOTE An escalator or moving walk is sometimes, but not always, deemed to be work equipment. Attention is drawn to the Provision and Use of Work Equipment Regulations 1998 [7], particularly with respect to the requirement for periodic inspection and maintenance. Attention is also drawn to the Health and Safety at Work, etc. Act 1974 [4].

4.5.1 *Acceptance*

Acceptance, inspection and testing of the escalator or moving walk should be carried out in accordance with BS EN 115.

NOTE 1 BS 5656-1 may be used to document these tests.

Timely arrangements should be made for accepting the escalator or moving walk on completion of the tests. Special arrangements (see **4.5.3** and **4.5.4**) are necessary if there is to be an interval between the escalator or moving walk being put into service going into normal service.

NOTE 2 It is advisable for the purchaser to arrange insurance cover for the escalator or moving walk.

Where specialized equipment is to be used in conjunction with a moving walk, e.g. shopping trolleys, etc., its compatibility and safety in use should be checked and confirmed prior to acceptance and being put into service. Such testing should form part of the commissioning, and the results should be recorded within commissioning documentation.

Acceptance procedures following tests should include the checking of the condition and repair of decorative finishes, before the contractor leaves the site.

4.5.2 *Warranty period and maintenance*

To ensure the continuance of satisfactory and safe operation, the purchaser (or building occupier) should arrange for the completed escalator or moving walk to receive regular servicing by persons competent to carry out these tasks at such intervals as advised by the contractor for the type of equipment and intensity of usage demand.

NOTE 1 Such service can be secured under a service contract. It is preferable and normal for the contractor to be entrusted with the servicing during the warranty period of a new escalator or moving walk.

All operations and maintenance should take account of the contractor's instruction handbook supplied with the installation.

NOTE 2 This will ensure that all parts are kept in safe and good working order (see BS EN 13015).

Throughout the lifetime of the installation it is the responsibility of the owner to ensure, in the interests of safety and operating efficiency, that:

— the equipment is not misused;

— unauthorized persons are not permitted to enter the escalator or moving walk machinery spaces.

Attention should be paid to methods of ensuring that escalators or moving walks are not overloaded in use.

NOTE 3 Attention is drawn to the list of regulations listed in Annex A.

NOTE 4 Any warranty provided by the contractor is generally conditional upon the escalator or moving walk receiving regular and adequate servicing and covers the free replacement of parts that prove defective through reasons of faulty materials or workmanship during the warranty period. The warranty period is generally 12 months and is known as the Defects Liability Period.

4.5.3 *Escalator or moving walk not in immediate use (caretaker maintenance)*

The principal contractor should take effective precautions against damage, especially damage to finishes or damage to equipment from dampness and builders' debris, until such time as the escalator or moving walk is required.

NOTE A separate service contract is usually made with the contractor to make regular visits during this period, to inspect, lubricate and report on the condition of the escalator or moving walk. During the inspection it is desirable that the escalator or moving walk be moved under power. A date is usually agreed with the contractor from which the warranty period (**4.5.2**, Note 4) will commence.

4.5.4 *Cleaning*

The deterioration of decorative finishes can occur owing to adverse site conditions both before and after completion of the installation.

After a caretaker maintenance period, the escalator or moving walk can require a further general cleaning down immediately before the taking into normal service. The contractor should be instructed accordingly to undertake this work and, if any damage has occurred, to repair this at the same time.

During the lifetime of the installation, cleaning of various parts (e.g. the balustrades, outer cladding, steps, soffits, lighting, machinery spaces, etc.) is required to prevent the accumulation of dust and debris, which can constitute an unsafe condition. This cleaning should be undertaken in accordance to an agreed method statement providing a safe system of work and only by persons competent to carry out these tasks.

Cleaning materials should be in accordance with the contractor's recommendations.

5 Building construction

5.1 General

NOTE This clause describes essential details of building construction for escalators and moving walks.

Escalators and moving walks are factory-constructed equipment and arrive on site prepared for installation in their final location.

Reference should be made to the approved drawings supplied by the manufacturer of the equipment in respect of additional building work.

5.2 Structural opening

5.2.1 *Structural opening dimensions*

For escalators and inclined moving walks it is essential that the floor opening dimensions of the structural opening are in accordance with the contractor's approved drawings and are plumb and square and set at the correct levels and accurately aligned. Expansion joints are sometimes needed around the upper and lower ends of the equipment.

The architect, or any person assuming such functions, in agreement with the builder, should ensure that the building dimensions are sufficient for and correspond to the specified equipment dimensions. Care should be taken, when a number of escalators or moving walks are located parallel to each other (side by side) and operated as a group, that sufficient space is available to accommodate the equipment. Further care should be taken, when a series of escalators or moving walks are installed, where passengers alight from one unit and board another unit operating sequentially in the same direction.

The building construction should be carried out in accordance with the guidance given in BS 5606. Particular attention should be given to the details of the structural opening tolerances given on the contractor's approved drawings.

NOTE 1 BS 5606 is a general code of practice for ensuring accuracy in building construction and indicates the expected limits of building accuracy for different types of construction.

NOTE 2 The structural opening tolerances are generally given with a positive value and a zero negative value.

NOTE 3 Construction tolerances, where there are interfaces with the escalator(s) or moving walk(s), are more onerous than standard construction tolerances.

5.2.2 *Structural opening construction*

It is essential that the surfaces of the structural opening be made of durable materials and treated to minimize the creation of dust.

As far as is practicable, surfaces close to the structural opening should form a smooth continuous flush surface without projection or recesses.

NOTE Attention is drawn to the minimum clearances in BS EN 115.

The structural opening should be constructed to withstand the loads and forces to which it will normally be subjected:

— by the equipment;

— by the imposed loads it is to carry;

— at the moment of emergency brake operation (in either a downward or an upward direction), e.g. remote drive escalators.

To assist the early planning, the guidance of the contractor or purchaser's representative should be sought regarding the load imposed by the escalator or moving walk on the building structure.

5.2.3 *Fire resistance*

In sections of the building where the structural opening is required to contribute against the spread of fire, a fire officer/adviser should be consulted to determine the degree of fire resistance required.

5.3 Escalators or moving walks without machine rooms

NOTE In general, escalators (compact escalators) or moving walks without machine rooms are installed into a construction space which is solely designed to accommodate the truss and does not have an associated machine room.

Machinery within the truss or behind the balustrade and the electrical equipment should not be accessible to unauthorized persons.

Machinery covers and machinery traps should be provided to enable servicing and inspection of the equipment, and should:

— be of sufficient size, mechanical strength and rigidity, as determined by risk assessment, to enable the safe undertaking of any tasks;

— be fire-resistant;

— not open towards any equipment;

— be provided with a safe method to lift-up and secure in place;

— be imperforate.

5.4 Escalators or moving walks with machine rooms

NOTE In certain circumstances, machine rooms or machinery spaces are provided (e.g. for escalators with remote drives) which enable servicing and inspection to be carried out from the non-passenger side.

5.4.1 *General*

All machine rooms or machinery spaces should not be accessible to unauthorized persons.

It is essential that machine rooms or machinery spaces are only used for accommodating the equipment necessary for the operation of the escalator or moving walk and do not provide means of access to other parts of the building.

Equipment necessary for the operation of the escalator or moving walk can include:

— equipment for ventilating, heating or air conditioning;

— fire detectors and suppression;

— pumps and drainage.

Electrical equipment should be selected to an appropriate insulation and protection (IP) rating.

5.4.2 *Machine room construction*

NOTE Attention is drawn to the fire resistance requirements for machine rooms given in the Building Regulations 2000 [8] and to any additional local regulations. Attention is also drawn to the need to take precautions to minimize the spread of fire from the machine room into the structural opening or from the machine room to adjacent parts of the building.

Machine rooms should be constructed to withstand the loads and forces to which it is expected that they will normally be subjected and only durable materials, that are known to create little or no dust, should be used.

Where a site is prone to water ingress (e.g. surface water or burst water mains) and to manage water arising from the operation of fire protection equipment, equipment floors should be sloped to collecting points and the water managed through systems, such as gullies, sumps and pumps.

The conditions in machine rooms should be such as to enable reliable operation of electrical switchgear and rotating machinery, and should allow maintenance to be carried out when necessary.

The use of large areas of glass windows in walls can give rise to large solar energy gains in the machine rooms and machinery spaces. It is preferable to keep controller equipment away from areas that are subject to direct sunlight for long periods. When such walls are used, care should be taken to ensure that adequate ventilation and or cooling is provided for all equipment.

Machine rooms should be weather-resistant. The walls, ceiling and floor should be sealed to prevent oil impregnation and to stop dust circulation.

Floors should be capable of sustaining the heaviest item of the escalator or moving walk machinery, should be constructed from non-slip materials, and should preferably be at one level. When there are a number of levels, differing by more than 0.5 m, stairways or steps and guard rails should be provided.

5.4.3 *Space and maintenance provisions*

Machine room dimensions should be such as to allow easy and safe access for both:

a) personnel to any part of the equipment; and

b) the removal of equipment.

Provision should be made for one or more steel beams or other suitable supports to be so positioned at a high level in any machine room as to accommodate the escalator or moving walk apparatus and permit the hoisting, installation and possible replacement of heavy equipment. The supports should be clearly marked with the safe working load, which should be determined in accordance with the appropriate British Standard, e.g. BS 2853 for runway beams.

Machine rooms should as far as possible protect the machinery from dust, harmful fumes, humidity or other adverse environmental pollution. Stale air from other parts of the building should not be exhausted into the machine room. Machine rooms should be soundly constructed, weather-resistant and dry, with provision for permanent ventilation to the open air. Recommendations for the heating and ventilation of machine rooms are given in **5.4.7**.

The working space should be of a sufficient size, as determined by risk assessment and human factors assessment, to enable the safe undertaking of any tasks. Requirements are given in BS EN 115 and guidance is given in BS 7801.

Permanent electric lighting should be installed in machine rooms and machinery spaces to provide an average illumination of at least 200 lux at floor level and particularly around machinery and controllers. Light switch(es) should be positioned adjacent to personnel access point(s). It is essential that all the lighting is independent of the power supply to the escalator or moving walk. In the event of the failure of the main lighting supply, means should be provided to enable safe egress from the machine room or machinery space.

At least one independent switched socket outlet, preferably equipped with RCD protection, should also be provided in each machine room and machinery space, supplied from circuits that are totally independent of the escalator or moving walk supplies. Each switched socket outlet should be capable of providing a minimum current of 13 A.

5.4.4 *Access to machine rooms*

It is important that access from the public access way to the interior of the rooms be clear, free from obstacles, tripping hazards and projections. There should be no need to pass through private accommodation. The access route should be illuminated to a level of not less than 50 lux at floor level.

A safe means of access/egress should be provided to all machine rooms and machinery spaces and the routes should have a headroom of at least 1.8 m.

Access for personnel to machine rooms and machinery spaces should, wherever possible, be effected entirely by way of either a semi-public stairway with a clear width of not less than 1 000 mm, or a private stair with a clear width of not less than 800 mm.

Doors giving access to machine rooms should open outwards and be secured against unauthorized access. Key-operated locks that can be opened without a key from the inside of the machine room should be fitted. Doors for personnel access should have the following clear dimensions:

— width not less than 0.6 m;

— height into main machine room or controller room at least 1.8 m.

These dimensions should be increased when necessary to provide access for equipment.

Careful consideration should be given to the siting of the machine room entrance. Where a door opens into a public circulation area, a safety glass vision panel should be provided in the door.

A permanent safety sign and warning notice, in accordance with Annex C, should displayed on the outside of the machine room doors.

NOTE It is sometimes necessary for security reasons and to avoid identifying the function of individual rooms to display the safety sign on the inside of the access door.

5.4.5 *Machine supports*

Where the drive machine is external to the truss the interface details should be agreed by all parties (see **4.2.5**, **4.3.3** and **5.2.2**).

See **5.4.3** for details of runway beams.

5.4.6 *Location of machine rooms*

The machine room should be located as close to the structural opening as possible without restricting the headroom required for normal safety precautions.

The specific position, type and anticipated loading of escalator or moving walk equipment should be detailed on the drawings prepared by the contractor, taking account of equipment access, changes of level in the machine room and final equipment location.

The contour of the machine room should not be finalized until the purchaser's representative, in conjunction with the contractor, is satisfied that it would meet the needs of the escalator or moving walk equipment that is ultimately to be accommodated.

5.4.7 *Heating and ventilation of machine rooms*

All machine rooms should be provided with adequate ventilation to dissipate the heat generated by the escalator or moving walk equipment. The ventilation should provide for reasonable working conditions for maintenance personnel and should maintain the temperatures necessary to ensure the stability of escalator or moving walk operations, as agreed with the contractor. If the machine room is located where temperatures could drop below 5 °C, heating should be provided to avoid frost and condensation and to maintain stability of operation.

Machine rooms for escalators or moving walks accommodating single and double installations in a temperate climate may be served by a high and low louvred convection ventilation arrangement. Machine rooms for groups of three or more escalators or moving walks might require increased ventilation, and forced ventilation might be necessary, the design of which should prevent local hot spots. The contractor should be consulted to ascertain the heat output of a complete installation.

Ventilation louvres should be designed and sited to prevent rain, snow and birds entering the machine room.

Building designers should take into account the possible need for standby heating and ventilating equipment, if the building has an integrated heating and ventilating system that is likely to shut down.

5.5 Noise and vibration

No escalator or moving walk installation can be silent or vibration-free in operation, and the intensity depends on particular circumstances. The location of escalators or moving walks should be such as to cause minimum disturbance. Beams and structural members associated with the escalator or moving walk installation should not penetrate into occupied areas such as office buildings and other quiet areas. When the function of the building requires it (e.g. hotels, hospitals, schools or libraries), the walls, floor and ceilings of machine rooms and machinery spaces should substantially absorb the sounds associated with the operation of the escalator or moving walk. Building design has a significant role to play in noise and vibration reduction and the design of the building structure should take account of this.

It is strongly recommended that the purchaser's representative checks the operation of the contractor's equipment in as near similar conditions as possible to determine the quality of isolation required to meet any specific conditions. It has frequently been found that identical escalator or moving walk equipment, about which complaints have been justified, has been perfectly satisfactory under a different building structural design.

If the escalator or moving walk is required to operate to specific requirements, such a request should be the subject of joint consultation between all parties concerned.

NOTE It is not possible to be specific regarding levels that are generally acceptable, as they depend on the circumstances of the installation. Where there is doubt, specialist advice should be sought.

5.6 Special environments

Escalator or moving walk equipment conforming to BS EN 115 is suitable for use inside commercial buildings and infrastructure locations.

It is not recommended that escalators or moving walks are installed in exposed or partially exposed environments. However, where this cannot be avoided, all areas that are exposed should be suitably protected to prevent direct water ingress, and weather-resistant controls should be employed. Environmental control of the location is sometimes necessary. Close liaison between the contractor and the client's design team is recommended at an early stage.

Where unusual environments are likely to be encountered, specialist advice should be sought at the design stage. Examples of situations that necessitate special consideration are:

— low temperatures;
— high temperatures;
— wet conditions, e.g. for slip resistance;
— hosing-down, e.g. for hygiene or decontamination;
— corrosive atmosphere;
— dusty atmospheres;
— vandal-prone installations;
— extreme variations in humidity;
— ship-board installations.

The installation of equipment in these environments should be avoided as far as possible owing to the increased complications involved.

NOTE The maximum inclination of 12° for inclined moving walks was established as the largest safe inclination that most persons could stand and walk on without overbalancing in ideal conditions. However where there are likely to be adverse conditions, e.g. water ingress, a risk assessment should be carried out to determine the maximum safe inclination to be installed.

6 Traffic design

6.1 Movement of people in buildings (circulation)

Escalators are typically used for short range movement between adjacent floors (deep underground railway systems excepted). They are found in offices between principal levels, in stores between trading floors, in shopping centres between malls, and elsewhere, such as railway stations, hospitals, museums, etc.

Inclined moving walks are typically used for short range movement in shopping centres, stores and railway stations. Horizontal moving walks are typically used for medium/long range horizontal movement in airports, railway stations and exhibition centres.

Escalators and moving walks are usually sited in an obvious circulation path making it easy for people to board them. Alternative circulation using adjacent lifts, stairs or ramps for journeys between adjacent floors should be clearly visible and signed.

NOTE 1 Attention is drawn to the Disability Discrimination Act 1995 [2]. See Clause **10** and **A.3**.

It is essential that the location of escalators or moving walks be planned for safe and efficient passenger movement, in order to ensure that the performance figures given in any calculations of traffic handling capacity (see Annex D) can be realised and that the vertical transport system will operate effectively.

NOTE 2 Recommendations for arrangement and location are given in Clause **7**.

6.2 Preliminary escalator or moving walk planning

NOTE Determining the number of passengers requiring transportation is a complex matter. The practical handling capacities of commonly available escalators and moving walks are indicated in Table D.1 and Table D.2. This subclause gives general guidance on the selection of an appropriate number of units to meet a particular passenger demand.

6.2.1 *Office buildings*

Generally escalators are used in office buildings to (vertically) serve the lower few floors and are often installed to relieve the traffic demand on adjacent lifts. The three main factors to be considered are:

— the number of floors to be served by the escalators;

— the population of each floor to be served by the escalators;

— the maximum peak demand, which can be unidirectional, as in the up or down peak periods, or multidirectional.

Unlike lifts, escalators provide an immediate means of transportation, if there is no queuing at the boarding point, but they take longer to reach the alighting point. There is a cross-over in time between the long waiting but relatively short travel time of a lift, and the immediate boarding but comparatively longer travel time of an escalator. This cross-over occurs at two to three floors of vertical travel, depending on the rise. It is common to assume that 90 % of intending passengers for the lowest three floors will use any escalators provided in preference to the lifts.

In the case of a series of escalators serving the lower floors of a building, the lowest escalators have to carry the passengers travelling to/from the higher escalators in sequence and should be sized accordingly.

Where no queuing can be tolerated, the escalators should be sized to meet twice the average arrival rate indicated.

As escalators can only provide unidirectional transportation it can be necessary to provide an operational facility to reverse the direction of the escalators to suit the dominant traffic flow.

The number of units required depends on the estimated passenger arrival rate. In a building with no nearby lifts, it should be assumed that all arriving passengers will use the escalators rather than the stairs.

NOTE BS 5655-6:2002, Table 6 gives an indication for a lift installation of the passenger arrival rate expressed as a percentage of the total building population.

6.2.2 *Transport facilities*

Escalators and moving walks are often provided at airports, above-ground railway facilities and underground railways. In deep underground systems, escalators often provide the principal means of vertical movement.

The passenger arrival rate in railway situations can be estimated from the train capacity. The main requirement for the escalators and moving walks is their ability to remove all the arriving passengers before a further train arrives. This can often be achieved by allowing queues to build up in the period between successive train arrivals. As passengers always have to walk to the escalator location, this reduces their queuing time.

As escalators and moving walks can only provide unidirectional transportation it can be necessary to provide an operational facility to reverse the direction of the escalators to suit the dominant traffic flow.

The distance of horizontal travel is an important factor for moving walks and the number of alighting/boarding points should be taken into account where successive moving walks are installed.

6.2.3 *Exhibition centres, leisure facilities, shopping centres and department stores*

In shopping centres, escalators and moving walks provide the main means of moving between different levels. The density of occupation on the escalators and moving walks is generally lower than in transportation facilities, and queuing is better tolerated.

In shopping centres, escalators should be installed in pairs to provide efficient passenger flows and to allow for breakdown and servicing. The traffic demand and hence the number of escalators is difficult to estimate, but convention suggests a pair every 100 m of mall length. The most commonly employed sizes are 800 mm and 1 000 mm in width.

Escalators are not suitable for the transportation of shopping trolleys and push chairs, and notices to this effect should be clearly displayed. Shopping trolleys having the facility to lock onto the pallet tread are however suitable for use on inclined moving walks.

Escalators are provided in department stores for the use of the store's customers and although they often access the different levels of a shopping centre, they should not be taken into account in the design of the transportation facilities in the shopping centre.

6.3 Heavy and intensive duty installations

In some locations, e.g. major railway stations, metro stations, major international airports and critical locations such as underground railway systems, where escalators with a 1 000 mm nominal step width or moving walks with 1 000 mm or larger pallet widths are installed, there is a tendency for one column of passengers to remain stationary and another column to walk on the escalator or moving walk. This reduces the travel time of the passengers, but does not increase the underlying handling capacity of the equipment.

The density of passengers in the walking column is also about 50 % lower than the stationary column, but because the passengers are walking the overall throughput of passengers does increase. The increase depends on the walking speed of the passengers and its relation to the equipment speed. As it is possible for a walking column to be halted by passengers stopping it is recommended that any increase in throughput is ignored in the traffic design.

7 Arrangement and location

7.1 General

When a standard escalator arrangement is able to meet the needs of the purchaser, a non-standard arrangement can only be justified in order to meet specific restrictions that cannot be easily overcome. In a new building, standard arrangements should be selected as a matter of course, as they simplify planning and execution and, if correctly selected, ensure a satisfactory installation. When a new escalator or moving walk is being installed in an existing building, its arrangement and location should be designed to take into account the existing environment, in order to avoid obstruction, bottlenecks, problems with building structure, etc.

The number of units in a particular location is dependent on the traffic demands at particular times of day and the need to take into account the redundancy requirements arising from maintenance or replacement.

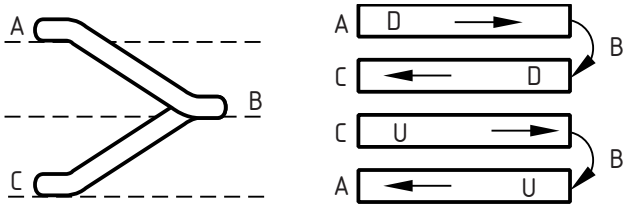
There are several standard escalator arrangements, as shown in Figure 1. For efficient circulation, types (a) and (b) permit the shortest transition path and time from one escalator to the succeeding one.

Type (b) requires a larger structural opening than types (a) and (c) and creates a higher risk of falling and complicated maintenance activities.

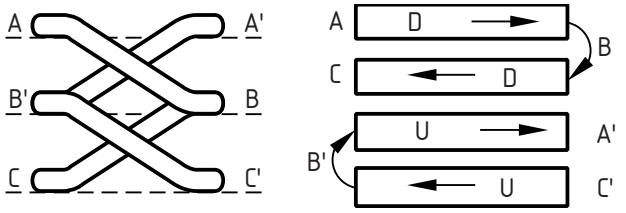
Horizontal and inclined moving walks are usually arranged as side-by-side pairs with an adjacent throughway.

In office buildings, escalator arrangement types (a) and (b) are usually installed. In transport facilities, and in exhibition centres and shopping centres, escalator arrangement types (a) and (b) and moving walks (horizontal and ramped) are usually provided.

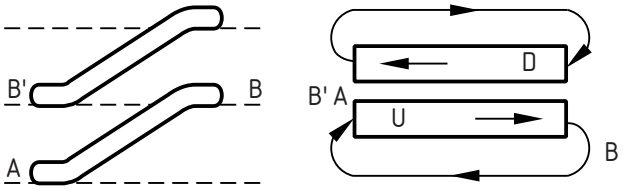
Types (b) and (c) are typical of a department store as they allow long circulation routes to be arranged.



a) Parallel



b) Cross-over



c) Walk round

Key

D Down

U Up

Figure 1 — Escalator configurations

7.2 Landings

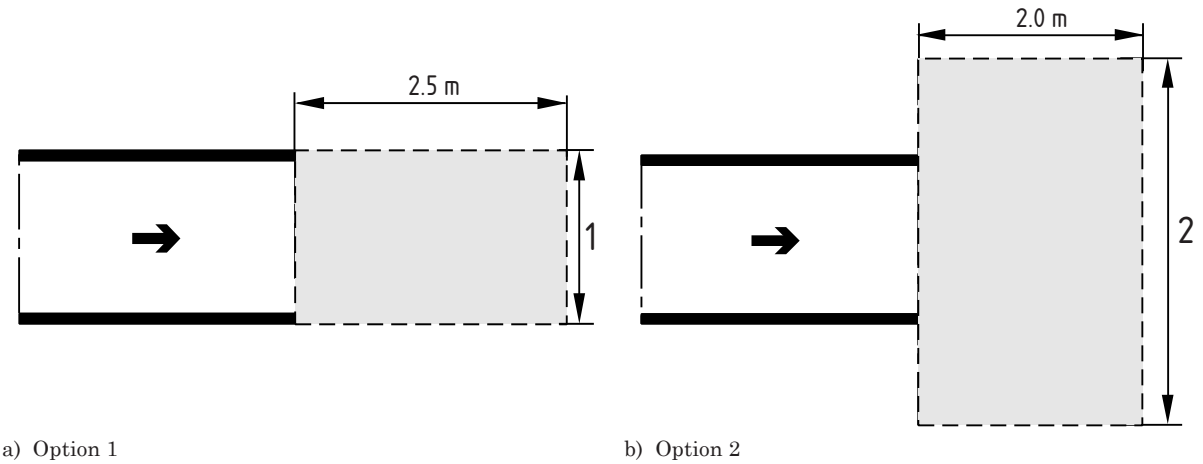
7.2.1 *General*

Landing depths should be in accordance with BS EN 115:1995, **5.2.1**. The two options are illustrated in Figure 2, where option 1 is a landing depth of 2.5 m and option 2 a landing depth of 2 m.

NOTE 1 These landing depths maximize the safety of passengers alighting from a moving escalator or moving walk by providing each escalator with an unrestricted area, or reserved space, which is not shared with another unit or used to provide a general circulation route.

At the landings the unrestricted area should lead into, or out of, an open and clear area, which is not bounded by walls, doors or screens.

NOTE 2 Of the two options offered by BS EN 115, option 2 provides an unrestricted space approximately 60 % larger than option 1.



a) Option 1 b) Option 2

Key

1 Distance between the handrail centreline

2 Double the distance between the handrail centreline

Figure 2 — Landings

7.2.2 *Successive escalators or moving walks*

Sometimes successive escalator arrangements are installed, where one escalator leads through a landing area to another escalator travelling in the same direction. Care should be taken in ensuring that appropriate separation between the escalators is provided (see **7.2.1**).

For successive single escalators or moving walks, a minimum separation of 5 m should be available when using option 1 and 4 m when using option 2, when there is one exit.

Where there are exits to each side of the landing, they provide the opportunity for pedestrians to cross from one side to the other and passengers to alight or board from both sides. Extra separation of at least a further 0.5 m is desirable in these circumstances (see the first paragraph of BS EN 115:1995, **5.2.1**).

This is particularly important where pairs of successive escalators are installed, as landing exits can be provided on one side or both sides. As in the case of single successive units, pedestrians and passengers can come into conflict. When this happens the separation of the successive units should be increased by at least 1 m.

7.3 Risks associated with location

The siting and the type of escalator installed can introduce additional hazards. The trend by architects and developers to expose one or both sides of escalators over a void, and the changes made to the balustrade/handrail design on compact escalators, can increase risks to users. Those responsible for the location of escalators should carry out risk assessments to identify what hazards are present, including foreseeable misuse, who is likely to be affected and which preventative measures need to be implemented to eliminate the hazard or reduce the risk to the lowest level.

Examples of misuse include: sitting on, standing on, sliding down the handrail; holding onto the handrail from the outside of the balustrade at the lower landing; being lifted onto the handrail from the newel ends; walking up the outer decking; and sliding down the decking. All of these can result in serious injury.

Where escalators are not bounded totally by adjacent walls or partitions and are therefore exposed over a void on one or both sides, persons are at risk of falling a substantial distance. The building designer might need to make provision for some form of additional protection to be provided beyond the handrail and balustrade. This could, for example, take the form of a glass enclosure or glass shield at the exposed point or some form of guard rail.

There is also an increased risk of trapping between the moving handrail and the adjacent structure or escalator.

Periodic reviews of the risk assessments following the installation should be undertaken to determine the adequacy of the control measures.

NOTE Attention is drawn to the Management of Health and Safety at Work Regulations 1999 [9].

8 Electrical installation

8.1 Main supply

The contractor should declare, on a schedule, the values of full load current, starting current and its duration, maximum permissible voltage drop and any other relevant details, e.g. drive systems, to enable the electrical contractor to determine the size of the supply cable.

The electrical installation up to the inlet terminal of the main isolating switch is not part of the escalator or moving walk installation and should conform in all respects to BS 7671.

The escalator or moving walk circuit from the intake room should be separate from other building services.

The electrical installation and appliances should conform to BS EN 115.

The main isolating switch should not cut the supply to the socket outlets or to the lighting circuits necessary for inspection and maintenance.

Auxiliary isolating switches, located close to the main isolating switch, should be provided to interrupt the supply to auxiliary equipment and marked unambiguously.

NOTE Auxiliary equipment includes heating, balustrade lighting and comb lighting, but excludes any switched sockets, bulkhead lights or portable hand lamps.

8.2 Remote machine rooms

The supply to the machine room lighting should be from a circuit separate from the escalator or moving walk power supply controlled by a fused switch or miniature circuit breaker (MCB) in the machine room, in accordance with BS EN 115:1995, **13.4**.

In every machine room containing escalator or moving walk equipment, there should be at least one 13 A socket outlet conforming to BS 1363-2. The supply to the socket outlets in the machine room should be taken from a circuit separate from the escalator or moving walk power supply, or taken from a point on the supply side of the main isolating switch and controlled by a fused switch or MCB in the machine room, in accordance with BS EN 115:1995, **13.6**. It is recommended that all socket outlets be provided with residual current (RCD) protection.

The circuits for the lighting and power supplies in the machine room should be in accordance with BS 7671.

Lighting in the machine room should give a level of illumination of at least 200 lux at floor level. There should be a lighting switch adjacent to every entrance to the room.

8.3 Temporary and permanent supplies

A temporary electricity supply should be available during installation in the machine room and near to the structural opening for both lighting and socket outlets for power tools. The temporary supply should be 110 V a.c., centre-tapped to earth and in accordance with BS 7375. If the contractor needs a 3-phase supply to operate a materials handling hoist, the capacity of this supply should be specified by the contractor.

The permanent electricity supply to the escalator or moving walk should be connected in sufficient time to permit the running adjustments and tests that are necessary before the escalator or moving walk completion can be carried out. If there is likely to be a delay in the connection of the main supply, a temporary supply with the same characteristics as the permanent supply should be provided to operate the escalator or moving walk.

8.4 Terminations

All wiring and cables that run outside the machine room, structural opening and machinery spaces, but are associated with the escalator or moving walk installation, should be installed by the electrical contractor to the specification of the contractor.

The contractor should provide a schedule of all such cables/wiring with appropriate instructions as to any special precautions required in respect of terminations, limit on length of run, screening and/or segregation. Unless otherwise agreed between the contractor and the electrical contractor, such wiring should be terminated in appropriate terminal boxes within the machine room or escalator or moving walk truss. The position of such boxes may be shown on installation drawings, but should be finally agreed with the escalator or moving walk contractor's site representative. The markings of terminals within such terminal boxes should be specified by the contractor.

8.5 Markings

All switches, controls and terminal boxes associated with the escalator or moving walk electrical installation should be clearly and indelibly marked, easily identified and their function indicated.

8.6 Electromagnetic compatibility (EMC)

Electrical installations should be in accordance with BS EN 12015 and BS EN 12016.

9 Escalator or moving walk installation

9.1 Controller technology

Escalators and moving walks are generally controlled by microprocessor and solid state devices, replacing the relay controllers used in the past. Programmable electronic devices when used should afford the same level of safety to the escalator or moving walk as that provided by conventional devices. In the case of failure, the system should always revert to a safe state. Insulation tests should be restricted to power and safety circuits.

9.2 Escalator or moving walk duty

Escalators and moving walks have to meet different traffic demands and it is important that the escalator or moving walk is capable of meeting these demands. Demand is measured in persons per hour and duty is measured in persons per day and/or hours of operation.

As a general guideline, the duty of escalators or moving walks can be categorized as light, medium, heavy or intensive duty as shown in Table 1. Intensive duty category escalators and moving walks are usually very critical to the operation of the facility in which they are located, and thus should provide an appropriate level of reliability and availability.

Table 1 — Duty categories of escalators and moving walks

Duty category	Typical usage (passengers per day)	Typical locations
Light	up to 3 000	Shops, museums, libraries and leisure facilities
Medium	up to 10 000	Department stores, shopping centres, regional airports and regional railway stations
Heavy	up to 20 000	Major railway and metro stations, major international airports and critical locations such as underground railway systems
Intensive	over 20 000	

When deciding the duty category, account should be taken of:

— the peak demands that might be made on the equipment;

— the required design life [see **B.2.1**g)];

— the duty cycle [see **B.2.1**h)];

— the number of passengers per day using the escalator or moving walk, which varies according to the type of usage, peak hour, seasonal changes, etc.;

— the lack of alternative routes of entry and exit;

— the importance of the route;

— any disruption when the equipment is out of service or being replaced.

9.3 Operating control options

The type of control option selected has an effect on energy reduction, improved efficiency and life of the equipment. There are three types of control option.

a) *Continuous operation*. The escalator or moving walk is intended to operate continuously at a single speed. The starting and stopping is carried out manually. This type of operation would be suitable for locations where there are continuous traffic flows.

b) *Variable speed operation*. The escalator or moving walk is intended to operate continuously, although the operating speed can be dependent on the passenger demand. The starting and stopping is carried out manually. The change of speed of the escalator or moving walk is initiated by the use of a passenger detection system such as pressure mats, photocells or passive infra red beams. This type of operation would be suitable for locations where there are periods of time when there is no passenger demand.

c) *On-demand start*. The escalator or moving walk is available for use in either direction of travel and automatically starts operating as a result of passenger demand. After a period of no passenger flow the escalator or moving walk automatically stops. The starting of the escalator or moving walk is initiated by the use of a passenger detection system such as pressure mats, photocells or passive infra red beams. This type of operation would be suitable for locations where there are long periods of time when there is no passenger demand and can cater for either direction of travel.

NOTE 1 A system has to be provided to manage the direction of operation.

NOTE 2 to b) and c) When the equipment changes speed, or is started up after periods of low passenger activity, it is important that the transition be smooth in order to prevent passenger falls. Variable speed drives provide a very smooth transition between speeds or a very smooth start-up.

10 Disabled access

The recommendations given in Clause **4** to Clause **9** are based on the assumption that persons using these facilities are able to do so unaided. However, motor and sensory abilities in a population can vary over a wide range, and escalators and moving walks are also likely to be used by persons with a range of other disabilities. Examples include:

a) people who are unable to use stairs due to a temporary mobility impairment, e.g. a broken leg, or a permanent mobility impairment, e.g. loss of a limb, limited range of movement and weight-bearing ability caused by arthritis, or reduced strength and endurance, e.g. as a result of a heart or lung complaint;

b) people who have sensory limitations, e.g. poor vision or impaired balance;

c) people who have cognitive impairments, e.g. persons with learning difficulties, or persons with intellectual deterioration which can result in problems understanding information and reduced ability to concentrate on a task.

Some individuals, in particular older people, might have more than one impairment. Some individuals are not able to use an escalator or moving walk independently, and rely on assistance/support being provided by a companion. Furthermore some individuals can be encumbered by objects or be responsible for other persons, which can affect their mobility. The extent to which an individual is incapacitated by impairments and encumbrances often depends on the usability of products, services and the environment.

The most important issue to take into account during the selection and installation of escalators and moving walks is their safe use by all persons.

NOTE 1 Attention is drawn to the Disability Discrimination Act 1995 [2]. See **A.3**.

Lifts are the preferred method of vertical travel for wheelchair users and persons with assistance dogs.

Wheelchair users can generally use horizontal moving walks and moving walks with an inclination of up to 6°, either unaided, or with an accompanying person.

Moving walks with inclinations greater than 6° and escalators are not suitable for use by wheelchair users.

Escalators and moving walks are not suitable for use by persons with dogs, unless the dogs can be carried.

Safety signs should be provided in accordance with Annex C and additional signs should be provided to indicate the location of alternative facilities.

The following specific recommendations and guidance are intended to assist persons with disabilities, but they can also improve the level of safety of other users and increase circulation efficiency.

NOTE 2 To enable the widest range of disabilities to be accommodated, it is advisable for alternative access arrangements, e.g. lifts, stairs and ramps, to be provided between the levels served by any escalators and moving walks, in close proximity to the escalators or moving walks and easy to find.

1) *Speed*. Because some older and less able people move more slowly and adjust to motion with difficulty, the slowest speed compatible with the traffic needs should be specified.

2) *Width*. The widths of escalator steps or moving walk pallets should be sufficient to accommodate users with walking aids, e.g. crutches, and those who need a companion alongside.

3) *Inclination*. The equipment inclination should be selected to take into account potential hazards such as slips and falls, weather conditions, emergency braking, etc., that could affect persons with mobility impairments.

4) *Steps*. The minimum number of steps recommended in BS EN 115 might not be sufficient. Where necessary, additional flat steps should be provided at the top and at the bottom of escalators, and level pallets at each end of moving walks, to allow users with poor balance to adjust to the change of inclination.

5) *Handrails*. The needs of users with limited grip should be taken into account, e.g. handrail width. Other considerations can include colour contrast with the surroundings, and luminance.

6) *Surface finishes*. Matt finishes should generally be used to avoid glare which causes difficulty for visually impaired users. The materials used in balustrade interior panelling should be selected to reduce confusion to persons with impaired vision. Step and pallet demarcation, which contrasts clearly with the stationary parts and between adjacent steps and pallets, should be provided. Where different materials are used for escalator or moving walk surfaces and landings, their coefficients of friction should be similar to minimize the risk of stumbling.

7) *Controls*. The emergency stop switches should be clearly visible and positioned so that they can be reached and operated by all users.

8) *Lighting*. Lighting levels should be at least 100 lux at floor level.

9) *Signs and information* (see Annex C). Due consideration should be given to the provision of information in alternative formats, for example, visual signs reinforced with audible information or written text with symbols for people with learning difficulties. Information to be provided may include:

— clear indication of alternative access;

— clear indication of direction of travel;

— audible warning at beginning and prior to end of travel.

10) *Landings*. Sufficient clear space should be provided at the landings to escalators or moving walks to deal with anticipated traffic requirements and to allow slow moving individuals, e.g. those using a walking aid, to prepare for boarding and alighting.

11) *Guarding*. To avoid creating hazards with any moving parts, additional guarding adjacent to escalators and moving walks can be advisable.

Annex A (informative)
Relevant statutory regulations

A.1 Summary of the Health and Safety at Work etc. Act 1974

Persons concerned with escalators or moving walks have duties under the Health and Safety at Work etc. Act 1974 [4], which include the following.

a) Employers have a duty to ensure, so far as is reasonably practicable, the health and safety of their employees while at work. This includes:

— the provision of plant and systems of work that are safe and without risk to health;

— the means to safely use and handle articles and substances;

— all necessary information, instruction, training and supervision;

— a safe means of access and egress;

— a safe working environment.

b) Employers, the self-employed and employees have a duty to conduct their undertakings in such a way as to ensure, so far as is reasonably practicable, that all persons who might be affected by the work activity are not exposed to risks to their health and safety.

c) Manufacturers, suppliers etc. of articles for use at work have a duty to ensure, so far as is reasonably practicable, that the articles are so designed and constructed that they will be safe and without risk to health when they are being set, used, cleaned or maintained.

d) Erectors and installers of articles for use at work have a duty to ensure, so far as is reasonably practicable, that nothing about the way articles are erected or installed is unsafe or a risk to health.

e) Persons concerned with premises have a duty to persons other than employees who use non-domestic premises made available to them as a place of work. It is the duty of the person who controls the premises to take such measures as it is reasonable for them to take to ensure, so far as is reasonably practicable, that the premises, the means of access and egress to and from the premises, and any plant of substance in the premises, are safe and without risk to health.

A.2 Summary of the Management of Health and Safety at Work Regulations 1999

The Management of Health and Safety at Work Regulations 1999 [9] implement the requirements of Framework Directive 89/391/EEC [10].

They include a requirement (Regulation 3) for every employer and self-employed person to make a suitable and sufficient assessment of the risks to health and safety of themselves and others arising out of, or in connection with, the conduct of the undertaking. The Regulations require the significant findings of the assessment to be recorded. The purpose of the assessment is to identify and quantify the risk. Employers are required to implement preventative and protective measures to eliminate risk, and to put in place effective control measures to address residual risks and hazards.

The Regulations also include requirements for training, health and safety assistance, information for employees, and a requirement to put in place such arrangements as are appropriate for the effective planning, organization, control, monitoring and review of the preventative and protective measures necessary.

A.3 Summary of the Disability Discrimination Act 1995

The Disability Discrimination Act 1995 [2] gives disabled people new rights in such areas as access to goods, facilities and services. It requires goods and services to be accessible to disabled people; this can include the removal of physical barriers, but does not impose specific requirements.

Businesses and service providers have a duty, from 1 October 2004, to make "reasonable adjustments" to the physical features of their premises in order to overcome barriers to access.

Service providers have a duty to consider the use of premises by people with mobility, visual, hearing, speech and dexterity impairments as well as those with learning difficulties and mental health disabilities.

"Reasonable adjustments" take account of:

— practicality;
— financial and other costs;
— disruption;
— resources available;
— availability of financial assistance.

Escalators and moving walks are included in the examples of "physical features".

NOTE The Disability Rights Commission have published a number of codes of practice relating to duties applicable under the Disability Discrimination Act 1995. Information is available from DRC Helpline, Freepost MID02164, Stratford-upon-Avon, CV37 9BR, telephone 08457 622633, or from the Disability Rights Commission website at www.drc-gb.org.

A.4 Summary of other relevant statutory provisions

NOTE 1 This list is not intended to be exhaustive and does not attempt to indicate which regulations are applicable in any given circumstance.

NOTE 2 The regulations are listed alphabetically and not by relative importance.

A.4.1 *Construction (Design and Management) Regulations 1994*

The Construction (Design and Management) Regulations 1994 [3] place duties on clients and their agents (where appointed), designers and contractors to coordinate and manage the health and safety aspects of a construction project with the aim to control and reduce the risks involved.

A.4.2 *Control of Asbestos at Work Regulations 1987*

The Control of Asbestos at Work Regulations 1987 [11] require employers to prevent the exposure of employees to asbestos, or if this is not reasonably practicable, to control such exposure to the lowest possible level. Before any work with asbestos is carried out, the Regulations require employers to make an assessment of the likely exposure of employees to asbestos dust, which can include a description of the precautions that are taken to control dust release and to protect workers and others who might be affected by that work.

A.4.3 *Control of Substances Hazardous to Health Regulations 2002*

The Control of Substances Hazardous to Health Regulations 2002 [12] set out a framework of action for employers and self-employed persons to follow, which aims to protect the health of all people who might be exposed to hazardous substances at work.

This includes:

— carrying out a risk assessment;
— identifying and implementing control measures;
— ensuring that control measures are used;
— ensuring that employees are properly informed, trained and supervised.

Hazardous substances include chemicals, dust, gases and fumes. Asbestos is excluded from the Control of Substances Hazardous to Health Regulations as it is covered by separate regulations (see **A.4.2**).

A.4.4 *Electricity at Work Regulations 1989*

The Electricity at Work Regulations 1989 [13] set out requirements for all electrical systems used at work, including construction, integrity, maintenance and isolation. They apply to employers and self-employed persons.

A.4.5 *Electromagnetic Compatibility Regulations 1992*

NOTE Generic standards that support the Electromagnetic Compatibility Regulations 1992 are BS EN 61000-6-1 for residential, commercial and light industry and BS EN 61000-6-2 for industrial environments. Industry standards for escalators and moving walks are BS EN 12015 and BS EN 12016.

The Electromagnetic Compatibility Regulations 1992 [14] deal with the two elements of electromagnetic compatibility, i.e. emission and immunity.

The emission requirements aim to ensure a level of electromagnetic emission that will cause minimal disturbance to other equipment.

The immunity requirements aim to ensure a level of electromagnetic immunity that will allow minimal disturbance to other equipment.

A.4.6 *Electrical Equipment (Safety) Regulations 1994*

The Electrical Equipment (Safety) Regulations 1994 [15] implement the requirements of composite Directive 93/68/EEC [16] and cover the supply of electrical equipment which, when properly installed, does not endanger persons, domestic animals or property and provides safe operation of the equipment by users free from electric shock. Low voltage is defined as 50 V a.c. to 1 000 V a.c. or 75 V d.c. to 1 500 V d.c.

Schedule 2 of these Regulations excludes parts for escalators or moving walks, as they are considered to be a factory-built assembly.

A.4.7 *Provision and Use of Work Equipment Regulations 1998*

The Provision and Use of Work Equipment Regulations 1998 [7] require risks to people's health and safety, from equipment they use at work, to be prevented or controlled by ensuring that it is:

— suitable for use;

— maintained in a safe condition; and

— inspected in certain circumstances.

"Work equipment" covers all equipment used by an employee or a self-employed person at work and includes tools, static and mobile machinery, installations and escalator or moving walk equipment.

A.4.8 *Personal Protective Equipment at Work Regulations 1992*

The Personal Protective Equipment at Work Regulations 1992 [17] implement the requirements of Personal Protective Equipment Directive 89/656/EEC [18].

Personal protective equipment means:

> "All equipment designed to be worn or held by a person at work to protect against one or more risks, and any addition or accessory designed to meet this objective."

Personal protective equipment includes:

— helmets;

— eye protection;

— ear protection;

— safety footwear;

— gloves;

— safety harness;

— protective clothing;

— high visibility clothing.

Employers are required to provide suitable personal protective equipment to each of their employees who might be exposed to risk.

Personal protective equipment is to be used as a last resort after all measures to prevent or control risks at source are exhausted.

The Regulations cover suitability, compatibility, maintenance, replacement, information, loss, defect, etc.

A.4.9 *Supply of Machinery (Safety) Regulations 1992 (as amended 1994)*

The Supply of Machinery (Safety) Regulations 1992 [1] implement the requirements of Machinery Directive 98/37/EC [19]. The Machinery Directive applies to a wide range of machines that include chain saws, power presses, tractors, etc., but it is also applicable to escalators and moving walks. Annex 1 of the Machinery Directive lists the essential health and safety requirements that apply to all machines.

NOTE The harmonized standard that supports the Machinery Directive and the Supply of Machinery (Safety) Regulations is BS EN 115.

A.4.10 *Workplace (Health, Safety and Welfare) Regulations 1992*

The Workplace (Health, Safety and Welfare) Regulations 1992 [20] implement the requirements of Workplace Directive 89/654/EEC [21] and aim to ensure that workplaces meet minimum standards of health, safety and welfare.

Regulation 19 requires moving walks and escalators to function safely, be equipped with any necessary safety devices and have one or more identifiable and accessible emergency stop controls.

A.5 Other statutory provisions

In addition to the statutory provisions listed in **A.1**, **A.2**, **A.3** and **A.4**, the following statutory provisions are examples of those that can be applicable to the construction, installation, service and use of escalators and moving walks:

— Building Regulations 2000 [8];
— Construction (Head Protection) Regulations 1989 [22];
— Construction (Health, Safety and Welfare) Regulations 1996 [23];
— Fire Precautions Act 1971 [24];
— Fire Precautions (Sub-surface Railway Stations) Regulations 1989 [25];
— Fire Precautions (Workplace) Regulations 1997 [26];
— Health and Safety (First Aid) Regulations 1981 [27];
— Health and Safety (Safety Signs and Signals) Regulations 1996 [28];
— Manual Handling Operations Regulations 1992 [29];
— Noise at Work Regulations 1989 [30];
— Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 [31].

Annex B (informative)
Examples of checklists for tender documents

B.1 Exchange of information

Typical information that has to be agreed between the purchaser's representative and the escalator or moving walk contractor (see **4.1**) includes:

a) the traffic handling capacity required (see Clause **6**);

b) the number, width, speed, inclination, rise and location of the escalators or moving walks necessary to give adequate escalator or moving walk service in the projected building;

c) any special requirements of local authorities and other requirements set out in the planning permit;

d) the requirements of any relevant statutory regulations;

e) the provision of safe and convenient access to the machinery spaces;

f) the loads that the escalator or moving walk will impose on the building structure and the holes to be left in the floor slab;

g) provisions for remote fixtures, e.g. signage, emergency stop buttons, etc.;

h) any special monitoring or control features;

i) the necessity for and type of isolation to minimize the transmission of vibration and noise to other parts of the building (see **5.5**);

j) machinery space heating and ventilation, if necessary;

k) the need for the builder to maintain accuracy of building in relation to dimensions, horizontal and vertical alignment and agreed tolerances (see **5.2**);

l) the time required for preparation and approval of relevant details and drawings for the manufacture and the installation of the escalator or moving walk equipment;

m) the requirements for supports and interfaces to the building structure;

n) the requirements for electrical supply, feeders, associated switchgear, etc.;

o) the time at which electric power will be required before completion of the escalator or moving walk contract;

p) the requirements for scaffolding in the structural opening and protection of the escalator or moving walk surround prior to and during installation and testing of equipment;

q) any special operational conditions;

r) any special environmental requirements;

s) delivery, installation and storage of equipment;

t) the means of escape in the event of fire or other emergency.

NOTE Attention is drawn to the requirements of Supply of Machinery (Safety) Regulations 1992 [1] and the Construction (Design and Management) Regulations 1994 [3].

B.2 Escalator or moving walk enquiry or invitation to tender

B.2.1 *General*

In addition to the exchange of information in **B.1** the following is a non-exhaustive list of the basic data needed by the contractor for each escalator or moving walk (see **4.2.1**):

a) customer's identification of escalator or moving walk;

b) rated speed, nominal step width, inclination (see **6.2** and **6.3**);

c) escalator rise or moving walk travel distance;

d) location and designation of levels served;

e) arrangement of a multiple escalator or moving walk installation (see **7.1** and Figure 1);

f) electricity supply (including emergency power supply): voltage, frequency, capacity, tolerance, etc. (see Clause **8**);

g) required design life;

h) escalator or moving walk duty cycle and control options (see **9.2** and **9.3**);

i) ride quality;

j) control system and indicators (see Clause **9**);

k) additional items (see **4.2.2**);

l) facilities for access by disabled persons (see Clause **10**, **A.3** and BS 8300);

NOTE Attention is drawn to the Disability Discrimination Act 1995 [2] and to the Building Regulations 2000 [8], Approved Document M.

m) fire detection and suppression systems to be used;

n) finishes (see **4.2.3**);

o) vandal-resistant requirements;

p) inclusions and exclusions (see **B.2.2** and **B.2.3**);

q) site programme (see **4.2.6**);

r) pre-tender-stage health and safety plan (see **4.2.7**);

s) building construction method (see **4.2.2**);

t) capacity and availability of cranage facilities;

u) escalator or moving walk emergency stop;

v) additional signs, notices for use and signals.

B.2.2 *Items normally supplied by the contractor*

The contractor normally supplies the following items (see **4.2.4**):

a) vibration isolation for the escalator or moving walk;

b) connections for alarm signals, where required;

c) electrical wiring and cables for the escalator or moving walk;

d) connection points for remote monitoring, where required;

e) tackle and small electrical tools for use during the actual installation;

f) services of personnel to install, commission and test;

g) test instruments;

h) test weights, if required;

i) operator training and instruction handbook;

j) cranage.

B.2.3 ***Items normally supplied by the building contractor***

The building contractor normally supplies the following items (see **4.2.4**):

a) builders' work, such as forming the structural openings plumb and square in accordance with the contractor's approved drawings, along with marked grid lines and datum points;

NOTE 1 Attention is drawn to local bye-laws and legislation, e.g. the Construction (Design and Management) Regulations 1994 [3] and the Health and Safety at Work, etc. Act 1974 [4], regarding any work carried out.

b) forming the support points to take the imposed loads, i.e. the supply/fixing of structural steelwork;

c) forming the machine room floor, including any reinforcement necessary for the imposed loads;

d) supplying and fixing of proof-tested, certified and marked temporary lifting beams above the support points along with adequate access scaffolding, including crash decking, where applicable;

e) supplying and fixing of proof-tested, certified and marked permanent lifting beams in the machine room;

f) provision of safe and adequate access to the machine room or machinery space;

g) supplying or fixing of access doors to the machine room, machinery space, emergency doors and inspection doors and their locks;

h) provision of completely weather-resistant installation location prior to delivery, including, if required, a secure storage area for associated materials/equipment;

i) guarding of structural openings, edge protection, harness anchorages and other measures necessary to ensure the safety and convenience of all personnel within the building;

j) provision of general access/egress lighting and a power supply for task lighting in the working areas throughout the duration of all activities;

k) supplying or installation of any electrical wiring external to the escalator or moving walk;

l) provision of three-phase and single-phase electrical power supplies prior to the commencement of the installation of the equipment and any other ancillary power supplies;

m) provision of permanent three-phase and single-phase electrical supplies at final commissioning (see **4.3.6**);

n) provision of flat surface at offloading point for crane and articulated vehicle, capable of withstanding the imposed loads;

o) provision of an agreed access route of entry on site and through the building free from all obstructions such as dwarf walls, beams, etc.;

p) provision of floor props, load spreading equipment, etc. as necessary along route of entry and ramping of any discrepancies between levels, capable of withstanding the imposed loads;

q) provision of protection to any finishes along the agreed access route, i.e. roadways, pavements, floors, walls, etc.;

r) provision of pulling and tieback anchorages, as necessary, along the access route;

s) offloading and storage in a protected area of escalator or moving walk materials and equipment that the contractor has delivered;

t) connection and testing of services, i.e. sprinkler systems, fire alarms, etc.;

u) provision and maintenance of temporary protection (over and above the protective skin provided by the contractor) to prevent damage by other trades, e.g. escalator or moving walk equipment damaged by dust produced from such processes as dry grinding and other building work;

NOTE 2 Cleaning should only be performed by, or under the supervision of, the contractor.

v) supplying and fixing of permanent access ladders, steps and guard rails;

w) provision of permanent ventilation or other arrangements to ensure a machine room temperature between 5 °C and 40 °C for escalators or moving walks in operation prior to testing;

x) ensuring that, when installed, the escalator or moving walk is not used as a thoroughfare or support for scaffolding/working platforms by other trades;

y) provision of any special requirements for road closures and traffic management and liaising with local authorities, insurance companies, consultants, other bodies or officials;

z) provision of calculations with respect to the building, or the obtaining of any necessary permissions and the issue of relevant notices;

aa) carrying out any role specified in the Construction (Design and Management) Regulations 1994 [3] other than that of "contractor";

ab) provision of mess rooms, sanitary accommodation and welfare facilities for personnel.

Annex C (normative)
Safety signs and warning notices

Safety signs and warning notices should be provided on, or adjacent, to the entrances to the escalator or moving walk. The wording of these notices should be in accordance with BS EN 115:1995, Clause **15**.

NOTE Attention is drawn to the Health and Safety (Safety Signs and Signals) Regulations 1996 [28], which require specific safety signs to be provided in workplaces whenever there is a risk that has not been avoided or controlled by other means, e.g. by engineering controls. Requirements for safety signs are specified in BS 5499-5.

The diameter or height of safety signs should be not less than 80 mm and the height of the sign plate and the lettering of the warning notices thereon should follow the preferred relationships recommended in BS 5499-1.

The following notices should be provided as a minimum:

a) "Small children must be held firmly" (BS EN 115:1995, Figure 6);

b) "Dogs must be carried" (BS EN 115:1995, Figure 8);

c) "Stand facing the direction of travel, keep feet away from sides" (BS EN 115:1995, Figure 7);

d) "Hold the handrail" (BS EN 115:1995, Figure 7).

Additional notices should be provided as required by local conditions. Examples include:

— "Use permitted only in footwear";
— "Transportation of bulky and heavy loads not permitted";
— "Transportation of pushchairs not permitted";
— "Not suitable for wheelchairs".

Annex D (informative)
Handling capacity

NOTE 1 The guidance given in this annex is applicable to the commonly available escalators and moving walks described in **4.1**.

BS EN 115 gives a formula for the theoretical handling capacity of an escalator or passenger conveyor (moving walk) as:

$c_t = v \times 3\,600 \times k/0.4$

where

c_t is the theoretical capacity (persons per hour);

v is the rated speed (m/s);

k is the factor (loading).

NOTE 2 The constant 0.4 arises as step depths are generally 0.4 m.

The factor k for various nominal step widths (z_1) is given as:

— $k = 1$ for $z_1 = 600$ mm, i.e. one person per step;

— $k = 1.5$ for $z_1 = 800$ mm, i.e. one and one half persons per step;

— $k = 2$ for $z_1 = 1\,000$ mm, i.e. two persons per step.

This level of theoretical loading equates to a passenger density per step of between 4.2 persons per square metre and 5.0 persons per square metre. Densities of this value are only found in enclosed spaces such as lift cars and are considered undesirable. It has been observed in transportation facilities, office and shopping centre situations that the practical levels of occupancy are approximately 50 % of the theoretical. Using this density, Table D.1 gives the practical handling capacities in persons per hour for the commonly available escalators.

Table D.1 — Practical handling capacities of commonly available escalators

Speed	**Handling capacity**		
	Step width 1 000 mm	**Step width 800 mm**	**Step width 600 mm**
m/s	persons per hour	persons per hour	persons per hour
0.50	4 500	3 375	2 250
0.65	5 850	4 388	2 925
0.75	6 750	5 063	3 375

BS EN 115 assumes the same passenger density for moving walks. Experience suggests that a density of 2.0 persons per square metre is likely and this assumption allows for the handling capacity of the widest moving walks to be provided in Table D.2 in persons per hour.

Table D.2 — Practical handling capacities of commonly available moving walks

Incline	**Speed**	**Handling capacity**	
		Moving walk width 1 000 mm	**Moving walk width 1 400 mm**
degrees	m/s	persons per hour	persons per hour
0	0.50	3 600	5 040
0	0.65	4 560	6 350
0	0.75	5 400	7 560
6	0.50	3 600	5 040
10	0.50	3 600	—
12	0.50	3 600	—

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BS 5655-6:2002, *Lifts and service lifts — Part 6: Code of practice for the selection and installation of new lifts.*

BS 5656-1:1997, *Safety rules for the construction and installation of escalators and passenger conveyors — Part 1: Specification and proformas for test and examination of new installations.*

BS 8300:2001, *Design of buildings and their approaches to meet the needs of disabled people — Code of practice.*

BS EN 61000-6-1:2001, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 6-1: Immunity for residential, commercial and light-industrial environments.*

BS EN 61000-6-2:2001, *Electromagnetic compatibility (EMC) — Part 6: Generic standards — Section 6-2: Immunity standard for industrial environments.*

BS EN 13015:2001, *Maintenance for escalators or moving walks and escalators — Rules for maintenance instructions.*

Other publications

NOTE Acts and regulations are published by The Stationery Office and enquiries concerning their availability should be directed to: The Stationery Office, Publications Centre, 51 Nine Elms Lane, London SW8 5DR. Tel: 0870 600 5522. Fax: 0870 600 5533. E-mail: esupport@theso.co.uk. Website: http://www.thestationeryoffice.co.uk.

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