BRITISH STANDARD

BS 2655-6: 1970

Incorporating Amendment Nos. 1, 2, 3, 4 and 5

Specification for

Lifts, escalators, passenger conveyors and paternosters —

Part 6: Building construction requirements

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Associated Offices' Technical Committee*
Association of Consulting Engineers
Association of Mining Electrical and Mechanical Engineers
Board of Trade
British Chemical Plant Manufacturers' Association
British Compressed Air Society
British Electrical and Allied Manufacturers' Association*
British Gear Manufacturers' Association
British Internal Combustion Engine Manufacturers' Association
British Mechanical Engineering Confederation*
British Pump Manufacturers' Association
British Steel Industry
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The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Railways Board
Department of Health and Social Security
Draughtsmen's and Allied Technician's Association
Electrical Trades Union
Engineers Surveyors' Association
Federation of Wire Rope Manufacturers of Great Britain
Fire Offices' Committee
Greater London Council
Institution of Electrical Engineers
Institution of Municipal Engineers
Ministry of Housing and Local Government
National Association of Lift Makers
Post Office
Retail Trading Standards Association

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Contents

Foreword

This British Standard, prepared under the authority of the Mechanical Engineering Industry Standards Committee, is a revision of and supersedes the 1958 edition of BS 2655, which was entitled "*Electric lifts*".

The new title reflects the extension of the scope of this British Standard. Amendments to Parts 2 and 3 have been published, and implement the change in title. The revised Part 1 and additional new parts are being published separately and, together with Parts 2 and 3, are as follows:

Part 1: General requirements for electric, hydraulic and hand-powered lifts. This part is basically a revision of the 1958 edition of BS 2655-1[1)], without the building requirements and list of definitions, and extended to cover the engineering and safety requirements for new hydraulic and hand-powered lifts as well as for new electric lifts.

Part 2: Single speed Polyphase induction motors for driving lifts. This part covers the type of electric motor specially designed for driving lifts. It should be used in conjunction with BS 2613[2)] and gives additional requirements, including the class of lift rating and special limits of temperature rise.

Part 3: Arrangements of standard electric lifts. This part gives standard dimensions for lift wells and machine rooms in relation to lift capacity and platform sizes, for seven classes of lifts.

Part 4: General requirements for escalators and passenger conveyors. This part specifies engineering and safety requirements for escalators and passenger conveyors. The latter may be described as machines in which the passenger carrying surface remains parallel to the direction of motion and is uninterrupted.

Part 5: General requirements for paternosters. This part specifies engineering and safety requirements for paternosters, which may be described as machines where series of cars are continuously running in closed loops and are characterized by the car floors remaining substantially horizontal when the direction of motion is reversed at the extremities of car travel.

Part 6: Building construction requirements. This part specifies structural and fire resistance requirements for the equipment covered by Parts 1, 4 and 5.

Part 7: Testing and inspection. This part specifies tests, examination and certification of new and modified equipment covered by Parts 1, 4 and 5.

Part 8: Modernization or reconstruction of lifts, escalators and paternosters. This part specifies engineering and safety requirements.

Part 9: Definitions. This part gives definitions of terms used in the remainder of the standard.

Part 10: General requirements for guarding. This part specifies requirements for the guarding of moving parts and protection against hazards from electrical equipment. It relates to equipment covered in Parts 1, 4 and 5.

CP 407:1972. British Standard Code of Practice for electric, hydraulic and hand-powered lifts.

The code gives general information and guidance for planning, purchasing, installation and maintenance of passenger, goods and service lifts.

In case of difficulty in classifying any equipment in accordance with the headings of Parts 1, 4 and 5, reference should be made to the relevant definitions in Part 9.

This Part 6 of the standard applies to the building construction requirements for the equipment covered by Parts 1, 4 and 5. Those clauses of the text which relate to powered lifts are based on Appendix B of the 1958 edition of BS 2655-1, with the following broad change. The requirements for top clearances and bottom overtravel, formerly part of Appendix B, are now transferred to the main body of Part 1 of the standard.

[1)] BS 2655, "*Electric lifts*" — Part 1: "*General Requirements*".

[2)] BS 2613, "*The electrical performance of rotating electrical machinery*".

The building requirements for the equipment covered by the standard have been brought together under one cover because of their interest to the architect or other person responsible for specifying the details of building construction. This last mentioned function is not, of course, the prime responsibility of the equipment manufacturer.

In covering the building construction requirements for escalators it has been borne in mind that, apart from their use by public transport undertakings, they are finding increasing application in shops and department stores. In the latter case they are frequently supplied by the manufacturers as complete units, with such items as machinery and control compartments forming an integral part of the escalator. This contrasts with the former case in which a machine room is provided.

Throughout this standard the metric and imperial systems are used side by side, but it is important that each contract shall use either the metric system throughout or the imperial system throughout. A mixture of the two may lead to complications, particularly in relation to ratings of lifts and lift speeds.

Section 2 of this Part of this standard is rendered obsolescent concurrently with the publication of BS 5655 "*Lifts and service lifts*" — Part 1:1979 "*Safety rules for the construction and installation of electric lifts*" and Part 2:1983 "*Specification for hydraulic lifts*", under the implementation conditions stated in those standards.

The relevant requirements of section 2 of BS 2655-6:1970 remain current only

1) when applied to service lifts, hand-powered lifts, paternosters, escalators and passenger conveyors as specified in sections 3, 4, 5 and 6 and when specific clauses in section 2 are invoked in those sections;

2) when required for the future maintenance and inspection of existing electric or hydraulic installations constructed in accordance with BS 2655.

Although BS 2655-4:1969 "*General requirements for escalators and passenger conveyors*" has also been made obsolescent by the publication of BS 5656 "*Safety rules for the construction and installation of escalators and passenger conveyors*" the building requirements specified in section 6 are still relevant pending the transfer of those requirements to a specification related to BS 5656.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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 to iv, pages 1 to 9 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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1 General

1.1 Scope

This Part of this British Standard applies to the building construction requirements for escalators, lifts, passenger conveyors and paternosters. The requirements for lifts are subdivided into those for powered lifts and hand-powered lifts.

Additional building work requirements (such as fixings, cutting away for switches and "making good") are not covered by the standard, and reference should be made to the drawings supplied by the manufacturer of the equipment.

1.2 Statutory regulations

Where reference is made in this standard to the "Building Regulations", this means compliance with:

1) the Building Regulations, 1965, applicable in England and Wales except inner London;

2) the London Building Acts, 1930:1939, and Construction byelaws in force thereunder, or

3) the Building Standards (Scotland) Regulations, 1963;

4) any revisions to the above currently in force.

2 Passenger and goods lifts (powered)

2.1 Lift well construction

A lift well, in association with its machine room, shall be arranged for the car and its counterweight to travel in the same lift well in juxtaposition to one another. The use of lift wells shall be restricted to the lift installation, and no other services shall be accommodated therein. The well, however, may contain certain heating equipment for the lift well, excluding hot water and steam heating; any control and adjustment devices shall be located outside the well.

The lift well shall not form part of the ventilation system of the building. Where two or more lifts are fixed in a common lift well, a rigid partition having a minimum height of 2.5 m shall be fixed at the bottom between any two lifts.

If the horizontal distance between the edge of a car roof and a moving part (car or counterweight) of an adjacent lift is less than 300 mm, this partition shall be extended for the full height of the well and over the width to be guarded. This width shall be at least equal to that of the moving part (or part of this) which is to be guarded, plus 0.1 m on each side.

2.2 Lift well enclosure

2.2.1 Materials of construction. Lift well enclosures shall be provided and shall be continuous on all sides from the pit to the top of the lift well. Such enclosures shall be imperforate except for doors and necessary access panels.

2.2.2 Strength. Lift well enclosures shall be of sufficient strength to support the lift guides at appropriate intervals, and to support in true alignment the landing doors with operating mechanisms and locking devices.

The structure of the well shall also be capable of supporting the loads that may be imposed by the machine, the guides during safety gear operation, the buffers, the tie down (anti-jump) device, etc.

Non-structural parts of the enclosure shall be capable of withstanding a horizontal force of 440 N (45 kgf) or 100 lbf applied at any point without under-going elastic deformation of more than 25 mm or 1 in.

2.2.3 Fire resistance

2.2.3.1 The material of construction shall be non-combustible and shall not be such that it might give off harmful gas or fumes in case of fire.

Where there is a statutory requirement for fire resistance of lift well enclosures and doors, the requirements of the current issue of the building regulations shall apply.

2.2.3.2 When the entrances having access to the lift well have doors which automatically close, the degree of fire resistance of the entrances shall be at least half that required for the enclosure.

Thus for lift well enclosures, the fire resistance of which is required to be one hour or less, the required fire resistance of the entrance shall be half an hour. Where the required fire resistance of the lift well enclosure is greater than one hour but not more than two hours, the required fire resistance of the entrance shall be one hour.

2.2.3.3 When the entrances having access to the lift well have doors which are manually closed, the degree of fire resistance of the entrances shall not be less than that required for the enclosure.

Thus for lift well enclosures, the fire resistance of which is required to be no greater than half an hour, the required fire resistance of the entrance shall be half an hour. When the required fire resistance of the lift well enclosure is greater than half an hour but not more than one hour, the required fire resistance of the entrance shall be one hour.

2.2.3.4 Landing doors and frames shall have a fire resistance NOT exceeding one hour. Where meeting the requirements of the first paragraph of **2.2.3.2** and **2.2.3.3** results in the need for a lift well entrance having a fire resistance exceeding one hour, the fire resistance in excess of one hour shall be provided by protection which is additional to the landing door. This protection, which is not supplied by the lift maker, may be in the form of a roller shutter with a fusible link.

2.2.3.5 Automatically or self-closing doors are not smoke-proof or smoke-tight, particularly in the case of sliding doors. Accordingly, if it is required that entrances to lift wells shall be smoke-tight, auxiliary protective means shall be provided in addition to the doors normally provided by the lift maker.

2.2.4 Vents. Provision shall be made at the top of the lift well enclosure for a vent with a minimum free area of 0.1 m^2, or 1 % of the well area, whichever is the greater, to allow for any accumulation of smoke therein to escape directly into the open air. For lifts whose speed exceeds 2.50 m/s the vent(s) shall be not less than 0.30 m^2 in free area for each lift well.

A common lift well for 1, 2 or 3 lifts whose speeds exceed 2.50 m/s requires a minimum vent area of 0.30 m^2. If the number of lifts is 4, 5 or 6 the minimum vent area shall be 0.40 m^2, 0.50 m^2 or 0.60 m^2 respectively.

The vents should be louvered or otherwise protected to prevent rain or birds entering the lift well.

The well shall not be used for the ventilation of rooms not associated with the lift installation or for the ventilation of the machine room.

2.2.5 Lift well inner surface. The inner surfaces of the lift well enclosure facing any car entrance shall, as far as is practicable, form a smooth continuous flush surface without projections or recesses.

Where any projections of tops of recesses cannot be made flush, they shall be bevelled on the underside to an angle of 75° from the horizontal by means of metal plates, concrete or other similar non-combustible material.

Other inner surfaces of the lift well enclosure shall, as far as is practicable, form a continuous flush surface without projections or recesses.

2.2.6 Clearances. The clearance between the lift well enclosure and the car sill, and between the lift well enclosure and any car entrance column, jamb or equipment projecting therefrom and extending the height of the lift car shall not exceed 150 mm or 6 in throughout the travel of the car in the lift well except at landing entrances.

Exception: where vertically bi-parting landing doors or two speed horizontally sliding doors are installed the above clearance may be increased to 230 mm or 9 in and 200 mm or 8 in respectively provided that the car door is opened and closed by power.

NOTE The above exception does not permit any car door on a lift car with more than one entrance to be opened by power unless that car door is opposite a landing entrance or, alternatively, unless the clearance between the car sill and the lift well enclosure is not more than 150 mm or 6 in.

2.2.7 Well illumination. Permanent electric lighting shall be provided in the well for illumination during service or repairs, even when all doors are closed. The lighting shall comprise one lamp at nor more than 500 mm from the highest and lowest points in the well, with intermediate lamps at 7 m maximum spacing.

2.2.8 Entrances. There shall be no entrance in a lift well enclosure that permits access to the lift car by passing under the counterweight.

2.2.8.1 *Emergency doors.* When a lift passes non-stop through a long section of well without any landing entrances being provided, emergency openings shall be arranged in front of each of the car entrances at not more than 11 m apart. The lift maker will provide such details to suit the conditions of a particular building and lift installation.

The fire resistance of each entrance shall be not less than that of the enclosure. The door(s) shall not open into the well, they shall be imperforate and satisfy the same requirements for mechanical strength as the landing doors at the normal lift entrances.

The door(s) to any emergency opening shall be fitted with a key operated lock, capable of being reclosed and relocked without a key. (The lock shall not include a device to retain the bolt in a retracted position.) The key shall bear a label drawing attention to the danger of using this key and the need to make sure the door is locked after closing. The door shall be openable from within the well without a key, even when locked.

The door(s) shall be electrically interlocked with the lift safety circuit.

A permanent notice shall be displayed on the outside of the door(s) stating LIFT WELL — DANGER. ACCESS FORBIDDEN TO UNAUTHORIZED PERSONNEL. CLOSE AND LOCK THIS DOOR.

Emergency doors shall have the following clear dimensions:

height, at least 1 800 mm

width, at least 350 mm

2.2.8.2 *Inspection doors and inspection trap doors.* These are permitted only where a specific servicing requirement exists or where the safety of personnel using the lift would otherwise be jeopardized. Inspection doors and inspection trap doors shall comply with all the requirements specified for emergency doors.

An inspection trap door may be fitted with a means of overriding the electrical interlock with the lift safety circuit using a constant pressure device only accessible with the trap door open.

The doors shall have the following clear dimensions.

Inspection door: height at least 1 400 mm, and width at least 600 mm

Inspection trap door: height at least 500 mm, and width at least 350 mm

2.3 Lift pits

2.3.1 A lift pit shall be provided at the bottom of every lift well. Lift pits shall be of sound water-proof construction, after allowance has been made for appropriate fixings, and the floor shall be approximately level and have a smooth finish.

It is undesirable for accessible space to occur under a lift pit. Where this is unavoidable, such as in an existing building, the buffer supports shall be of sufficient strength to withstand the buffer loads imposed by the car and the counterweight as calculated in accordance with **2.2.4** of BS 2655-1:1970. Additionally, there shall be installed, under the counterweight buffer,

a) a solid pier down to solid ground, or

b) the counterweight shall be fitted with a safety gear.

If there is an access door to the pit, other than the landing door, it shall comply with the requirements of **2.2.8.1** and **2.2.8.2**. Such a door is recommended if the pit depth exceeds 2.5 m and if the layout of the premises so permits.

If there is no other access a permanent means shall be provided, easily accessible from the landing door, to permit competent personnel to descend safely into the pit. This shall not project into the clear running space of the lift equipment.

2.3.2 The bore hole for direct acting hydraulic lifts shall be lined with a tube which prevents its collapse and which prevents the ingress of water. The tube shall provide sufficient clearance around the jack to allow the cylinder to be inspected with instruments.

2.4 Machine rooms

2.4.1 General requirements. A machine room shall be provided for, and restricted to, the housing of the lift machine(s) and associated equipment.

In no case shall machine or pulley rooms be used for purposes other than lifts. They shall not contain cables or devices other than for the lift.

These rooms may, however, contain:

a) machines for service lifts or escalators;

b) equipment for airconditioning or heating these rooms, excluding hot water or steam heating;

c) fire detectors or extinguishers, with a high operating temperature suited to the electrical equipment, stable over a period of time, and suitably protected against accidental impact.

Any secondary machine room in which motor generators and ancillary equipment are installed shall comply with the requirements for machine rooms.

When the function of the building requires it (e.g. dwellings, hotels, hospitals, schools, libraries, etc.) the wall, floors and ceilings of machine rooms shall absorb substantially the sounds associated with the operation of the lifts.

Fixed ladders in machine rooms shall be installed in accordance with BS 4211.

2.4.2 Materials of construction. The machine rooms shall be constructed of elements whose fire resistance is in accordance with the Building Regulations, and precautions should be taken to minimize spread of fire from the machine room into the lift well or from the machine room to adjacent parts of the building.

Machine rooms shall be soundly constructed to withstand the forces to which they will normally be subjected.

The floors shall have a non-slip surface and shall be imperforate except for the minimum number of openings necessary for the passage of ropes, etc. The dimension of such holes in the slab and machine room floor shall be reduced to a minimum, with the aim of removing the danger of objects falling through. To this end, for openings situated above the well (including those for electric cables), ferrules or other effective means shall be used, which project at least 50 mm above the slab or finished floor.

Machine room floors should preferably be at one level. Where a change of level of more than 500 mm occurs in the floor, stairs or steps and guard rails shall be provided.

The floor walls and ceiling of the machine room shall be treated, e.g. tiled or at least painted, to reduce the production of dust and grit to a minimum.

2.4.3 Internal clearance and maintenance provisions. Machine room dimensions shall allow easy and safe access

a) for personnel to any part of the equipment, and

b) for removal of equipment.

One or more steel beams or other suitable supports shall be provided at high level in the machine room suitably positioned to accommodate the lifting apparatus and to permit the hoisting, installation and possible replacement of heavy equipment. The safe working loads shall be clearly marked on these supports.

Machine rooms shall be provided with a floor capable of sustaining the heaviest unit of the lift machinery.

Machine rooms shall, 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 shall not be exhausted into the machine room.

They shall be soundly constructed, weatherproof and dry, with provision for permanent ventilation to the open air not less than 0.10 m^2 of free area per lift.

Machine room dimensions shall allow the following clearances.

c) At least 900 mm in front of the controllers and for the full width of them, but not less than 500 mm wide.

d) At least 500 mm behind the controllers (where access to the back is only for purposes not requiring the controller to be energized) and for the same width as required at the front. Where controllers have permanent enclosures not requiring access to the back, no clear space is required at the back. Where controllers require access to the back for purposes requiring the controller to be energized, at least 900 mm clearance at the back shall be provided and for the same width as required at the front.

e) At least 500 mm × 600 mm clear horizontal area for servicing and inspecting moving parts, where this is necessary.

f) At least 500 mm wide passageways to all the foregoing, which may reduce to 400 mm wide in areas devoid of moving parts.

g) At least 300 mm above the highest point of the machine (including rotating parts) and above pulleys (excluding diverters mounted immediately under the lift machine).

h) At least 2 150 mm clear height from the floor of the main movement/working area. In practice this will be increased to accommodate lifting equipment.

i) At least 1 500 mm clear height in such as pulley rooms unless controllers are installed inside, in which case the minimum height shall be 2 150 mm.

Permanent electric lighting shall be provided in machine rooms to give at least 200 lx at floor level and particularly around machinery and controllers. Light switch(es) shall be adjacent to the personnel access point(s). The lighting shall be independent of the power supply to the machine room unless connected before the live side of the main switch. At least one switched socket-outlet shall be provided in each machine room.

2.4.4 Access. Access from the public way to the interior of the rooms containing the machines, their associated equipment and pulleys shall be convenient and safe throughout, and without there being need to pass through private accommodation. The access route shall be well illuminated.

The routes to the machine rooms and access points shall have a minimum headroom of 1.8 m. Sills and edges not exceeding 0.4 m high at, or in front of, the entrance are discounted.

Access for personnel to machine or pulley rooms shall, for preference, be effected entirely by way of stairways.

If it is difficult to install stairs, ladders may be used that satisfy the following conditions.

a) They shall not be liable to slip or to turn over.

b) They shall, when in position, form an angle between 70° and 76° with the horizontal, unless they are fixed and their height is less than 1.5 m.

c) They shall be used exclusively for this purpose and be kept always available in the vicinity; the necessary provisions shall be made for that purpose.

d) Adjacent to the top end of the ladder, there shall be one or more hand holds within easy reach.

Doors giving access to machine rooms and pulley rooms shall not open inwards. The doors shall be secure against unauthorized access and shall be fitted with key operated locks that can be opened without a key from inside. The doors shall have the following clear dimensions:

e) width, at least 600 mm (unless increased for equipment access);

f) height, at least 1 800 mm into main machine room or controller room;

g) height, at least 1 100 mm into secondary machine room (pulley room).

A permanent notice reading DANGER. LIFT MACHINERY. UNAUTHORIZED ACCESS PROHIBITED. DOOR TO BE KEPT LOCKED shall be displayed on the outside of the machine room door. The characters shall be not less than 13 mm high.

When personnel access is via a trap door, a permanent notice shall be displayed in the machine room, adjacent to the trap door, stating DANGER OF FALLING. RECLOSE THE TRAP DOOR. The character size shall be as stated for machine room doors.

Permanent means shall be provided to reduce the risk of personnel or materials falling through an open trap provided for personnel access.

Trapdoors for personnel access shall:

h) provide a clear passage of at least 800 mm × 800 mm;

i) when closed, be flush with finished floor and capable of supporting safely the mass of two persons or 200 kg at any point;

j) be counterbalanced and open upwards unless associated with retractable ladders;

k) be fitted with key operated locks that can be opened without a key from inside the room.

Trapdoors for equipment access shall:

l) when closed, be flush with finished floor;

m) be lockable only from inside the machine room;

n) be soundly constructed, since they may be required temporarily to support heavy machinery.

2.4.5 Ventilation. All machine rooms and pulley rooms shall be provided with adequate ventilation.

The ambient temperature in the machine rooms shall be maintained within the following limits:

a) + 5 °C and 40 °C for traction drive machines;

b) + 15 °C and 35 °C for hydraulic lift pump rooms.

2.5 Multi-level machine rooms

The penthouses or other space in which overhead pulleys, overspeed governors and other machinery are housed shall have a clear height of at least 1.20 m or 4 ft, shall allow safe and convenient access, shall have a substantial platform or floor, and be provided with permanent and adequate artificial illumination. Both platforms and access shall be provided with guard rails.

2.6 Machine supports

All machines, pulleys, overspeed governors and similar units shall be supported and held to prevent any unit from becoming loose or displaced. Supporting beams shall be of steel or reinforced concrete.

When calculating the size of beams and their supports, the total load on the beams shall be taken as the weight of all fixed apparatus supported by the beams, plus TWICE the weight of those parts of the lift which have vertical motion (including the contract load).

The deflection of the beams with load as specified above shall not exceed 1/1 500 of the distance across the lift well. The datum for deflection is taken as a straight line between the beam supports on the lift well. For the purpose of calculation these beams shall be treated as simply supported.

2.7 Sprinklers

If sprinklers are installed in lift wells or machine rooms they shall be of a type which does not deteriorate in service and shall be adequately guarded against accidental damage.

3 Service lifts (powered)

3.1 Lift well construction

A lift well, in association with its machine room, shall be arranged for the car and its counterweight to travel in the same lift well in juxtaposition to one another.

The use of lift wells shall be restricted to the lift installation and no other services shall be accommodated therein.

The lift well shall not form part of the ventilation system of the building.

Sufficient clearances at the top and bottom shall be provided so that if the car or counterweight strikes the buffers, the counterweight or car respectively shall not strike any portion of the top of the lift well structure.

3.2 Lift well enclosure

3.2.1 Materials of construction. The requirements of **2.2.1** apply.

3.2.2 Strength. The requirements of **2.2.2** apply.

3.2.3 Fire resistance. The requirements of **2.2.3** apply, except that where local or national building regulations permit, the requirements of the first paragraph of **2.2.3.1** do not apply.

3.2.4 Entrances. There shall be no entrance in a lift well enclosure that permits access to the lift car by passing under the counterweight.

3.2.5 Lift well inner surface. The requirements of **2.2.5** apply.

3.2.6 Clearances. The requirements of **2.2.6** apply.

3.3 Lift pits

The requirements of **2.3.1** apply, unless the bottom serving height is above floor level, in which case the requirements of **4.3** apply.

3.4 Machine rooms

It is usual to accommodate the machine with its ancillary equipment within the lift well.

Where a machine room is separate from the lift well, a safe and convenient means of access at all times shall be provided. The machine room shall be soundly constructed, weather-proof, dry and provided with adequate ventilation, and shall provide access to all parts of the equipment.

Adequate machine room space shall be provided for the controller(s) to be arranged, with the following clearances. A clear space of 0.90 m or 3 ft is required in front of all controllers, since they must of necessity be energized for maintenance purposes. Where access to the back or sides of a controller is only for such purposes as do not require the controller to be energized, then a minimum clear space of 0.50 m or 1 ft 9 in shall be provided. Where a controller is permanently enclosed with no possible access at the sides or back, then no clear space is required at the sides or back.

Permanent provision for adequate artificial light shall be made in machine rooms and penthouses, and the light switch shall be fixed adjacent to the entrance. At least one 3-pin socket outlet suitable for use with portable lamps or tools shall be provided in the machine room.

A permanent notice reading "DANGER. LIFT MACHINERY. UNAUTHORIZED ACCESS PROHIBITED. DOOR TO BE KEPT LOCKED" shall be displayed on the outside of the machine room door. The characters shall not be less than 13 mm or ½ in high.

3.5 Sprinklers

The requirements of **2.7** apply.

4 Hand-powered lifts

4.1 Lift well construction

A lift well, in association with its machine room, shall be arranged for the car and its counterweight to travel in juxtaposition to one another.

The use of lift wells shall be restricted to the lift installation and no other services shall be accommodated therein.

The lift well shall not form part of the ventilation system of the building.

4.2 Lift well enclosure

4.2.1 Materials of construction. The requirements of **2.2.1** apply.

4.2.2 Strength. The requirements of **2.2.2** apply.

4.2.3 Fire resistance. The requirements of **3.2.3** apply.

4.2.4 Entrance. There shall be no entrance in a lift well enclosure that permits access to the lift car by passing under the counterweight.

4.2.5 Lift well inner surface. The requirements of **2.2.5** apply.

4.2.6 Clearances. The requirements of **2.2.6** apply.

4.3 Lift pits

Lifts may be constructed without a pit. In such a case a protective guard, forming part of the enclosure and whose height shall be level with the cage floor, shall be provided. Where a lift pit is provided at the bottom of the lift well, the pit shall be of sound water-proof construction, after allowance has been made for appropriate fixings, and the floor shall be approximately level and have a smooth finish.

It is undesirable that any accessible space be permitted under a lift pit. Where such a space exists, the pit floor shall be of sufficient strength to with-stand forces imposed by free falling counterweights and loaded cars.

4.4 Machine rooms

It is usual to accommodate the machine with its ancillary equipment within the lift well. All machine rooms should have at least 1.20 m or 4 ft clear height, but this may be reduced when machinery is enclosed within the lift well. Where a machine room is separate from the lift well a safe and convenient means of access at all times shall be provided. The machine room shall be soundly constructed, weather-proof, dry and provided with adequate ventilation, and shall provide access to all parts of the equipment.

Permanent provision for adequate artificial light shall be made in separate machine rooms and penthouses and the light switch shall be fixed adjacent to the entrance. At least one 3-pin socket outlet for use with portable lamps or tools shall be provided in the machine room.

Where a control rope passes through floors, suitable fairings shall be provided.

A permanent notice reading "DANGER. LIFT MACHINERY. UNAUTHORIZED ACCESS PROHIBITED. DOORS TO BE KEPT LOCKED" shall be displayed on the outside of the machine room door. The characters shall not be less than 13 mm or ½ in high.

4.5 Sprinklers

The requirements of **2.7** apply.

5 Paternosters

5.1 Paternoster well construction

The use of paternoster wells shall be restricted to the paternoster installation and no other services shall be accommodated therein.

The paternoster well shall not form part of the ventilation system of the building.

When a paternoster passes through a number of floors of a building without any landing entrances being provided at these floors, emergency openings shall be arranged in front of each of the entrances at every third floor.

5.2 Paternoster well enclosure

5.2.1 Materials of construction. Paternoster well enclosures shall be provided and shall be continuous on all sides from the pit to the top of the paternoster well. Such enclosures shall be imperforate except for entrances and necessary access panels.

The material of construction shall be non-combustible and shall not be such that it might give off harmful gas or fumes in case of fire.

5.2.2 Strength. Paternoster well enclosures shall be of sufficient strength to support the paternoster guides at suitable intervals. Non-structural parts of the enclosure shall be capable of withstanding a horizontal force of 440 N (45 kgf) or 100 lbf applied at any point without undergoing elastic deformation of more than 25 mm or 1 in.

5.2.3 Paternoster well inner surface. The inner faces of the paternoster enclosure facing the car entrances shall form a smooth continuous flush surface without projections or recesses.

5.3 Paternoster pits

A paternoster pit shall be provided at the bottom of every paternoster well. Pits shall be of sound water-proof construction and the floor shall be approximately level and have a smooth finish.

A permanent safe means of access to the pit shall be provided for the use of personnel authorized to service the paternoster installation. Where a fixed ladder is provided it shall be located within easy reach of the lockable access door and shall not project into the clear well dimensions.

It is undesirable that any accessible space be permitted under the pit. Where this is unavoidable, the pit floor shall be of sufficient strength to withstand the loads imposed by suspension chain failure.

5.4 Machine rooms

5.4.1 General requirements. The requirements of **2.4.1** apply.

5.4.2 Materials of construction. The requirements of **2.4.2** apply.

5.4.3 Internal clearances and maintenance provisions. Machine rooms shall be arranged to allow reasonable access to, and the removal of, any part of the equipment. A steel joist shall be provided over the machine at a height above the machine platform sufficient to accommodate the machine and lifting apparatus and to allow adequate clearance for the removal of any part of the machine necessary for maintenance purposes. Machine rooms shall be provided with a floor capable of sustaining the heaviest unit of the paternoster machinery.

The machine room shall have a height as indicated on the paternoster maker's drawings so as to allow adequate clearance for the top change-over of the paternoster cars. It shall be soundly constructed, weather-proof and dry, with a provision for permanent ventilation direct to the open air of not less than 0.10 m^2 or 1 ft^2 of free area per paternoster.

Adequate machine room space shall be provided so that the controller can be arranged with the necessary 0.90 m or 3 ft clear space in front for maintenance purposes. The controller shall be permanently enclosed at sides and back.

Permanent provision for adequate artificial light shall be made in machine rooms and the light switch shall be fixed adjacent to the entrance. At least one 3-pin socket outlet suitable for use with portable lamps or tools shall be provided in the machine room.

5.4.4 Access. A safe and convenient route with a minimum clear height of 1.80 m or 6 ft shall be provided for access to the machine room. Where stairs are provided they shall be permanently installed and shall be provided with handrails in the machine room. Trapdoors shall be hinged, balanced and of good construction and fit, so as to minimize the transmission of noise.

Machine rooms shall be secured against unauthorized access.

A permanent notice reading "DANGER. PATERNOSTER MACHINERY. UNAUTHORIZED ACCESS PROHIBITED. DOOR TO BE KEPT LOCKED" shall be displayed on the outside of the machine room door. The characters shall not be less than 13 mm or ½ in high.

5.5 Machine supports

The bedplate of the machine shall be supported and held, to prevent displacement, by a suitable concrete plinth to the dimensions indicated on the paternoster maker's drawings. The plinth shall be supported on steel or reinforced concrete beams.

When calculating the size of beams and supports, the total load on the beams shall be taken as the weight of all apparatus supported by the beams, plus TWICE the weight of those parts of the paternoster which have vertical motion (including the contract load).

The deflection of the beams with load as specified above shall not exceed 1/1 500 of the distance across the paternoster well. The datum for deflection is taken as a straight line between the beam supports on the paternoster well. For the purpose of calculation these beams shall be treated as simply supported.

6 Escalators and passenger conveyors

6.1 Access

Sufficient access in the building and a clear passage for the assembled equipment or its sections to the seating position and supports shall be arranged. Any floors over which the assembled equipment or its sections have to pass shall be of sufficient strength or suitably strutted to support the loads.

6.2 Lifting points

Suitable lifting points shall be provided to enable the assembled equipment or its sections to be lifted and manoeuvred into the installed position.

6.3 Floor openings

Openings in the floor shall be provided and trimmed to accommodate the landing portions of the equipment. The opening in the upper floor shall provide a minimum clear height of 2.30 m or 7 ft 6 in above the nose line of the escalator steps or passenger conveyor belt on the incline.

6.4 Pit

Where the lower landing of the equipment requires excavation, a pit of sound water-proof construction shall be provided.

6.5 Supports

Steel or reinforced concrete beams with bearer plates shall be provided within the building framework to carry the loads imposed by the equipment.

When calculating the size of beams and their supports, the total load on the beams shall be taken as the weight of all apparatus supported by the beams plus TWICE the maximum passenger load carried by the beams when the equipment is at rest.

The factor of safety for beams based on ultimate strength of the material and the load as specified above shall not be less than 5. The deflection of the beams with load as specified above shall not exceed 1/1 500 of the span.

6.6 External enclosure

The sides and undersides of the main trusses and machinery spaces shall be enclosed with non-combustible materials. Means shall be provided for adequate ventilation of the driving machinery and control spaces.

6.7 Protection

Where the equipment passes through an open floor, the exposed sides and the floor opening shall be protected with a solid balustrade to a height at least equivalent to the height of the moving handrail at the landings.

6.8 Fire protection

Floor openings for the equipment shall, if required by local or national regulations, be protected against the passage of flame, smoke or gases in the event of fire. Protective means with the requisite grade of fire resistance are usually selected from the following:

1) a separate building enclosure constructed exclusively for accommodating the equipment;

2) a kiosk or enclosure constructed over the floor opening and so completely enclosing the top landing of the equipment;

3) roller shutters which are automatically released to cover the balustraded floor opening and the equipment at its top landing;

4) a system of sprinklers arranged to protect the floor opening.

6.9 Lighting

Lighting shall be arranged so that all exposed tread surfaces are illuminated to an intensity of not less than 100 lux or 10 foot candles.

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